SPECIFICATION, BILL OF QUANTITIES AND DRAWINGS FOR PROPOSED NEW MAGISTRATES COURT ON ERF 253, JAN KEMPDORP

FOR THE DEPARTMENT OF PUBLIC WORKS & INFRASTRUCTURE FOR MECHANICAL ENGINEERING WORK WHICH INCLUDES ELECTRONICS, ACCESS CONTROL, SECURITY, HVAC, FIRE PROTECTION, PLUMBING AND WET SERVICES SYSTEMS AND A NEW PASSENGER LIFT INSTALLATION

WCS 046363

PART C6: MECHANICAL ENGINEERING

Prepared for:	Prepared by:
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JULY 2021

SUMMARY OF SECTION: BILL OF QUANTITIES

SUMMARY OF SECTION: PART C6: MECHANICAL ENGINEERING	
BOQ SUBTOTAL DESCRIPTION	AMOUNT
SUB TOTAL: PART C6.1 – ELECTRONIC AND SECURITY SYSTEMS	
SUB TOTAL: PART C6.2 – HVAC SYSTEMS	
SUB TOTAL: PART C6.3 FIRE PROTECTION SYSTEMS	
SUB TOTAL: PART C6.4 – PLUMBING AND WET SERVICES	
SUB TOTAL: PART C6.5 – NEW PASSENGER LIFT	
TOTAL AMOUNT FOR MECHANICAL ENGINEERING CARRIED TO THE MAIN TENDER SECTION SUMMARY (EXCLUDING VAT)	

CONTENTS OF SECTIONS:

BILL OF QUANTITIES, SPECIFICATION AND DRAWINGS

FOR

PROPOSED NEW MAGISTRATES COURT ON ERF 253, JAN KEMPDORP FOR THE DEPARTMENT OF PUBLIC WORKS & INFRASTRUCTURE FOR MECHANICAL ENGINEERING WORKS

WCS 046363

PART C6:
PART C6.1: ELECTRONIC AND SAFETY SYSTEMS

Prepared for:	Prepared by:
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JULY 2021

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PART C6.1.1: NOTICE TO TENDERERS

1. The quantities given in the Bill of Quantities are estimates only, and subject to re-measuring during the execution of the work. The Contractor shall obtain the Engineer's detailed instructions for all work before ordering any materials or executing work or making arrangements for it.
2. The Works as finally completed in accordance with the Contract shall be measured and paid for as specified in the Bill of Quantities and in accordance with the General and Special Conditions of Contract, the Specifications and Project Specifications and the Drawings. Unless otherwise stated, items are measured net in accordance with the Drawings, and no allowance has been made for waste.
3. The validity of the contract will in no way be affected by differences between the quantities in the Bill of Quantities and the quantities finally certified for payment.

PART C6.1.2: SCOPE OF WORK

1. General

The installation work to be carried out under this project consists of the following:

(a) CCTV system
(b) Network
(c) Control and monitoring equipment
(d) Integrated Security Management Software (ISMS)
(e) Security Sub-systems integration
(f) Access control system
(g) Emergency Voice Alarm Communication system
(h) Fire detection system
(i) Fire suppression system
(j) Intruder Alarm system
(k) Panic / Duress Alarm system
(l) Boom & Spike barrier system
(m) Emergency Voice Alarm Communication system (Refuge Place)
(n) X-Ray Scanning
(o) Metal detection
(p) Turnstiles
(q) Intercom
(r) Conduits and Trunks
(s) Raised Access Flooring
(t) Maintenance

PART C6.1.3: PROJECT INSTALLATION SPECIFICATIONS

1. General

The installations shall be done and tested in accordance with the following Acts and Regulations:

1.1 General standards and regulations

a) Local municipal by-laws and regulations
b) Local fire regulations
c) National Building Regulations Act (No.103 of 1977)
d) Occupational Health and Safety Act: (No 85 of 1993)
e) Major Hazardous Installations Regulations
f) General Safety Regulations
g) Fire Brigade Services Act (No 99 0f 1987)
h) Electricity act of 1987
i) Explosive act of 1956
j) The Application of the National Building Regulations SANS 10400

1.2 Technical standards and regulations

a) ISO 11064:2006 Ergonomic Design of Control Centres
b) SANS 10222-5-1-1. CCTV installations - CCTV surveillance systems for use in security applications - Operational requirements
c) SANS 10222-5-1-4: CCTV installations - CCTV surveillance systems for use in security applications - Testing, commissioning and hand-over requirements
d) SANS 10222-5-1-5. CCTV installations - CCTV surveillance systems for use in security applications - Maintenance requirements
e) SANS 10139: Fire detection and alarm systems for buildings
f) SANS 7240-16: Fire detection and alarm systems Part 16: Sound system control and indicating equipment
g) SANS 60849: Sound Systems for Emergency Purpose
h) SANS 10400: The application of the National Building Regulations.
i) SANS 2220-1-1:2013: Electrical security systems Part 1-1: Intruder alarm systems General requirements
j) SANS 14520: Gaseous Fire Extinguishing Systems
k) SANS 246: Fire Protection for Computer Rooms
l) SANS 2220-2-4: Electrical security systems: Access control systems — Reader controllers
m) SANS 2220-2-5: Electrical security systems: Access control systems Biometric readers
n) SANS 2220-2-7: Electrical security systems: Access control systems — Barriers
o) SANS 10222-2: Electrical security installations: Access control
p) IEC 62463: X-ray systems for the screening of persons for security and the carrying of illicit items
q) SANS 2220-1-1 Electrical security systems Part 1-1: Intruder alarm systems – General requirements
r) BY-LAW NO. 5 Standard Installation Specification for Intruder Alarm Systems for Domestic, Commercial, Retail and Industrial Installations

2. SITE CONDITIONS

Tenderers are advised to visit the site and acquaint themselves with all local conditions pertaining to the execution of the installation before tender closing date. No claims from the Contractor which may arise from insufficient knowledge of site access, type of site, labour conditions, establishment space, transport and loading/unloading facilities, power and water supply, etc. will be considered after submission of tenders.
For services where prior permission is required before contractors can visit the site, a visit will be arranged for all interested parties.

3. MATERIAL AND EQUIPMENT

All material and equipment shall conform in respect of quality, manufacture, tests and performance, with the requirements of the South African Bureau of Standards or where no such standards exist, with the relevant current Specification of the British Standards Institution.
All material and equipment shall be of high quality and suitable for the conditions on site. These conditions shall include weather conditions as well as conditions under which materials are installed, stored and used.
The Contractor shall, where requested to do so, submit samples of equipment and material to the Engineer for approval prior to installation.

4. INSTALLATION WORK

NO DEVIATION FROM THE SPECIFICATION will be tolerated or paid for without the written approval of the Engineer.

The installation shall be done in accordance with the drawings issued by the Engineer as approved by the Client and no installation work shall be carried out without issued for construction drawings.
All routing requirements and conduit installation work shall be done by the Electrical Contractor and all additional reticulation routes required by the tenderer shall be indicated and marked on his tender submission during the time of tender
At the end of each day, the Contractor shall be responsible for the clean-up, removal, and secure disposal of all debris.

The complete installation shall comply with the requirements of this document. Should any discrepancies or contradictions exist between this document and the Equipment Specification for the specific security system installation, then the latter shall take precedence.

In the event of discrepancies between the drawings, specifications and bill of quantities the employer shall decide whether the work as executed shall be re-measured on site or whether re measurement shall be effected from the working drawings only.

The Employer's authorized representative will inspect the installation from time to time during the progress of the work. Discrepancies will be pointed out to the tenderer/bidder and these shall be remedied at the tenderer/bidder's expense. Under no circumstances shall these inspections relieve the tenderer/bidder of his obligations in terms of the tender documents.

The tenderer/bidder shall notify the Employer in time when the installation reaches important stages of completion so that the Employer's authorized representative may schedule his inspections in the best interest of all parties concerned.

The conduits, draw-boxes and wiring ducts shall be installed completely by the Electrical discipline, including draw wires in the conduits.

Tenderers must submit a detailed schedule of any additional ducting and/or conduits required with their tender offers. It shall remain the responsibility of tenderer to ensure that the conduits and wiring ducts are adequate for the installation. If no such schedule is submitted with the successful tender, no additional ducting and/or conduits will be paid for under this contract. No wiring duct may be more than 60% full when the installation is complete

a) All wiring and tubing shall be properly supported and run in a neat and workmanlike manner. All conduiting and wiring within enclosures shall be neatly bundled and anchored to prevent obstruction to devices and terminals.
b) The contractor shall be responsible to ensure that conduit is installed by the electrical contractor and should it be found that more is required the contractor must notify the engineer of these extra requirements.
c) Fire and security cables may not be tied to power cables in any way and should not be run in the same sleeve as power.
d) The contractor shall enter all computer programs and data files into the related computers including all control programs, initial approved parameters and settings, English descriptors and colour graphics complete with dynamic dispersed data.
e) Contractor shall complete the installation by the dates given for Practical Completion and shall return to site afterwards to do finer adjustments training and Final Handover.

4.1 INSTALLATION AND TERMINATION OF CONDUITS AND CONDUIT ACCESSORIES

This section covers the installation of conduits and conduit accessories in buildings and other structures under normal environmental conditions.

a) The following types of conduit installations are included:
    i. Screwed metallic conduit - black enamelled and galvanised
    ii. Plain-end metallic conduit - black enamelled and galvanised.
    iii. Non-metallic conduit.
    iv. Flexible conduit

b) Conduits may be installed as follows:
    i. In open roof spaces
    ii. Cast in concrete,
    iii. Surface mounted against walls, concrete slabs, etc
    iv. In wall chases.

c) Where conduits are to be installed in concrete, this shall be undertaken while the building work is still in progress. Conduits may only be surface mounted where specified or where the Department has given its written consent.
d) Under no circumstances will conduit having a wall thickness of less than 1.6mm be allowed in screeding laid on top of concrete slabs.

e) Bending and setting of conduits must be done with special bending apparatus manufactured for the purpose and which are obtainable from the manufacturers of the conduit systems. Damage to conduit resulting from the use of incorrect bending apparatus or methods applied must on indication by the Department's inspectorate staff, be completely removed and rectified and any wiring already drawn into such damaged conduits must be completely renewed at the contractor's expense.

f) Tenderers must ensure that general approval of the proposed conduit system to be used is obtained from the local electricity supply authority prior to the submission of their tender. Under no circumstances will consideration be given by the Department to any claim submitted by the contractor, which may result from a lack of knowledge in regard to the supply authority's requirements.

4.2 OTHER SERVICES

Conduits may not be installed closer than 150 mm to pipes containing gas, steam, hot water or other materials, which may damage the conduits or conductors. Conduits may not touch pipes of other service installations in order to prevent electrolytic corrosion. Where this is unavoidable, cathodic protection shall be provided.

4.3 SCREWED METALLIC CONDUIT

The installation shall comply with SANS 10142.

4.3.1 Galvanised Conduit

Galvanised conduit and accessories shall be used in the following:

a) In damp areas.
b) In areas exposed to the weather
c) In plenum chambers containing humidifying equipment.
d) For surface mounted conduit installations in kitchens and boiler rooms.
e) In screeds resting directly on soil
f) For connection points to future installations.
g) For underground conduit containing earthing conductors.

4.3.2 Terminations

a) **Spouted Connections** – Conduits shall be connected directly to draw-boxes with spouted connections. Conduits shall be screwed lightly home and no threads shall be visible.

b) **Power skirting, etc** – Conduits shall be terminated by means of a brass female bush and two locknuts in pressed steel distribution boxes, cable ducts, power skirting, etc. The conduit end shall only project far enough through the entry hole to accommodate the bush and locknut. Alternatively, the method detailed in (c) may be used.

c) **Draw-boxes** – A female bush and two locknuts shall be used to terminate conduits at draw-boxes and outlet boxes without spouts, should there be sufficient room in the box. Where there is insufficient room, a coupling, brass male bush and locknut may be used with sufficient allowance for the reduction of the internal diameter by the male bush.

d) **Holes** – Holes to accommodate brass bushes shall be large enough to accommodate the bush with a minimum of clearance.

e) **Bush-nuts** – Bush-nuts for the connection of earth conductors to conduits are not acceptable.

4.3.3 Screws, Bolts and Nuts

Steel locknuts of thick gauge steel with milled sides shall be used in all cases. Cadmium-plated bolts and nuts shall be used except where the installation is exposed to the weather in which case brass bolts and nuts shall be used. Screws shall be installed in all tapped holes in fittings and accessories to prevent damage to the screw thread by concrete or plaster. The screws shall be screwed completely down to prevent damage to the thread on the screw.

4.3.4 Conduit Ends

Conduit ends shall be cut at right angles to ensure that ends butt squarely at joints. Threads shall not be visible at joints and connections except at running joints. The total length of the thread on the two conduit ends shall not exceed the length of the coupling.

4.3.5 Joints

All conduit ends shall be reamed and all joints tightly screwed. Only approved couplings shall be used. Running joints with long threads shall be kept to a minimum and locknuts shall be provided to ensure a strong mechanical and a continuous electrical joint. Running joints in screwed conduit are to be avoided as far as possible and all conduit systems shall be set or bent to the required angles. The use of normal bends must be kept to a minimum with exception of larger diameter conduits where the use of such bends is essential.

4.3.6 Finish

All joints shall be painted with red lead to prevent them from rusting in damp areas and in cases where the installation is exposed to the weather for any length of time. Where the galvanising or black paint has been damaged, the area shall first be cleaned and a coat of zinc base paint applied subsequently. Additional coats of paint shall only be applied after the undercoat has completely dried. All surface mounted non-galvanised metallic conduit must be painted.

4.3.7 Continuity

Mechanical and electrical continuity shall be maintained throughout the conduit installation.

4.4 PLAIN-END METALLIC CONDUIT

As an alternative to the screwed conduit, plain-end conduit complying with the Department's standard specification for "CONDUITS AND CONDUIT ACCESSORIES", may be installed subject to the following additional conditions:

a) Bending and setting of plain-end conduit must be done with special benders and apparatus manufactured for this purpose and which are obtainable from the suppliers of the system. Damaged conduit resulting from the use of incorrect bending apparatus shall be completely removed and any wiring already drawn into such damaged conduits shall be completely renewed at the Contractor's expense.

b) Screwed conduit must be used in the following instances:
   i. In flameproof installations.

ii. Load bearing conduit.
iii. Surface mounted conduit

c) Plain-end conduit and associated accessories shall be manufactured of mild steel having a minimum thickness of 1,2 mm and shall comply with SANS 1065. Conduit manufactured of lighter gauge material, i.e., 0,97 mm, will not be permitted.

4.5 NON-METALLIC CONDUIT

4.5.1 Installation Conditions

Where specified for a particular service, non-metallic conduit may be installed under the following conditions:

a) All non-metallic conduit shall comply fully with SANS 950 and shall be installed in accordance with Appendix C of the same specification as well as SANS 10142.
b) The conduit shall be supported and fixed with saddles with a maximum spacing of 1 m, even in roof spaces. (Refer to SANS 10142.) The Contractor shall supply and install all additional supporting timbers required.
c) Non metallic conduit and fittings shall not be used under the following conditions:
   i. Outside a building (unless protected, or sheltered under eaves),
   ii. For mechanical load bearing.
   iii. Where they may be subjected to temperatures below -10°C or above 70°C for prolonged periods.
   iv. As primary electrical insulation.
   v. In areas where they may be subject to mechanical damage
   vi. For applications other than those for which they are designed.
   vii In concrete slab unless specified to the contrary.

4.5.2 Painting Of Conduits

Exposed conduit may be painted with normal oil or PVA paints, but care must be taken to ensure that the paint used does not contain any component that will soften or have any other detrimental effect on the materials from which the conduit and fittings are manufactured.

4.5.3 Connecting Of Conduit To Metal Equipment/Components

When any part of a non-metallic conduit system has to be connected to metal equipment or components (e.g., surface socket-outlet or switch box, existing metallic conduit system, etc.) fittings and joints manufactured specifically for this purpose must be used. Non-metallic conduit must not be threaded to fit metallic connectors.

4.5.4 Bends

In conduit of nominal size not exceeding 25 mm, bends may be made in accordance with par. 4.5.5. In all other cases bends must be achieved by the use of accessories that are introduced into the conduit run. Bends shall comply with SANS 10142.

4.5.5 BENDING

Conduit of nominal size up to and including 25mm may be cold bent by hand provided that the radius of the bend is greater than six times the nominal size of the conduit, and that the external

angle of the bend does not exceed 90°. The procedure (which involves the use of a bending spring) should be as follows:

a) Determine the angle through which the conduit is to be bent.
b) Warm the cold conduit over the length to be bent by rubbing with hands.
c) Select a bending spring which matches the conduit size and insert in to the conduit at the point where the bend is required
d) Bend the conduit slowly with one motion (either with the hands alone approximately 1 m apart, or across the knee) to double the required angle, release the conduit and, when its position is stable, withdraw the bending spring (turning it in an anti-clockwise direction to reduce its diameter) and gently correct the angle
e) Install and secure the conduit immediately following bending

4.5.6 Adhesive Joints

All adhesive joints must be made in a clean dry area. The surfaces of all components to be bonded must be dry and clean.

The insertion depth should be marked on the conduit end and the adhesive applied (by means of a soft clean brush) as quickly as possible to the surfaces to be bonded by brushing lengthwise along the conduit, ensuring that a thin coating of uniform thickness is formed. The joint must be made immediately after the application of the adhesive by pushing the prepared parts squarely together with a twisting motion to the full insertion depth. Care must be taken to avoid squeezing adhesive into the collarway and all excess adhesive must be wiped off.

NOTE Solvent adhesives contain highly volatile liquids and their containers should not be left open.

4.5.7 Cutting

A fine-tooth hacksaw should be used to cut conduit to the required length. Each cut end should be square and free from swarf, burrs and loose material. When determining the length of conduit to be cut, allowance must be made for the length of couplings or accessories attached to the conduit. Incorrect determination will cause bulging of the conduit or insufficient joint length.

4.6 FLEXIBLE CONDUIT

a) The installation shall comply with SANS 10142.
b) Flexible conduit shall preferably be connected to the remainder of the installation by means of a draw-box. The flexible conduit may be connected directly to the end of a conduit if an existing draw-box is available within 2 m of the junction and if the flexible conduit can easily be rewired.
c) Flexible conduit shall consist of metal-reinforced plastic conduit or PVC-covered metal conduit with an internal diameter of at least 15mm, unless approved to the contrary. In false ceiling voids, flexible conduit of galvanised steel construction may be used, connectors for coupling to the flexible conduit shall be of the gland or screw-in type, manufactured of either brass or mild steel plated with either zinc or cadmium.

4.7 INSTALLATION REQUIREMENTS

4.7.1 Positions Of Outlets

All accessories such as boxes shall be accurately positioned. It is the responsibility of the Contractor to ensure that all outlets are installed level and square, at the correct height from the floor, ceiling or roof level and in the correct position relative to building lines and equipment positions as specified. It shall be the responsibility of the Contractor to determine the correct final floor, ceiling

and roof levels. Draw-boxes shall not be installed in positions where they will be inaccessible after completion of the installation. Draw-boxes shall be installed in inconspicuous positions to the approval of the Department's representative and shall be indicated on the "as built" drawings

4.7.2 Cover Plates

All draw-boxes and outlets shall be fitted with cover plates or with blank cover plates if unused. Blank cover plates shall match other cover plates in the same area. Flush mounted cover plates in both ceilings and walls shall overlap the draw-box and edges of the recess. If the fixing lugs are substantially deeper than the finished wall surfaces, suitable coiled steel wire or tubes shall be used as spacers.

4.7.3 Draw-Wires

Galvanised steel draw-wires shall be installed in all unwired conduits.

4.7.4 Bends

A maximum of two 90 bends or the equivalent displacement will be allowed between outlets and/or boxes.

Draw-boxes shall be installed at maximum intervals of 15 m in straight runs. All bends shall be made without heating the conduit or without reducing the diameter of the conduit. The inside radius of a bend shall not be less than five times the outside diameter of the conduit. (Refer to SANS [illegible] 10)

4.7.5 Flush Mounted Outlet Boxes

The edges of flush mounted outlet boxes shall not be deeper than 10 mm from the final surface. Spacer springs shall be used under screws where necessary.

a) **Excess Holes** – All excess holes in draw-boxes or other conduit accessories shall be securely blanked off by means of brass plugs to render the installation vermin proof.

b) **Debris** – Care shall be taken to prevent debris or moisture from entering conduits during and after installation. Conduit ends shall be sealed by means of a solid plug which shall be screwed to the conduit end. Conduits shall be cleaned and swabbed to remove oil, moisture or other debris that may be present before conductors are installed. Swabs shall not be attached to the conductors.

c) **Defects** – Each length of conduit shall be inspected for defects and all burrs shall be removed. All conduits that are split, dented or otherwise damaged or any conduits with sharp internal edges shall be removed from site. The Contractor shall ensure that conduits are not blocked.

d) **Withdrawal Of Conductors** – To ensure that all electrical conductors are easily withdrawable from conduits and to ensure that there are no joints in the conductors, the Department's representative will have the right to have the conductors of any circuit removed at his discretion. If the conductors are found to be in a satisfactory condition after having been withdrawn, the Department shall bear the cost of withdrawing and re-installing such conductors. If the conductors are found to have been damaged during installation or removal or if joints are found, they shall be replaced and the cost shall be borne by the Contractor.

4.8 SURFACE INSTALLATIONS AND INSTALLATIONS IN ROOF SPACES

Wherever possible, the conduit installation is to be concealed in the building work; however, where unavoidable or otherwise specified, conduit installed on the surface must be plumbed or levelled and only straight lengths shall be used.

4.8.1 Appearance

a) All conduits shall be installed horizontally or vertically as determined by the route and the Contractor shall take all measures to ensure a neat installation.
b) Where conduits are to be installed directly alongside door frames, beams, etc. that are not true, conduits shall be installed parallel to the frames, beams, etc.
c) All labels shall be removed from surface mounted conduit.

4.8.2 Saddles

Conduits shall be firmly secured by means of saddles and screws and in accordance with SANS 10142. Where saddles are used to secure vertical lengths of conduit connected to surface mounted boxes or socket outlet boxes, the saddles shall be spaced so that the intervals between the box and the first saddle, between any two successive saddles and between the last saddle and the ceiling or roof are equidistant. Conduits shall be secured within 150 mm before and after each 90° bend and within 100mm of each outlet box.

4.8.3 Joints

Joints will only be allowed in surface conduit lengths exceeding 3.5 m. Threads shall not be visible at joints of completed installations, except where running joints are used. Running joints will be allowed only when absolutely necessary. All running joints shall be provided with locknuts and shall be painted with red lead immediately after installation.

4.8.4 Accessories

Inspection bends or tee pieces shall not be used. Non-inspection type bends may be used in the case of 32mm or 50 mm diameter conduits

4.8.5 Offsets

Where an offset is required at conduit terminations or crossovers, the conduit shall be saddled at the offset.

4.8.6 Cross-Over

Conduit routes shall be carefully planned to avoid crossovers. Where a crossover is inevitable, one conduit only shall be offset to cross the other. Crossovers shall be as short as possible and shall be uniform. Alternatively, crossovers shall be installed in purpose-made boxes. This method shall be employed on face brick walls and in other circumstances where required by the Department.

4.8.7 Parallel Conduit

Parallel conduit runs shall be equidistant and saddles shall be installed in line. Alternatively, a special clamp may be used to secure all conduits in unison. In the case of conduits of different diameters, the latter method shall only be used if a purpose-made clamp designed to accommodate the various conduit sizes, is provided.

4.8.8 Painting Of Conduit

All surface mounted conduits and accessories shall be painted with two coats of a high-quality enamel paint or as otherwise specified. The colour shall comply with the colour code specified for

the installation or where no code has been specified, shall match the colour of the surrounding finishes.

4.8.9 Conduit In Roof Spaces

a) In open roof spaces (no ceiling) conduits shall run along the wall plates and the rafters. The installation of conduits suspended between the rafters is not acceptable.
b) Conduit in roof spaces shall be installed parallel or at right angles to the roof members and shall be secured at intervals not exceeding 1,5 m by means of saddles screwed to the roof timbers for metallic conduit and 1m for non-metallic conduit.
c) Nails or crampels will not be allowed.
d) Under flat roofs in false ceilings or where there is less than 900 mm clearance, or in instances where the ceilings are insulated with glass-wool or other insulating material impeding access, the conduit shall be installed in a manner which allows for wiring from below the ceilings.
e) Where non-metallic conduit has been specified for a particular service, the conduit shall be supported and fixed with saddles with a maximum spacing of 450mm throughout the installation. The contractor shall supply and install all additional supporting timbers in the roof space as required.

4.8.10 Fixing To Walls

Only approved plugging materials such as aluminium inserts, fibre plugs or plastic plugs, etc., and round-head screws shall be used when fixing saddles to walls. Wood plugs are not acceptable nor should plugs be installed in joints in brick walls

4.9 EXPANSION JOINTS

a) Where conduits cross expansion joints in the structure, approved draw-boxes which provide a flexible connection in the conduit installation shall be installed.
b) The draw-box shall be installed adjacent to the expansion joint of the structure and a conduit sleeve, one size larger than that specified for the circuit, shall be provided on the side of the draw-box nearest the joint. The one end of the sleeve shall terminate at the edge of the joint and the other shall be secured to the draw-box by means of locknuts.
c) The circuit conduit passing through the sleeve shall be terminated 40 mm inside the draw-box and in the case of metallic conduit, the conduit end shall be fitted with a brass bush. The gap between the sleeve and the conduit at the joint shall be sealed with 'Pratley Tic-Tac' or equal sealing compound, to prevent the ingress of wet cement. In the case of metallic conduit, an earth clip shall be fitted to the conduit projection inside the draw box and the conduit bonded to the box by means of 2.5mm2 bare copper earth wire and a brass bolt and nut.
d) The end of the other circuit conduit shall be secured to the draw-box by means of locknuts and a brass bush in the case of screwed metallic conduit or a standard bushed adaptor for other conduit types.
e) In the case of metallic conduit, a 2,5mm2 bare copper wire shall be installed between the first conduit boxes on either side of the joint, in addition to an earth wire, which may be specified for the circuit. The conduit boxes shall be drilled and tapped and the earth wire shall be bonded to the boxes by means of lugs and brass screws.
f) Suitable steel cover plates shall be screwed to draw-boxes installed along the expansion joint. The cover plates shall be installed before the ceilings are painted.
g) Where a number of conduits are installed in parallel, they shall cross the expansion joint of the structure via a single draw-box. A number of draw-boxes adjacent to each other will not be allowed.

4.10 CHASES AND BUILDER'S WORK

a) Except where otherwise specified the Contractor shall be responsible for the builder's work related to the installation of conduits, outlet boxes, trays, and other wall outlet boxes and will undertake the necessary chasing and cutting of walls and the provision of openings in ceilings and floors and other electrical outlets.
b) Electrical materials to be built in must be supplied, placed and fixed in position by the Contractor when required to do so. The Contractor shall also ensure that these materials are installed in the correct positions.
c) The Contractor must provide all chases and is required to cover conduits installed in chases by a layer of 4:1 mixture of coarse sand and cement, finished 6 mm below the face of the plaster and roughened. Chases shall be deep enough to ensure that the top of conduits are at least 12 mm below the finished surface of the plaster.
d) Where the Contractor is responsible for the cutting of chases or the building in of conduits and other equipment, he will be held responsible for all damage as a result of this work and will be required to make good to the satisfaction of the Department.
e) This ruling is particularly applicable but not exclusively to the rewiring and renewal of existing installations. Chases shall be made by means of a cutting machine.
f) Under no circumstances shall face brick walls or finished surfaces be chased or cut without the written permission of the Department. Where it is necessary to cut or drill holes in the concrete structure, the prior permission of the Department shall be obtained.

4.11 INSTALLATION OF CABLES

4.11.1 General

a) Cables with copper conductors shall be used throughout unless otherwise specified or approved.
b) It is a definite requirement that the Contractor shall only employ personnel fully conversant with cable manufacturer's recommendations for jointing and terminating cables.

4.11.2 Identification Of Cables

a) Cables shall be identified at all terminations by means of punched metallic bands or marked with labels or tags. (Refer also to SANS 10142).
b) The use of PVC tape with punched characters is not acceptable.
c) The identification numbers of cables shall be shown on "as built" drawings of the installation

4.11.3 Trenching

a) The Contractor shall be responsible for all trenching excavations unless specified to the contrary.
b) The Contractor shall, before trenching commences, familiarise himself with the routes and site conditions and the procedure and order of doing the work shall be planned in conjunction with the general construction programme for other services and building requirements.
c) The Contractor shall acquaint himself with the position of all the existing services such as stormwater pipes, water mains, sewer mains, gas pipes, telephone cables, etc before any excavations are commenced. For this purpose, they shall approach the Department's representative, the local municipal authority and any other authority which may be involved, in writing.

d) The Contractor will be held responsible for damage to any existing services brought to their attention by the relevant authorities and shall be responsible for the cost of repairs
e) The Contractor shall take all the necessary precautions and provide the necessary warning signs and/or lights to ensure that the public and/or employees on site are not endangered.
f) The Contractor shall ensure that the excavations will not endanger existing structures, roads, railways, other site constructions or other property.

4.11.4 Mechanical Excavators

a) Power driven mechanical excavators may be used for trenching operations provided that they are not used in close proximity to other plant, services or other installations likely to be damaged by the use of such machinery.
b) The use of power-driven mechanical excavators shall be subject to the approval of the Department. Should the excavator produce trenches that exceed the required dimensions, payment based on volumetric excavation rates will be calculated on the required dimensions only.

4.11.5 Routes

a) Trenches shall connect the points shown on the drawings in a straight line. Any deviations due to obstructions or existing services shall be approved by the Department beforehand.
b) The Department reserves the right to alter any cable route or portion thereof in advance of cable laying. Payment in respect of any additional or wasted work involved shall be at the documented rates.
c) The removal of obstructions along the cable routes shall be subject to the approval of the Department.

4.11.6 Shoring And Waterlogging

a) The Contractor shall provide shoring for use in locations where there is a danger of the sides of the trench collapsing due to waterlogging or other ground conditions. Refer to the e.g., Occupational Health and Safety Act.
b) The strength of shoring must be adequate for site conditions prevailing and the shoring must be braced across the trench.
c) The Contractor shall provide all pumps and equipment required to remove accumulated water from trenches. Water or any other liquid removed shall be disposed of without any nuisance or hazard.

4.11.7 Trenching

a) Trenching shall be programmed in advance and the approved programme shall not be departed from except with the consent of the Department.
b) Trenches shall be as straight as possible and shall be excavated to the dimensions indicated in this specification.
c) The bottom of the trench shall be of smooth contour, and shall have no sharp dips or rises which may cause tensile forces in the cable during backfilling.
d) The excavated material shall be placed adjacent to each trench in such a manner as to prevent nuisance, interference or damage to adjacent drains, gateways, trenches, water furrows, other works, properties or traffic. Where this is not possible the excavated materials shall be removed from site and returned for backfilling on completion of cable laying.
e) Surplus material shall be removed from site and disposed of at the cost of the Contractor.

f) Trenches across roads, access ways or footpaths shall not be left open. If cables cannot be laid immediately the Contractor shall install temporary "bridges" or cover plates of sufficient strength to accommodate the traffic concerned.
g) In the event of damage to other services or structures during trenching operations the Contractor shall immediately notify the Department and institute repairs.
h) Prior to cable laying the trench shall be inspected thoroughly and all objects likely to cause damage to the cables either during or after laying shall be removed.
i) Extreme care shall be taken not to disturb surveyor's pegs. These pegs shall not be covered with excavated material. If the surveyor's pegs are disturbed, they shall be replaced by a person qualified to do so.

4.11.8 Dimensions Of Trenches

a) Cable trenches for one or two cables shall not be less than 300 mm wide and need not be more than 450 mm wide. This dimension shall be valid for the total trench depth
b) The width shall be increased where more cables are installed to allow for the spacings.
c) Where trenches change direction or where cable slack is to be accommodated, the Contractor shall ensure that the requirements of the relevant SANS Specification regarding the bending radii of cables are met when determining trench widths.
d) Trench depths shall be determined in accordance with cable laying depths and bedding thickness.
e) Payment will be made on a volumetric excavation rate calculated on the basis of the given maximum dimensions or the actual dimensions, whichever is the lesser.

4.11.9 Bedding

a) The bottom of the trench shall be filled across the full width with a 75mm layer of suitable soil sifted through a 6mm mesh and levelled off.
b) Only sandy clay or loam soil with a satisfactory thermal resistivity (not exceeding 1,5°C m/W) may be used for this purpose. Sea or river sand, ash, chalk, peat, clinker or clayey soil shall not be used. The use of crusher sand is acceptable
c) Where no suitable soil is available on site, the Contractor shall import fill from elsewhere and make all the necessary arrangements to do so. The cost of importing soil for bedding purposes shall be included in the unit rates for excavations.
d) After cable laying a further layer of bedding shall be provided to extend to 75 mm above the cables.
e) The bedding under joints shall be fully consolidated to prevent subsequent settling

4.11.10 Cable Sleeves

a) Where cables cross under roads, railway tracks, other service areas, etc and where cables enter buildings, the cables shall be installed in High Density Polyethylene (HDPE)pipes
b) Pipes shall be joined in accordance with the manufacturer's instructions.
c) Sleeves shall have a minimum diameter of 50mm. In the case of roads, the sleeves shall extend at least 1m beyond the road edge or kerb on both sides of the road.
d) All sleeves shall be graded 1:400 for water drainage.
e) Cable sleeves shall be installed to the spacings and depths stated in paragraph 4.12 below.
f) The ends of all sleeves shall be sealed with a non-hardening watertight compound after the installation of cables.

4.11.11 Backfilling

a) The Contractor shall not commence with the backfilling of trenches without prior notification to the Department so that the cable installation may be inspected. Should the Contractor fail to give a timeous notification, the trenches shall be re opened at the Contractor's cost. Such an inspection will not be unreasonably delayed.
b) Backfilling shall be undertaken with soil suitable to ensure settling without voids. The maximum allowable diameter of stones presents in the backfill material, is 75mm.
c) The Contractor shall have allowed in his tender for the importation of suitable backfill material if required.
d) The backfill shall be compacted in layers of 150mm and sufficient allowance shall be made for final settlement. The Contractor shall maintain the refilled trench at his expense for the duration of the contract. Surplus material shall be removed from site and suitably disposed of.
e) On completion, the surface shall be made good to match the surrounding area.
f) In the case of roadways or paved areas the excavations shall be consolidated to the original density of the surrounding material and the surface finish reinstated.

4.12 INSTALLATION OF UNDERGROUND CABLES

a) Cables for telephones, communication systems and other low voltage systems (less than 50 V) shall be separated from power cables by at least 1 m. All control or pilot cables without a lead sheath and steel armouring shall be laid at least 300mm from power cables.
b) Cables shall not be buried on top of each other unless layers are specified. The minimum spacing between layers shall be 200mm

4.13 GROUPING AND SPACING OF CABLES IN BUILDINGS AND STRUCTURES

Cables for telephones, communication systems and other low voltage systems (less than 50 V) shall be separated from power cables. In building ducts, a physical barrier shall be provided between power cables and cables for other services. Where armoured cables are used for such other services, they shall be installed on separate cable trays or shall otherwise be at least 1m away from power cables. Where unarmoured cables are used for these other services, they shall be installed in separate conduits or metal channels.

4.14 EARTHING

This section covers the earthing of electrical installations in buildings or other structures. The total earthing system of any electrical installation shall be in accordance with SANS 10142.

4.14.1 Requirements of an Effective Earth

a) An effective earth must prevent dangerous over voltages arising between metallic structures, frames, supports or enclosures of electrical equipment and the ground during fault conditions
b) An effective earth must be able to permit fault currents of sufficient magnitude to flow so as to operate protective devices to isolate the fault before damage can occur
c) The ohmic resistance of an effective earth must be low enough to ensure that the step potential on the ground in the vicinity of the earthing point is within safe limits under fault conditions i.e., a voltage gradient not exceeding 40 V/m for fault durations exceeding 1s.

4.14.2 Types Of Earth Electrodes

a) **Trench Earths** – Trench earths comprise a bare copper or galvanised iron conductor laid at a minimum of 800mm below ground level, usually when underground cables are installed. This type of earth electrode provides a relatively large contact area between electrode and surrounding ground, makes contact with a variety of types of soil and soils of varying moisture content en route and is economical to install.

b) **Spike Earths** – Spike earths comprise rods of bare copper, copper-coated steel, stainless steel or galvanised steel designed for the purpose of penetrating ground to depths of up to several metres. A low resistance earth may sometimes be obtained by driving multiple spikes at some distance from each other in order to provide parallel paths. In hard or rocky ground, it is usually necessary to drill holes into which earth spikes are inserted and then packed with soft soil.

c) **Foundation Earths** – Foundation earths comprise bare copper or galvanised iron conductors laid under the foundations of buildings, miniature substations, distribution pillars, bases of wooden, concrete or steel poles and structures. Because soil under foundations usually retains moisture, foundation earths are located to take advantage of this favourable condition. Furthermore, they are economical to install.

4.14.3 Materials For Earth Electrodes

a) Bare copper, either in stranded, strip or rod form, is considered the most suitable general-purpose material for earth electrodes. Its main disadvantage is its cost and susceptibility to theft.
b) Bare galvanised iron and steel, either in stranded, strip or rod form, has a satisfactory record of survival in non-aggressive soils and is more economical than copper.
c) Bare aleminium is unsuitable as electrode material.

4.14.4 Corrosion

Because galvanised ferrous metals corrode sacrificially to copper, galvanised iron and steel electrodes should not be buried in close proximity to bare copper.

4.15 LIGHTNING AND SURGE PROTECTION

Lightning protection will be required on the incoming power supply to the security equipment and shall be done at the single point where the supply enters the building. Lightning protection shall be installed from Live to Earth (L-E) and from Neutral to Earth (N-E) on a single-phase supply. If the same supply is reticulated to another building additional lightning protection shall be required where it enters the next building. The protection shall be as described above.
The lightning protection devices shall contain an MOV (Metal Oxide Varistors) The product specification sheets shall be supplied to the engineer for approval of the lightning arrester prior to installation.
Lightning Arresters are to be directly connected to earth electrode following the shortest path.
Each Lightning arrester is to be connected at a dedicated earth rod. Protection is to be full rated throughout the system. All lightning protection shall be done in compliance with the relevant SABS & IEC standards.

The contractor shall provide and install all the necessary Transient Voltage Surge Suppression (TVSS) devices SAD (Silicon Avalanche Diodes), for the protection of the electrical/ electronic control equipment, communication and data lines. TVSS devices shall protect all AC and DC circuits from the effect of lightning, induced over voltages, internally generated transients and utility switching transients.
All metallic data, communications, video, and sensor lines entering or leaving a building shall be protected with surge protection devices.
Grounding of protective devices shall be in accordance with the manufacturer's recommendations and/or as described in these specifications and drawings.
All signal line protective devices shall be located at the terminal point nearest the cable interface with the exterior cable plant. Devices shall be mounted to the back panel of the cabinet.
Where equipment is fed from a panel board not protected by a panel board protector, provide a branch circuit protector installed at the panel board.

5. CABLING

2.1 GENERAL

All cables shall be allocated an identifiable and unique cable number. All cables including patch leads shall be clearly labelled. Labels shall be affixed within 250mm of each termination.
Cables shall be fitted with tags at the following points

- On the cable sheath next to the gland at each end
- in cable pits.
- At any additional point on the cable sheath (or around the core bunch) where the preceding requirements are not readily traceable from the core terminations.
- Any inspection box or round box cover.

Cable identification tags shall be orientated uniformly to read.

- Left to right from the logical viewing point horizontally.
- From bottom to top viewed from the right were installed vertically.

Duplication of cabling and equipment identities shall be avoided at all cost.
Avoid over-tightening cable ties
The identification numbers of cables shall be shown on "as built" drawings of the installation.

2.2 CAT6 CABLE

a) RJ45 connectors shall be are used to properly terminate the cable.
b) The cable shall not be installed close to AC power cables or high current DC power cables (min. distance between power cables and video cable is 300mm).
c) The installer shall not exceed the maximum distance for the video cable (max. distance is 80m).
d) It is recommended to have a continuous cable run with terminations only at each end.
e) At the monitoring equipment, enough length of the cable should be left to accommodate future moving around of the equipment when a need arises.

2.3 CABLE TAGGING REQUIREMENTS

For the labelling of cables any one of the following methods is acceptable:
a) Cable-Tie Markers

b) Clip-On Labels
c) Printable Slide-in Labels

2.4 CABLE TAGS

Cable tags shall be provided in accordance with SANS 10142.

2.5 MARKERS AND TAGS

Markers and Tags shall comply with the following specifications:
Markers and Tags shall be totally:

- UV-resistant;
- Fade-resistant;
- and Corrosion resistant.

Shall have a minimum life expectancy of 10 years.
Shall not be damaged by any commercially available solvent.

2.6 EQUIPMENT FIXING REQUIREMENTS

Under no circumstances shall double sided tape be used anywhere on this installation for whatever purpose.

a) **Bracket Mount**
There are different bracket bases to suit different installation surfaces. Installation on the wall should adopt wall bracket; installation on the projecting corner of two walls or on the corner of a cubic pillar should adopt the corner bracket; installation around a round pillar should adopt the pole bracket.

b) **Drywall**
Dry wall plugs, Toggle Bolt anchors (Butterfly nuts) or SuperfastTM Toggle anchors may be used to fix cameras

c) **Brick Walls**
HILTI, Fisher, UPAT or RAWL type plugs are acceptable for fixing cameras.

d) **Concrete**
HILTI gun, RAWL bolts or chemical bolts are an acceptable means of fixing cameras.

e) **Ceilings**
For suspended ceilings, Toggle Bolt anchors (Butterfly nuts) or SuperfastTM Toggle anchors are an acceptable means of fixing cameras. Drywall screws will also be accepted if they are screwed directly into the support struts.
For normal ceilings Toggle Bolt anchors (Butterfly nuts) or SuperfastTM Toggle anchors are an acceptable means of fixing cameras.

f) **Steel**
Up to 3mm; Self-tapping screw with drill, a self-tapping screw or aluminium pop rivets (except for door hinges) are an acceptable means of fixing cameras.
Above 3mm; bolts and nuts are an acceptable means of fixing cameras.

g) **Wood**
Drywall screws are an acceptable means of fixing cameras.

h) **Aluminium**
A self tapping screw or aluminium pop rivets are an acceptable means of fixing cameras.

2.7 WITHDRAWAL OF CABLES

To ensure that all equipment cables are easily withdraw able from conduits and to ensure that there are no joints in the conductors, the Employer's representative shall have the right to have the cables of any equipment removed at his discretion. If the cables are found to be in a satisfactory condition after having been withdrawn, the Employer shall bear the cost of withdrawing and re-installing such cables. If the cables are found to have been damaged during installation or removal or if joints are found, they shall be replaced and the cost shall be borne by the tenderer/bidder.

Securing of equipment – the tenderers/bidders shall make their own arrangements for securing and safe-guarding of equipment and materials.

6. SAFETY

Correct safety procedures must be adhered to at all times and work must be carried out under the control and supervision of an experienced responsible person as detailed in Regulation C180 of the machinery and occupational safety act of 1983.

7. ELECTRICITY AND WATER SUPPLY FOR CONSTRUCTION PURPOSES ON SITE

If electricity and water are not available to the tenderers/bidders, they shall however make their own arrangements with the relevant supply authorities and when required for connections for electricity and water, they shall supply all cabling and piping as necessary

8. SUPPLY, TRANSPORT AND HANDLING OF EQUIPMENT

Suitable transportation vehicles and lifting tools shall be provided by the tenderer/bidder and used to load, transport and off- load such equipment.

9. DRAWINGS

The drawings generally show the scope and extent of the proposed work and shall not be viewed as showing every minute detail of the work to be executed.
The tenderers/bidders shall ensure that they are conversant with the layouts of the building and of other services before they commence with any work on the building.
Any problems that the tenderer/bidder may experience during the contract period must be discussed in time with the Consulting Engineer.

10. WORKMANSHIP AND STAFF

The workmanship shall be of the highest standard and to the satisfaction of the Employer.

All interior work shall on indication by the Employer's inspecting officers, immediately be broken down and rectified at the expense of the tenderer/bidder.

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.

11.PHYSICAL INSPECTION PROCEDURES

Once the tenderer/bidder has completed the installation, written notice shall be given to the Employer in order that a mutually acceptable date can be arranged for a joint inspection.
During the inspection, the representative of the Employer shall compile a list of items (if any) requiring further attention. A copy of this list shall be provided to the tenderer/bidder that will have a period of 7 days in which to rectify the mistakes of the installation
The tenderers/bidders shall then provide written notice that they are ready for an inspection of the remedial work to the imperfect installations.
This procedure will continue until the entire installation has been correctly completed to the satisfaction of the Employer

12.TESTS AND OPERATIONAL INSPECTION PROCEDURES

In addition to the above the tenderer/bidder shall have the complete installation tested, commissioned and approved by the local authorities where applicable.
Subsequent to the above testing and approval, the tenderer/bidder shall in the presence of the representative of the Employer test all security systems 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. The Contractor shall provide all instruments and equipment required for testing and any water, power and fuel required for the commissioning and testing of the installation at completion.

13.ACCEPTANCE TESTS

Acceptance tests shall be executed on the systems as a whole before the first delivery can take place.
Successful completion of the acceptance tests will serve as proof that the system is functioning in accordance with the functional requirement of the system. No handing over of the system or execution of
Tests on Completion in terms of the Contract shall take place before the Engineer is satisfied that the system conforms to the specification/s.

The test procedures must include at least the following

(a) Purpose of tests.

(b) Test equipment needed/used.

(c) Logical explanation of actions and/or measurements to be taken in order to determine compliance with the specifications.

(d) Test reports containing the following:

I. Remarks.

II. Name and capacity of person that performed the test

III. Date of tests.

IV. Space for acceptance of the test report by the Engineer and the Employer.

V. Compliance Checklist

14.MAINTENANCE OF INSTALLATIONS (12-MONTH GUARANTEE PERIOD)

(a) With effect from the date of the First Delivery Certificate the tenderer/bidder shall undertake the regular servicing of the installation during the 12-month guarantee period and shall make all adjustments necessary for the correct operation thereof.

(b) If during the said period the installations are not in working order for any reason for which the tenderer/bidder is responsible, or if the installations develop defects, they shall immediately upon being notified thereof take steps to remedy the defects and make any necessary adjustments.

(c) Should such stoppages be so frequent as to become troublesome, or should the installations otherwise prove unsatisfactory during the said period the tenderer/bidder shall, if called upon by the Representative/Agent, at their own expense replace the whole installation or such parts thereof as the Representative/ Agent may deem necessary with apparatus specified by the Representative/Agent.

(d) The contractor must be able to render a 24-hour maintenance and repair service at all times, excluding statutory holidays. Full details of the firm's standby service facilities must be submitted at the time of tendering.

14.1 PREVENTIVE MAINTENANCE

Planned servicing of the system carried out on a scheduled basis.

a) **Recommended frequency of maintenance - The systems shall receive at least one planned maintenance visit each year.** However, additional planned maintenance visits may be required depending on the complexity of the system, the environmental conditions, and the need to change 'perishable items' etc.

Note: These planned maintenance visits are in addition to any service call visits which may be required.

14.2 MAINTENANCE TECHNICIAN

The contractor must provide a technician who will be stationed on site for the duration of this period. This technician shall make sure that system is running hassle-free by attending to any technical problems should they arise.

15.MANUALS

Three (3) copies of operating manuals shall be handed over to and signed for by the Representative/Agent on site together with the drawings and schedules described. All operators' instruction manuals must be in English. The contents of the manuals shall reflect the training contents (operator) and maintenance.

16.TRAINING

After completion of the installation and when the system is in working order, the Contractor will be required to thoroughly train the operators in the complete operation and control of the system, including the basic adjustments and alignments to be made, until the operators is fully conversant with the equipment and its use.

a) All training shall be by the contractor and shall utilise specified manuals, as-built documentation and the on line help utility. The following training shall be repeated quarterly during the warranty period.
b) Operator training shall include two initial two-hour sessions encompassing Sequence of operation review

17. AS-BUILT DRAWINGS

As each portion of the work is completed, the tenderer/bidder shall provide the Employer with as-built drawings showing the exact locations of all equipment deemed necessary for the perfect operation of the systems.
System architecture showing all devices/equipment will be required. Data sheets of all products.

PART C6.1.4: FUNCTIONAL SPECIFICATIONS FOR INTEGRATED SECURITY SYSTEMS

1. SECURITY MANAGEMENT SOFTWARE (SMS)

1.1 General Description and System Overview

The Contractor shall supply, install and commission a fully integrated multi-workstation security management system to facilitate the control and monitoring of all security sub-system components by means of a mouse activated operator workstation.

Operator Workstations shall be located within the local control room within the site as well as the head of security office.

The Contractor shall provide all materials, labour and supervision required to install, commission and document the complete system as required by this specification.

The SMS offered shall have demonstrated proven operation in a minimum of three (3) facilities, and a list of reference sites shall be provided as part of the tender response.

1.2 Security Sub-System Integration

The Security Management System (SMS) shall provide the integration platform for all Security Sub-Systems. It is a specific requirement of this tender that the SMS shall interface directly with all sub-system hardware by means of existing drivers supplied as part of the SMS software. *Hardwired interface of one sub-system to another to achieve integration with the SMS shall not be accepted.*

The SMS software shall perform all interlocking functions between various subsystems i.e., the automated switching of CCTV images upon door alarms, fire alarms, intrusion detection etc. The SMS software shall be capable of configuring the necessary interlock functions either by providing a configuration table or an internal scripting facility or a combination of the two. The programming of interlock functions within sub-system hardware/software as a means of achieving the required functionality shall not be accepted. The tenderer shall provide a description of the interface protocol for each sub-system hardware platform offered as part of this tender, in the clause-by-clause compliance statement to be returned with their submission.

The SMS software shall provide the necessary soft control functions to eliminate the need for any additional control components such as keyboards, joysticks or proprietary operator panels.

System operators shall be capable of controlling all functions of the sub-system hardware components via a single mouse driven operator workstation running on a Windows 7 or later operating platform within a single Security Management Application.

The following sub-system hardware components shall be directly integrated with the Security Management System by means of a high-level interface:

a) PLC based door locking system
b) Access Control based door locking system
c) IP Intercom system
d) EVAC/Public Address system

e) IP based CCTV system
f) IP based Video Recording system
g) Fire Detection system
h) Uninterruptible Power Supplies
i) Intruder Alarm system
j) Boom & Spike barrier system
k) Emergency Voice Alarm Communication system (Refuge Place)

The following devices shall be interfaced to the Security Management System via the PLC based door locking system by providing remote multi-I/O modules where required:

a) Duress Buttons
b) Non controlled door position switches (DPS)
c) Standby Generator Sets

1.3 Security Management functions

The Security Management System (SMS) shall provide the following software functions:

a) Graphical representation of the site by means of multiple area maps
b) Control and Monitoring of PLC controlled Doors
c) Control and Monitoring of Access Controlled Doors
d) Control and Monitoring of Intercom and EVAC Stations
e) Monitoring of Emergency and Fire Doors
f) Manual and event-based selection of IP based fixed and PTZ CCTV cameras
g) Control of Pan, Tilt, Zoom functions of CCTV Cameras
h) Configuration of Network Video Recording
i) Event based retrieval of recorded video footage
j) Monitoring of Intruder Detection devices
k) Monitoring of Fire Detection devices
l) Monitoring of centralized UPSs
m) Monitoring of Duress Buttons
n) Monitoring of Standby Generator sets
o) Staff and Visitor Enrollment
p) Visitation Management

1.4 Integration Description

1.4.1 IP Based CCTV Sub-System

A fully IP based CCTV System shall be integrated with the SMS via a high-level interface (HLI) at each workstation or server. The full functionality of the system shall be integrated with the SMS to provide enhanced features including but not limited to:

a) Camera to Monitor commands
b) Sequence to Monitor commands
c) Sequence programming commands
d) Pan, Tilt, Zoom commands
e) PTZ preset select commands
f) PTZ preset save commands
g) Monitor Blanking commands

Camera Types that are not available as direct IP cameras shall be converted to IP via a single channel H264 IP Video Encoder mounted directly at the camera position.

1.4.2 IP Based Network Video Recording Sub-System

A fully IP based Video Recording System shall be integrated with the SMS whereby all images are stored on Digital Video Recording Servers installed within the security equipment room in the site. NVRs shall be connected directly to the appropriate 24 Port managed switches within the local equipment cabinets

The managed Ethernet switches shall be configured to limit the Video traffic onto the incoming 1Gb uplink ports on the switches, by restricting outgoing streams to those required for live video feeds based on Operator selection, and recorded video footage being reviewed by Central Operator Workstations or the Operations room

In order to minimize traffic on the 1 GB uplink ports, the allocated recording stream on each of the Direct IP cameras shall be assigned to the IP address of the Network Video Recorders within the local subnet.

The full functionality of the NVR system shall be integrated with the SMS to provide enhanced features including but not limited to:

a) Individual Channel Record and Stop commands based on other sub-system conditions such as Intercom, CCTV and Locking.
b) Channel Playback select
c) Play
d) Stop
e) Pause
f) Back
g) Left Jump
h) Right Jump
i) Left Shift
j) Right Shift
k) Plus
l) Minus
m) Log
n) Search

The search and playback shall be an integrated function of the SMS and shall not require any third-party software platform to perform these functions.

Upon operator request the SMS system shall be capable of instructing the NVR system to playback video images to allow proper investigation of the visual event. The SMS management workstation shall be capable of recalling associated historical Video and Audio data based upon events logged to the event recording database on the severs.
System supervisors with the correct user level shall be able to query the event database as described in this specification and by double-clicking on a specific event shall be presented with the associated Video and Audio footage automatically.

1.4.3 PLC Based Door Locking Sub-System

The locking sub-system hardware shall be integrated with the SMS via a high-level interface (HLI). The full functionality of the locking sub-system hardware shall be integrated with the SMS to provide enhanced features including but not limited to:

a) Door Lock
b) Door Unlock
c) Door Inhibit
d) Door lockdown
e) Door lockdown time preset
f) Door Status monitoring
g) Door Alarm annunciation
h) Door auto-close
i) Hardware fault diagnostics

The locking sub-system shall control and monitor all electrically controlled swing doors, sliding doors and gates within the facility.
The locking system control hardware (I/O points) shall be an integrated function of the door control module as described in this specification.

1.4.4 I/O Alarm Monitoring Sub-System

An Alarm monitoring sub-system shall be provided to monitor specific hardwired alarm I/O points within the facility, which shall be managed by the PLC based door locking system hardware. Such Alarms shall include but not be limited to the following:

a) DPS monitored door alarms.
b) Duress alarms.
c) Standby generator alarms
d) UPS alarms.

The alarm monitoring system control hardware (I/O points) shall be an integrated function of the door control module as well as the multiple I/O control modules described in this specification.

1.4.5 Access Control Sub-System

The Access Control requirement consists of two sub-components:

a) **Biometric Logon of Operator Workstations** – Each Security Management System Operator Workstation shall be provided with a vandal resistant fingerprint reader for logging on to the Workstation. Operator's commands and events shall be logged into the centralized database against the relevant Operators details.

b) **Biometric Access Controlled Doors** – each Access Controlled door shall be equipped with a Vandal resistant IP65 rated Fingerprint Reader as detailed in the specification.
The Access Control Terminal (ACT) offered shall incorporate Finger recognition within a single housing. By default, 1 to Many (1: N) fingerprint matching shall be utilized for identification.
The following functionality shall be provided by the Access Control System:
    - Staff Management
    - Visitation Management

1.4.6 Intercom & Public Address (EVAC) Sub-System

The Digital Intercom and Public Address sub-system hardware shall be integrated with the SMS via a high-level Interface (HLI). The full functionality of the system shall be integrated with the SMS to provide enhanced features including but not limited to:

a) Station Call-In
b) Station Fault Analysis
c) Call In Divert
d) Call Answer
e) Call Cancel
f) Call In Queuing
g) Tamper Alarm monitoring
h) Threshold Monitoring (Disturbance detection)
i) Individual station Speaker and Microphone sensitivity adjustment

The Intercom and Public Address system shall enable the selection of any individual or group of intercom stations/speakers by any operator workstation within the facility.

1.4.7 Centralized UPS System

The Dual redundant centralized UPSs shall be fully integrated with the Security Management System by means of a High-Level Interface (HLI), to provide operators and technicians with detailed status and alarm conditions regarding the UPS systems.

Due to the Centralized configuration, the following detailed diagnostic information is required, and shall be presented to the operator via a drop-down menu option within the SMS:

a) UPS Data
   - Manufacturer
   - Type
   - Serial Number
   - Software Version

b) Battery Data:
   - Battery Status
   - Time Remaining in minutes
   - Remaining Charge in %
   - Battery Voltage
   - Battery Current
   - Battery Temperature in Deg C

c) AC Input Data:
   - Frequency per phase
   - Voltage per phase
   - Current per phase
   - Power per phase

d) AC Output Data:
   - Frequency per phase
   - Voltage per phase
   - Current per phase
   - Power per phase

- Load % per phase

e) UPS Alarm Conditions:
   - Battery Failure
   - On Battery Power
   - Low Battery
   - Depleted Battery
   - Over Temperature
   - Input Supply Out of Limits
   - Output Out of Limits
   - Output Overload
   - Bypass Active
   - Bypass Inhibited
   - Charger Failure
   - Fan Failure
   - Fuse Failure
   - Diagnostic Test Failure
   - Communications Failure
   - Shutdown Pending
   - Shutdown Imminent

All alarm conditions shall be presented to the operator within the Fault queue as described in the specification.

1.4.8 Fire Detection System

The Main Fire Detection Panel shall be fully integrated with the SMS via a high-level interface (HLI) at the redundant SMS server workstations. The full functionality of the system shall be integrated with the SMS to provide enhanced features including but not limited to:

a) Detector Healthy status
b) Detector Alarm status
c) Detector Fault/Maintenance status
d) Detector Inhibit status
e) Detector Inhibit Command
f) Detector Un-inhibit Command
g) Alarm Silence Command
h) Alarm Reset Command
i) Synchronize Clock Command
j) Communication Failure Alarm

The position and status of each Detector, Sounder and Manual Call Point unit within the site shall be indicated on the appropriate area map of the SMS.

A Fire Detection Layer On/Off option shall be available through the menu structure, which shall toggle the display of the smoke detector icons on and off as required. This function is required to minimize congestion of icons on the area maps, due to the location of other sub-system equipment rooms.

Upon an alarm condition regardless of Fire Layer status, the affected detector icon shall be displayed, and the alarm condition shall be presented to the operator within the Fault queue as described in the specification.

1.4.9 Intruder Alarm System

The Alarm Control Panel shall be fully integrated with the SMS via a high-level interface (HLI) at the redundant SMS server workstations. The full functionality of the system shall be integrated with the SMS to provide enhanced features including but not limited to:

a) Detector Healthy status
b) Detector Alarm status
c) Detector Fault/Maintenance status
d) Alarm Reset Command
e) Synchronize Clock Command
f) Communication Failure Alarm

The position and status of each Detector and Sounder within the site shall be indicated on the appropriate area map of the SMS.

An Intruder Alarm Layer On/Off option shall be available through the menu structure, which shall toggle the display of the motion detector icons on and off as required. This function is required to minimize congestion of icons on the area maps, due to the location of other sub-system equipment icons.

Upon an alarm condition regardless of Intruder Alarm Layer status, the affected motion detector icon shall be displayed, and the alarm condition shall be presented to the operator within the Fault queue as described in the specification.

1.5 SYSTEM CONFIGURATION

The Interactive Security Management System (SMS) shall consist of multiple Operator Workstations, situated in the local control room. This network shall be a dedicated security network for use by the SMS only.

The network interface between buildings shall be by means of a Fibre Optic medium, and shall form a star configuration from the server room to each building.

The Operator workstations shall serve as the graphic based operator interfaces between the operators and other security subsystems as specified herein.

All operator functions shall be controlled by means of a mouse, and shall require the minimum movement and actions in order to complete a required task.

The audio sub-system components within each control room shall form an integral part of the control console, and shall not require the use of external control equipment such as PTT buttons, Operator Keyboards etc.

All security sub-system control functions shall be interlocked to ensure that functional procedures are adhered to.

The following Interlock functions shall be programmed as an integrated function of the Security Management System:

a) The selection of Cameras prior to Door opening
b) The selection of Intercom communications prior to Door opening
c) Automatic Camera select upon door opening
d) Sally port door interlocking
e) Monitored door interlocking
f) Automatic Camera selection upon Intercom activation
g) Automatic Video recording on camera image activity
h) Automatic event recording on individual operator activity
i) Automatic Control console "LOG OFF" on control room door
j) Interlock capability according to operator log-in level

Alarm processing, alarm logging, alarm response data entry, graphical and text-based user interface, data entry, and other system management functions shall be performed by the SMS operator workstations connected to the SMS network. The operator workstations shall be located in the Central Control Room and other nominated locations.

The SMS shall utilize a single global database and shall be fully distributed to Distributed control modules connected to the SMS security network. All system operators shall have limited access to this information/data from the operator workstations.

The system shall be designed such that failure of any control module or operator workstation shall not functionally affect the operation of any other module, network, building or Operator workstation connected to the SMS network.
Similarly, should any area lose power or suffer a loss in communications due to a break in the communications cabling, all Distributed control modules installed in that area shall continue to operate with no loss of functionality.

The SMS shall be fully programmable to allow:

a) Response instructions to be displayed for all alarm types.
b) Use dynamic (real time) graphics to display device status.
c) Initiate operator commands via system tailored icons.
d) Display building layouts in a graphical representation.
e) Easy to follow menus with single key select options, to assist in the daily routine operations of each site.
f) Allocate alarm priorities.
g) Set Alarm response properties.
h) Generate User defined reports.

The contractor shall allow adequate time to liaise with the Engineer in order to detail any user specific requirements necessary for the operation of each building, system, alarm type, and alarm response configuration within the system. This shall include the configuration of maps, report formats, access schedules, alarm response instructions and the like, to suit each operator workstation.

The system shall be modular in design to allow for future system expansion with minimum cost and disruption to the existing operational system.

Tenderers are to specify the systems total capacity for future expansions

Such upgrades shall not render a redundancy in field hardware, the Central Processing Units or any major component of software, firmware or operating systems.

1.6 SYSTEM PERFORMANCE

1.6.1 Local Operator Workstations

The interaction delay between activating a control icon on any given operator workstation and the controlled point activation, (i.e., the lock), shall be no greater than one half of one second (0.5 sec).
The interaction delay between controlled point activation and any given operator workstation response by the associate icon changing state (colour) shall be no greater than one half of one second (0.5 sec).
The interaction delay between recalling any floor plan at any given operator workstation shall be no greater than one quarter of one second (0.25) second.

1.7 MINIMUM HARDWARE REQUIREMENTS

1.7.1 Server Workstation

A redundant server configuration shall be provided.

1.8 MINIMUM SOFTWARE REQUIREMENTS

1.8.1 The Security Management System (SMS) software shall be designed specifically for Integrated Security Management Applications, shall have a proven track record in the security industry, and shall be an Off-the-shelf package available through a distributor network. The off-the shelf software shall be programmed and tailored to the specified functions and features described herein.

1.8.2 The software shall convey and accurate floor plan of all areas that require display on the monitors. The software shall utilize the maximum resolution and colours of the 1080p monitor to enhance and simplify the displayed control and status information. Fast orientation and ergonomics will be the goal of the graphic displays.

1.8.3 The software shall provide integrated Biometric (Fingerprint) log-on security functionality with security level protection for all Mouse driven operator workstations. The Biometric (Finger print) logon facility shall be capable of providing a one too many search algorithms to confirm operator credentials, without the need for entering user details.

1.8.4 There shall be a minimum of ninety-nine (99) levels of access, and shall be expandable.

1.8.5 The software shall provide a user database within the Management workstation. The database shall support a minimum of two thousand (2000) users.

1.8.6 The software shall provide on-line utilities accessed through the Management workstation menu structure. These utilities shall provide the system supervisor with the ability to edit and update required data bases, system operating variable, report configuration and generation, alarm tags and point descriptions, etc.

1.8.7 All software licenses shall be transferred to the Owner at completion of the project. This shall include but not be limited to all original installation disks, software manuals, equipment manuals, etc. All project specific applications software shall be transferred at the end of warranty period.

1.9 OPERATOR VISUAL DISPLAY UNITS

1.9.1 General

The SMS system offered shall be capable of providing a multiple operator workstation environment, which may be configured for full or selective operational & functional monitoring and control of select areas and functions.

Operator workstations shall be located as indicated in the tender drawings issued.
The operator workstations shall operate in both text and graphics-based display. Any operator workstation shall be capable of controlling any area within the site providing the respective operator is authorized to do so.

The operator workstation shall also be capable of implementing changes to the system configuration and parameters, provided the operator has the necessary administration rights.
Entries, deletions or modifications to the configuration shall be possible via the operator workstation VDU/Keyboard without loss of, or degradation to, any other system functionality.
The following workstation functions shall be possible:

a) Displaying point status information.
b) Manually initiating control commands.
c) Displaying system events and alarms.
d) Displaying staff and visitor photographs for positive identification.
e) Enrolling and verifying staff and visitor fingerprints. (Visitation Management module)
f) Assigning operator access levels.
g) Altering time schedules and creating new time schedules.
h) Assigning or modifying time schedules for automatic operation of monitored doors/gates and redirection of duress alarms and indicators appropriate to the user's building/department/etc.
i) Overriding time-controlled functions, momentarily, to allow operator control of doors/gates/and the like.
j) Altering existing or assigning new descriptions or actions.
k) Displaying status of all alarm sectors within the user's areas.
l) Performing on-line backup copies of complete system without any degradation in the overall system performance.
m) Displaying building alarms including fire alarms, intruder alarms, duress push buttons, etc
n) Enable the viewing of Sub-system status icons to be enabled or disabled through a built-in menu structure.

All of the above shall be restricted by user level to the operator workstation.

1.9.2 Monitors

All operator workstations shall be of robust construction, ergonomically designed to minimize operator fatigue.

1.9.3 Keyboards

Keyboards shall be supplied with all workstations, however shall only be used for commissioning and maintenance purposes. All operator functions shall be performed by means of an optical mouse, with system screens being designed so as to require the minimum operator action. Functions such as audio system Push to talk, volume up and down control etc. shall be possible by means of function keys on the SMS workstation.

1.9.4 Mouse

All mouse devices shall be optical of robust construction and suitably secured by an interconnecting cable.

1.9.5 Printer

A high-quality printer shall be supplied, installed and commissioned as part of this contract, for use with the management workstation in order to generate user defined management reports.

The printer shall incorporate a visible control panel with LED indication for power on, paper out and ready.

The printer shall be installed and configured into the Management workstation to be installed within the Control Room.

The printer shall be supplied with both power and data cables of suitable length to suit the location. In addition, the printer shall be set up complete with one full box of paper and two spare ink cartridges each.

1.9.6 Networking

Each SMS workstation installed on the security LAN shall be capable of monitoring and reporting the current status of all workstations on the network.

Should communications between workstations or control equipment be disrupted, an alarm shall be generated at the Control Room Operator workstations to alert the operators of the failure within the communications network.

Alarms generated shall be displayed at the operator stations, while updating the system database with the Time, Date and relevant workstation detail.

Failure of any operator workstation shall not prevent communication between any other workstation or Distributed control modules and their associated devices.

1.10 SOFTWARE

1.10.1 General

Software shall be fully proven prior to being supplied, installed, tested and commissioned.

A list of reference sites at which the system software has been installed and operational at the date of the closing of this tender shall be provided.

The operator interface software shall incorporate English language descriptions and messages using both text-based menus and graphical/icon displays. All configurations (e.g., entering of alarm response properties, adjusting time schedules, user data, etc.) shall be performed on line without effecting the operation of the overall system.

Selective access to different operator functions shall be configured based on an operator's user level.

After any predefined period, if no operator activity has occurred at the operator workstations, that station shall automatically request Biometric verification failing which the station shall log off.

The time period before automatic logging off of workstations shall be user configurable, and shall be determined during commissioning of the system, in liaison with the Engineer.

1.10.2 Operating System

The operating system shall be a recognized and widely accepted standard operating system that shall suit the requirements of the system to be installed. The operating system shall be a real time multi-user/multi-tasking system such as Windows 7.

The operating system shall have proven and demonstrated reliable operation in the security environment.

Facilities shall be provided to store all programs on site and include all equipment necessary to backup and reload all system programs, including the operating system with all user specific system parameters.

1.10.3 System Access

Operators shall be required to "log on" to operator workstations using the finger print reader provided at each operator station before being able to access the system or user information, reset alarms or access any other system functions.

Access to all workstations shall be limited through allocation of access levels.

A minimum of 200 users and 99 User levels shall be available. Only users allocated with a user level of 99 shall be capable of the assignment and changing of passwords to all levels.

Each operator shall be allowed to access different operator commands and functions, and view certain individually assigned events, menus and functions based on their assigned user level.

1.10.4 Scheduling

The SMS system shall have the ability to configure schedules which do not restrict the user to pre determined times, dates or access levels. Access to and editing of these schedules shall be possible via the Management workstation.

The following schedules shall be configurable:

a) Automated Public Address Announcements.
b) Operator station Access times.
c) Designated Alarm priority changes.
d) Automated door locking/unlocking.

1.11 ARCHIVING HISTORICAL DATA

1.11.1 General

Archiving of historical data shall take place automatically according to a configurable time frame, which shall be set via the Management workstation. The archived files shall be stored on the Raid 1 servers situated in the Server Room equipment rack. The system shall be capable of storing archived history files for a minimum period of 12 months.

Archived history files shall be read directly from the current or archived databases, without terminating or suspending the logging of current events

1.11.2 Overwriting

The SMS software shall display an alarm to system operators warning of the imminent loss of archived data once the available disk space becomes full. The alarm shall occur with sufficient margin to allow the systems operator to execute a manual history file dump to the removable storage medium, if required (normally 80%). The percentage alarm set point shall be variable by the highest user level.

1.11.3 System Logging

The server workstations shall be capable of logging the following data:
Event related data:

Item	Database Fields
1	Time and Date Stamp
2	Equipment Type
3	Control Area
4	Equipment Designation
5	Equipment Location
6	Alarm/Event Type
7	Alarm/Event Status
8	Responsible Operator
9	Operator Workstation Name
10	Control Area
11	Alarm/Event Priority

Logged Events/Alarms:

Item	Intercom Events/Alarms
1.1	Intercom Station Call in
1.2	Intercom Station Activated
1.3	Intercom Station I/O Failure
1.4	Intercom Station Tamper Alarm
1.5	Intercom Station Threshold Alarm
1.6	Intercom Station Fault
1.7	Intercom Call-in Transferred
1.8	Intercom Call-in Unanswered
1.9	Intercom Station Isolated
1.10	Intercom Station Isolated warning
1.11	Intercom System Hardware Failure
1.12	Intercom System Communication Failure
1.13	Intercom Alarm/Failure Acknowledged
1.14	Intercom System Call Central Command
1.15	Intercom System Call Movement Command

Item	CCTV Events/Alarms
2.1	CCTV Camera Activated
2.2	CCTV PTZ Preset Edited
2.3	CCTV Sequence Selected
2.4	CCTV Sequence Edited
2.5	CCTV System Hardware Failure
2.6	CCTV System Communication Failure
2.7	CCTV Alarm/Failure Acknowledged

Item	DVR Events/Alarms
3.1	DVR Channel Record Command
3.2	DVR Channel Halt Record Command
3.3	DVR System Hardware Failure
3.4	DVR System Communication Failure
3.5	DVR Alarm/Failure Acknowledged

Item	Door Events/Alarms
2.1	Door Open Command
2.2	Door Closed Command
2.3	Door Fault on Closing
2.4	Door Fault on Opening
2.5	Door Forced Open Manually
2.6	Door Open outside of limits
2.7	Door Open for extended period
2.8	Door Control module Communication Failure
2.9	Door DPS Opened
2.10	Door DPS Closed
2.11	Door Interlock Override Command

2.12	Door Group Activated
2.13	Door Group Edited
2.14	Door Emergency Release Activated
2.15	Door Control System Hardware Failure
2.16	Door Control System Communication Failure
2.17	Door Alarm/Failure Acknowledged

Item	Gate Events/Alarms
5.1	Gate Open Command
5.2	Gate Stop Command
5.3	Gate Close Command
5.4	Gate Fault on Closing
5.5	Gate Fault on Opening
5.6	Gate Forced Open Manually
5.7	Gate Open outside of limits
5.8	Gate Open for extended period
5.9	Gate Control module Communication Failure
5.10	Gate Alarm/Failure Acknowledged

Item	Public Address Events/Alarms
7.1	Public Address Zone Manual Activation
7.2	Public Address Zone Scheduled Activation

Item	Intrusion Events/Alarms
8.1	Intrusion Zone Activated
8.2	Intrusion Zone Alarm Acknowledged

Item	Panic Button Events/Alarms
9.1	Panic Button Activated
9.2	Panic Button Activation Acknowledged

Item	UPS Events/Alarms
10.1	UPS Mains Failure Alarm
10.2	UPS Load on Bypass
10.3	UPS Battery Low
10.4	UPS Battery Failure
10.5	UPS Load not protected
10.6	UPS Surge Arrestor Failure
10.7	UPS Communication Failure
10.8	UPS Alarm/Failure Acknowledged

Item	SMS Events/Alarms
13.1	New Operator Enrollment Successful
13.2	New Operator Enrollment Failed
13.3	Operator Details Edited
13.4	Operator Details Deleted

13.5	Workstation Logon Successful
13.6	Workstation Logon Failed
13.7	Workstation Unauthorized Access Attempted
13.8	Workstation Manual Logoff
13.9	Workstation Automatic Logoff
13.10	Workstation Inhibited
13.11	Workstation Re-instated
13.14	Workstation Online
13.15	Workstation Offline
13.16	Workstation Communication Failure
13.17	Workstation Alarm/Failure Acknowledge

1.11.4 System Reporting

The SMS shall be capable of performing SQL queries to the current or archived databases on the server workstations, format the data into customized reports which shall allow for the following:

a) Display of all relevant information on any individual alarm point including alarm point identification by device number and alarm point status.
b) Display all alarm points in the system in alarm or normal condition, as a single log.
c) Display all emergency procedures applicable to any alarm type with corresponding alarm response actions and locations, per alarm device.

Reporting details shall include:

a) Alarm point status
b) Alarm count per device.
c) Alarm activity over a time period, selected by time and date.
d) Display of selected alarm transactions based on alarm type and a calendar / time period.
e) Display system operators login/out history
f) Display all operator commands entered by any or all operators based on time/calendar interval

1.12 SYSTEM STATUS

The SMS shall provide a menu option which, when selected, allows the system to display or print a list of current alarms, faults and conditions including the current fault conditions relating to SMS workstations, Distributes control modules, sub-system equipment hardware and associated devices.

In graphical display mode the system shall display maps of each building complete with all internal levels and shall indicate all systems equipment status (i.e., open/closed; isolated/active; alarm; tamper etc.).

1.13 Current Alarm Window

The system shall provide an efficient and reliable alarm handling procedure and shall include both audio and visual annunciation, logging to the database and recording of the history file the device description, point description, location, time and date the alarm occurred.

The system software shall have the ability to route only selected alarms to specific operator workstations, allowing different locations or applications to be segregated on a building or system basis.

All systems activity shall be presented to ensure proper actions have been taken and that no alarm is left unattended for any lengthy period. Alarms, which have been acknowledged, and not cleared/reset shall be clearly distinguishable.

Upon occurrence of an alarm(s) a user configurable audible tone shall sound at the operator workstation(s) and display an indication of the incoming alarm together with its priority

If there are additional alarms to acknowledge the operator's station shall continue to sound the appropriate alarm tone, display the number of alarms waiting and identify the highest priority alarm.

The first alarm displayed shall be the highest priority alarm followed by the next highest priority alarm, etc.

All alarms are required to be separately acknowledged by the operator, by means of the mouse provided to acknowledge and reset each alarm separately.

Each time new alarms are created the system shall restack the alarms so the operator sees them in order of priority

The system shall also have an alarm/event status display available to the operator at all times on the operator's station.

The display shall be a real-time dynamic display of alarms in the active state, or system component failures.

An audit trail shall be used to log the actions taken by all system operators in response to an alarm. The audit trail shall note:

a) When the alarm was activated.
b) When the alarm was acknowledged.
c) Who acknowledged the alarm.
d) When the alarm was restored.

The system shall record every user command, acknowledgment and log every operator login

These transactions shall be routed to the history database.

Any alarm point which has been suppressed/inhibited by the operator shall on expiry of the time zone, or when unsuppressed by the operator, generate an alarm if the alarm point is in the "active" state. The report to the operator terminal shall be the same as described above.

Each alarm point shall have the site for a description of the alarm occurring.

Comprehensive outline for operator instructions, detailing all response actions shall be provided for all alarms.

1.14 GRAPHICAL DISPLAY

The SMS shall support a maximum of 150 colour maps for the purpose of displaying the location and real-time status of any SMS input or output.

Graphical maps to be included within the initial configuration are to show in detail the following areas.

- Site plan showing all buildings and locations of all alarm points and operator workstations.
- All buildings devices/status/alarms and the like.
- All building tamper, communications, power and the like devices/status/alarms and the like.
- Other maps as required to clearly display all alarm input within buildings, or an external equipment cubicle location.

Each site map shall be provided with a site plan key, which shall be common to all maps and situated in the same position. The key shall provide a means for the operator to quickly navigate through the entire site without the need to use standard navigation buttons or the main site map.

All device location and statuses shall be detailed on each map and colured accordingly for ease of recognition of both the device type and real-time status.

Text messaging identifying the device type, designation and alarm status shall be available in a "mouse over" or "windows hint" structure to minimize text on individual maps.

All text descriptors shall be approved by the Engineer prior to final acceptance. Liaise with the Engineer when programming these maps and other alarm/response descriptions.

Function key descriptions shall also be displayed as mouse over or windows hints.

Graphical map displays shall be of high resolution to enable accurate images to be represented. The configuration software shall provide a complete graphical design environment in order to design/edit building and site maps. A standard icon library shall be available to the designer in a window environment to enable efficient editing of existing maps by means of dragging and dropping equipment icons onto maps.

The system shall allow maps to be linked by means of navigation buttons to allow operators to "zoom" in or out to display either additional detail or an overall map.

Point status and locations shall be clearly displayed using colour-coded icons. All icons shall display real time status of each point with continuous updates being provided to any dynamic screen display.

Updates shall occur every 1 second or less. Icons shall be easily duplicated from a library of standard symbols at the configuration stage of developing the graphics.

1.15 SECURITY MANAGEMENT FUNCTIONS

1.15.1 Configuration

The SMS shall consist of a multiple screen representation of the entire site, which shall contain all of the necessary icons to control all security sub system equipment and devices situated throughout the site. All icons shall be activated with the use of a mouse. All icons and status indicators shall be a minimum of 5mm in diameter. All symbols shall provide status by colour and/or associated text.

1.15.2 Global Function Operations

Global function icons shall be located at the bottom of each graphic screen in the form of a footer window, which shall be common to all area maps. These icons, if active, shall control the global functions for the entire site.

a) **System Control** – activating this icon shall cause the system to switch to the system control screen. The System Control screen shall provide a complete system diagnostic window for all sub-system components and communication systems within the entire site.
The diagnostic information shall include but not be limited to the following:

i. UPS System:
- Load on Bypass
- Load not protected
- Mains Failure
- Battery Fault
- Battery Low
- Surge Arrestor Failure

ii. Control Hardware Status:
- TCP/IP communication Failure
- Control Network communication Failure
- Device Network communication Failure
- I/O Device Failure
- Communication Redundancy Integrity
- CCTV Matrix communication Alarm

iii. Door position switch violation alarm per DPS
iv. Controlled door security violation alarm per door
v. Fire door security violation alarm per door
vi. Panic Button activated alarm per Panic Button
vii. Intercom Call in Failure per Intercom
viii. Operator Log on Violation

Where applicable all alarm conditions shall allow for operator acknowledgement and automatic selection of the alarmed zone layout screen.

b) **Site Plan** – The site plan shall consist of an interactive miniature layout of the entire site and shall be situated on the bottom Right-hand side of each operator screen.
The site plan shall provide the operator with a quick method to access an individual area to monitor and / or control.
The site plan shall also indicate critical operational information to the operator, which shall include but not be limited to the following:

a) Fire Doors Unsecured
b) Sally port Doors Unsecured
c) Control Room Logon Status
d) Control Room Call In
e) Control Room Communication Alarm.

e) **Volume Up** – Activating and maintaining this icon shall result in an increase in the operator console speaker volume. The icon shall change status to RED to indicate activation of this function.

d) **Volume Down** – Activating and maintaining this icon shall result in a decrease in the operator console speaker volume. The icon shall change status to RED to indicate activation of this function.

e) **Select** – Activating this icon shall result in either the first audio call-in or the currently selected audio call-in in the Audio Call-in Queue to be answered. Upon answering the call, the call shall be removed from the Audio Call In queue on all workstations.

f) **Reset** – Activating this icon shall result in either the first audio call-in or the currently selected audio call-in in the Audio Call-in Queue to be reset. Upon resetting the call, the call shall be removed from the Audio Call In queue on all workstations.

g) **All Page** –Activating the ALL PAGE icon on the footer window shall activate all Public Address station within the immediate area of control, and in the case of a Central Operator shall activate all stations within the facility. The PTT function shall be enabled and remain enabled until the ALL PAGE icon is selected again in which case the stations are de-activated and the PTT released.
The ALL PAGE icon shall change colour when active to clearly indicate the current status.

h) **Audio Call In Queue** - The SMS footer window shall contain an Audio Call-in queue facility into which audio call requests are entered on a first in first out (FIFO) basis.

Upon receipt of an audio call-in from any intercom station in the facility, the call in detail listing the control area, equipment designation and the specific location of the calling intercom station shall be entered into a FIFO queue.
The call-in priority of each intercom station within the facility shall be individually configurable within the SMS, and station priority shall take preference over the FIFO queue. Intercom station call requests of higher priority e.g., Control room call-in requests shall be entered into the top of the queue

The following methods of answering calls-ins shall be possible:

- Highlighting the desired call-in in the Audio queue and clicking on the "Select" icon in the footer window.
- Clicking repeatedly on the "Select" icon in the footer window, which shall automatically answer the oldest entry in the Audio queue
- Double clicking on any entry in the Audio queue.
-

Any of the above-mentioned methods of answering a call-in shall reset the currently selected intercom station and enable the selected station as well as simultaneously removing the entry from the Audio queue on all workstations.
When the local operator workstations are logged on, call-ins from the relevant local area shall be directed to the local workstation. In the event that the call is not answered within thirty seconds, the call shall be forwarded to the Central Control room workstations. Call-

ins from local areas in which a local operator is not logged in, shall be forwarded immediately to the Central Control room operators.

i) **Fault Queue –**
The SMS footer window shall contain a Fault queue site into which all security sub-system or control system faults are entered in order of priority.
Upon receipt of any security sub-system or control system fault, the relevant fault detail including the control area, equipment designation and the specific location of the fault shall be entered into the Fault queue.
The Fault queue is intended to provide a quick reference to the system operator of current alarms, and is intended to replace functionality of the Current Alarm window described in the specification.
Faults may be dealt with in the following ways:

- By right clicking on a specific fault in the queue, the operator shall be presented with an "Acknowledge" option. Clicking on the Acknowledge option shall enter the acknowledgement into the event recording system and remove the fault from the queue.
- By double clicking on a specific fault in the queue, the appropriate area map shall be displayed with the faulty equipment control icon clearly visible. The equipment icon shall display the fault detail in a mouse-over or "hint" fashion. Right clicking on relevant equipment icon shall present the operator with an "Acknowledge" option. Clicking on the Acknowledge option shall enter the acknowledgement into the event recording system and remove the fault from the queue.

Local operator workstations shall display alarms and faults related to the immediate area of control only. Control room operator workstations shall display all current alarms within the entire site.

j) **Synchronized Clock System –**
All operator workstations footer windows shall contain a synchronized digital clock, which indicates the Date and Time in 24 Hour mode. The accuracy of the synchronized digital clock system shall be within +- one (1) minute within a thirty (30) day period, and shall be synchronized with the management workstation within the central control room each hour on the hour.

k) **Operator Logon Details**
The SMS footer window shall contain the detail of the currently logged on operator including full name and authorized user level.

1.15.3 Locking Operations

a) **Door Position status (Monitored Only)**
There shall be a status icon for each monitored door to indicate the position of the door. The status icon shall illuminate red when the door is unsecured and shall be green when the door is secure.
Each DPS icon shall provide mouse over or "hint" fashion detail of fault conditions relating to the equipment element as well as indicating the equipment designation.
A right mouse click over any icon shall provide the operator with an option to acknowledge an alarm condition as well as to view the engineering properties of the element provided the necessary user level is active.

b) Unlock Icon (Swing Door)

There shall be a single control icon with visual status indication for each controlled swing door lock. Activating the UNLOCK command shall apply power to the lock and activate the UNLOCK control cycle. The associated status icon shall indicate red when the incorporated lock status switch indicates an unsecured state and green when the lock is secured. Each door icon shall provide mouse over or "hint" fashion detail of fault conditions relating to the door.

A right mouse click over any icon shall provide the operator with an options to acknowledge an alarm condition, to inhibit a door open command, or to view the engineering properties of the element provided the necessary user level is active. Inhibiting a door open command shall change the icon colour to blue.

c) Unlock / Lock Icon (Sliding & Fire Doors)

There shall be a single control icon with visual status indication for each controlled sliding door control mechanism. Activating the UNLOCK/LOCK icon shall either activate the UNLOCK cycle or the LOCK CYCLE of the mechanism in a toggle fashion. The associated status icon shall illuminate red when the door is unsecured and green when the lock is secured. Activation of this icon whilst the associated door is in travel shall cause the door to instantly change its direction of travel. Each door icon shall provide mouse over or "hint" fashion detail of fault conditions relating to the door.

A right mouse click over any icon shall provide the operator with an options to acknowledge an alarm condition, to inhibit a door open command, or to view the engineering properties of the element provided the necessary user level is active. Inhibiting a door open command shall change the icon colour to blue.

d) Open / Close / Stop Icons (Sliding gates)

There shall be three individual control icons with visual status indication for each controlled sliding gate. Activating the OPEN icon shall activate the OPEN cycle of the controlled device. Activating the CLOSE icon shall activate the CLOSE cycle of the controlled device. Activating the STOP icon while the device is in the OPEN cycle or CLOSE cycle shall STOP the device. The associated status icon shall illuminate red when the locking device is unsecured and shall be green when the locking device is secured. Each gate icon shall provide mouse over or "hint" fashion detail of fault conditions relating to the door.

A right mouse click over any icon shall provide the operator with an option to acknowledge an alarm condition or to view the engineering properties of the element provided the necessary user level is active.

e) Emergency release

An Emergency release icon shall be provided for each housing unit day room area, which shall be used to initiate an automated opening sequence for Cell and Exercise yard doors. The opening sequence shall be configurable within the SMS in order to provide the most efficient opening sequence.

Activating this icon shall cause a pop-up window to appear on top of the graphically displayed area. Located within this window shall be text explaining to the operator that the activation of this function shall result in all controlled doors in the corresponding area to be released under an emergency procedure. Also located within this window there shall be three icons namely "Open", "Close" and "Cancel". Activating the icon with the text "Open" text will activate the emergency open routine. Activating the icon with the text

"Close" text will activate result in the same doors to smultaneously close. Activating the icon with the text "Cancel" shall remove the pop-up window and resume normal operation.
Once an emergency release routine has been activated the doors in the controlled area shall open and indicate an emergency condition by flashing the affected door icons in RED. The activation of the emergency close routine shall return the icon status to normal.

f) **Interlock Group Status**
Activating a door lock icon that is part of an interlocked group of doors of which one or more doors are currently open, shall cause a pop-up window to appear on top of the graphically displayed area to indicate to the operator that an interlocked door is currently open and that the "Interlock Override" function should be activated to open the door.
Right clicking on the door icon shall provide the operator with an interlock lock group option, which when selected shall indicate each door contained in the relevant interlock group.

g) **Interlock Override**
Activating this icon shall enable the operator to override an interlocked door. The override function shall only remain active for 10 seconds. Activating a door control icon while override is active shall cause the associated door to unlock or open. When the override timeout limit is reached, the system shall return to normal operation.
During the active 10s period the icon shall Flash RED to indicate activity.

h) **Group Assign Icon**
Activating this icon shall result in the door status icons of all doors in the corresponding Cell area to turn White. By toggling the door control icon whilst in the "Group Assign" mode shall toggle the door icon colour from White to Grey. A White icon shall indicate that the door is included in the controlled group, whilst a Grey icon indicates that it is not included in the group.
Upon activating the Group Assign icon for a second time the system shall return to a normal state and set the controlled door group into memory. Re-activation of the Group Assign icon shall cause the door control icons to indicate their current group assign status from memory.

i) **Group Release**
Activating this icon shall cause a pop-up window to appear on top of the graphically displayed area. Located within this window shall be three icons namely "Open", "Close" and "Cancel". Activating the icon with the text "Open" text will result in the doors included in the Group Assign memory to Open. Activating the icon with the text "Close" text will result in the doors included in the Group Assign memory to Close. Activating the icon with the text "Cancel" shall remove the pop-up window and resume normal operation.

L15.4 Intercom Operations

a) **Audio Control – Staff/Cell Intercom Icon**
The SMS shall provide a control icon with visual status indication for each intercom station within the entire facility.
The icons shall be used to initiate or terminate an audio channel between the relevant control room operator's audio console and the selected intercom station.

Each Intercom station icon shall provide mouse over or "Hint" fashion detail of fault conditions relating to the station as well as indicating the equipment designation.
The alarm detail displayed by the "hint" function shall include:

- Intercom station Tamper alarm
- Intercom station Threshold alarm
- Intercom station I/O alarm
- Intercom station Communications alarm

All alarm conditions shall be presented to the operator within the Fault queue as described in the specification.

A right mouse click over any icon shall provide the operator with an option to acknowledge an alarm condition, to inhibit an intercom station, or to view the engineering properties of the element provided the necessary user level is active. Inhibiting an intercom station shall change the icon colour to blue.

i **Intercom Station Call Up** – Activating a station icon shall open a talk path between the operator and the associated intercom station. The associated status icon shall illuminate yellow to indicate an active channel. Activating the station icon, a second time shall close the talk path and the status icon shall extinguish.

ii. **Staff Station Call-In** – Upon activation of a Staff station call-in button located on the intercom station faceplate, the associated status icon shall illuminate and flash between yellow and gray with an audible tone. Activating the associated intercom station icon shall open a talk path between the operator and the staff station. The status icon shall illuminate yellow and the audible tone shall silence. Once complete, activating of the staff station icon a second time shall close the talk path and the associated status icon shall extinguish.

iii. **Automatic termination of an audio channel** – Should multiple audio call in's be received by the local operator, the operator shall only be required to select each audio icon once. The second icon selected shall initiate an audio channel to the appropriate intercom station and initiate an automatic de-select command to the previous channel.

iv. **Delayed Call-In** – Upon activation of a Staff or Cell station call-in button on an intercom station which falls under the control of a local control workstation, provided the particular operator is logged in, the call shall at first be routed to the local operator. If the local operator fails to respond to a call in within 60 seconds, the call is automatically routed to central control. This event is to be logged to the event recording system.

v. **Audio Queue** – An Audio Call-in queue facility shall be provided as an integrated function of the SMS system.

1.15.5 Closed Circuit Television (C.C.T.V.) Operation

a. CCTV Fixed Camera Select
The SMS shall provide a single control icon with visual status indication for each CCTV Fixed Camera within the entire site.

Activating a camera icon shall cause the associated camera to be switched to the relevant operator's spot monitor via the IP Interface to the CCTV Virtual Matrix. By selecting another camera icon the spot monitor image shall change accordingly.
Camera to Monitor commands shall be configured within the SMS to determine the allocation of spot monitors to operator workstations
Currently selected camera icons shall illuminate RED, whilst un-selected icons shall illuminate GREEN
Each Camera icon shall provide mouse over or "hint" fashion detail of the camera designation.
A right mouse click over any icon shall provide the operator with an option to view the engineering properties of the element provided the necessary user level is active.

b. C.C.T.V. PTZ Camera Select

The SMS shall provide a single control icon with visual status indication for each CCTV PTZ Camera within the entire site.
Activating a PTZ camera icon shall cause the associated camera to be switched to the relevant operator's spot monitor via the High-Level Interface to the CCTV Matrix. By selecting any other camera icon, the spot monitor image shall change accordingly.
Camera to Monitor commands shall be configured within the SMS to determine the allocation of spot monitors to operator workstations.
Currently selected PTZ camera icons shall illuminate RED, whilst un-selected icons shall illuminate PURPLE.
Each PTZ Camera icon shall provide mouse over or "hint" fashion detail of the camera designation.
A right mouse click over any icon shall provide the operator with an option to view the engineering properties of the element provided the necessary user level is active.

c. C.C.T.V. PTZ Control

Once a PTZ camera icon has been selected by the operator, the SMS shall provide a pop-up control window, which shall allow the following PTZ control functions:

- Pan Left
- Pan Right
- Tilt Up
- Tilt Down
- Simultaneous Pan Left, Tilt Up
- Simultaneous Pan Right, Tilt Up
- Simultaneous Pan Left, Tilt Down
- Simultaneous Pan Right, Tilt Down
- Zoom In
- Zoom Out
- Continuous rotate Left
- Continuous rotate Right
- Rotate Stop
- Preset Position Select
- Guard tour initiate

d. C.C.T.V. PTZ Preset Save

The SMS shall provide the operator with a menu option which shall initiate a pop-up control window, which shall allow the following PTZ control functions:

- PTZ Camera Select (1-n)

- PTZ Preset Select (1-99)
- Pan Left
- Pan Right
- Tilt Up
- Tilt Down
- Simultaneous Pan Left, Tilt Up
- Simultaneous Pan Right, Tilt Up
- Simultaneous Pan Left, Tilt Down
- Simultaneous Pan Right, Tilt Down
- Zoom In
- Zoom Out
- PTZ Preset Store Command
- PTZ Preset Load Command

The SMS shall be able to assign a specific PTZ Preset position to a standard fixed camera icon. The operator shall be able to click on a fixed camera icon, which shall load a PTZ preset position onto the appropriate spot monitor.

e. **Sequence to Monitor Select**

The SMS shall provide a single control icon with visual status indication for each Monitor within the individual control rooms.

A control room layout map shall be configured within the SMS, indicating the physical layout of the control desk and the CCTV monitors for the relevant SMS workstation.

The Monitor icon shall illuminate RED if a CCTV sequence has not been assigned to a specific monitor, and GREEN when a logical sequence has been assigned. The sequence number and description shall be displayed within the Monitor icon when a logical sequence has been assigned.

The operator shall be able to select the desired camera sequence by means of a Right mouse key function on the monitor icon.

Camera sequences may be assigned to any Monitor in the site including the spot monitors if required, however the manual selection of a camera image shall automatically override the sequence allocation.

1.16 VISITATION MANAGEMENT MODULE

The Access Control hardware provided shall support the Visitation Management System, which shall be provided as a fully integrated module of the Security Management System provided under this contract.

The Visitation Management System Module (VMS), shall provide for a fully integrated Biometric based Visitor and Staff identification System providing the following components as a minimum:

- Visit Booking
- Visitor, Staff Enrolment
- Visitor, Staff Verification
- Visitation Management
- Integration to Security Management System

1.16.1 System Components

The base system shall consist of the following components, however shall be indefinitely expandable to provide additional Visitation points, Inmate and staff tracking points, as may be required.

- Electrically actuated Turnstiles (Dual Direction), with an access control terminal mounted on each side (General or Visitors entrance gate).
- Visitor Enrolment stations (General or Visitors entrance gate).
- Visitor Verification stations (Contact and Non-Contact Visitation areas).
- Management Administration station (Administration building).

1.16.2 Component Description

a. Electrically Actuated Turnstiles (Full Height)

Full height bi-directional electrically activated turnstiles with a parallel 850mm bypass gate shall be mounted in passageways for the monitoring and control of people in strategic areas of the court. The turnstiles shall be equipped with a fingerprint reader on both sides of the turnstile. The turnstiles shall be electrically released either by swiping an authorized card and confirming with a valid fingerprint, or manually activated by the relevant Operator Station.

b. Enrollment Station

The Enrollment Station shall consist of a dedicated PC workstation situated at the general or visitor's entrance. The station shall consist of a PC, fingerprint reader, Camera, adhesive label printer and a storage tray for temporary visitation cards.

The station shall be used to enroll visitor information into the system, and to print and issue a temporary visitation identification card to each visitor, which shall contain the visitor details with a bar code for database indexing

c. Management Administration Station

The Management station shall be installed within the Administration building, and shall consist of a PC workstation, fingerprint reader, Camera, LaserJet reporting printer and a Desktop Colour PVC identification card Printer.

The station shall be used to enroll staff members onto the system.

Staff members shall have their picture and fingerprints captured and shall be issued with a permanent staff access card, which shall be required to enter and leave the facility via the entrance turnstile.

1.16.3 Environmental Conditions

The following environmental issues shall be taken into consideration.

a.) **Temperature**

To avoid overheating of the PCs, air conditioning equipment shall be provided.

b.) **Humidity**

The contractor shall ensure that the humidity shall be maintained within the manufacturer's specification and controlled via the internal air conditioning. The tenderer shall ensure the adequacy of the current air conditioning system and make allowances to replace under rated units.

c.) **Anti-Static**

Adequate measures shall be taken to discharge any possible static at installation points. An installation specific survey with a list of recommended protection measures shall be required from the contractor.

1.16.4 Training

A comprehensive operator-training programme shall be provided and shall cover all aspects of the Management system so as to provide first line local support to operators both operational and managerial.

The training shall include the following topics as a minimum:

a. **Software**
   i System overview
   ii Pre-booking Visits Procedure
   iii.Visits Orders
   iv.Logging onto the System
   v.Enrolment procedure, and the understanding of fingerprint technology
   vi.Verification Points and Procedures (In and Out)
   vii.Red List Notification
   viii.Visits Notification Prisoner / Visitor
   ix.Visitor Pass & ID Card Design
   x.System Maintenance
   xi.Reporting and Enquiries

b. **Support**
   i.Trouble Shooting Problems / Queries
   ii.The Support Program and Support Procedures
   iii.Support Communications
   iv.Environmental Issues

1.17 GRAPHICAL USER INTERFACE

The following software functions are required as a fully integrated software module of the Security Management System provided as part of this tender.

The functions described are to be built in functions of the Security Management Operator Workstation software.

Due to the complex nature of the sub-system integration required by the system it is imperative that the Supplier of the Security Management System provides a direct interface (driver) to the sub-system hardware offered in this tender, and that the functions described below are in-built functions of the software.

1.17.1 Site Perimeter Map

A graphical presentation of the site perimeter shall include the following:

a) Position of the perimeter
b) Doors
c) Other static information (buildings or roads) that may be required to assist the operator to identify the location of an occurrence.
d) The following Icons representing the alarm / maintenance status of field detection devices shall be included:
e) The operational (maintenance) status of field equipment for each field controller.

Abnormal conditions shall be acknowledged by the operator by activating a single icon. This shall also stop the audible sounder.

The colour of status icons shall change in the following sequence.
Green - Normal condition
Red Flashing - New alarm condition
Red Solid - Condition has been accepted by the operator

Blue shall indicate a device in a permanent abnormal condition and must be addressed by a maintenance repair procedure. Step 4 shall be omitted in case of certain maintenance devices or in case of CCTV surveillance where no field reset is required.

The following requirements shall be the minimum requirements for the user interface:

1.17.2 Operational Information

The following are shown on the operator interface:

a) Site perimeter Layout
b) Icons representing the alarm status of detection devices
c) Buttons to accept and reset alarms
d) Buttons to issue a reason for alarms

1.17.3 Management Information

a) Operational Status

Parameters providing a summary of the operational status of the equipment including:

i. Percentage site online
ii. Condition of field communication network

b) System performance

Summary of the number alarms during a daily, weekly and monthly period. Alarms are categorized as the following types:

i. Valid Alarms
ii. Nuisance Alarms
iii. Unknown Alarms

c) Operator performance

Values representing the maximum time the current and previous operator took to accept and reset alarms. Unattended time shall also be indicated
Open a window to view the log

d) Diagnostic Information

The following diagnostic status information shall be made available.

i. Real time Alarm status of all devices
ii. Maintenance status of these devices
iii. Buttons to inhibit any device
iv. Analogue values of detection devices

2. DISTRIBUTED SYSTEM

2.1 GENERAL.

All Distributed control modules and associated hardware required to provide the alarm inputs, control outputs, access control, device monitoring and the like described in this document shall be included as part of this Contract.

The modules shall be designed to continually monitor all devices connected and supervise all general inputs (i.e., or alarm points) and cabling to control outputs.

As a minimum requirement, all inputs shall be "end of line resistor" monitored and provide indication of normal, alarm and tamper (open or short) conditions

All inputs shall be continuously supervised for high or low impedance (using end of line resistors). Upon a change of this impedance an appropriate alarm shall be annunciated to the various devices (including operator's terminal, printer and history file).

All alarms generated in the field shall be received by the Distributed control modules, and shall generate an interrupt to signify to the system that an alarm has occurred, and report its status, which shall be annunciated to any or all devices such as operator stations, printers and the history file.

Various Distributed control modules shall be used dependant on the application, and as detailed below.
Any input throughout the system shall be able to be interlocked with any other input or output through software assignment of conditional logic.

It shall be possible to disable individual or groups of alarm inputs and control any output via any operator station.

During suppressed/inhibited mode, the alarm point wiring shall be monitored to detect any unauthorized tampering (i.e., tamper alarms shall be monitored 24 hours a day, every day).

The Distributed Control System shall consist of autonomous control systems located within each local control area. Each local control system shall be capable of utilizing multiple processing units to perform the application specific logic functions, as well as to provide system redundancy

The failure or loss of any single door or I/O control device shall not hamper the operation of any other control device or processing unit, and shall not degrade the overall system response time as indicated in the System Performance Guidelines.

Each control system shall be capable of communicating in a peer-to-peer configuration over a communication network utilizing a non-proprietary, commercially available technology and open protocol.

The communication network shall be IP based directly to the point of installation, and shall not employ any non-standard or proprietary hardware or software. All door control modules in a local control zone (i.e., housing pod) shall be terminated at the relevant Ethernet Switch within the local area equipment cabinet, and run in either a point to point or bus Ethernet configuration.
The use of discreet multi-core cabling to each door to control door functions shall not be accepted as an alternative to a bus or point to point Ethernet topology.

2.2 SYSTEM COMPONENTS

All system modules shall share the same control language and programming structure, where applicable.

All system modules shall have built-in comprehensive self-test and self-diagnostic capabilities.

All system modules shall have built in status indication of power supply voltages and module processor healthy indication to show proper operation.

All 24 VDC system modules shall have on board voltage regulation for logic power supply.

All system modules shall have on board, auto-resetting over – current protection devices for the logic supply and field input circuits.

The system modules shall provide all necessary logic functions, timing functions, input points, output points memory, communication capabilities and software for the operating functions and features shown in the contract documents.

All system modules shall be general non-location specific in their construction. They shall be made location specific and operationally customized by software configuration of network variables during the installation process

2.3 PROGRAMMABLE LOGIC CONTROLLERS

The Distributed Control System shall be hosted by Industrial Programmable Logic Controllers (PLC), installed within each local area equipment cabinet.

Each PLC shall host a dedicated area such as a housing block, or group of areas. Autonomy and isolation of areas shall be achieved by installing standard Layer 2 Ethernet Switches. Dual port Ethernet compatible Door modules shall be installed in a bus configuration with the bus cabling originating at the local area switch, and shall terminate at the last door on the appropriate door run.

The PLC hardware offered shall be capable of hosting a minimum of 64 controlled cell or passage security doors plus associated I/O and peripheral devices such as Duress buttons, monitored door position switches etc.

2.4 DOOR CONTROL MODULES

The programmable door control modules shall provide the necessary I/O points to cater for the monitoring and control requirements of sliding and swing doors, and shall be installed in a recessed housing or door header located above the door or lock.

The module shall provide 2x 10/100Mb Ethernet ports to enable the devices to be run in a bus configuration between consecutive cell and/or passage doors.
The module shall also have a minimum of eight (8) optically isolated inputs for the monitoring of door position switches and / or reset cell switches.

The module shall also be used as an interface to other security and miscellaneous monitored and controlled devices

The door module with the following minimum requirements, shall allow for the direct termination of all field signals, light relays etc. as well as the connection of the data and power services, without the need for external switching relays or communication devices:

2.4.1 Output Requirements

The module shall allow for the direct termination of the following Output points:

a) 1x Sliding / Swing Door Open solenoid valve
b) 1x Sliding Door Close solenoid valve

2.4.2 Input Requirements

The module shall allow for the direct termination of the following Input points:

a) 1x Sliding Door Closed/ Swing Door Secure
b) 1x Sliding Door Open/ Swing Door DPS
c) 1x Sliding Door Obstruction Detection
d) 1x Magistrate Duress Alarm Input

2.5 CONTROL MODULES

The control panel modules shall be designed to be installed within the local control room cabinet. The module shall provide for the control of 16 Output points and 16 input points. Connection to the control panel will be via front mounting Pluggable screw cage terminations.

2.6 COMMUNICATION NETWORK

The communication network shall be based upon industry standard Ethernet 10/100/1000 Mb/sec utilizing standard of the shelf non proprietary hardware

2.7 DURESS BUTTONS

Duress buttons shall consist of a latching industrial type red mushroom head button without key release.
The device shall be flush mounted in a standard 100mm by 100mm socket outlet connection box.

2.7.1 Activation

Activation of any duress button shall sound an audible tone in the associated control room and cause the associated icon on the operator control console to flash.
The audible tone may be silenced from the control console causing the icon to remain steady with a red colour. The emergency condition of the icon shall only be reset once the alarm has been acknowledged by the operator.
All duress alarms shall be logged together with the appropriate time and date stamp within the management workstation together with the current operator detail.

2.7.2 Hardware Platform

All Inputs required for the Duress System shall be provided by the Distributed Control System (DCS) as detailed in the specification.

3. CCTV SYSTEM (IP)

3.1 SYSTEM - GENERAL REQUIREMENTS

The video management software (VMV) shall be an open architecture Video Surveillance System.
The system shall be a digital video/audio recording and remote monitoring system with a capability of simultaneously displaying, recording, replaying, searching, and transmitting both video and audio.
The system shall be truly hybrid in nature, and shall be capable of supporting the following video sources:

a) I.P. Video cameras (most popular brands are to be included in this) A separate list of supported I.P. cameras are to be provided.
b) I.P. video encoders (3rd party).
c) Video systems.
d) ONVIF compliant devices.

The system shall use Universal Plug and Play (UPnP) and ONVIF Device discovery to discover I.P. devices and retrieve the settings from those devices

The system shall be of a "client/server" nature with the following components:

a) Recording Management Servers.
b) Client viewing and management stations.
c) On-site clients.
d) Off-site clients.
e) Off-site PDA/Cell phone/Tablet clients
f) Alarm Management Server.

The system shall be capable of running in a Windows (32 or 64 bit), or a Linux, operating system environment.

The software shall be capable of running in a "virtual server" environment (For example, VMWare).
Each recording management server shall be capable of managing multiple IP camera video streams, limited only by hardware processing capability, and available local/remote system storage.

The overall system shall have no limit to the number of cameras/video streams.
The system shall enable remote users to connect to the system via ADSL, VPN, or any other source of communication. It shall be able to perform ALL on-site capability and setup, via this remote connection.

The system shall have a true remote setup client, and not rely on remote desktop applications.
The system shall maintain user activity logs.
The system shall enable all sub-systems on site to be time-synchronised.
The system shall manage an unlimited number of Inputs and Relay outputs.
The system shall provide setup wizards for fast, simple addition of cameras.
The system shall store complete site configuration on site (or off-site) for retrieval in the event of hard drive failure. This configuration shall be easily re-instated.
The system shall be easily upgraded to later versions via a CD, USB key, or other means.
The system shall be easily expandable by the addition of I.P. camera licenses, or analogue system hardware.

Special features shall be pre-built into the system, and may be unlocked with a software key, enabling a qualified user to quickly activate these features as required

3.2 VIDEO/AUDIO STREAMING AND STORAGE MANAGEMENT

The system shall manage the recording, and streaming, of both video and audio from the various sources.

The system shall be capable of:

a) The system shall enable the user to designate a camera as "covert". In this case, the camera should only be seen and viewed/reviewed by users with the relevant access rights.

b) The system shall be capable of "trans-coding" video streams to a lower bandwidth, for off-site monitoring (subject to the availability of suitable video streams & the processing power of the video servers).

c) The system shall provide a "monitor" recording feature, which enables the recording of any display monitor (VGA/HDMI) connected to any Windows device as if it were an I.P. camera. All functionality associated with a standard I.P. camera shall be applied to this video stream.

d) The system shall control access rights for archiving and reviewing of archived video footage.

e) All archived video shall be signed with a digital signature for authenticity, and the signature shall be encrypted. The system shall be Kalagate approved.

f) The system shall provide the facility to add a user selectable watermark to video being archived.

g) The system shall provide the facility to add a random, system generated, or user generated, password to video being archived.

h) The system shall be capable of storing video footage from the same cameras to multiple databases simultaneously. The databases may be on the same recording server, or on a network storage device.

i) The system shall provide a "copy and paste" capability which will enable users to easily copy all camera settings, including information from multiple video streams, across multiple cameras.

j) The system shall provide the capability to perform a scheduled backup as follows:

   i. Archive selected cameras,

   ii. Archive only a selected period of recorded footage.

   iii. Archive at a selected time of day.

k) The system shall provide the capability to create Privacy Zones in a camera's feed.

   i. Privacy Zones shall be areas that are not viewable by Operators in a camera's feed

   ii. Privacy Zones must be editable/addable after camera addition.

   iii. These privacy zones must be present in live, review, and archived video footage.

   iv. The software must be capable of hiding/showing privacy zones (this capability must be dependent on user access rights).

   v. Privacy zones' presence in archived footage must be dependent on whether or not they have been hidden/shown by the user.

3.3 GRAPHICAL USER INTERFACE (GUI)

The system shall provide a graphical user interface (GUI) which enables users to easily see all resources (Cameras, Audio components, databases, Inputs, Outputs, Layouts etc.) on a complete site, and shall not be limited to specific DVR's or I.P. Network Video Servers.

The GUI shall be capable of being viewed over up to 4 monitors from one client software computer.
The user shall be able to customise the monitors so that they can view different components (e.g., maps, cameras, integration data etc. on different monitors or on window "tabs" on the same monitor).
The layout of the user interface shall be customizable. System functions or features that are not activated, or to which the user does not have access shall be hidden from view – the user shall only see functions that he/she uses.
User access to site resources shall be access-controlled by username and password, whether local or remote viewing, restricted by the access level of the individual user.
The software shall enable users to create folders, and allocate resources to selected folders in the interface.
From the GUI, it shall be possible to open multiple sites simultaneously and display them on selected monitors on the system. This includes site maps, camera feeds and other site resources.
In order to ensure that there is fast access and bandwidth management for remote client connections, all site resources, maps, and other site-specific parameters shall be downloaded and stored locally at the remote client's location. If they have been modified at site, they are to be re-loaded from the site to the remote client connection upon re-connection.
The system shall enable the user to select specific cameras to be viewed on selected monitors, or selected panels within selected monitors.
The system shall enable users to view and pause live cameras.
The system shall enable users to playback recorded footage.
The system shall allow specific cameras to be viewed live, and played back simultaneously, and synchronised together if requested.
The system shall allow multiple cameras to be played back simultaneously and synchronised together if requested.
The system shall provide the capability to drag-and-drop cameras from a resource panel into selected monitors, or panels on the monitor.
The system shall enable users to drag-and-drop cameras, from a map, into selected monitors or panels on the monitor.
The GUI shall allow the same camera to be viewed live on multiple monitors or panels on one monitor.
The system shall enable the configuration and initiation of tours of cameras on selected monitors or on panels within a selected monitor.
The system shall provide the capability to create and save multiple "layouts" of cameras that can then be easily selected, either manually by a user, or automatically on an event.
The system shall allow the configuration and initiation of tours of "layouts" (also known as a "salvo") to selected monitors.
The system shall enable the user to "de-warp" video from 180- or 360-degree panoramic cameras.
The system shall enable the user view up to 64 cameras on a single monitor.
The GUI shall enable users to digitally zoom into specific camera views.
If a camera is configured to supply multiple streams, and both streams are designated for live viewing, then the GUI shall allow users to choose which stream to show for live viewing.
The GUI shall be able to optionally show VMD algorithms functioning by displaying overlays of:
a) VMD triggers.
b) VMD zones.
c) VMD detection areas.
The system shall enable users to control PTZ cameras from the GUI, or from an attached keyboard/joystick controller in order to:
a) Pan, Tilt and Zoom.
b) Move PTZ camera faster and slower.

c) Focus and Iris control
d) Set PTZ camera pre set positions.
e) Assign unique names to PTZ camera pre set positions.
f) Move to PTZ camera default positions.

Reviewing and Archiving Video Footage.

a) The system shall enable users to easily review any camera on the system, from any client software connected to the system, either off-site or on-site.
b) The GUI shall enable the synchronisation of cameras during playback.
c) The GUI shall enable the user to mark start and end times of video to be archived
d) The system shall enable users to archive multiple cameras simultaneously.
e) The system shall enable users to archive selected footage from one or multiple cameras to DVD, USB Memory device, local or remote Hard Drives.
f) The system shall enable the user to save the archive "player" along with the video.
g) The system shall enable users to pause playback of video and print, copy to a clipboard, or save an Image to a select storage location.

The user should be able to control outputs from the GUI

The user should be able to see input triggers from the GUI.

Map Interface.

a) The system shall provide a multi-layer interactive map facility.
b) The map facility shall be hierarchical with "drill-down" capability
c) The system shall enable users to drag-and-drop cameras from the map to monitors for viewing.
d) The system shall enable users to trigger an event from the map by "clicking" on a map icon.
e) The system shall enable remote users to automatically view the site map.
f) The system shall enable remote clients to download and store the maps locally to remove the need to download the map for each connection.
g) Comprehensive map setup/editing software shall provide the means to create and edit maps. This software shall include at least the following functions:
h) Setup Wizard.
i) Vector drawing tools.
j) Image import.
k) Detailed, editable properties for all objects.
l) Cloning object properties to other objects.
m) Create object actions.
n) Layers have transparency / hide- show
o) Object and entire map rotation.
p) Comments.
q) Optional grid.
r) Cameras with editable fields of view.
s) Domes with associated, editable presets.
t) Color and texture fills.
u) Object ordering and list per layer.
v) Editable text.
w) Create map hyperlinks.
x) Zooming.
y) Adding cameras with drag-and-drop icons (fixed or PTZ)
z) Association of icons with system cameras.
aa) Adding of I/O via drag-and-drop icons.
bb) Importing of graphics in JPG or PNG format.
cc) Ability to associate layers with preset PTZ positions.

dd) Ability to switch layers on or off in response to a system event (e.g., to indicate a door opening/closing).

ee) Drag site resources from a site resources list directly to the map

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3.4 EVENTS TRIGGERS AND ACTIONS

The system shall provide an event and action management capability with the following features.

Events.

a) The system shall have the ability to trigger events on the following.

i. Trigger from cameras/encoders on the network. This includes physical inputs or Video analytics triggers.

ii. Built-in motion detection.

iii 3rd Party Devices (e.g., Access control, Fire Panels, Alarm Panels, Point-Of-Sale, etc.).

iv Local user events (events initiated by an operator).

v. Recordings initiated by a time schedule.

b) The system should have an "AND" function which will prevent triggers occurring unless an event trigger AND an I/O input is present.

c) The system shall enable the user to specify event specific, validity schedules.

d) The system shall provide a "debounce" delay setting to limit the frequency of triggers.

Actions

a) The system shall be able to perform one or more of the following actions upon the receipt of an event trigger:

i. Perform an action either "while" an event is occurring or "when" an event occurs.

ii. Record video footage from one or more cameras to a selected database.

iii. Record pre-events from one or more cameras.

iv. Record synchronised video and audio.

v. Switch or toggle one or more relay outputs which are provided by the system or cameras/encoders connected to the system.

vi. "Pulse" one or more relay outputs which are provided by the system or cameras/encoders connected to the system.

vii. Move one or more PTZ cameras to "preset" positions.

viii. Switch one or more selected cameras to one or more selected monitors connected to the system.

ix. Switch a camera "layout" to a selected monitor.

x. Record data from a 3rd party system (e.g., Point-Of-sale, Access control, Alarm panels).

xi. Initiate a graphical action on a map.

xii. Play a pre-recorded audio clip via the local client server OR via an audio output on an I.P. camera or encoder.

xiii. Send an email to selected recipients.

xiv. Send an alarm to a user viewing the system via the Viewing software and Alarm Management Gateway (see Section 9). This is applicable to local or remote systems.

- On an action that is sending an alarm, or notifying a user, there shall be at least 3 user-defined levels of priority that may be allocated to the specific events
- Upon sending a notification to an Alarm Gateway, the system shall allow the user to define video previews to be sent with the event notification.
- There shall be a user defined delay option to limit the number of alarms sent.

xv. Stop a previously initiated action.

b) All actions shall be subject to user defined time schedules.

The system shall provide the ability to create "event templates" which will enable users to easily associate common actions across multiple cameras.

3.5 VIDEO ANALYTICS

The system shall be capable of utilising the on-board analytics on the I.P. camera or encoder to initiate an event with which selected actions can be associated as per paragraph 5
The system shall have built-in Video Motion Detection algorithms, and will be capable of performing these on video streams received.
The built-in motion detection shall have the following features:

a) Variable sensitivity.

b) Size masking.

   i. Reject objects smaller than a specified size.

   ii. Reject objects larger than a specified size.

c) Multi-zone VMD areas per camera with the ability to vary sensitivity in each zone.

d) It shall be possible to employ an advanced version of the video motion detection that uses a learning algorithm to detect a noise level (e.g., slow cloud movement, slow movement of trees in wind, background traffic, and moving machine parts) and to generate a mask to eliminate these ambient movements as false triggers. The mask shall decay when repetitive ambient movement ceases, thereby minimizing false alarms, and reducing irrelevant recordings, alarms, and security responses.

e) A day/night setting capability to enable different VMD settings for day and night. Automatic day/night switching or switching at specified times are to be optional.

f) A schedule which enables/disables selected VMD triggers at certain times of day.

g) The ability to track moving objects as they move through different areas of a facility. In response to this movement, PTZ cameras shall be moved to preset positions

The system shall have the capability to add analytics like people counting, "abandoned object", "removed object", Automatic Licence Plate Recognition (ANPR), and line crossing detection under license.
Motion detection trigger images are to be stored to the database, and associated with any recordings completed due to that motion detection trigger.
The GUI shall have the capability to show:

a) Masking areas of VMD.

b) VMD triggers

c) VMD detection areas.

The VMD setup window shall enable users to view live or recorded video, for VMD setup/testing purposes

3.6 INTEGRATION

The system shall have the capability to integrate 3rd party products like Access Control, Point-Of-Sale, Alarm Panels, and other devices capable of communicating data via RS232 or Ethernet.
The integration capability will be dependent on the integrated device but the system shall be capable of the following features:

a) Reception of data from the 3rd party device.

b) Perform specific triggers and actions dependent on specific data received.

c) Perform triggers and actions on specific data as per section.

d) Store the data in logical fields in a selected database.

e) Associate video data from one or more cameras with specific data events.

f) Provide the ability to "mine" the database to find selected data/transactions and the associated video data.
g) Synchronise the video and data in time using Network Time Protocol (NTP)
h) Play back video and data simultaneously and synchronously.
i) Provide easy filtering of database data for search purposes.
j) Provide "quick-search" capability via a drop-down user interface.
k) Provide a live display of data received and simultaneously view associated cameras.

The system shall integrate with I/O devices to control outputs and receive inputs from the I/O devices. These devices may be on a network camera, encoder (server), or on a dedicated network I/O device.

3.7 SUPPORT, HEALTH MONITORING AND TECHNICAL REPORTS

The system shall provide a complete remote setup and maintenance client. Remote desktop applications are not acceptable
The remote setup client shall have the same complete functionality of the server software.
The system shall keep logs and provide reporting capability of the following.
a) Hard drive integrity and failures.
b) Reboots.
i. Cause of reboots, including:
ii. Software server reboots
iii. Power failure reboots.
iv. User reboots.
v. Remote user reboots.
c) Time of reboot.
d) Camera failures
e) Software server failures.
f) System setup and configuration.
g) Recording setup and configuration.
h) Recording times of the system, per camera.
i) System temperatures.
It shall be possible for users to save their reports as "templates" for easy generation of future reports.
It shall be possible to export reports in either text or html format.
It shall be possible to email reports.
It shall be possible to print and archive (save) reports.
Reports shall be in html format, with automatic generation of a table of contents, and hyperlinks to sections.
It shall be possible to automatically compile and email selected reports to selected recipients to a specified schedule.
The system shall be capable of sending alarms to a user or an Alarm Management Gateway if any of the following occurs:
a) Cameras failed more than a specified number of times in a specified time period.
b) Cameras were down for more than a specified percentage of time in a specified period.
c) System temperature greater than system requirements.
d) Fan speeds of system below requirements.
e) Hard drive SMART parameters outside system required norms.
f) If the number of recorded events on any particular day is less than it should be (based on an historical mean), indicating a possible technical fault.

g) If an unusual shutdown sequence has occurred (e.g., a user pulls out the power lead).
h) If there is digital indication that a camera lens has been spray-painted or completely covered by other means.
i) If a communications medium has failed (e.g., Ethernet or Modem).
j) If the reboot frequency is unusually high.
k) If an automated routine base station ping of a capture station has failed.
l) It shall be possible to set the system to trigger a technical alarm if an IP encoder or camera goes down.
m) It shall be possible to trigger a test technical alarm from a single unit within a site of units.
n) All systems shall continuously test all other systems on the site for "up-time" and if any systems do not respond, then an alarm may be sent.

The sending of alarms shall have filters to enable users to limit the number of alarms sent. These settings shall include:

a) Send alarm each time an event occurs.
b) Send alarm immediately and then every specified time period.
c) Send alarm once only

3.8 ALARM MANAGEMENT GATEWAY

The alarm management server shall have a database that manages all alarms sent from one or more sites.

The alarms database shall be available for viewing, and for handling alarms, from multiple client desktops under password control.

The alarm gateway database shall be used to store unit lists, incoming alarm data, full audit trails, plus downloaded video and audio, providing for centralized control of all relevant data.

The database shall also feature search filters to mine the database.

It shall be optional to assign audio notifications to the different priority incoming alarms.

Where incoming alarms are unhandled in the incoming queue, the highest priority alarm in the incoming queue shall sound its audio notification every thirty seconds, until handled.

It shall be possible to customize the incoming alarm audio notifications.

Alarms shall display sequentially in separate panes: incoming (awaiting handling), current (being handled) and archived (handled).

An operator shall be able to respond to an alarm and automatically connect to the site from where the alarm was initiated.

The system shall be optionally configured so that, on connection, the operator shall see the client-customized desktop / screen configuration, alarm information, and map pertaining to that particular alarm. It shall be possible to configure the map so that an event alarm icon flashes at the appropriate point where the alarm was initiated.

It shall be possible to temporarily disable (block) repetitive invalid alarms for specified periods. This blocking shall be specified from the capture unit, and shall require explanatory comment by the blocking operator.

It shall be possible for operators to simultaneously clear multiple alarms from the incoming queue.

Operators shall be able to handle multiple remote alarms simultaneously - a separate interface tab shall represent each connection.

Where multiple operators are handling alarms, the system shall keep all operators informed as to an alarm's status, and who is handling which alarm.

Even when out of the alarm-queue desktop, operators shall still see an alarm status bar indicating the number of incoming, un-handled alarms by color coded priority.

Operators shall be able to add comments to Current and Archived alarms. To facilitate fast responses, default comments shall be selectable from a menu, but it shall also be possible to add custom text comments.
It shall be possible to modify the default comments menu with more appropriate custom comments.
Control room operators shall optionally use dual, triple or quad-monitor interfaces, with Alarm, Resources, Map desktops, and other software spread across the monitors.
The software shall enable systems to be connected using TCP/IP, over LAN/WAN on Ethernet/Token Ring or PSTN/ISDN. These connections shall be on a "mix-and-match" basis.
The alarm interface shall feature a clearly-visible graphical indicator of the gateway-connection status (connected or disconnected).
The alarm interface shall be access-controlled independent of the remainder of the software, and shall have its own user management utility.
The control room solution shall be capable of bi-directional audio transmission and monitoring
Operator logins, and responses to incoming calls, shall be recorded by an Audit Trail facility that is protected from manipulation.
It shall be possible for operators to electronically escalate an alarm to a "case", and assign people to investigate, thereby alerting and involving security management structures.
It shall be possible to create a case independently of an alarm.
The system shall establish an audit trail and timeline of case responses, enable electronic collaboration between all assigned parties, commit important personnel to the process, and ensure that the case has to be properly resolved/signed off before it can be "closed".
Users to which cases have been escalated shall receive electronic notification of case assignments.
A case management utility shall provide the means to manage the formal security process from the alarm interface.
Case managers shall be able to further escalate cases, to higher and higher levels of inspection
The system shall provide detailed, customizable reports based on connections, response times, logins, and handling times.
It shall be possible to schedule the system to run reports automatically, and to perform automated actions with the reports, such as emailing the report to recipients.
The alarm management system shall monitor connections to remote units via phantom alarms (a site heartbeat) at set intervals. It will generate a trigger when a remote alarming unit fails to send its phantom alarm.
It shall be possible to send technical and event alarm SMSs from the alarm management system.
It shall be possible to filter historical alarms using their associated recordings and metadata. Filter parameters shall include Alarms, Sessions (where multiple alarms may have been sent through on a single connection), control-room Operator (based on 'login information), and Cases (alarms that were escalated for further investigation).
From the historical alarms interface, it shall be possible to double-click an entry (Alarm, Session, Operator Login, Case) for a more detailed information/action screen related to that entry, from which it shall be possible to do the following:

a) View alarming site name.
b) View alarming server name
c) View alarm description
d) View control-room Operator who handled an alarm or a session.
e) View the name of the control room unit through which an alarm or session was handled.
f) View time of an alarm event.
g) View time that an alarm event was dispatched to the control room.
h) View an alarm's arrival time at the control room.
i) View time taken to handle an alarm by the control-room Operator.
j) View Comments associated with alarms, sessions and cases.

k) View recordings associated with an alarm
l) Archive associated alarm recordings to CD/DVD/USB.
m) Connect to the historical alarming site to fetch further recordings associated with the alarm, if they still exist in the remote site's database/s.
n) View Cases associated with an alarm.
o) Show the entire Session in which an alarm was handled.
p) Add further Comments to historical alarms, sessions and cases.
q) Escalate an historical alarm to a Case for further investigation and resolution.
r) Show the entire Session in which an alarm was handled.
s) Show control-room Operator logins associated with an alarm session
t) View all alarms associated with a session.
u) View a control-room Operator's login duration, start time and end time
v) View the number of Sessions handled by a control-room Operator during a Login.
w) View all Sessions handled by a control-room Operator during a Login.
x) View a Case description.
y) View the name of the user who escalated an alarm to a Case, with the date-time.
z) View the name of the user who closed a Case, with the date-time.
aa) View a list of Case users, with their Status relating to a Case (Active - still working on it, or Inactive – no longer working on it).
bb) View a Timeline of user actions relating to a Case.
cc) View the Status of a Case.
dd) View all Alarms associated with a Case.
ee) View all Comments associated with a Case.

3.9 SYSTEM SECURITY AND ACCESS RIGHTS

The system shall have an optional technical alarm that warns the user and/or a control room if unusual system shutdowns/reboots have occurred.
The system shall have an optional technical alarm that warns the user and/or a control room if an image is recorded at a very low image size from any camera, as would happen with the spray-painting or otherwise blocking of camera lenses.
User Access shall be configurable at an Administrator-level plus thirty further levels of user access.
The system shall be accessed by user name and password, and all user actions shall be recorded against the user's name in an operator audit trail. This audit trail shall be accessible, printable, and access-controllable.
It shall be possible to specify a limit to the user login period, after which users must login again.
Access for remote users shall be controllable from the local system rather than from the remote viewing system.
It shall be possible to restrict access on the set-up and viewing of databases, cameras, remote units, communications, operational panels, and system set-up functions.
It shall be possible to "hide" selected databases, and camera views, from specific levels of system user, so that the user is unaware of their existence.
For prosecution, and other legal purposes, recorded images shall be digitally signed with a unique identifier that is lost if an attempt is made to manipulate the image

3.10 AUDIT LOGS

Users with appropriate access rights shall be able to view and print audit trails of operator and system activity from the graphical user interface.

An operator log shall provide an historical log of operator actions, across all user logon names. This Operator Log shall be able to be used for:

a) Research operator responses to situations (e.g., whether operators followed correct procedures after an alarm notification).
b) To track configuration-related actions (e.g., renaming, enabling, disabling, re-configuring, setting up).
c) To track individuals responsible for security breaches, and
d) To perform any other activity that is made possible by a detailed knowledge of user actions.

The operator log information shall be presented in a screen interface that provides options in sorting the information, including sorting by specific user, by all users, by operator changes to the local system, and by operator changes to remote systems.

A system log shall provide an historical log (list) of automated (system) actions.

3.11 INTEGRATED KEYBOARD

The system shall feature an integrated keyboard control.
The keyboard joystick shall be able to function as a mouse or a dome controller, enabling operation with a VGA graphical user interface or an analogue camera display
The keyboard shall feature fast key selection of cameras, presets, VGA monitors, outputs, camera tours and screen layouts.
Dome camera function buttons shall be accessible to the fingers of the hand on the joystick, so that operators need not relinquish control of the joystick.
The keyboard LCD display shall be writable by the digital surveillance system.
Keyboard key LEDs shall indicate the state of keys and functions.
It shall be possible to adjust the joystick's pan and tilt sensitivity.

3.12 FAILOVER

The system shall have provision for a failover server.
A hot-spare structure will be used to accomplish this.
The failover server will continually monitor recording servers.
System alarms will be generated if a failover slave server is down.
The failover server will assume full functionality of a failed slave recording server.
The site will continue to function as if the recording server had not failed.
Video will be re-inserted on the original recording server's database on recovery.
A single failover server can only assume the functions of a single failed recording server.
Multiple failover servers will be required to assume the functions of multiple failed recording servers.
Failover servers will have unique IP addresses.
Failover servers will require camera licenses equal to, or great than, the number of cameras on the recording server that is to be failed over. Camera licenses will be equally shared across multiple failover servers.
Each failover server will require a failover server license with a warning in the status bar if it is unlicensed.
Only NVRs can be failed over. NetBSD servers, and servers with frame grabber cards, are excluded.
A Site master NVR will have limited failover, and will require alternate provision for 100% failover.
With a failed-over master NVR there will be limited functionality on the site – recording will continue on the failover server, but the IP address will be different to that of the original site master NVR.
The site will not be externally accessible on the original master IP address.

3.13 FORENSIC TOOL

The system shall have provision for a forensic tool to troubleshoot and obtain the following historical site server data:

a) Network camera summary – total network throughput, drop ratio, and count of camera stalls.
b) Database writes - disk writing bitrate, and drops to local or network storage
c) Dropped packets – external network, internal UDP between servers, and internal video frames.
d) Video streaming – sent, received, and decoded for live viewing.
e) Software compressor – encoded and decoded pixel rate, and percentage of frames.
f) Internal messaging – UDP packets missed and received between processes, and number of logs per minute sent
g) Video frames – missed and received between internal processes.

The system shall have provision for a forensic tool to troubleshoot and obtain the following historical camera-specific data:

a) Network cameras – bitrate, dropped packets, cameras stalls, camera down, and number of events per camera.
b) Database cameras – bitrate, bytes written to disk, camera down, and number of events per camera.

The system shall have provision to present the forensic data in a graphical format based on the following:

a) Date and time selection.
b) Time frame selection.

The system shall have provision whilst in the Graph Window to facilitate the following:

a) Zoom in on a time period of data.
b) View the data values.
c) Export as a Comma Separated Values (CSV) file.

3.14 VIDEO MANAGEMENT SERVER

3.14.1 General Characteristics

i. The IP Video Management Appliance shall be a RAID-5 protected management solution for network surveillance systems.
ii. Software updates shall be available free of charge during the product warranty period. The software installed on the IP Video Management Appliance shall not be subject to any additional Software Maintenance Agreements (SMAs).
iii. The IP Video Management Appliance shall utilize "enterprise-rated" hard drives in a fault tolerant RAID-5 configuration.
iv. The IP Video Management Appliance shall be a pre-configured video management solution with up to 24 TB of gross storage capacity.
v. The IP Video Management Appliance shall offer a bandwidth of 475 Mbit/s.
vi. The IP Video Management Appliance shall offer a dual port Gigabit Ethernet network interface, 8 GB system memory and an Intel Xeon Quad Core Processor.
vii. The IP Video Management Appliance shall offer remote monitoring via a desktop application or a Web browser.

3.14.2 Functions

vii. The IP Video Management Appliance shall offer an energy-efficient hot-swap redundant power supply.
i. The IP Video Management Appliance shall offer hot swap SATA-III hard drives providing up to 24 TB of gross storage capacity
ii. The IP Video Management Appliance shall come pre-installed and pre-configured with all necessary software.
iii. The IP Video Management Appliance shall utilize Microsoft Windows Storage Server 2012 R2.
iv. The Operating System of the IP Video Management Appliance shall run solid state disks in redundant configuration.

3.14.3 Access to Video

i. The IP Video Management Appliance shall deliver high-quality HD video despite low or limited bandwidth connections.
ii. The IP Video Management Appliance shall offer Dynamic Transcoding technology that retrieves data and subsequently decodes and decompresses the data stream to a lower bit stream.
iii. The IP Video Management Appliance shall instantly enhance the video detail to full HD quality when the video is paused.

3.14.4 Management

i. The IP Video Management Appliance shall come with the VMS management application pre-configured
ii. The IP Video Management Appliance shall allow operators to use one central tool for configuration and operations management.

3.14.5 Health Monitoring

i. The IP Video Management Appliance shall provide SNMP, Remote Desktop and HTTP monitoring support.
ii. The IP Video Management Appliance shall offer high-availability hardware, embedded design, and system wide monitoring

3.14.6 Storage

i The IP Video Management Appliance shall contain up to four (4) 3.5 in. SATA storage trays.
ii. The IP Video Management Appliance shall have up to 4 SSATA (7,200 RPM, 64 MB cache, 3.5 in.) Hard drives installed.
iii. The IP Video Management Appliance shall offer a 3108-based SAS/SATA RAID card with 8 internal ports.
iv. The IP Video Management Appliance shall include an AMD FirePro W4100; 4 x Mini Display Port graphics card
v. The IP Video Management Appliance shall include a Creative Sound Blaster PCI sound card.
The IP Video Management Appliance shall include 2 x 120 GB SSD drives in RAID-1

3.15 NETWORK VIDEO RECORDER (NVR)

3.15.1 General Characteristics:

i. The network video recorder shall be an all-in-one recording solution for network surveillance systems.
ii. The network video recorder shall be a pre-configured and pre-installed IP video recording solution with up to 160 TB (16 x 10 TB) storage capacity
iii. The network video recorder shall offer front-swappable SATA-II hard drives providing 160 TB of gross storage capacity.
iv. The network video recorder shall run the Video Streaming Gateway to allow third-party camera integration.
v. The network video recorder shall allow remote viewing via the Video Security App and the Video Security Client.
vi. The network video recorder shall offer a bandwidth of 800 Mbit/s (read and write) with IP-cameras/encoders and equipped with 16 HDDs.
vii. The network video recorder shall offer an Intel Atom N3150 processor + Marvell 88SE9215 storage controller.
viii. The network video recorder shall utilize Microsoft Windows Storage Server 2012 R2 (64 bit)
ix. The network video recorder shall have tamper-protection.
x. The network video recorder shall offer comprehensive search and playback functions.
xi. The network video recorder shall offer remote search and playback functions.
xii. The network video recorder shall allow viewing, playback and configuration via a remote Web management connection.
xiii. The network video recorder shall operate a Windows based operating system.

3.15.2 Functions

i. The network video recorder shall come pre-installed and pre-configured with all necessary software.
ii. The network video recorder shall enable viewing of high-quality UHD video despite low or limited bandwidth by utilizing Dynamic Transcoding technology
iii. The network video recorder shall decode and decompress the data stream to a lower bit rate stream tailored to the bandwidth of the connection.
iv. The network video recorder shall offer SSD: a solid-state, non-volatile memory module that contains a backup image of all system software needed to a full system recovery.
v. The network video recorder shall have Alarm Inputs and Relay-Outputs.

3.15.3 Recording

i. The network video recorder shall simultaneously record a maximum 160 channels
ii. The network video recorder shall record at up to 310 Mbps per channel
iii. The network video recorder shall allow manual and automatic recording.
iv. The network video recorder shall allow automatic recording via a schedule or based on an alarm.

3.15.4 Management

i. The network video recorder shall provide a browser-based user interface for system configuration and unified appliance management.

iv. Alternatively, the network video recorder shall allow operators to use one central tool for configuration and operations management.

3.15.5 Control

i. The network video recorder shall provide alarm inputs/outputs on the rear panel of the device.
ii. The network video recorder shall support the use of PC software or a built-in web application via a network for live viewing, playback and configuration.
iii. The network video recorder shall contain a 10/100/1000Base-T Ethernet ports for local or wide area network connection.

3.15.6 Remote Viewing

i. The network video recorder shall provide the Video Security Client for remote viewing.
ii. offers its customers a connectivity service (DDNS) for access to network-connected devices without any advanced network configuration.

3.15.7 Storage

i. The network video recorder shall contain sixteen (16) 3.5 in. SATA storage trays
ii. The network video recorder shall have a maximum of sixteen (16) HDD hard drives installed.
iii. The network video recorder shall include a graphics memory controller integrated in the Intel Atom N3150 processor.
iv. The network video recorder shall include a 4 x1 GbE RJ45 network port

3.16 1/2.8" 2.8 - 12mm Day/Night HD 2 Mega Pixels IP Vari-Focal Starlight IR Bullet camera with PoE

3.16.1 General Characteristics

i. The camera shall offer 1080p resolution at 16:9 aspect ratio
ii. The camera shall offer tamper and intelligent motion detection.
iii. The camera shall have a built-in active infrared illuminator
iv. The camera shall utilize Intelligent Dynamic Noise Reduction (iDNR) technology to reduce the bitrate and storage requirements by removing noise artifacts.
v. The camera shall accept power via Power over Ethernet (IEEE 802.3af compliant).

3.16.2 Network Video

i. The camera shall provide direct network connection using H.265, H.264 and M-JPEG compression and bandwidth throttling to efficiently manage bandwidth and storage requirements while delivering outstanding image quality.
ii. The camera shall allow full camera control and configuration capabilities over the network.
iii. The camera shall deliver video, at rates up to 60 images per second, via TCP/IP over a 10/100 Base-T, auto-sensing, half/full duplex, RJ45 Ethernet connection.
iv. The camera shall conform to the ONVIF standard.

3.16.3 Night Vision (Infrared)

i. The camera shall have a 4 LED high efficiency array (850 nm) for effective night vision up to 60m

3.16.4 Control

i The camera shall be configured via a web browser or PC surveillance software

3.17 2.8-13MM, DAY/NIGHT HD 2 MEGA PIXELS IP VARI-FOCAL IR DOME CAMERA WITH POE

3.17.1 General Characteristics

i. The camera shall be capable of operating in an indoor environment.
ii. The camera shall offer 1920 x 1080 (2MP) sensor pixels.
iii. The camera shall offer tamper detection and Essential Video Analytics.
iv. The camera shall offer two way full duplex audio communication.
v. The camera shall have a built-in active infrared illuminator
vi. The camera shall utilize Intelligent Dynamic Noise Reduction (iDNR) technology to reduce the bitrate and storage requirements by removing noise artifacts
vii. The camera shall offer Intelligent streaming possibilities.
viii. The camera shall have a gyro sensor / accelerometer
ix. The camera shall provide eight independent, fully programmable privacy mask areas.

3.17.2 Network Video

i. The camera shall provide direct network connection using H.265, H.264 and M-JPEG compression and bandwidth throttling to efficiently manage bandwidth and storage requirements while delivering outstanding image quality.
ii. The camera shall allow full camera control and configuration capabilities over the network.
iii. The camera shall deliver video, at rates up to 30 images per second, via TCP/IP over a 10/100 Base-T, auto-sensing, half/full duplex, RJ45 Ethernet connection.

3.17.3 The camera shall conform to the ONVIF Profile S and G standard **dio**

i. The camera shall have line in and line out jack connectors for two-way, full duplex audio communication with audio compression AAC, G.711, L16 (live and recording).

3.17.4 Night Vision (Infrared)

i The camera shall have a 10 LED high efficiency array (850 nm) for effective night vision up to 30 m.

3.17.5 Control

i. The camera shall be configured via a web browser or PC surveillance software.

3.17.6 Recording and Storage Management

i The camera shall support iSCSI devices to allow video stream to be recorded directly to an iSCSI RAID array.
ii. The camera shall support iSCSI storage targets to enable the camera to function as a conventional DVR.

iii. The camera shall have an SD card slot that uses standard, off-the-shelf SD cards for local storage (up to 2TB).
iv. The local storage feature shall be capable of storage for Automatic Network Replenishment (ANR).
v. Local Recording: Continuous recording, ring recording, alarm/events/schedule recording.

3.17.7 Alarm Handling Features

i. The camera shall provide the capability on alarm to display up to a 31-character, programmable alarm message.
ii. The camera shall provide email alarm messaging with optional JPEG posting.

3.17.8 Embedded Video Content Analysis

i. The camera shall be VCA enabled.
ii. The camera shall be capable of processing and analyzing video within the camera itself, with no extra hardware required.
iii. The camera shall be capable of detecting and sending alarms for abnormal events.
iv. The camera shall allow users to set up to 10 separate profiles and switch profiles based on a day/night or holiday schedules.
v. The camera shall offer Essential Video Analytics that uses an Intelligent tracker to

3.18 2.8-13MM, DAY/NIGHT HD 2 MEGA PIXELS IP VARI-FOCAL STARLIGHT DOME CAMERA WITH POE (WIDE DYNAMIC RANGE)

3.18.1 General Characteristics:

i. The vandal resistant HD camera shall be capable of operating in an indoor or an outdoor environment.
ii. The vandal resistant HD camera shall offer a 3-9 mm or a 10-23 mm automatic varifocal, super resolution lenses with an advanced iris design.
iii. The vandal resistant HD camera shall offer Content-based Imaging Technology (C-BIT).
iv. The vandal resistant HD camera shall utilize Intelligent Dynamic Noise Reduction (iDNR) technology to reduce the bitrate and storage requirements by removing noise artifacts.
v. The vandal resistant HD camera shall provide direct network connection using H.264 and JPEG compression and bandwidth throttling to efficiently manage bandwidth and storage requirements while delivering outstanding image quality.
vi. The vandal resistant HD camera shall conform to the ONVIF Profile S specification.
vii. The vandal resistant HD camera shall offer Intelligent Video Analysis (IVA).
viii The vandal resistant HD camera shall provide an on-screen display to simplify the camera/lens back focus and network configuration settings.
ix. The vandal resistant HD camera shall provide enhanced night viewing through the increase of IR sensitivity by automatically switching a motorized IR filter from colour to monochrome operation in low-light or IR illuminated applications. Allow the IR filter to be switched manually via the alarm input, pre-programmed in a camera mode or profile.
x The vandal resistant HD camera shall utilize pixel-by-pixel analysis to automatically compensate for bright areas of a high contrast scene (Back light) without having to define a window or area.

xi. The vandal resistant HD camera shall provide intelligent Auto Exposure (IAE) to improve visibility of dark objects against a light background and vice versa. Use IVA to detect in which parts of the image local contrast enhancement can improve image usability

3.18.2 Imaging

i. The vandal resistant HD camera shall offer intelligent Dynamic Noise Reduction to reduce bandwidth and storage requirements by optimizing the detail-to bandwidth ratio via temporal and spatial noise filtering.
ii. The vandal resistant HD camera shall offer two regions of interest to zoom into a specific area of the full image.
iii. The vandal resistant HD camera shall allow regions of interest to be sent in separate streams so it is possible to view both an overview and a detail at the same time.

3.18.3 Storage Management

i. The vandal resistant HD camera shall support iSCSI devices to allow video stream to be recorded directly to an iSCSI RAID array.
ii. The vandal resistant HD camera shall support iSCSI storage targets to enable the camera to function as a conventional DVR.
iii. The vandal resistant HD camera shall have a microSD card slot that uses standard off-the-shelf microSD (SDHC and SDXC) cards for local storage (up to 2 TB).
iv. The local storage feature shall be capable of storage for Automatic Network Replenishment (ANR)

3.18.4 IP Connectivity

i. The vandal resistant HD camera shall allow full camera control and configuration capabilities over the network
ii The vandal resistant HD camera shall conform to the ONVIF Profile S standard.
iii The vandal resistant HD camera shall offer Embedded Intelligent Video Analytics (IVA)

3.18.5 Intelligent Video Analysis

i. The vandal resistant HD camera shall be capable of processing and analyzing video within the camera itself, with no extra hardware required.
ii. The vandal resistant HD camera shall be capable of detecting and sending alarms for abnormal events.
iii The vandal resistant HD camera shall allow users to set up to 10 separate profiles and switch profiles based on a day/night or holiday schedules
iv. The vandal resistant HD camera shall offer a tracking feature that can follow objects within a defined region of interest.

3.18.6 Image Posting

i. The vandal resistant HD camera shall offer periodic JPEG image posting to an FTP server or to a Dropbox account.
ii. The vandal resistant HD camera shall offer best face detection and JPEG best face image posting to FTP server or to a Dropbox account.

3.19 1/2.8" DAY/NIGHT HD 2 MEGA PIXELS IP VARI-FOCAL STARLIGHT BOX CAMERAS WITH POE (WDR)

3.19.1 General Characteristics:

i. The camera shall utilize a 1/2.7-inch CMOS HD image sensor.
ii. The camera shall offer Content-based Imaging Technology (C-BIT).
iii. The camera shall utilize Intelligent Dynamic Noise Reduction (iDNR) technology to reduce the bitrate and storage requirements by removing noise artifacts.
iv. The camera shall provide direct network connection using H.264 and JPEG compression and bandwidth throttling to efficiently manage bandwidth and storage requirements while delivering outstanding image quality.
v. The camera shall work with Power over Ethernet IEEE 802.3af (802.3at type 1) for indoor applications with a compliant power supply source.
vi. The camera shall conform to the ONVIF Profile S specification.
vii. A user shall be able to view video on a PC using a Web browser, with the Video Management System, Video Client or Recording Station
viii. The camera shall provide MOTION+ video motion detection analysis system that provides basic video content analysis.
ix. The camera shall provide six configurable user modes that provide optimized settings for distinct applications
x. The camera shall offer Intelligent Video Analysis (IVA).
xi. The camera shall provide four independent, fully programmable privacy mask areas.
xii. The camera shall provide an on-screen display to simplify the camera/lens back focus and network configuration settings.
xiii. The camera shall provide enhanced night viewing through the increase of IR sensitivity by automatically switching a motorized IR filter from color to monochrome operation in low light or IR illuminated applications. Allow the IR filter to be switched manually via the alarm input, preprogrammed in a camera mode or profile.
xiv. The camera shall utilize pixel-by-pixel analysis to automatically compensate for bright areas of a high contrast scene (Back light) without having to define a window or area.
xv. The camera shall provide intelligent Auto Exposure (iAE) to improve visibility of high contrast scenes (dark objects against a light background and the reverse). Use IVA to detect in which parts of the image local contrast enhancement can improve image usability.
xvi. The camera shall offer intelligent Dynamic Noise Reduction to reduce bandwidth and storage requirements by optimizing the detail-to-bandwidth ratio via temporal and spatial noise filtering.
xvii. The camera shall offer regions of interest to zoom into a specific area of the full image.
xviii. The camera shall allow regions of interest to be sent in separate streams so it is possible to view both an overview and a detail at the same time.
xix. The camera shall provide enhanced night viewing through the increase of IR sensitivity by automatically switching a motorized IR filter from color to monochrome operation in low-light or IR illuminated applications. Allow the IR filter to be switched manually via the alarm input, preprogrammed in a camera mode or profile
xx. The camera shall utilize pixel-by-pixel analysis to automatically compensate for bright areas of a high contrast scene (Back light) without having to define a window or area.
xxi. The camera shall accept CS and C mount type lenses and detect automatically the type of lens used and optimize performance accordingly.

xxii. The camera shall provide a lens wizard for local or remote control of the motorized lens back focus system to allow focusing at maximum lens opening to ensure that the objects of interest within the field of view always remain in focus

xxiii. The camera shall provide a multi-language on-screen display

3.19.2 Storage Management

i. The camera shall support iSCSI devices to allow video stream to be recorded directly to an iSCSI RAID array

ii. The day/night IP camera shall support iSCSI storage targets to enable the camera to function as a conventional DVR.

iii. The day/night IP camera shall have a microSD card slot that uses standard, off-the-shelf microSD (SDHC and SDXC) cards for local storage (up to 2 TB).

iv. The local storage feature shall be capable of storage for Automatic Network Replenishment (ANR).

v. The camera shall provide email alarm messaging with optional JPEG posting.

vi. The camera shall offer Embedded Intelligent Video Analytics (IVA).

3.19.3 Intelligent Video Analysis

i. The camera shall be capable of processing and analyzing video within the camera itself, with no extra hardware required

ii. The camera shall be capable of detecting and sending alarms for abnormal events.

iii. The camera shall allow users to set up to 10 separate profiles and switch profiles based on a day/night or holiday schedules.

3.20 OUTDOOR DAY/NIGHT 2 MEGA PIXELS STARLIGHT IP PTZ CAMERA

3.20.1 General Characteristics:

i The HD PTZ camera shall provide a 1/2.8 inch type CMOS day/night camera with the following:

- 1944 x 1212 (2.35 MP) effective picture elements.
- Sensitivity to below 1.0 lux.

ii. The HD PTZ camera shall provide direct network connection using H.265, H.264, and M-JPEG compression and bandwidth throttling to manage bandwidth and storage requirements efficiently while delivering outstanding image quality.

iii. The HD PTZ camera shall offer a dynamic range of 120 dB for clear images in extreme high-contrast environments.

iv. The HD PTZ camera shall offer Intelligent Tracking that controls the pan, tilt, and zoom movements of the camera to follow an object or individual continuously.

v The camera shall utilize Intelligent Dynamic Noise Reduction (IDNR) technology to reduce the bitrate and storage requirements by removing noise artifacts.

3.20.2 Imaging

i. The HD PTZ camera shall produce a color image with a minimum scene illumination of 0.0077 lux and a monochrome image, when in the night mode, with a minimum illumination of 0.0008 lux at 30 IRE

ii. The HD PTZ camera shall offer automatic focus and iris control with manual override.

iii. The HD PTZ camera shall offer a Sodium Vapor White Balance mode that automatically compensate for light from a sodium vapor lamp to restore objects to their true color.

iv. The HD PTZ camera shall offer an anti fog image feature that assists the camera in registering a usable image through the heaviest fog.

v. The HD PTZ camera shall have an auto exposure (AE) function in which the camera determines the optimum level of iris, gain, and shutter speed for a specific scene and then produces an image of the scene.

3.20.3 PTZ Features

i. The camera shall provide a pan range of 360° continuous.

ii. The camera shall provide a tilt angle of 0° above the horizon for pendant housings.

iii. The camera shall divide the cameras 360° rotation into 16 independent sectors with 20-character titles per sector. Any or all of the 16 sectors can be blanked from the operator's view.

iv. The camera shall offer the ability to define 32 masks, with up to 8 masks per scene that prohibit areas of the field of view from being seen even if the camera is panned, tilted, or zoomed.

v. The camera shall store up to 256 preset scenes with each preset programmable for 20-character titles.

vi. The camera shall support the following tour modes:

- One (1) preset tour capable of 64 sequential pre-positions and a configurable dwell time between positions.
- Two (2) separate tours of an operator's keyboard movements consisting of pan, tilt and zoom activities. The recorded tours can be continuously played back.
- One (1) 360° AutoPan mode.
- One (1) AutoPan mode between limits.

vii The camera shall execute one of the following programmable options when an operator stops manual control of the camera, and a programmed period of time is allowed to expire: return to a stored preset number, return to the automated tour previously executed, and do nothing.

3.20.4 Pre-programmed Modes

i. The camera shall offer three (3) pre-programmed but configurable user modes.

ii. The pre-programmed modes shall be optimized with the best settings for the following environments:

- Indoor: For general day-to-night changes without sun highlights and street lighting
- Outdoor: For general day to-night changes with sun highlights and street lighting
- Traffic: Monitoring traffic or fast-moving objects; motion artifacts are minimized

iii The camera shall allow users to customize these modes for the specific requirements of the camera site.

3.20.5 Intelligent Video Analysis

i. The camera shall be able to process and analyze video within the camera itself, with no extra hardware required.

ii. The camera shall be able to detect and send alarms for abnormal events.

iii. The camera shall be configurable to analyze up to 16 different scenes for one or more events, including Line Crossing, Loitering, Idle Object, Removed Object, Conditional Change, Trajectory Tracking, and Filters.

iv. The camera shall allow users to set up to 16 separate profiles and switch profiles based on a day/night or holiday schedules.

v. The camera shall support scene tours that automatically reposition the camera to each scene for a specified duration.

vi. The camera shall be able to count moving objects that are currently within a user defined area.
vii. The camera shall be able to count objects that are moving in a user-defined direction.
viii. The camera shall be able to combine object events and states for user-defined events.
ix. The camera shall be able to detect and send alarms for user-defined events.
x The camera shall be able to detect and start alarms when objects are in alarm fields, even when the camera is moving.
xi. The camera shall use machine learning to define and classify objects of interest, both moving and non-moving, and then generate detectors for the objects. The machine learning program shall allow distribution of detectors to other cameras.
xii. The camera shall incorporate an Alarm Rule Engine, enabling abnormal events that IVA detects to prompt the camera to take one or more actions such as;
- Trigger a relay connected to an alarm siren and/or strobe
- Trigger a visual alert to be displayed on the operator's screen
- Go to a specified scene (preset position)

3.20.6 Intelligent Tracking

i. The camera shall offer Intelligent Tracking to track an object continuously using pan, tilt, and zoom actions.
ii. The camera shall provide automatic motion tracking using intelligent video analytics.
iii. The camera shall be able to follow an object continually when passing behind a privacy mask.
iv. The camera shall allow a user to define virtual masks for a scene so certain objects are not considered for flow analysis and will not trigger Intelligent Tracking.
v. The camera shall offer the following control options for the Intelligent Tracking feature:
- Off – the camera does not track moving object.
- Auto – the camera actively analyzes the video to detect moving objects.
- One Click – the camera allows a user to click a moving object in the live video image to activate Intelligent Tracking.
- Triggered – the camera continuously analyzes the scene for IVA alarms or an IVA rule violation. If an alarm or rule violation is detected, the camera activates Intelligent Tracking to track the object that triggered the alarm or rule violation.

vi. The camera shall able to restart tracking if a target starts moving in the same area where the initial target stopped moving or if the camera detects an object moving along the last known trajectory.
vii The camera shall allow an operator to select an object to track in the live image view.
viii. The camera shall automatically start tracking a target that violates an IVA rule or triggers an IVA alarm.

3.20.7 Local Storage

i. Memory Card Slot: SD/SDHC/SDXC memory card (maximum 2TB – SDXC)
ii. Recording: Continuous recording of video and audio, alarm/events/schedule recording

3.21 INDOOR DAY /NIGHT HD 2 MEGA PIXELS IP IR PANORAMIC CAMERA

3.21.1 General Characteristics:

i. The camera shall offer full 180° or 360° panoramic surveillance with complete area coverage, fine details and high speeds (5MP @ 15 fps sensor).
ii. The camera shall offer full situational awareness and simultaneous E-PTZ views.

iii. The camera shall provide edge or client-side dewarping for easy integration.
iv. The camera shall use the DORI (Detect, Observe, Recognize, Identify) standard system (EN-50125-7) to distinguish persons or objects within a covered area.
v. The camera shall utilize Intelligent Dynamic Noise Reduction technology to remove noise artifacts and reduce the bitrate by up to 50% (giving reduced bandwidth and storage requirements).
vi The camera shall provide direct network connection using H.264 and JPEG compression and bandwidth throttling to efficiently manage bandwidth and storage requirements while delivering outstanding image quality.
vii. The camera shall work with Power over Ethernet IEEE 802.3af (802.3at type 1) for indoor applications with a compliant power supply source.
viii. The camera shall support AutoMDIX
ix The camera shall conform to the ONVIF Profile S specification.
x A user shall be able to view video on a PC using a Web browser, with the Video Management System, Video Client or Video Security Client.
xi. The camera shall provide MOTION+ for video content analysis.
xii. The camera shall be supplied with a surface mount box (SMB) for easy indoor installation.
xiii. The camera shall provide configurable scene modes that give optimized settings for distinct applications.
xiv. The camera shall provide eight independent, fully programmable privacy mask areas.
xv. The camera shall utilize pixel-by-pixel analysis to automatically compensate for bright areas of a high contrast scene without having to define a window or area.
xvi. The camera shall have a discreet, low-profile, aesthetic design.

3.21.2 Network Video

i. The camera shall provide direct network connection.
ii The camera shall allow full camera control and configuration capabilities over the network.
iii. The camera shall deliver video, at rates up to 15 frames per second, over a 10/100 Base-T, auto-sensing, half/full duplex, RJ45 Ethernet connection.
iv. The camera shall comply with the IEEE 802.3af Power over Ethernet standard
v. The camera shall conform to the ONVIF Profile S standard.

3.21.3 Image Posting

i. The camera shall offer periodic JPEG image posting to an FTP server or a Dropbox account.
ii. The camera shall offer best face detection and JPEG best face image posting to an FTP server or to a Dropbox account.

3.21.4 Access Security

i The camera shall offer three levels of password protection.
ii The camera shall support 802.1x authentication using a RADIUS (Remote Authentication Dial In User Service) server
iii. The camera shall store an SSL certificate for use with HTTPS
iv. The camera shall be capable of being independently AES encrypted with 128-bit keys.

3.21.5 Recording and Storage Management

i. The camera shall support iSCSI devices to allow video stream to be recorded directly to an iSCSI RAID array.

ii. The camera shall support iSCSI storage targets to enable the camera to function as a conventional DVR.
iii. The camera shall have an SD card slot that uses standard, off-the-shelf SD cards for local storage (up to 2 TB).
iv. The local storage feature shall be capable of storage for Automatic Network Replenishment (ANR).
v. Local Recording: Continuous recording, ring recording, alarm/events/schedule recording.

3.21.6 Embedded Video Content Analysis

i. The camera shall be VCA enabled.
ii. The camera shall be capable of processing and analyzing video within the camera itself, with no extra hardware required.
iii. The camera shall be capable of detecting and sending alarms for abnormal events.
iv. The camera shall allow users to set up to 10 separate profiles and switch profiles based on a day/night or holiday schedules
v The camera shall offer MOTION+ video motion analysis that uses an algorithm based on pixel change and includes object size filtering and tamper-detection capabilities.

3.22 1.8-3MM, DAY/NIGHT HD 2 MEGA PIXELS IP VARI-FOCAL STARLIGHT DOME CAMERA WITH POE

3.22.1 General Characteristics:

i. The day/night HD camera shall offer a high dynamic range based on a dual exposure process.
ii. The intelligent Automatic Exposure (iAE) allows you to view moving objects in bright or dark
iii. The day/night HD camera shall utilize Intelligent Dynamic Noise Reduction (iDNR) technology to remove noise artifacts to reduce bandwidth and storage requirements.
iv. The day/night HD camera shall provide direct network connection using H.264 and JPEG compression and bandwidth throttling to efficiently manage bandwidth and storage requirements while delivering outstanding image quality.
v. The day/night HD camera shall support AutoMDIX.
vi. The day/night HD camera shall conform to the ONVIF Profile S specification.
vii. A user shall be able to view video on a PC using a Web browser with the Video Management System, Video Client or Recording Station
viii. The day/night HD camera shall be capable of integration with third-party video management software.
ix. The day/night HD camera shall provide MOTION+ video motion detection analysis system that provides basic video content analysis.
x. The day/night HD camera shall offer Intelligent Video Analysis (IVA).
xi. The day/night HD camera shall provide four (4) independent, fully programmable privacy mask areas.
xii. The day/night HD camera shall provide an on-screen display to simplify the camera/lens back focus and network configuration settings

3.22.2 Imaging

i The day/night HD camera shall utilize a 1.8 to 3 mm optically corrected ultra-wide-angle lens.

i. The day/night HD camera shall utilize a 3.8 to 13 mm optically corrected wide angle lens.
ii. The day/night HD camera shall utilize a 9 to 40 mm optically corrected telephoto lens.
iv. The day/night HD camera shall offer regions of interest to zoom into a specific area of the full image.
v. The day/night HD camera shall allow regions of interest to be sent in separate streams so it is possible to view both an overview and a detail at the same time.
vi The day/night HD camera shall produce a colour image with a minimum scene illumination of 0.25 lux and a monochrome image, when in the night mode, with a minimum illumination of 0.08 lux at 30 IRE.
vii. The day/night HD camera shall provide enhanced night viewing through the increase of IR sensitivity by automatically switching a motorized IR filter from colour to monochrome operation in low-light or IR illuminated applications. Allow the IR filter to be switched manually via the alarm input, pre-programmed in a camera mode or profile
viii The day/night HD camera shall utilize pixel-by-pixel analysis to automatically compensate for bright areas of a high contrast scene (Back light) without having to define a window or area

3.22.3 Storage Management

i. The day/night HD camera shall support iSCSI devices to allow video stream to be recorded directly to an iSCSI RAID array.
ii. The day/night IP camera shall support iSCSI storage targets to enable the camera to function as a conventional DVR.
iv. The day/night IP camera shall have a microSD card slot that uses standard, off-the-shelf microSD SDHC or SDXC cards for local storage (up to 2 TB).
v. The local storage feature shall be capable of storage for Automatic Network Replenishment (ANR)

3.22.4 Alarm Handling Features:

i. The day/night HD camera shall provide a relay output that may be selected for normally opened or normally closed operation.
ii. The relay can be activated from an external alarm input to the camera, manual activation from the browser, upon video motion detection, or video loss.

3.22.5 IP Connectivity

i. The day/night HD camera shall conform to the ONVIF standard.
ii. The day/night HD camera shall offer Embedded Intelligent Video Analytics (IVA).

3.22.6 Embedded Video Content Analysis

i. The day/night HD camera shall be VCA enabled.
ii. The day/night HD camera shall offer MOTION+ video motion analysis that uses an algorithm based on pixel change.
iii The day/night HD camera MOTION+ feature shall include object size filtering and tamper-detection capabilities.

3.22.7 Intelligent Video Analysis

i. The day/night HD camera shall be capable of processing and analyzing video within the camera itself, with no extra hardware required.
ii. The day/night HD camera shall be capable of detecting and sending alarms for abnormal events.

iii. The day/night HD camera shall allow users to set up to 10 separate profiles and switch profiles based on a day/night or holiday schedules.

3.23 IR ILLUMINATOR

3.23.1 Performance Requirements:

i The infrared illuminator shall use reduced power consumption.
ii The infrared illuminator shall use high-efficiency surface mount LEDs.
iii. The infrared illuminator shall produce even illumination for a balanced distribution of light across a scene and depth-wise with asymmetric horizontal beam patterns of 10°, 20°, 30°, 60°, 95° and 120°.
iv. The infrared illuminator shall produce vertical beam patterns of 10° for all asymmetric horizontal beam patterns except for the horizontal beam pattern of 95° where the vertical beam pattern shall be 14° and the horizontal beam pattern of 120° where the vertical beam pattern shall be 17°.
v. The infrared illuminator shall eliminate hotspots in the foreground and underexposed backgrounds with 3D Diffuser technology.
vi. The infrared illuminator shall produce even illumination with uniformity of less than 55% variation across field of illumination.
vii. The infrared illuminator shall enable increased surveillance range, wider beam patterns, and evenly illuminated nighttime surveillance with 3D Diffuser technology.
viii. The infrared illuminator shall produce an illumination level of typical center power no less than 0.3lm/ft^2 at the tested distances listed in Section C Performance Range.
ix. The infrared illuminator shall have Constant Light technology that provides a constant light output over the lifetime of the product.
x. The infrared illuminator shall feature an on board microprocessor to monitor LED feedback and output.
xi. The infrared illuminator shall have a constant light output when operated at an ambient temperature of -40°C to +50°C.
xii. The infrared illuminator shall enable optimal night-time performance of megapixel cameras, pan-tilt cameras, speed domes and other critical surveillance applications.
xiii. The infrared illuminator shall enable proper night-time function of video analytics and other intelligent video software.
xiv. The infrared illuminator shall have a built-in, sensitivity adjustable photocell for automatic on / off operation.
xv. The infrared illuminator shall be switchable by an external device via a built-in telemetry input.
xvi The infrared illuminator shall have a built-in relay output to trigger another device when switching on / off.

3.23.2 General Characteristics:

i. The infrared illuminator shall be a solid-state LED type.
ii. The infrared illuminator shall provide illumination from 30 m to 320 m
iii. The infrared illuminator shall be designed to IP66 for operation in harsh weather conditions.
iv. The infrared illuminator shall have been tested for outdoor usage.
v. The infrared Illuminator shall be powered by a universal, low voltage Class II power supply.

3.23.3 Construction:

i. The infrared illuminator shall be compact, robust and sealed for performance under all weather conditions.
ii. The infrared illuminator shall have a solid-state design without any moving mechanical parts.
iii. The infrared illuminator shall be made of robust aluminium casting and extrusion
iv. The infrared illuminator shall have a black finish.
v. The infrared illuminator shall operate independently of any cooling fan or similar device, either internal or external.
vi. The infrared illuminator shall dissipate thermal energy through an integral heat sink.
vii. The infrared illuminator shall be supplied with 4 m high-temperature power cable.

3.23.4 Environmental:

i. The infrared illuminator shall have a pressure equalization valve to ensure reliable long term environmental performance.

3.24 IP LICENSE PLATE CAMERA

3.24.1 General Characteristics

i. The license plate capture camera shall be specially designed to capture high-quality images of vehicle license plates.
ii. The license plate capture camera feature shall offer analog and IP models.
iii. The license plate capture camera shall include infrared illumination.
iv. The license plate capture camera shall filter out visible light and eliminate the effects of headlight glare.
v. The license plate capture camera shall minimize plate overexposure from sunlight for more accurate automatic license plate recognition
vi. The license plate capture camera shall include adjustable imaging modes to fine tune the imager for specific regions or license plate recognition algorithms.
vii. The license plate capture camera shall integrate with the Digital Video Recorder, the Video Management System, and with the Video Client.
viii. The license plate capture camera shall integrate with third-party ANPR software.

3.24.2 Analog Imager Requirements

i. The analog imager shall be fitted with a 5-50 mm varifocal lens.
ii. The analog imager shall offer one fully programmable video motion detection area.
iii. The analog imager shall offer four fully programmable, independent privacy masks.
iv. The analog imager shall produce a composite video signal, via a BNC connector, for service or maintenance purpose that allows a direct input to conventional analog CCTV video equipment.
v. The analog imager shall provide an on-screen display to simplify the illumination, and network configuration settings

3.24.3 IP Imager Requirements

i. The IP imager shall be fitted with a 5-50 mm varifocal lens.
ii. The IP imager shall offer one fully programmable video motion detection area.
iii. The IP imager shall offer four fully programmable, independent privacy masks.
iv. The IP imager shall provide direct network connection using H.264 (ISO/IEC 14496-10); M JPEG, and JPEG compression and bandwidth throttling to efficiently manage bandwidth and storage requirements while delivering outstanding image quality.

v. The IP imager shall offer Power over Ethernet Plus (IEEE 802.3at class 4) support.
vi. The IP imager shall conform to the ONVIF standard.

3.24.4 License Plate Capture Requirements

i. The license plate capture camera shall utilize the Night Capture Imaging System.
ii. The Night Capture Imaging System shall provide a burst of infrared illumination and simultaneously filter out visible light.
iii. The license plate capture camera shall utilize Advanced Ambient Compensation
iv. Advanced Ambient Compensation shall utilize high-intensity pulsed infrared illumination and an ultra-fast shutter.
v. The license plate capture camera shall be capable of capturing the following nominal plate widths (with 4CIF encoding over capture range):
   - North America: 110 pixels
   - Europe: 130 pixels
vi. The license plate capture camera shall be capable of capturing the following usable plate widths (with 4CIF encoding over capture range):
   - North America: 80 to 140 pixels
   - Europe: 100 to 170 pixels
vii. The license plate capture camera shall be optimized to capture:
   - 520 x 115 mm (approximate) license plates (European)
   - 12 x 6 in. (approximate) license plates (North America)
viii. The license plate capture camera shall be equipped with an 850 nm pulsed LED array IR illuminator
ix. The license plate capture camera shall have a capture range of 3.8 to 28.0 m
x. The license plate capture camera shall have an optimal distance of 4.9 m to 21.3 m
xi. The license plate capture camera shall be capable of capturing clear plate images from vehicles moving at speeds up to 225 km/h at 30° mounting angle.

3.24.5 IP Connectivity

i. The IP imager shall allow full camera control and configuration capabilities over the network except for mechanical adjustments.
ii. The IP imager shall offer Power over Ethernet Plus (IEEE 802.3at class 4) support.
iii. The IP imager shall be capable of capturing and storing images using H.264 and JPEG encoding and compression at 4CIF/D1 and CIF resolutions.
iv. The IP imager shall deliver DVD-quality 4CIF video, at rates up to 30 images per second, via TCP/IP over Shielded Cat5/Cat6 cable. Leverage's bandwidth throttling and multicasting capabilities to manage bandwidth and storage requirements efficiently while delivering the best possible image quality and resolution.
v The IP imager shall generate two independent H.264 streams, an I-frame recording stream, and an M-JPEG stream simultaneously.
vi. The IP imager shall support iSCSI devices to allow video stream to be recorded directly to an iSCSI RAID array
vii. The IP imager shall conform to the ONVIF standard.

4. ALARM SYSTEM

4.1 SYSTEM - GENERAL REQUIREMENTS

When the intruder alarm system is disarmed, tampering with the enclosure of the control equipment or the signalling equipment shall cause a visible and/or audible alarm condition to be

activated immediately. When the intruder alarm system is armed any such tampering shall create an alarm condition.

Where the frame of a protected door, window or other entry exit point can be readily displaced, this displacement must create an alarm condition.
Every detection circuit forming part of the intruder alarm system shall be so arranged that failure of the power supply to the circuit displays a fault condition during arming.

4.2 SYSTEM PERFORMANCE

i. The control panel shall be a 4-partition panel burglary that supports up to 4 expandable to 40 zones using basic hardwired and wireless zones
ii. The system shall be capable of interfacing with a long-range radio (LRR) unit
iii. Intrusion Detection System components shall be connected using the following Cables:

- Keypads using four conductors, non-shielded cable:
  - General Purpose applications
  - Riser applications use
  - Plenum applications use
- Zone Expanders Modules shall connect to a data bus using two-conductor non-shielded cable:
  - General Purpose applications use
  - Riser applications use
  - Plenum applications use
  - Direct burial applications use
- Unpowered detection devices connect to zone inputs using two-conductor non-shielded cable:
  - General Purpose applications use
  - Riser applications use
  - Plenum applications use
- Powered detection devices connect to zone inputs using four-conductor non-shielded cable:
  - General Purpose applications use
  - Riser applications use
  - Plenum applications use
  - Direct burial applications use
- The Siren output shall use two-conductor non-shielded cable:
  - General Purpose applications use
  - Riser applications use
  - Plenum applications use
- Power connections for control panels shall be made using two-conductor non-shielded cable:
  - General Purpose applications use
  - Riser applications use
  - Plenum applications use
- Ground connections to control panels shall be made using solid insulated copper ground wire:
  - General Purpose applications

iv. Basic Hardwired Zones: Control shall provide 8 hardwire zones with the following characteristics:

- EOLR supervision shall support N.O. or N.C. sensors
- Zones/Points shall be individually assignable to any partition.

v. **Optional Expansion Zones:**

- Polling Loop Expansion: Control shall support up to 32 additional hardwire zones using a built-in two-wire polling (multiplex) loop interface. The polling loop shall provide power and data to remote

point modules, and constantly monitor the states of all zones on the loop. The polling loop zones shall have the following characteristics:

- Individually assignable to one of 4 partitions.
- Supervised by the control panel.

- **Wireless Expansion Zone:** Control shall support up to 32 wireless zones using an RF receiver (fewer if using hardwire and/or polling loop zones). Wireless zones shall have the following characteristics.
  - Supervised by control panel for check-in signals (except certain non-supervised transmitters).
  - Tamper-protection for supervised zones.
  - Individually assignable to one of 4 partitions.
  - Individually assignable to bell outputs and/or auxiliary relays.
  - Support wireless devices listed for Commercial Burglary using the RF Receiver.

vi. **Partitions:** Control shall provide the ability to operate 4 separate areas, each functioning as if it has its own control. Partitioning features shall include:

- A Common Lobby partition (1-3), which can be programmed to perform the following functions:
  - Arm automatically when the last partition that shares the common lobby is armed.
  - Disarm when the first partition that shares the common lobby is disarmed.
- A Master partition (4), used strictly to assign keypads for the purpose of viewing the status of all 4 partitions at the same time (master keypads).
- Assignable by zone
- Assignable by keypad/annunciator.
- Assignable by relay to one or all 8 partitions.
- Ability to display burglary and panic and/or trouble conditions at all other partitions' keypads (selectable option)
- Certain system options selectable by partition, such as entry/exit delay.

vii. **User Codes:** Control shall accommodate 60 user codes, all of which can operate any or all partitions. Certain characteristics shall be assigned to each user code, as follows.

- Authority level (Master, Manager, or several other Operator levels). Each User Code (other than the installer code) shall be capable of being assigned the same or a different level of authority for each partition that it will operate.
- Opening/Closing central station reporting option.
- Specific partitions that the code can operate.
- Global arming capability (ability to arm all partitions the code has access to in one command).
- Use of an RF (button) to arm and disarm the system (RF key must first be enrolled into the system).

viii. **Peripheral Devices:** Control shall support up to 28 devices, which can be any combination of keypads, RF receivers, relay modules, and interactive phone module. Peripheral devices shall have the following characteristics:

- Each device set to an individual address according to the device's instructions.
- Each device enabled in system programming.

ix. **Keypad:** Control shall accommodate up to 12 keypads. The keypads shall be capable of the following:

- Performing all system arming functions.
- Being assigned to any partition.
- Providing four programmable single-button function keys, which can be used for:
  - Panic Functions: activated by wired and wireless keypads, reported separately by partition.
  - Keypad Macros: 32 keypad macro commands per system (each macro is a series of keypad commands). Assignable to the A, B, C and D keys by partition.

x. **Optional Output Relays:** A total of 6-38 relay outputs shall be accommodated using relay modules. Each relay module shall provide 4 Form C (normally open and normally closed) relays for general-purpose use. The relays shall be capable of being:
- Programmed to activate in response to system events.
- Programmed to activate using time intervals.
- Activated manually.
- Assigned an alpha descriptor.

xi. **Optional Interactive Phone Module:** The control shall support the IP Modules, which permit access to the security system in order to perform the following functions:
- Obtain system status information.
- Arm and disarm the security system.
- Control relays
- Battery saving feature.

xii. **Wireless Equipment:** Control shall be compatible with Wireless Security equipment including:
- Commercial Wireless Receiver:
  - The receiver shall be capable of receiving as many points as the control panel is rated for.
  - Up to 1 Receivers may be used on the system.

5. EMERGENCY VOICE ALARM COMMUNICATION SYSTEM

5.1 VOICE ALARM SYSTEM GENERAL DESCRIPTION

i. The voice alarm system shall be the integrated solution for background music (BGM), public address (PA) and emergency voice evacuation (EVAC). All the essential EVAC functionality – such as system supervision, spare amplifier switching, loudspeaker line surveillance, digital message management and a fireman's panel interface – shall be combined.

ii The system shall provide for emergency call (EMG), business call and BGM audio, up to 60 zones, 8 call stations and two remote control panels. The voice alarm system shall be a one channel/two channel system. It shall be compatible with BGM sources and 100 V booster amplifiers. It shall be capable of connecting to EVAC compliant loudspeakers and accessories for an integrated public address and voice alarm solution.

iii The system shall be fully SANS 60849 compliant. It shall have full system supervision, loudspeaker line impedance supervision, a supervised emergency microphone on the front panel and a supervised message manager for 255 pre-recorded messages and chimes. It shall be possible to merge messages to allow even more flexible use of pre-recorded announcements and evacuation messages. It shall be possible for each message to have any length within the total available capacity. The memory shall have a capacity of 16 MB. It shall be possible to upload from a PC via USB into the memory, after which the unit shall operate without PC connection. The standard WAV-format shall be used for the messages and sample rates of 8kHz up to 24kHz with 16-bit word length (linear PCM) shall be supported.

iv. Volume override relay contacts shall be provided for each zone separately for overriding local loudspeaker volume controls. All current override schemes shall be supported (3-wire and 4 wire override schemes i.e., standard 24V and failsafe). Upon a call or an activated trigger input these contacts shall be activated for the appropriate zones, together with an additional voltage free contact (Call Active) for control purposes.

v. A 24Vdc output shall be available to supply power to external relays, so no external power supply shall be required for that purpose. A LED volume unit (VU-meter) shall allow for monitoring of the master output.

vi. The maximum allowed total cable length between the controller and the last router in the chain shall be 1000 meters. The maximum allowed total cable length between the controller and the last call station in the chain shall be 1000 meters. The maximum allowed total cable length between the controller and the remote control (RC) panel shall be 1000 meters.

vii. The controller and each connected router shall have 12 trigger inputs to start business and emergency messages. Each shall be configurable for a message consisting of a sequence of up to 8 wave files. It shall be possible for wave files to be used in different combinations with other messages, optimizing flexibility and used storage space.

viii. As the basis of the voice alarm system, the controller shall have all the essential functionality for compliance with SANS 60849 standard, including full system supervision, loudspeaker line impedance supervision, a supervised emergency microphone on the front panel and a supervised message manager. The messages shall be mergeable to allow even more flexible use of pre-recorded announcements and evacuation messages. The controller shall be used as a stand-alone system with up to 6 zones or expanded to up to 60 zones using additional 6-zone routers. Up to 8 call stations shall be connectable. Interconnections shall be made using standard RJ45 connectors and CAT5 cable.

ix. It shall be possible to connect 480 watts per router. The audio output shall use standard analog audio 100 V line switching for full compatibility with public address equipment and EVAC-compliant loudspeakers. The system shall be configured using DIP switches for basic functionality and a PC for more advanced functions. It shall be possible to specify 16 priority levels.

x. A built-in 240 W booster amplifier shall provide the power for the emergency call channel and BGM. It shall be possible to add additional booster amplifiers as spare, to provide two-channel operation, or if the total power requirement exceeds 240 W (maximum 480 W per 6 zones). All booster amplifiers shall be supervised.

xi. The controller shall have tone controls to allow for adjustment of the BGM sound. It shall have separate bass and treble controls. The controller shall have two BGM source inputs and a mic/line input with configurable priority, speech filter, phantom power and selectable voice operated exchange (VOX) activation. It shall be possible to select 16 priority levels for microphone, call stations and trigger inputs for optimum system flexibility. It shall have two connectors to connect the call stations. It shall have 12 input triggers with 6 supervised trigger inputs. Furthermore, it shall have one tape output on cinch connectors. The trigger outputs shall be on floating relays. The controller shall have an emergency active relay, a fault relay and two general purpose relays, for control purposes. The fault relay shall be failsafe.

xii The output section shall have six transformer-isolated 100 V constant voltage outputs for driving 100 V-loudspeakers in six separate zones. All zones shall be individually selectable from the front panel and the BGM output level in each zone shall be individually settable in 6 steps. The BGM output shall be connected to the 70V line, thus it shall be possible to connect a total load of 480 Watts in a two-channel system combined with a 480-Watt booster.

xiii. The output of the booster shall be also available as a separate output at 100V and 70 V. A separate 100 V Call Only output shall be provided for addressing an area where BGM is not required but where priority announcements are. Six configurable volume override output contacts shall be available for overriding local volume controls during priority calls. A LED VU-meter shall monitor the output.

xiv. The voice alarm router shall be an expansion unit adding 6 zones as well as 12 input- and 8 output contacts to the voice alarm system. It shall be able to use the booster built in the voice alarm controller. It shall provide outputs and inputs for one or two boosters in a multi amplifier one- or two-channel system. It shall provide dual channel operation for calls and BGM simultaneously to a maximum of six different zones, using two booster amplifiers. Also, single channel operation shall be possible with only one booster.

xv The router shall have a set of relays for zone-switching the power amplifier output(s) to different loudspeaker groups. Each of the zones shall be switched between the call channel (upon call-station selection or all-call microphone or emergency activation), the BGM channel (upon front panel selection), or off. The zone power handling capacity of the router shall be 480 Watts. The router shall also have 12 input triggers. 6 triggers shall be supervised for EMG purposes.

xvi. The 6-zone call station shall be a stylish high quality call station with a stable metal base, a flexible microphone stem and a unidirectional condenser microphone. It shall be intended for making calls to selected zones. The special design shall allow for neatly flush mounting in desk tops. Using dipswitches on the bottom of the call station, the call station ID shall be selectable. The call station shall have selectable gain, speech filter and limiter for improved intelligibility.

xvii. On each call station it shall be possible to select 6 zones with the possibility to connect a call station keypad to increase the number of zones or zone groups that can be selected.

xviii. It shall have LED indications for zone selection, fault and emergency state. The call station extension shall provide seven additional zone and zone group keys.

xix. On each call station it shall be possible to select 6 zones with the possibility to connect up to 8 call station keypads to increase the number of zones or zone groups that can be selected. Selected zones shall be indicated with LEDs on the call station, three additional LEDs shall give visible feedback on the active state of the microphone and the system. Green shall indicate microphone active; amber shall indicate that the system has detected a fault (SANS 60849) and red shall indicate that the system shall be in the emergency state.

6. CONTROL SYSTEM

6.1 24-INCH-HIGH PERFORMANCE HD LED MONITORS

6.1.1 Performance Requirements

i. The HD monitor shall include the following inputs: an analog RGB, a digital DVI-D, and a digital HDMI.
ii. The HD monitor shall have a maximum contrast ratio of 1,000:1.
iii. The HD monitor shall be capable of being mounted to a wall or placed on a desktop with an included stand.

iv. The HD monitor shall support Full HD 1080p resolution (1920 x 1080)
v The HD monitor shall offer an LED backlight panel.
vi. The HD monitor shall have a viewable picture area of 32 inches.
vii. The HD monitor shall automatically focus on setting the correct colour, temperature, and gamma curve settings
viii The HD monitor shall display images using an aspect ratio of 16:9.
ix The HD monitor shall offer an active display area of (H) 476.64 mm x (V) 268.11 mm.
x The HD monitor shall be capable of displaying 16.7 million colours.

6.1.2 Controls

i. The HD monitor shall provide a front control panel that allows the user to adjust image quality, brightness, size, position, and geometry for optimal viewing.
ii The HD monitor shall provide a front control lockout feature so that only authorized users can adjust menu settings.
iii. The HD monitor shall have front panel LED indicators that convey the state of the monitor.

6.2 42-INCH-HIGH PERFORMANCE HD LED MONITORS

6.2.1 Performance Requirements:

i. The HD monitor shall include the following inputs: an analog RGB, a digital DVI-D, a YC (S-video), a loop-through video, a digital HDMI, and one BNC.
ii The HD monitor shall have a maximum contrast ratio of 4,000:1.
iii. The HD monitor shall include the Trigger and Auto Switch features.
iv. The HD monitor shall be capable of being mounted to a wall.
v. The HD monitor shall include a remote-control device.
vi. The HD monitor shall support monitor wall applications.
vii. The HD monitor shall support Full HD 1080p resolution (1920 x 1080).
viii. The HD monitor shall offer an LED backlight panel.
ix. The HD monitor shall have a viewable picture area of 42 inches.
x. The HD monitor shall automatically focus on setting the correct colour, temperature, and gamma curve settings.
xi The HD monitor shall display images using an aspect ratio of 16:9.
xii. The HD monitor shall offer an active display area of (H) 930.24 mm x (V) 523.26 mm
xiii. The HD monitor shall be capable of displaying 1,073 million colours.

6.2.2 Controls

i The HD monitor shall provide a rear control panel that allows the user to adjust image quality, brightness, size, position, and geometry for optimal viewing.
ii. The HD monitor shall provide a rear control lockout feature so that only authorized users can adjust menu settings.
iii. The HD monitor shall have front panel LED indicators that convey the state of the monitor.

6.3 MULTIPLE MONITOR COMPUTER SYSTEM (VIDEO WALL SERVERS)

i. A multiple monitor computer system shall manage the video wall displays and give the most functionality for the multiple screen array.
ii. The video wall controller shall allow the operator to utilize each screen independently

7. NETWORK BACKBONE

7.1 Fibre Optic Switches

7.1.1 24 SFP Ports, (2) 10/100/1000 RJ-45 Ports, (2) Gigabit Ports Managed Layer 3 Ethernet Switches

A. DESCRIPTION

i. The Gigabit TP / SFP combo ports can be either 10 / 100 / 1000Mbps on TP ports or 1000Base-SX / LX only through the SFP (Small Form-Factor Pluggable) interface.
ii. The SFP module shall utilize 850nm optics capable of bi-directional data transmission of 1000Base-SX on two multimode optical fibres.
iii. The SFP module shall utilize 1310nm optics capable of bi-directional data transmission of 1000Base-LX on two single-mode optical fibres.
iv. The SFP module shall utilize 1310nm/1490nm or 1310nm/1550nm optics capable of bi-directional data transmission of 1000Base-BX on one single-mode optical fibre.
v. The SFP module shall utilize 1310nm optics capable of bi-directional data transmission of 100Base-FX on multimode or single-mode optical fibres.

B. GENERAL SPECIFICATIONS

i. The switch shall comply with IEEE 802.3, 802.3u, 802.3ab and 802.3z Ethernet standard.
ii. The switch shall support the Ethernet data IEEE 802.3 protocol using Auto-negotiating and Auto-MDI/MDI-X features.
iii. The switch shall support the transmission of 100 Mbps over a multimode or single-mode fibre.
iv. The switch shall support the transmission of 1000 Mbps over a multimode or single-mode fibre.
v. The switch shall provide a RS-232 serial connection for local management of the device.
vi. The switch shall be connected with Cat 5/5e/6 UTP/STP cable system for its RJ-45 interface ports.
vii. The switch shall provide power, link speed and fibre port status indicating LED's for monitoring proper system operation.

7.2 INDUSTRIAL FIELD SWITCHES

7.2.1 Industrial 8-Port 10/100/1000T 802.3at PoE + 2-Port 100/1000X SFP Managed Switch with Wide Operating Temperature (Field Switch)

A. DESCRIPTION

i. The PoE Industrial Switch shall provide 8 10/100Mbps Fast Ethernet ports and 2 Gigabit TP/SFP combo interfaces with 8 full powered PoE ports (no port sharing) delivered in a rugged high-strength case

- The PoE in-line power shall be compliant with the IEEE 802.3af standard providing 15.4W per port that can power devices at a distance up to 100 meters through the 4-pair Cat 5/6 UTP wire.
- Full PoE per IEEE802.3af standards (15.4 W) shall be provided to each of the 8 ports with no PoE sharing between ports.

ii The Gigabit TP / SFP combo ports shall be either 10 / 100 / 1000Mbps on TP ports or 1000Base SX / LX only through the SFP (Small Form-Factor Pluggable) interface.

- The SFP module shall utilize 1370nm optics capable of bi-directional data transmission of 100Base-FX on multimode or single mode optical fibers.
- The SFP module shall utilize 850nm optics capable of bi-directional data transmission of 1000Base-SX on two multimode optical fibers.
- The SFP module shall utilize 1310nm optics capable of bi-directional data transmission of 1000Base-LX on two single-mode optical fibers.
- The SFP module shall utilize 1210nm/1490nm or 1310nm/1550nm optics capable of bi-directional data transmission of 1000Base BX on one single-mode optical fiber.

iii. The PoE Industrial Switch shall be an industrially hardened and fully managed Ethernet Switch specifically designed to operate reliably in electrically harsh and climatically demanding environments.

B. GENERAL SPECIFICATIONS

i. The module shall support the transmission of up to 2 or 3 channels of 100 Mbps over a multimode or single-mode fiber.

ii. The module shall support the transmission of up to 2 or 3 channels of 1000 Mbps over a multimode or single-mode fiber.

iii. The module shall support the Ethernet data IEEE 802.3 protocol using Auto-negotiating and Auto-MDI/MDI-X features.

iv. The module shall require no in-field electrical or optical adjustments or in-line attenuators to ease installation.

v. The module shall provide power, power fault, Ring master, link speed, and fiber port status indicating LED's for monitoring proper system operation.

vi. The module shall have redundant power supply connections to minimize single point failure.

vii. The module shall provide a RS-232 serial connection for local management of the device.

7.3 COPPER SWITCHES (POE) – FIELD

7.3.1 24-Port 10/100/1000 Layer 2 Managed PoE Ethernet Switch with 4 Gigabit Combo TP/SFP Slots

A. DESCRIPTION

i. The Layer 2 Managed PoE Switch shall provide 24 10/100TX ports with IEEE 802.3af PoE and 2 Gigabit TP/SFP combination ports.

ii. The PoE in-line power shall be compliant with the IEEE 802.3af standard providing 15.4W per port that can power 24 PoE compliant devices at a distance up to 100 meters through the 4-pair Cat 5/5e UTP wire

iii. The Gigabit TP / SFP combo ports shall be either 10 / 100 / 1000Mbps on TP ports, or, 1000Base SX / LX only through SFP (Small Form-Factor Pluggable) interface.

- The SFP module shall utilize 850nm optics capable of bi-directional data transmission of 1000Base-SX on two multimode optical fibers.
- The SFP module shall utilize 1310nm optics capable of bi-directional data transmission of 1000Base-LX on two single-mode optical fibers.

- The SFP module shall utilize 1310nm/1490nm or 1310nm/1550nm optics capable of bi-directional data transmission of 1000Base-BX on one single mode optical fiber.

B. GENERAL SPECIFICATIONS

i. The switch shall support the Ethernet data IEEE 802.3 protocol using Auto-negotiating and Auto-MDI/MDI-X features.
ii. The switch shall comply with IEEE 802.3af Power over Ethernet.
iii. The switch shall support IEEE802.3af Power over Ethernet detection and 48VDC power injection from port#1 to port#24.
iv. The switch shall transmit DC Voltage to the Cat5/5e cable and transfer data and power simultaneously to remote PD (Powered Device) equipment.
v. The module shall Auto-detect PoE IEEE 802.3af equipment; protect devices from being damaged by incorrect installation.
vi. The switch shall provide power, link speed, PoE in-use and fiber port status indicating LED's for monitoring proper system operation.
vii. The switch shall provide a RS-232 serial connection for local management of the device.
viii. The switch shall be connected with Cat 5/5e/6 UTP/STP cable system for its RJ-45 interface ports.
ix. The switch shall support a total distance of up to 100 meters on each PoE port.

7.4 COPPER SWITCHES (POE) – CORE

7.4.1 24-Port 10/100/1000TX, PoE and 4 Gigabit TP/SFP Combo Managed Ethernet Switch

A. DESCRIPTION

i. The Layer 3 Managed Gigabit Ethernet Switch shall provide 24 Gigabit ports with 4 shared mini-GBIC SFP combination ports.
ii. They shall be equipped with 2 dedicated High-Speed HDMI-like interfaces for stacking management.
iii. The PoE in-line power shall be compliant with the IEEE 802.3af standard providing 15.4W per port that can power up to 24 PoE compliant devices at a distance up to 100 meters through the 4-pair Cat 5/5e UTP cable.
iv. The Gigabit TP / SFP combo ports can be either 10 / 100 / 1000Mbps on TP ports or 1000Base-SX / LX only through the SFP (Small Form-Factor Pluggable) interface.

- The SFP module shall utilize 850nm optics capable of bi-directional data transmission of 1000Base-SX on two multimode optical fibers.
- The SFP module shall utilize 1310nm optics capable of bi-directional data transmission of 1000Base-LX on two single-mode optical fibers.
- The SFP module shall utilize 1310nm/1490nm or 1310nm/1550nm optics capable of bi-directional data transmission of 1000Base-BX on one single-mode optical fiber.
- The SFP module shall utilize 1310nm optics capable of bi-directional data transmission of 100Base-FX on multimode or single-mode optical fibers.

B. GENERAL SPECIFICATIONS

i. The switch shall comply with IEEE 802.3, 802.3u, 802.3ab and 802.3z Ethernet standard.
ii. The switch shall support the Ethernet data IEEE 802.3 protocol using Auto-negotiating and Auto-MDI/MDI-X features.

iii. The switch shall support the transmission of 100 Mbps over a multimode or single-mode fiber.
iv. The switch shall support the transmission of 1000 Mbps over a multimode or single-mode fiber.
v. The switch shall provide a RS-232 serial connection for local management of the device.
vi. The switch shall be connected with Cat 5/5e/6 UTP/STP cable system for its RJ 45 interface ports
vii. The switch shall support IEEE802.3af Power over Ethernet detection and 48VDC power injection at port#1 to port#24,
viii. The switch shall transmit DC Voltage to the Cat5/5e cable and transfer data and power simultaneously to remote PD (Powered Device) equipment.
ix. The switch shall Auto detect of PoE IEEE 802.3af equipment; protect devices from being damaged by incorrect installation.
x. The switch shall support a total distance up to 100 meters on each PoE port.
xi. The switch shall provide power, Stack group master, stacking interfaces, FAN alert, link active, PoE In-use and fiber port status indicating LED's for monitoring proper system operation.

7.5 TRANSCEIVERS MODULES

A. DESCRIPTION

i Performance Requirements: Provide a MSA Compliant Small Form-Factor Pluggable (SFP) Optical Device.
- The devices shall utilize 850/1310/1550 nm optics capable of simultaneous bi directional signal transmission on one or two multimode optical fibers.
- The devices shall utilize 1310/1550 nm optics capable of simultaneous bi-directional signal transmission on one or two single mode optical fibers.

B. GENERAL SPECIFICATIONS

i. The interchangeable SFP modules shall be available for use with copper media, or multimode and single mode optical fiber.
ii. The optical fiber SFP modules shall be available in Fast Ethernet one and two fiber versions and Gigabit one and two fiber versions.
iii They also shall be available with LC or SC optical connectors.
iv. The SFP modules shall have different wavelengths and optical power to offer distances from 300 meters to 120 kilometers.
v. The module shall require no in-field electrical or optical adjustments or in-line attenuators to ease installation.
vi. The module shall have an MTBF of >100,000 hours.
vii. All LED indicators and both electrical and mechanical connections shall be identified with silk-screened labels.
viii. The module shall have a lifetime warranty to reduce system life cycle cost in an event of a module failure

7.6 FIBRE OPTIC CABLES

7.6.1 Low Count Duct Optic Fibre Cable

a) The cables shall be specifically designed for employment of low fibre counts in the duct environment.
b) These cables shall be suitable for duct applications, both long haul and for LAN backbone in the industrial environment.
c) A non-metallic construction shall ensure lightning immunity
d) The cables shall be furnished with high modulus glass strength members, applied contra-helically, to withstand high installation tensions, and to eliminate torsional stresses.
e) The tough water-resistant outer sheath as well as the gel filled loose tube shall ensure the cables' suitability for the duct environment.
f) The cables shall be available in either flame retardant PVC or Low Smoke Zero Halogen (LSZH), fire retardant, non-toxic sheaths to comply with the strictest building regulations
g) This cable shall be small and lightweight, and tolerate a small bend radius for ease of installation. The small cable size also makes it possible to efficiently utilise duct space.

7.6.2 Low Loss Single Mode Optic Fibre

a) The cables shall be ideally suited for industrial applications, specifically designed for short haul duct installations.
b) A non-metallic construction shall ensure lightning immunity.
c) These cables shall be robust and provide experimentcrent protection from crushing forces.
d) They shall provide sustained reliability over a wide temperature range.
e) They shall remain relatively stress free while the cable contracts and expands with temperature differences.
f) The tough water-resistant sheath and gel filled tubes ensure its suitability for the duct environment.
g) In addition, the cable shall be available with a Low Smoke Zero Halogen (LSZH) sheath to comply with the strictest building regulations.

8. FIRE DETECTION SYSTEM

8.1 GENERAL REQUIREMENTS

a) The fire detection and alarm system shall comprise of main fire alarm control panels, optical smoke sensors, heat sensors, and optical smoke/heat sensor with integral sounder units, manual call points, electronic sounders, repeat panels, and interface units, each with its own short circuit built-in isolators. All loop cabling and any other components and accessories deemed necessary for a safe, reliable and satisfactory system will conform to **SANS 10139** (Fire Detection and Alarm Systems for Buildings)
b) Contractor will train and instruct client's personnel in the correct use, operation and supervision of the system, prior to the handing over of the project.
c) The system will be configured to allow on site modifications with the minimum of disruption using the PC based software to facilitate future changes or alterations to the buildings.

8.2 SYSTEM DESCRIPTION

a) The fire detection and alarm system will be designed to facilitate accurate identification of the source of heat / smoke / fire in their early stages to minimize occurrences of false alarms due to faulty equipment, electrical transients, system faults etc
b) The fire alarm control panels will make final decision on whether a fire or fault exists by comparing the plotted patterns from a fire sensor against known fire and fault patterns held in its memory.

c) System will be true Analogue with the ability to print the output from a fire sensor over a period of time

d) All system components and devices will be connected to two-wire loop circuits (as shown in the typical schematics) with each component having its own individual built-in isolator.

e) Removal or disconnection of any component from the loop will not affect the functioning and performance of other components and the system.

f) System will be of safe addressable type i.e., all the devices on the loops of the FACP will be allocated addresses automatically from the panel at the time of system power up on a numerically lowest unused value basis (algorithms) and also given an address during commissioning, the value of which will be stored in non-volatile memory, within the electronics module of the outstation. This value will be read during loop allocation and provided it is valid will be used to setup the outstations primary address

g) SAFE Addressing will cover the benefits of Soft Addressing and also overcome the limitations of Hard Addressing. This means that of the devices are inserted or removed all the existing devices will keep the same address.

h) The panel will allocate the address in strict sequential order when the loop is powered up to speed up commissioning and ensure that it is impossible for two devices to have the same address.

i) Fire Detection and Alarm Systems, which rely only on soft addressing or hard addressing techniques, are not acceptable

j) Facilities will be provided to constantly monitor and check the following circuits and fault conditions;

   i. The power supply to the loop /s:
   ii. For open-circuit, short-circuit, earth fault and any other fault condition in the loop wiring:
   iii. For communication failure and errors in all cards and loops
   iv. For faults in keyboard and printer circuits
   v. Monitoring of all devices status every 1.3 minutes to create a table of each 1 analogue channel for event analysis

k) All devices Optical/Heat Sensor, Optical Smoke, Beacon Sounder, Fire Alarm Interface Units, Manual Call Points, etc. will be installed on the same loop.

l) All devices will be assigned a maximum of 32-character alphanumeric label. In case of fire, fault or warning, the label of device sensing threshold will appear on visual display unit of the panel.

m) Any correction in label will have to be carried out from the built-in keyboard of FACP. Use of separate PC or tools for on-site programming will not be acceptable.

n) Any event i.e., Fire, fault or warning will be recorded with time, date and place of occurrence in the memory of FACP. These events can either be displayed on VDU or printed, as required.

o) Provision will be done at the fire alarm control panels to silence the loop powered alarm sounders but the visual indication will remain until the system is reset.

p) It will be possible to change the sensitivity of analogue sensors from fire alarm control panel only.

q) The sensitivity will be varied automatically, if required, by time zoning feature whereby it allows sensors to be programmed to respond at different sensitivities relative to any time of day, and any day of week.

r) Facility to introduce / change delay periods in operating loop powered individual sounders / group of sounders /speaker circuits, will be possible to program from FACP without the need to change any hardware.

s) The main fire alarm control panels will be located as shown on the schematics and the floor drawings.

8.3 SYSTEM OF OPERATION

In the event of a fire being reported from the smoke/heat Detectors, activation of manual call points the sequence of alarm operation will be as follows:

a) If a fire condition is reported from a smoke or heat detector, Manual Break Glass, then the evacuation alarm tone will be done by the electronic sounders in the same zone. Then after a certain delay (to be agreed at the time of commissioning) or after 3 minutes the alarm has not been acknowledged, the evacuation tone from the sounders will activated in the adjacent fire zones. Or on the floor directly above and below. All other floors or zones will be given the Alert tone. The evacuation of the building will be staged in phases to allow orderly movement of people.

b) Activation of the fire alarm system will directly initiate some or all of the following to be agreed as a part of the overall engineering policy.

i. Signal to all elevator machine rooms indicating fire status (to control lifts)
ii. Release doors normally locked by magnetic devices.
iii. Release doors normally held open by magnetic devices
iv. Shutdown mechanical equipment ventilation plant
v. Start-up smoke extract fans
vi Automatically activate Evac system
vii. Automatically activate fire suppression system

8.4 SYSTEM, COMPONENTS AND DEVICES.

i. The panel will be computer controlled using analogue technique to detect smoke / heat / fire conditions. The panel will be complete with, but not limited to, the following elements:

- Visual display unit capable of displaying LCD Alphanumeric 40 characters x 8 line display minimum backlit display.
- Built-in 40-character thermal printer operating when the access door is open there will also be an option to enable the printer when the door is closed.
- Built-in full QWERTY keyboard Labelling of devices will be done from this keyboard. Also, this keyboard if required will do any correction in label and onsite programming & maintenance.
- Integral rechargeable sealed lead acid battery and charger, with 26-hour back up in the event of supply mains failure.
- Essential controls – sound alarms, silence alarms and reset fire. These will be enabled by a key switch.
- Cancel fault buzzer
- Fire, fault, warning and power on lamps.
- Simple mean driven function keys with password protection will allow users to an extensive range of software-based features such as:
  - Last 100 fire events
  - Last 255 system events
  - Current fault and warning logs
  - Analysis of analogue sensor information
  - Interrogation of sensor cleanliness
  - Loop map connections
  - Enable/ disable sensors, zones, sounders, interface unit channels.
  - Fire plan configuration menus
  - Outstation label changes
  - Address allocation

- Status of outstation
  Status of all cards
- Printer on, off, line feed and test facilities
- Address allocation including SAFE addressing.

- All control buttons and keyboard will be enclosed behind a lockable cover
- Up to 256-device capacity per 1km loop.
- RS 232/ RS 485 computer communication option.
- Will have minimum of 2 Master alarm circuits 24V 400Ma max per circuit.
- Will have a secure networking facility to indicate a remote zone and remote zone text across the network.

ii. Sensors

All analogue sensors and bases shall be provided by the contractor/supplier of the control equipment. The sensor bases for interfacing between the loop wiring and the sensor head shall not contain any electronics. The base fixings shall be suitable for SA industry standard or conduit boxes. All bases shall have the necessary connections for sending/repeat fire signals to a remote LED unit.

The sensors provided shall be lockable into position if required and removal of locked sensors shall be achievable only through the use of the appropriate removal tool. Sensor removal tools should be provided on completion of the contract as part of the spare parts profile. The removal of a sensor from its base shall not affect the continuity of the detection loop.

The following types of analogue sensors will be available as standard

- Heat sensor
- Optical Heat sensor
- Beam sensor (transmitter and receiver) with 7 programmable sensitivity settings

All of the above shall be compatible with the aforementioned base providing inter-changeability between sensor heads without the requirement for switch settings. All sensors will also have an integral short circuit isolator, which in the event of a single cable fault will isolate the faulty section of cable and retain all devices on the loop operationally in less than 1 second.

The sensitivity off all sensors will be adjustable from the control panel. This may be carried out manually to manage false activation issues or automatically using the system clock i.e. day/night settings for specific risks. It shall be possible to programme sensors within a range of sensitivity levels from State 0 (high level) through to State 15 (disabled).

Each sensor will possess an integral Red LED giving a flashing indication of a fire signal or a continuous indication for certain fault conditions. The integral LED can also be enabled/disabled to provide operational status i.e., short flashes that indicate the unit is powered and communicating with the control panel.

iii. Manual Call Points:

The manual call points shall be electrically compatible with all of the aforementioned sensor types. Each device shall contain its own microprocessor giving a 1 second response time from initiation. The MCP shall be available as a semi-flush mounting unit fixing to a standard single gang recessed box or as surface mounting unit on a matching red plastic back box.

The MCP will have the ability to be tested functionally without the need to remove the front cover or breaking the glass with a special test key (supplied as standard) The key shall insert in the front facia of the MCP ensuring easy access of the key at all times The key will also be used to reset the MCP when fitted with a resetable plastic element. The option to retrofit a clip-on transparent plastic cover to prevent accidental or malicious activation should be available as standard.

iv. ALARM SOUNDERS

Alarm Sounders are all Electronic sounders Addressable and loop powered and Standard Evacuate & Alert tone with voice messaging Programmable tones selectable by control panel.
Synchronisation of all sounders to be fully synchronised with all other analogue addressable loop powered sounder speech devices on the system.

The safe addressable Alarm Sounders will be loop wired and loop signalled and provided with built-in short circuit isolation and will be sited in the emergency stairwell staff/utility areas and plant rooms. The sounders will be configured via software to operate individually or in sectored groups, totally independent of the way they have been connected to the loops. The sounders will have the synchronization feature to ensure that all the sounders give alert and evacuate tones that are totally in phase. Conventional Sounders that "free-run" and therefore be out of phase with each other will not be accepted.

The Sounders will have Minimum sound pressure level 102 dBA at 1 metre with frequencies of 970 Hz and 910 Hz. Variety of sounds shall be available.
A volume control shall be included for areas where a reduced sound output is required.

v. Interface Modules:

Fire detection interface units will be directly connected to the loop to provide both inputs and outputs for the control or annunciation of other life safety, security and building management systems. These units shall be either self-contained wall mountable units or DIN rail mounting units for fitting within 3rd party control equipment/panels. Each device will incorporate a short circuit isolator as standard to maintain system integrity in the event of an equipment failure or wiring fault. As standard six variants will be available:

(i) 4 channel input and/or output interface
(ii) 1 channel Low Voltage input/output interface
(iii)1 channel Low Voltage input only interface
(iv)Mains Voltage 240V 13A switched output interface
(v) Mains powered 4 channel interfaces with monitored integral power supply unit, battery standby and 250mA output circuits
(vi)Key switch operated single channel interface

8.5 INSTALLATION

i. Fire alarm components will be installed directly to conduit outlet boxes at the following mounting heights above finished floor level, measured to the centre of box unless stated otherwise.
ii. Fix manual call station semi-recessed at 1.5m. heights above finished floor.
iii. Automatic smoke and heat sensors: Ceiling mounted
iv. Alarm sounders: 2.20m above finished floor

8.6 WIRING AND WIRING FACILITIES:

i. Supply and install the necessary conduit, enclosed trucking to the Fire Cable and accessories and wiring for the fire alarm system.
ii. All cables associated with Fire Alarm installation will be of fire resistant 2 core 1.5 sq. mm.
iii. Multi core cables having more than 2 cores will not be allowed for loop wiring due to inadequate separation and possible interference problems.
iv. All wiring will be installed to provide complete and satisfactory function system in all respects.
v. All cable terminations at components and junction boxes will have identification tags, indicating throughout the system.
vi. The Fire Alarm/Detection system wiring will be completely independent from the other system wiring in all respects in accordance with the IEE Regulations.

8.7 TESTING AND COMMISSIONING

i. After the installation is complete, the contractor will conduct operating and commissioning tests.
ii The equipment will be demonstrated to operate in accordance with the requirements of the specification.
iii. The system installation, testing and commissioning will be as per Local approvals and requirements.
iv. The fire alarm system will be completely programmed in accordance with Fire Department requirement.
v. A company trained representative will personally supervise the complete installation and final testing of the system.
vi All tests will be carried out in the presence of the Client or persons authorized by the consultant / client.
vii Upon the completion of the acceptance tests, the representatives will instruct operatives in the proper operation, maintenance programming, configuration, and testing of the system.
viii. The vendor will provide equipment and /or software which is necessary to allow field modification of the programming and configuration.

9. FIRE SUPPRESSION SYSTEM

9.1 SYSTEM DESCRIPTION

a) The system shall be a Total Flood FM-200 Suppression System.
b) The system shall provide a FM-200 minimum design concentration of 7.2% by volume for Class A hazards and 9.0% by volume for Class B hazards, in all areas and/or protected spaces, at the minimum anticipated temperature within the protected area.
c) System design shall not exceed 10.5% for normally occupied spaces, adjusted for maximum space temperature anticipated, with provisions for room evacuation before agent release.
d) The system shall be complete in all ways. It shall include all mechanical and electrical installation, all detection and control equipment, agent storage containers, FM-200 agent, discharge nozzles, pipe and fittings, manual release and abort stations, audible and visual alarm devices, auxiliary devices and controls, shutdowns, alarm interface, caution/advisory signs, functional checkout and testing, training and all other operations necessary for a functional, UL Listed and/or FM approved FM-200 Clean Agent Suppression System.
e) Provide two (2) inspections during the first year of service. Inspections shall be made at 6 month intervals commencing when the system is first placed into normal service.

f) The general contractor shall be responsible for sealing and securing the protected spaces against agent loss and/or leakage during the 10-minute "hold" period.

g) The system shall be actuated by a combination of ionization and/or photoelectric detectors installed for maximum area coverage of 23.2 m^2 per detector, in both the room, underfloor and above ceiling protected spaces. If the airflow is one air change per minute, photoelectric detectors only shall be installed for maximum area coverage of 11.6 m^2 per detector.

h) Detectors shall be Cross-Zoned detection requiring two detectors to be in alarm before release.

i) Automatic operation of each protected area shall be as follows:

- Actuation of one (1) detector, within the system, shall:
  - Illuminate the "ALARM" lamp on the control panel face.
  - Energize an alarm bell and/or an optional visual indicator.
  - Transfer auxiliary contacts which can perform auxiliary system functions such as: i) Operate door holder/closures on access doors, ii) Transmit a signal to a fire alarm system, iii) Shutdown HVAC equipment.
  - Light an individual lamp on an optional annunciator.
- Actuation of a 2nd detector, within the system, shall:
  - Illuminate the "PRE-DISCHARGE" lamp on the control panel face.
  - Energize a pre-discharge horn or horn/strobe device.
  - Shut down the HVAC system and/or close dampers.
  - Start time-delay sequence (not to exceed 60 seconds).
  - System abort sequence is enabled at this time.
  - Light an individual lamp on an optional annunciator.
- After completion of the time-delay sequence, the FM-200 Clean Agent system shall discharge and the following shall occur:
  - Illuminate a "SYSTEM FIRED" lamp on the control panel face.
  - Shutdown of all power to high-voltage equipment.
  - Energize a visual indicator(s) outside the hazard in which the discharge occurred.
  - Energize a "System Fired" audible device. (Optional)
- The system shall be capable of being actuated by manual discharge devices located at each hazard exit. Operation of a manual device shall duplicate the sequence description above except that the time delay and abort functions shall be bypassed. The manual discharge station shall be of the electrical actuation type and shall be supervised at the main control panel.

9.2 MATERIALS AND EQUIPMENT

A. GENERAL REQUIREMENTS

i. The FM-200 Clean Agent System materials and equipment shall be standard products of the supplier's latest design and suitable to perform the functions intended.

ii. When one or more pieces of equipment must perform the same function(s), there shall be duplicates produced by one manufacturer.

iii. All devices and equipment shall be UL Listed and/or FM approved.

iv. The gas shall display the following properties

- Remove heat energy from fire, not oxygen from the environment
- Absorb heat from the flame zone and interrupts the chemical chain reaction of the combustion process.
- Be a Low-pressure gas system.
- Have a low toxicity level.

- Shall not displace oxygen and therefore is safer for use in occupied spaces without fear of oxygen deprivation
- Shall have been proven safe for people,
- Shall contain no bromine or chlorine and therefore has zero Ozone Depleting Potential (ODP).
- Be effective in the protection of data processing, telecommunications and electronic equipment as well as most flammable liquids and gases.
- Shall be clear and not obscure vision
- Require minimal container storage space
- Extinguish fires quickly through a combination of chemical interaction and physical heat removal.
- Provide rapid suppression with a short discharge time of typically 6 to 10 seconds.
- Be a clean gaseous agent leaving no residue
- Be a low pressure gas

B. FM-200 AGENT STORAGE AND DISTRIBUTION

i. Each system shall have its own supply of clean agent.
ii. The system design can be modular, central storage, or a combination of both design criteria.
iii. Systems shall be designed in accordance with the manufacturer's guidelines.
iv. Each supply shall be located within the hazard area, or as near as possible, to reduce the amount of pipe and fittings required to install the system.
v. The clean agent shall be stored in the manufacturer's Storage Containers.
vi. Containers shall be super-pressurized with dry nitrogen to an operating pressure of 24.8 bar at 20°C.
vii. Containers shall be of high-strength low alloy steel construction.
viii. Containers shall be actuated by a resettable electric actuator with mechanical override located at each agent container or connected back of cylinders
ix. Non-resettable or explosive devices shall not be permitted.
x. Each container shall have a pressure gauge and low-pressure switch to provide visual and electrical supervision of the container pressure.
xi. The low-pressure switch shall be wired to the control panel to provide an audible and visual "Trouble" alarms in the event the container pressure drops below (17 bar).
xii The pressure gauge shall be colour coded to provide an easy, visual indication of container pressure.
xiii Each container shall have a pressure relief provision that automatically operates before the internal pressure exceeds 51.7 bar.
xiv. Engineered discharge nozzles shall be provided within the manufacturer's guidelines to distribute the FM-200 agent throughout the protected spaces.
xv. The nozzles shall be designed to provide proper agent quantity and distribution.
- Nozzles shall be available in 10 mm through 50 mm pipe sizes. Each size shall be available in 180° and 360° distribution patterns.
- Ceiling plates can be used with the nozzles to conceal pipe entry holes through ceiling tiles
xvi Distribution piping, and fittings, shall be installed in accordance with the manufacturer's requirements, and approved piping standards and guidelines.
xvii. All distribution piping shall be installed by qualified individuals using accepted practices and quality procedures.
xviii. All piping shall be adequately supported and anchored at all directional changes and nozzle locations
- All piping shall be reamed, blown clear and swabbed with suitable solvents to remove burrs, mill varnish and cutting oils before assembly, thread only.

- All pipe threads shall be sealed with Teflon tape pipe sealant applied to the male

C. CONTROL PANEL

i. The control system and its components shall be UL listed and FM approved for use as a local fire alarm system with releasing device service
ii. The control system shall perform all functions necessary to operate the system detection, actuation and auxiliary functions.
iii. The control system shall include battery standby power to support 24 hours in standby and 5 minutes in alarm.
iv The control system shall be microprocessor based utilizing a distributed processing concept. A single microprocessor failure shall not impact operation of additional modules on the system.
v The control system shall be capable of supporting Cross Zoned Detection
vi. The control system shall supply integrated 7Amp power supply circuitry.

D. MANUAL RELEASE (Electric)

i. The electric manual release switch shall be a dual action device which provides a means of manually discharging the Suppression System when used in conjunction with the control system.
ii The Manual Release switch shall be a dual action device requiring two distinct operations to initiate a system actuation
iii. Manual actuation shall bypass the time delay and abort functions shall cause the system to discharge . It shall cause all release and shutdown devices to operate in the same manner as if the system had operated automatically.
iv. A Manual Release switch shall be located at each exit from the protected hazard.

E. AUDIBLE and VISUAL ALARMS

i. Alarm audible and visual signal devices shall operate from the control panel.
ii. A Strobe device shall be placed outside, and above, each exit door from the protected space.
iii. Provide an advisory sign at each light location

F. CAUTION and ADVISORY SIGNS

Signs shall be provided to comply with regulation, standards and the recommendations of the FM-200 equipment suppliers.

i. Entrance sign: (1) required at each entrance to a protected space.
ii. Manual discharge sign: (1) required at each manual discharge station
iii. Flashing light sign: (1) required at each flashing light over each exit from a protected space.

G. SYSTEM and CONTROL WIRING

i. All system wiring shall be furnished and installed by the contractor.
ii. All wiring shall be installed in electrical metallic tubing (EMT), or conduit, and must be installed and kept separate from all other building wiring.
iii. All system components shall be securely supported independent of the wiring.
iv Runs of conduit and wiring shall be straight, neatly arranged, properly supported, and installed parallel and perpendicular to walls and partitions.

H. TESTING AND DOCUMENTATION

i After the system installation has been completed, the entire system shall be checked out, inspected and functionally tested by qualified, trained personnel, in accordance with the manufacturer's recommended procedures

ii. All containers and distribution piping shall be checked for proper mounting and installation.

iii. All electrical wiring shall be tested for proper connection, continuity and resistance to earth.

iv. The complete system shall be functionally tested, in the presence of the owner or his representative, and all functions, including system and equipment interlocks, must be operational at least five (5) days prior to the final acceptance tests.

v. Each detector shall be tested in accordance with the manufacturer's recommended procedures, and test values recorded.

vi. All system and equipment interlocks, such as door release devices, audible and visual devices, equipment shutdowns, local and remote alarms, etc. shall function as required and designed.

vii. Each control panel circuit shall be tested for trouble by inducing a trouble condition into the system.

J. OPERATION and MAINTENANCE

i Prior to final acceptance, the installing contractor shall provide complete operation and maintenance instruction manuals, 3 copies for each system, to the owner.

ii. All aspects of system operation and maintenance shall be detailed, including piping isometrics, wiring diagrams of all circuits, a written description of the system design, sequence of operation and drawings illustrating control logic and equipment used in the system.

iii. Checklists and procedures for emergency situations, troubleshooting techniques, maintenance operations and procedures shall be included in the manual.

J.AS-BUILT DRAWINGS

i. Upon completion of each system, the installing contractor shall provide 3 copies of system "As Built" drawings to the owner.

ii. The drawings shall show actual installation details including all equipment locations (i.e.: control panel(s), agent container(s), detectors, alarms, manuals and aborts, etc.) as well as piping and conduit routing details.

iii. Show all room or facilities modifications, including door and/or damper installations completed.

iv. One (1) copy of reproducible engineering drawings shall be provided reflecting all actual installation details.

K. ACCEPTANCE TESTS

i. At the time "As-Built" drawings and maintenance/operations manuals are submitted, the installing contractor shall submit a "Test Plan" describing procedures to be used to test the control system(s).

ii. The Test Plan shall include a step-by-step description of all tests to be performed and shall indicate the type and location of test apparatus to be employed

iii. The tests shall demonstrate that the operational and installation requirements of this specification have been met.

iv. All tests shall be conducted in the presence of the owner and shall not be conducted until the Test Plan has been approved.

v. The tests shall demonstrate that the entire control system functions as designed and intended.

vi. All circuits shall be tested: automatic actuation, solenoid and manual actuation, HVAC and power shutdowns, audible and visual alarm devices and manual override of abort functions.

vii. Supervision of all panel circuits, including AC power and battery power supplies, shall be tested and qualified.

viii. A room pressurization test shall be conducted, in each protected space, to determine the presence of openings which would affect the agent concentration levels.

ix. If room pressurization testing indicates that openings exist which would result in leakage and/or loss of the extinguishing agent, the installing contractor shall be responsible for coordinating the proper sealing of the protected space(s).

x. The contractor shall be responsible for adequately sealing all protected space(s) against agent loss or leakage.

xi. The contractor shall inspect all work to ascertain that the protected space(s) have been adequately and properly sealed.

xii. THE SUPPRESSION SYSTEM INSTALLING CONTRACTOR SHALL BE RESPONSIBLE FOR THE SUCCESS OF THE ROOM PRESSURIZATION TESTS.

xiii. If the first room pressurization test is not successful, in accordance with these specifications, the contractor shall determine, and correct, the cause of the test failure.

xiv. The contractor shall conduct additional room pressurization tests, at no additional cost to the owner, until a successful test is obtained.

xv. Copies of successful test results shall be submitted to the owner for record.

xvi. Upon acceptance by the owner, the completed system(s) shall be placed into service.

L. SYSTEM INSPECTIONS

i. The installing contractor shall provide two (2) inspections of each system, installed under this contract, during the one-year warranty period.

ii. The first inspection shall be at the six-month interval, and the second inspection at the 12-month interval, after system acceptance.

iii. Inspections shall be conducted in accordance with the manufacturer's guidelines and the recommendations of SANS.

iv. Documents certifying satisfactory system(s) operation shall be submitted to the owner upon completion of each inspection.

M. WARRANTY

The system components furnished and installed under this contract shall be warranted against defects in design, materials and workmanship for the full warranty period which is standard with the manufacturer, but in no case less than one (1) year from the date of system acceptance.

10.ACCESS CONTROL SYSTEM

10.1. Access Control Management System General Description

10.1.1. General

As an Access Control System, the "ACS" shall provide the following features:

(a) The "ACS" shall provide the ability to control up to 256 Access Control Sites.

(b) The "ACS" shall provide the ability to control up to 64 System Controllers per site, hereafter referred to as locations.

(c) The "ACS" shall provide the ability to control up to 300,000 users per site. "ACS" system users shall hereafter be referred to as tag holders.

(d) The "ACS" shall ensure that Fingerprint Biometric Readers are an option.

(e) The "ACS" shall provide the option to implement Daylight Savings Settings per site.
(f) The "ACS" shall provide the option to implement Anti-Passback on single access points, or on user defined groupings of access points, hereafter referred to as zones.
(g) The "ACS" shall provide the option of limiting the number of users in an Anti-Passback zone.
(h) The "ACS" shall provide the option of multiple reader types at each location. These options shall include, but not be limited to
Fingerprint Biometric Readers
Tag Readers
Keypad readers
Harsh Environment Metal readers
3rd Party card readers
(i) The "ACS" shall provide the option of setting individual reader modes at each access control reader. These modes shall include, but not be limited to:
Biometric Only (1:n to Many – Identification Mode)
Biometric – 2nd Factor (TAG and/or PIN)
TAG only mode
TAG + PIN mode
TAG + REASON CODE mode
Personal Access Code mode
Locked Mode
Unlocked Mode
Emergency Mode
(j) The "ACS" shall provide the option of single tag use, or multiple tag use per location.
(k) The "ACS" shall provide an interface for the administration of tag holders.
(l) The "ACS" tag holder interface shall provide the ability to assign up to 8 tags per tag holder.
(m) The "ACS" tag holder interface shall provide the option of linking up to 10 access groups to a single tag.
(n) The "ACS" tag holder interface shall provide the option of assigning access groups across multiple sites in the "ACS".
(o) The "ACS" shall provide the ability to configure up to 10 000 Access Groups per site.
(p) The "ACS" shall provide the ability to configure up to three combinations of Time Pattern and Allowable Access Doors (Areas) per Access Group
(q) The "ACS" shall provide the ability to configure up to 512 Access Time Patterns per site.
(r) The "ACS" shall provide the ability to configure up to 1024 Areas per site.
(s) The "ACS" shall provide the ability to generate multiple Time Triggered Actions per site.
(t) The "ACS" shall provide the option for defining Holidays whereby access rights can be denied or granted based on a tag holders individual access groups.

10.1.2. "ACS" Concept

The "ACS" system shall provide general access control for employees, as well as visitors. This shall be facilitated by the creation of doors, access groups and tag rights assignment. The underlying architecture of the "ACS" shall be one of EVENTS and ACTIONS.

An event is defined as a 'pre-defined system condition'. An example of a system event is an 'allowed normal' transaction or an 'Input Alarm' transaction that the "ACS" system controller recognizes in its database of events. The "ACS" controller shall recognize a range of events that include, but are not limited to the following categories:

Tag transactions – Allowed, Denied, APB, Zone, location, Time, suspended, blacklisted, Special, Reason code, Duress etc
Zone monitoring Transactions – Zone Full, Empty, Not Empty, etc.
Location monitoring Transactions – Location locked.
Input Alarm transactions - Input triggered.
Door Sensing transactions – Door Forced, not opened, opened normally, open too long, closed, etc.
"ACS" hardware transactions – timeouts, power ups, etc
Time based event.

An Action is defined as a "physical capability of "ACS" hardware components. The "ACS" components include Relays, buzzers and LED's, as well as software defined multiple action components.
Each "ACS" hardware device shall have system defined default actions. The "ACS" software shall provide the administrator with the ability to create custom actions for each individual hardware component. The default, as well as user defined actions shall be configurable by duration. LED components shall be configurable by duration and LED colour. The Relay components shall be configurable by relay duration. The buzzer components shall be configurable by duration and buzzer tone and volume.

The "ACS" system controllers shall constantly monitor the system for the occurrence of any "ACS" event that occurs. When the event occurs, the "ACS" system controller shall trigger up to five user defined actions for the specific event that has occurred. These actions shall include, but not be limited to a combination of:
Relay Actions
LED Actions
Buzzer Actions
Multiple Actions
All system events shall be stored in the "ACS" database with date/time stamps.
In the case of Time-Based events, the "ACS" controllers shall trigger actions based on specific times, once off, or recurring.

10.1.3. Software

The "ACS" software shall be written in an industry standard 4th Generation Programming Language. The "ACS" software shall be Client/Server in design. The "ACS" database shall be open in nature, allowing for simple integration with 3rd party software packages. There shall be two database vendor options available – An industry standard Open-Source database, with its relevant database management systems (DBMS) tools, or an industry standard proprietary DBMS.
The "ACS" software shall be modular in design, providing the option of installing the respective modules on multiple client workstations across an organizations network. The "ACS" software shall also be able to run on a single workstation.
The "ACS" software shall make use of simple, easy-to-navigate graphical user interfaces that make use of either a drill-down tree structure, or a menu driven option.
The "ACS" software shall provide a Configuration module that allows for the complete configuration of the "ACS" including the setup of "ACS" hardware, "ACS" tag holders including Fingerprint Biometric template management and all "ACS" functionality.
The "ACS" configuration module shall also provide a software operator security module that provides the "ACS" administrator the option of configuring user profiles and creating user groups. The Operator Security module shall enable the administrator to provide granular access control rights to applications as well as access to tree structures, menus, and popup menus.

A separate database engine module shall facilitate the upload of system parameters and tag holder data to the "ACS" hardware and fingerprint template distribution to the fingerprint readers, whilst at the same time providing a separate downloader thread for download of all system related transactions from the "ACS" Hardware. The database engine module shall provide advanced connectivity options for configuration of multiple connection mediums, as well as an automated database backup site that shall backup the "ACS" database to a specified network drive. The "ACS" database Engine shall create an offline transaction file on the local workstation if the Network connection to the database is lost.
During initial system setup, or any subsequent system setup, the "ACS" database engine module shall provide the functionality to Auto identify new devices connected to the system. The "ACS" database engine shall interrogate the devices for their unique serial numbers and device type, and auto-assign logical addresses to each hardware device. The "ACS" database engine shall also populate the "ACS" database with the information previously gathered during the Auto Identification process. This information shall be viewable and configurable in the "ACS" configuration module.
The "ACS" software suite shall provide a Graphics module that allows software users to view, in real time, all "ACS" system related transactions. The Graphics module shall provide a transaction viewer module that shall report on all Access transactions, Alarm transactions and Message Protocols that are triggered by the software user. The Graphics module shall provide the graphics user to view 2 dimensional images of the entire "ACS" site, as well as 2-D images of all floor plans for the site.
The "ACS" software suite shall provide a tag holder administration module that shall enable the system administrator to separate tag holders into Employee groups and Visitor groups.
The "ACS" software suite shall provide system administration utilities including, but not limited to the following: A firmware upgrade utility that provides technicians the ability to upgrade and troubleshoot a factory installation. A database archive utility, An Ethernet device configuration utility and a CSV import utility.
The "ACS" software suite shall also provide modules that enable communications with 3rd party systems including, but not limited to the following: Industry Standard Fingerprint Biometrics devices, Fire Detection systems, Intrusion alarm systems and Digital Video Recording Systems (CCTV)
The "ACS" software shall also include all relevant configuration manuals in industry standard format.
The "ACS" shall provide a web-based reporting structure that negates the need for additional software to be installed on client workstations. Software users shall be able to connect to the Web-Reports via a standard Web Browser such as Microsoft Internet Explorer, or the open-source Mozilla.

10.1.4. Hardware

(a) The "ACS" hardware architecture shall be Client/Server in nature with local door readers relying on System controllers to make all system related decisions.
(b) The "ACS" shall support a maximum of 64 System controllers per site.
(c) The "ACS" system controllers shall be regularly polled by the Database Engine Module to download "ACS" transactions to the system database and to upload relevant "ACS" configuration data to the system controllers. The "ACS" system controllers shall be able to run in a true offline mode when the "ACS" database engine module connection is not present.
(d) The "ACS" system controllers shall buffer up to one million system transactions per controller in the event of a loss of connection to the "ACS" database engine. Once the connection is re-

established, the "ACS" system controllers shall automatically dump the system transactions to the "ACS" database

(e) The System controllers shall each be capable of controlling up to 32 Access control terminals, (64 IP Addresses) which shall include all or a combination of the following devices: Door Controllers with their respective readers, 3rd Party Interface Door Controllers, Digital Input boards, Relay Extension boards, Fingerprint Biometric Readers, Time & Attendance Readers, Radio Frequency (RF) and Long-Range Readers.

(f) Optional to the standard door controllers, the "ACS" hardware shall include Intelligent Door Controllers that shall allow access to the 2000 most recent tags used at the door in the unlikely event of a communications bus failure.

(g) The "ACS" Systems Controllers shall provide multiple connectivity options including, but not limited to RS485 and 10/100 Ethernet.

(h) All devices that connect to Systems controllers, hereafter referred to as terminals, shall connect to the Systems controllers via an RS485 connection port on the System Controller.

(i) The Fingerprint Biometric readers must connect via 10/100 Ethernet.

(j) The "ACS" System Controllers shall report any offline terminals without delay.

(k) The "ACS" terminals shall provide a combination of the following user-configurable components for use in the day-to-day operations of the "ACS": Dry contact relays, Light Emitting Diodes (LED), Multi-function Digital inputs and 3rd party interface ports.

(l) The "ACS" door readers shall support either industry standard 125Khz proximity tags, or the 13.56 Mhz frequency Mifare tags. Door readers shall connect to the "ACS" via standard "ACS" door controllers, or the "ACS" 3rd Party interface boards. 3rd Party Door entry devices such as the Fingerprint Biometrics shall connect to the "ACS" via the 3rd Party interface boards.

(m) Door Readers shall support either proprietary system protocols, or industry standard Wiegand protocols.

(n) Door readers shall support the following or a combination of the following components that clearly indicate ingress or egress transaction approval or denial: Software configurable Bi-Colour LED and software configurable buzzer.

(o) The "ACS" software shall be capable of initiating protocol commands directly to the "ACS" hardware through the "ACS" database engine via user selectable messaging ports, through the Graphics module or through the "ACS" configuration module.

10.1.5. Integration

(a) The "ACS" system shall provide the backbone for various 3rd Party product integrations. Such integration shall include interfacing to various 3rd Party hardware vendors as well as software integration to multiple software vendors and systems

(b) The "ACS" shall provide 3rd Party terminal ports on specific door controllers whereby multiple technologies can be connected to the "ACS". These technologies shall include, but not be limited to, Fingerprint Biometrics Devices, Mifare Readers, Wiegand Readers, Bar-code readers and Radio frequency (RF) devices

(c) These systems shall integrate at the protocol level and communications across the multiple systems shall be seamless.

(d) The "ACS" database shall provide the option for integration to 3rd Party software modules, including, but not limited to: Human Resource Systems, Time and Attendance systems, Enterprise Resource Planning (ERP) systems, Supply Chain Management (SCM), Customer Resource Management (CRM) and Estate Management Systems.

(e) The "ACS" system shall provide the option to pass the Access Request from the "ACS" to one of the higher-level systems for primary approval of the Access Control request. This "Host Validation" shall occur seamlessly and without delay.

(f) The "ACS" system vendor shall be able to provide API's, Database Schemas and 'Best Practice' guidelines to systems integrators.

(g) The "ACS" system shall provide user configurable 'open' TCP socket ports in its "ACS" database engine software to allow authenticated applications to monitor Access transactions, Alarm transactions and to perform real time door monitoring. There shall also be ports available for protocol messaging to "ACS" hardware, enabling 3rd Party systems to generate "ACS" actions on the system in real time.

10.1.6. Architecture

The "ACS" shall have a distributed processing architecture consisting of hardware, software and a system database.

Key Elements

- **Hardware**

Hardware components of the "ACS" include System Controllers, Terminals, Readers, Tags, communications buses, and other components required for operation. For detailed requirements, refer to the Hardware section.

- Software

Includes the software package used to configure the site or sites, add, delete and edit tag holders, and monitor hardware. For detailed requirements, refer to the Software section.

People

People using the "ACS" shall fall into two groups:

System Users
These are the installers, administrators, and technicians who work on the "ACS"
Tag Holders
These are the people who have access to Sites permanently or temporarily, where the "ACS" is installed
a)
b) Note:

Tag Holders are not limited to people. Any non-human object using a tag, Fingerprint Biometric reader or remote transmitter is effectively a tag holder. For example, a vehicle can also be regarded as a tag holder

Interaction

The hardware is required to physically provide access control to an installation. Software shall communicate effectively with the hardware to ensure efficient access control. The hardware and software shall be designed to provide intuitive, fool-proof operation and interaction with people.

10.1.7. Features

a) Access control

The specified system shall provide full advanced access control, with the following additional features:

b) Building Management

Emergency Mode – when activated, pre-selected doors shall be opened automatically
Alarm Mode – when a security or fire alarm is activated, a signal shall be received by the "ACS" and system configured actions shall be triggered.
Time Triggered Actions – specified actions are activated at specified times
Event Triggered Actions – specified actions are activated when a specified event is detected

c) Time and Attendance (TA)

The "ACS" shall provide suitable hardware and software, and integration tools to facilitate a TA subsystem.

d) Anti-Pass back (APB) Control

The "ACS" shall have a site to set a **Relaxed** or **Strict** APB status per location or grouping of locations.

e) Security

The "ACS" system shall provide high levels of physical security by ensuring the following basic principles
Robust hardware – The "ACS" system shall provide, as it's means of transaction collection, high quality, robust readers and peripheral devices.
Tamper proof hardware – The "ACS" hardware shall incorporate Tamper-switches on System Controllers, and high-risk terminals, and the "ACS" software shall report any alarms generated on "ACS" hardware
Secure software – The "ACS" software shall provide the option to implement operator security on all "ACS" software modules.

f) Monitoring

The "ACS" shall provide the ability to assign designated users certain monitoring roles. These users shall have accessed the "ACS" software to monitor transactions, alarms, and tag-holders, but shall not be able to make configuration changes. Monitoring modules shall include a Graphical Floor plan monitoring module and a text-based Transaction module. The aforementioned modules shall report on all Access transactions, Status transactions and Alarm transactions.

g) Expansion Options

The "ACS" system shall provide simple system expansion options for expansion of existing hardware, software and the addition of additional sites.

h) Integration

The "ACS" shall provide integration options for integration with the following third-party systems:
Intrusion Alarm systems
Fire alarms
Elevators
Human Resources Databases
Time and Attendance Systems
ERP, SCM and CRM Systems
Student Enrolment Systems
Digital and Network Video Recording Systems

i) Remote Administration

It shall be possible to administer the "ACS" sites remotely by utilizing the following technologies.
Dial-in via GPRS modem
Ethernet

j) Details

The "ACS" shall support the use of Zones and Locations to group similar functioning access points into user configurable groups.

k) Zones

A zone is defined as the combination of multiple locations that allow access to and from an area. Zones shall support the following features and functionality;

Anti-Passback
Embedded zones (zones within zones)
Inter-leading zones
Tag counting

The "ACS" shall support inter zone communications to facilitate the transfer of transaction related data across single or multiple zones

l) Locations

A location is a single point of access to a zone and usually consists of a door with one or more readers. Locations shall support the following hardware:

"ACS" proprietary 125Khz antenna readers
"ACS" proprietary 125Khz Remote reader
Mifare 13.56Mhz readers
RF reader
Wiegand 125khz readers
Barcode reader
Mag-stripe reader
Fingerprint Biometric readers

Locking systems
Sensors – All, or a combination of the following:
o Door States sensors
o Alarm Input sensors
o Inhibit Scanner sensors
o Emergency Mode sensors
o System lockdown sensors

Additionally, locations shall be graphically represented in the "ACS" software.

10.1.8. Tags

Tags are passive electronic devices containing a unique code. A tag code is transmitted when it is within range of a suitable reader. The "ACS" must support the following tag types in addition to Fingerprint Biometrics:

125KHz Slim and Omega tags (ISO standard Manchester encoded)
125KHz Writing 128 bit
125KHz WriTag 2048 bit
13.56Mhz Mifare
UID
F433MHz
Infared

10.1.9. **Tag Holders**

The "ACS" shall allow Tag Holders to have more than one Tag. Additionally, it shall be possible to configure different access rights on different tags.

10.1.10. Tag Modes

The "ACS" shall support the following reader modes across all locations, or in multiple combinations:

Biometric Only
Combination of Biometric and Tag based areas on one system
Tag only
Tag + PIN
Tag + PIN + Reason Code
Tag + Reason Code
PIN access only
Door Entry Code (general, single, low security code)
Supervisor Unlock
Locked
Unlocked
Dual tag requirement
Specified Allowed tag transaction recording
Duraplogic special entry
APB override
Blacklist tag

Suspend tag
Date-selectable auto validate and delete

10.1.11. Hardware

The "ACS" shall consist of a combination of physical components, grouped under one of the following terms:
System Controllers
Door Controllers
Door Readers (card based)
Fingerprint Biometric readers
Input Monitoring devices
Output Relay devices

10.2. Design considerations

Selected hardware must exhibit the following:

Tamper proof construction
o If a unit is tampered with, it must generate an alarm
In-the-field firmware upgrade
Standards
o CE
o FCC
o RoHS
o 3ABS
o Pd – Lead Free

10.3. Exposed Hardware

The "ACS" hardware shall include robust, weather resistant, vandal proof hardware. The hardware be housed in either ABS plastic housings, or metal alloy housings. The "ACS" readers shall be resistant to the following:

Harsh weather
Harsh environment
Physical abuse by people

In this case, it is essential that exposed hardware be physically resistant to harsh and abusive conditions. It must conform to at least IP53 standards, and have the IP66 option available

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10.4. System Controllers

The System Controllers shall be intelligent hardware devices with a full onboard database of tags and access data. The System Controllers shall operate in a truly standalone mode when there is no network connection available to the "ACS" database engine module. The System Controllers shall not have any reduced functionality when the "ACS" database engine is offline.

Each system controller shall be capable of storing up to 300 000 tags, and shall be capable of buffering up to 1 million transactions should the connection to the "ACS" polling module be lost.

The "ACS" shall support the following connectivity options between System Controllers
RS485 – with connectivity speeds of 38400 Baud
Ethernet connectivity – with support for up to 100Mbps connectivity speeds

The "ACS" polling module shall provide an AUTODETECT function that shall poll the RS485 bus, or the LAN/WAN for any "ACS" controllers. The "ACS" controllers shall respond back with their respective factory assigned addresses which shall be automatically inserted into the "ACS" database. The "ACS" system controllers logically addresses shall automatically be assigned to the devices without any user intervention.

The "ACS" System Controller shall support up to 64 physical devices connected to its RS485 terminal communications bus.

10.5. Door Controllers

A Door controller is a hardware device that is used to interface readers, door locks, and similar hardware with a system controller.
The "ACS" door controllers shall include the following types:
Proprietary door controllers for connection of proprietary "ACS" readers.
3rd Party door controllers for connection of 3rd Party door readers, Multi Discipline Readers and Biometric devices
RS485 -Intelligent door controllers that shall store the most recent 1000 allowed tags in its database to allow entry in the case of a communications failure with the system controller and operate in truly stand-alone mode.
Ethernet connectivity with support for up to 100Mbps connectivity of speeds.
Intelligent TCP/IP door controllers that shall store the most recent 30,000 allowed tags in its database to allow entry in the case of a communications failure with the system controller and operate in truly stand-alone mode.
Door Controllers shall have the following or a combination of the following components built in to facilitate the opening of doors and the monitoring of doors:
Dry Contact Relays
Digital inputs
Antenna Ports for connection to proprietary "ACS" readers
Communications port for connection to 3rd Party readers.

10.6. Readers – Card Based

A reader is a hardware device that detects the unique code embedded in a tag or remote transmitter.
The "ACS" readers shall be of the following type:
ABS Plastic
Metal Alloy
ABS Plastic with Keypad
Metal Alloy with Keypad
RF Receivers
Stainless Steel with ABS Plastic
Stainless Steel with ABS Plastic plus Keypad

All readers with the exception of the RF receiver shall have the following or a combination of the following components:

Software configurable buzzer
Software configurable Bi colour LED

The "ACS" shall support the following Reader technologies:
"ACS" proprietary 125Khz antenna readers
"ACS" proprietary 125Khz Remote reader
Mifare 13.56Mhz readers
RF reader
Wiegand 125khz readers
Barcode reader
Mag-stripe reader
Finger Biometric Reader

10.7. Communications

Communications between the "ACS" Server and the "ACS" system components shall have the following architecture:
"ACS" Server to System Controller shall support either RS485, TCP/IP or UDP Multicast protocols.
"ACS" Controllers to "ACS" terminals shall be RS485
"ACS" Door Controllers shall support a variety of protocols including, but not limited to:
o Vendor Proprietary
o Wiegand

Communications busses shall be configurable via a star or daisy chain topology.

10.8. Third party

The "ACS" shall provide support the following third party hardware:

Industry Standard Fingerprint biometric readers
Miwa lock
Wiegand reader – 26, 44, 37bit
Mifare reader
Mag-stripe reader
IID readers

10.9. Software

(a) General

The "ACS" software shall meet the following general criteria:

Fully featured client-server architecture
Written in Java for platform independence so it can run on non-Microsoft operating systems such as Linux
Modular design comprising the following key applications
o Polling module
o Configuration module
o Graphic display module
o Multivendor Database Support

o Context sensitive Help
Modular design comprising the following support applications and utilities:
o Alarms Modules
o Employee enrolment module
o Transaction viewer with photo ID popup
o Visitor enrolment module
o Database archive site
o CSV import of tag holder information
o Translation utility
o Ethernet device Discovery utility
o General System Diagnostic modules

(b) Architecture

Each software module shall be able to run on individual client workstations if required. Conversely, all software modules shall be able to co-exist on the same workstation without overloading the workstations resources.

(c) GUI

All "ACS" software modules shall have a graphical user interface (GUI). The configuration GUI shall be in an easy to use Tree format displaying "ACS" functions in separate nodes.

(d) Translation

The Access software module shall offer a site to translate the text labels and menu items on the GUI. The translation feature must consist of a utility that enables a user to do the following:
Select a Locale – country
Select a language and replace the default words with local words
Apply the language settings via a menu command

10.10. Features and Functions

General Features

The "ACS" software shall support the following features.

Holidays
Password protection on each Site
Password protection on every application and utility
Reports accessible in a web based format
Translatable to accommodate multiple languages
Time zone offset and daylight savings
Multiple time zones support
Application Help
Tag holder Archive Site
Bulk Tag holder Adding
Systems Analysis utility
Reason Code Editor utility
System Event Editor utility

Card Design utility

General Functions

The software must be suitable for users to configure, monitor, and administrate all aspects of the "ACS" including the following

Sites
Hardware
Tags and tag holders
Access patterns

Backup

The software must provide for scheduled backup of data, to specific local or network directories, at specific times

Operator Security

The "ACS" software shall include an Operator Security module that will enable the System Administrator to define operator groups for users who will operate the various modules. The Operator Security module shall facilitate the creation of Users and Passwords, and user Groups. The System Administrator shall be able to set up Application security as well as granular security settings within each application. The Operator Security module shall facilitate the assignment of Tag holder Access groups to selected Operator groups.

RDBMS Database

The "ACS" shall support the following database types

Microsoft SQL Server 2000 or later
Firebird SQL database
General
The database shall support a minimum of 256 Sites
There shall be no limit to the number of Tags or Tag Holders records stored in each individual Site
The database must support connection via JDBC data source

All databases must have the following:

Full SQL compliancy
Support for multiple connections
A manual SQL querying site
Load balancing capabilities
Password protection
Administration
Multiple users shall be able to administrate the database
Administrators shall be able to administrate the database industry standard DBMS software
Installation
The must be provision for the database to reside on the Host PC, or on a dedicated server connected to the network

10.12. Polling Module

(a) "ACS" database Engine

An "ACS" database engine is required to send and receive transactions to and from controllers. This action must happen without affecting normal operation. The "ACS" database engine module shall be capable of performing the following operations

Auto-detecting hardware on a communication bus, and assign Logical addresses intelligently so as to avoid duplicate addresses
Comparing and validating hardware on the communication bus with hardware records in the database
Verifying hardware firmware versions
Displaying real-time transactions on demand
Scheduled back-ups with:
o A user-definable number of back-up files
o A user-definable back-up file path
In the event that the Database Server fails, the "ACS" database engine shall automatically start creating a backup of transaction logs. When communications to the Server have been re-established, the "ACS" database engine must then transfer the transaction logs to the database.
Indicating when hardware goes offline and generating an alert for this event
The "ACS" database engine shall be able to connect to the database over a networked solution separating the database server from the "ACS" software.
The "ACS" database engine shall be able to connect to the Hardware via RS232, USB or UDP.
The "ACS" database engine shall incorporate a web server that allows anyone with the correct access permissions to view transaction history of any Tagholder; this web service is not dependent on the software to be polling the hardware. The System Administrator shall have the option to allow security on the web server or allow open permissions.
The "ACS" database engine shall have an Interface to view what messages are outstanding for each controller and have the option to clear the messages.
The "ACS" database engine shall have a feature for use when using Ethernet type controllers to import their settings into the database.
The "ACS" database engine shall have an upload feature that prepares the upload data in a queue and then provides an upload to each controller.
The "ACS" database engine shall not cause any downtime of controllers should an upload be performed.
The "ACS" database engine shall provide a clear output message to the System Administrator should the upload process fail at any point.

(b) Advanced Options

The Database engine module shall support the following advanced configuration options:

Ability to set times and timeouts for the following:
o Controller Timeout
o Controller slow poll drop time
o Challenge Timeout
o AutoID Time
o Terminal bus additional timeout

o Controller bus additional timeout
o Uploader database connection reset time
o Uploader cycle delay
o Uploader inter table delay
o Uploader daily start time
o Uploader daily end time
o Poller inter poll delay
o Poller daily start time
o Poller daily end time
Host Interface fast polling
Terminal Bus fast polling
When using the controllers in broadcast mode set the option to transmit the broadcast twice
In the event that a controller goes offline, have the ability to relay APB until the Controller comes back online
Append carriage return to fast polling
Reset of advanced options to factory default

(e) **Polling Module Properties**

The Polling module must enable the following properties configurable.

Database type
Database driver
Database URL
Encoding key
Database encoding
Logging mode with the following options:
o No Logging
o Log outgoing messages
o Log all messages
o Log all messages longer than threshold
o Log incoming messages
o Log incoming messages longer than threshold
Auto start on startup with an auto start delay
Web Server on start with an inactivity delay
Full upload on first pass
Redirect to file
Delete expired tags
Validation on start
Set UDP Comms
Set Administrator password
Set Web Server username and password
Set Site SLA

10.13. Configuration Module

A configuration module shall be required to set-up a Site for access control by configuring access hardware. System components shall be graphically represented by a hierarchical tree diagram in a left-hand pane of the window. On selecting each component, its corresponding settings shall be displayed in the main application window pane.

The configuration module shall reference a user-configurable text-based properties file containing the following information:

Database file paths
Localization Encoding
Name of default Site
Communication Type

The properties file shall enable the System Administrator to customize preferences for using the various modules by changing settings in the file.

Configuration Tree

The configuration tree shall contain the following nodes.
System— Display a summary of all sites' logical Addressing, site name, site ID, and site groupword
Sites—must display and enable editing of the following information:
o Site number
o Site name
o Enforce zone routing
o Shared site option
o Daylight saving time offset in seconds
o Daylight savings time: start date and start time
o Daylight savings time: end date and end time
o There shall be an option to enable the Any Tag feature
o There shall be an option to set a Site mask for increased security
o The System Administrator shall be able to set the TCP/IP Port connectivity numbers for the different utility modules namely:

- Transaction viewer
- Alarm
- Messaging
- Host Validation
- Door Status

Hosts –shall display host number, host name, and IP address Each host must drill down to display the following:
o Controller
o Zone
o Location
o Terminal
Access Time patterns—The ATP node shall enable adding of access time patterns, and editing of the following parameters for each time pattern:
o Time pattern name
o Start time
o Duration
o Days of the week
Areas Clicking on the Areas node shall display a tree diagram of all controllers with their relevant doors and terminals, and the option to add or edit new Areas.
Tag holder access groups - clicking on the Tag holders Access groups node shall open the Tag holder Access Groups utility that shall allow the System Administrator to add up to ten thousand Access definitions by linking together Access Time Patterns and Areas

Tag holders – clicking on the tag holder's node shall display all information pertaining to tag holders including:
- Personal Details – Name, surname, Notes etc
- Custom Field Data
- Information on up to eight TAGS

Holidays
Device time patterns
Time triggered actions
Actions – It shall be possible to add or edit system actions from the actions node
Inputs – It shall be possible to alter the functionality of all defined system inputs by clicking on the Inputs node
Outputs – it shall be possible to edit the default state of all system outputs for the system by clicking on the outputs node.
Common Zones
Messages

Host Components

Controller

When a specific System Controller node is selected, the "ACS" software shall display the Controller name, Controller parameters and have an option to enable or disable the controller. There shall be a site to enable supported tag types and set the terminal port baud rate as part of the controller parameters

For Ethernet based controllers, there shall be an option to enter in an IP Address and Port numbers for both hardware and PC port.

There shall be a separate action tab that enables a user to add, delete, and configure preset controller actions

Zone

The zone screen shall display and enable editing of the following information and parameters:
- Zone name
- APB mode – Strict, relaxed or none
- Supervisor group for the zone
- Fully nested within zone selection
- Part of common zone selection
- Relaxed exit conditions for the zone option (time override for tags on site)
- APB lockout time in minutes
- Limit tags inside selected zone – the "ACS" shall allow limits to specific numbers of tags in each individual zone.

Location

The location screen shall display and enable editing of the following information and parameters:
- Location name
- Location type
- Interleading to zone selection
- Enforce interleading zone routing option

o Multiple tag access for one or two tags

Terminal

When a specific terminal node is selected, the "ACS" software shall display and enable the editing of the following information and parameters on a Terminal tab:
o Terminal name
o Terminal enabled option
o Position: Entry or Exit
o Disable terminal
o Must have a separate button to enable different parameters on the terminal, namely:
- Change default buzzer Volume
- Change the Same tag Timeout
- Toggle between Host validation and Controller validation
- Set the frequency of random search
- Set the Time pattern for the enabling/disabling the random search feature

A **terminal mode** tab shall enable the user to set the following configuration options:
o Default terminal mode with the option of including a report
o Device time pattern with the option of including a report

An **Input** tab shall enable the user to define and configure up to 16 digital inputs per terminal each with the following information:
o Input port number
o Input name
o Input function

Each defined input shall have an option to enable time patterns and set default input parameters to monitor **open contact, closed contact or change** of contact.

Time Patterns

Time patterns shall be divided into 2 separate instances, Access Time Patterns and Device Time pattern. The "ACS" must support up to 128 Access time patterns, and up to 250 Device time patterns.
Device Time Patterns must relate to all Hardware, Access Time Patterns must relate to Groups and Tagholders. Both Access Time Patterns and Device Time Patterns shall allow the System Administrator to define the following options:
Time pattern name
Start time
Duration
Days of the week
Holidays

Tagholder Access Groups

The "ACS" shall support up to 10 000 Access groups, each Access Group must support up to 10 access Descriptions. There shall be 2 Tabs to Separate the TagBuilders Access Groups into Employees and Visitors. Tagholder access groups shall offer the following configuration options:
Supervisor Unlock

Special Actions
Start and Expiry dates per group

Tag Holders

The "ACS" must support the following

Displays detailed Tag Holder information including passport-style photograph
Multiple tags per Tag Holder
Tag Holder screen has search site using first name, last name, address, company, department, or tag number
Suspension of Tags
Batch mode to load tags
Batch mode to print tags
Supports Impro Card printing
Unlimited Templates
Dual sided printing
Linked to database tables
Image import - landscape or portrait

Holidays

The "ACS" shall support up to 32 predefined Holidays.

IP Mapping

In the event that the Customer chooses Ethernet enabled Controllers an IP mapping section must appear that enables the Operator to view all IP addresses of controllers.

Configuration Site

Users shall be able to customize their preferences for the access module by changing settings in a properties file.
The following configuration and set-up options shall be available via a menu:

Display properties for the following components must be configurable by selecting a swatch, or HSB or RGB values:
o Tree background
o Non selectable node text
o Non selectable node background
System event editor
o Enter custom event descriptions for specified events
o Choose whether event type is normal, alarm, or special alarm
Reason codes
o Enter or modify up to 100 descriptions for reason codes
Change fixed address
o Select a controller and change its fixed address to a new value
System user security set up
o Add or delete system users and specify user rights within each application
Event log—displays a list of the following events with the option to save values to a log file:

o Date
o Time
o User
o Event
o Description
o Detail
o Status
o Site
Camera Setup—used to integrate CCTV systems
Card designer – The card designer allows the "ACS" administrator to design multiple templates for printing Tagholder cards. The card designer shall provide the following functions.
o Placement of Database fields on the card template.
o Placement of predefined graphics on the card template.
o Placement of Custom Text on the card template.
o Placement of Circles or lines on the card template.
o Design of double-sided cards
o Definition of Print medium – either to Card or to Label
Batch printing of Cards
General Configuration module properties
Database Maintenance
Batch Enrolment of Tagholders
Move tagholders between Sites
Force upload of Hardware or Tagholder data to controllers

10.14. Reports

At Minimum, the Reports Feature shall include the following:
Access
o The Message Board Report shows the latest in and out transaction for each person.
o Last Access Report Shows where the employee is now. Must be filtered by Name, Door and Date.
o Employee Transaction Report displays a detailed report on all transactions made by employees. Must be filtered by Site, Date and Time, Person, Tag Code, Department, Event and Vicinity.
o Transaction Report displays all tagholders transactions on a specific date. Must be filtered by Name, Door and Date.
o Audit Trail Report displays all the audit transactions of what the system administrator has done. Must be filtered by Date and Type.
o First Access Report displays all tagholders First Access transaction for a specific day. Must be filtered by Name, Door and Date.
o Last Access for day displays all tagholders Last Access transaction for a specific day. Must be filtered by Name, Door and Date.
o Visitor Transaction Report displays a detailed report on all transactions made by visitors. Must be filtered by Site, Date and Time, Person, Tag Code, Department, Event and Vicinity.
o Reason Code Report displays a detailed report on all reason code transactions made by employees. Must be filtered by Site, Date and Time.
o Event Transaction report this report shows which events were triggered by an input.
Person
o Person Report displays a report of transactions for individual employees. Must be filtered by Employee, Start and End Dates.
o Zone Occupancy Report displays tagholders that are IN a specific zone.
o Absenteeism Report displays a list of employees that were absent on specific days.

o Access Pattern Report displays individual employees Time IN, Time OUT, Total Hours Worked (Last Out - Last In), Average Time In, Average Time Out and Average Hours Worked.
o Hours Worked in APB Zones Report displays an employee's IN and OUT transactions of all Strict APB Zones. Calculates the hours worked using those IN and OUT transactions. Must be filtered by Employee, Zone, Start and End Dates.
o Person Detailed Access Report displays all tagholders who have access to a location, zone and controller.
o Person Details Report displays a detailed report for individual tagholders. Must be filtered by Person, Start and End Dates
o Zone Occupancy Report displays tagholders that are IN a specific common zone.
o Department Report displays a report of transactions for employees in a Department. Must be filtered by Department, Site, Start and End Dates.
o Department Access pattern and Time Report displays a summarized daily hours worked and total hours worked report on all tagholders and is grouped by department. Must be filtered by Person, Department, Company, Start and End Dates.
o Department Hours Worked in APB Zones Report displays employees FIRST IN and FIRST OUT transactions. Calculates the hours worked using IN and OUT clockings of each day. Must be filtered by Employee, Department, Employer, Zone, Start and End Dates.
o Holiday Report displays the holidays in Table or Calendar format.

System

o Status Report displays all the status transactions from the controllers and terminals on a specific date i.e. Terminal timeouts, Tables corrupt and Request to Enter/Exit. Must be filtered by Date and Time
o Door Access Report displays how frequently each door has been accessed. Must be filtered by Date.
o Alarm Report displays all alarms that have been generated by the system. Must be filtered by Date and Time.

Configuration

o Area Report displays all terminals within each area of a site.
o Access Report displays all locations that a tagholder has access to. Must be filtered by Site, Person, Tag Code, Department and Vicinity.
o Terminal Action Report. Shows all terminals and their available actions

Tagholders

o Employees Report displays all employees that have valid tags/fingerprints in the system. Must be filtered by Site and Department.
o Employees without tags Report displays all employees that don't have valid tags in the system. Must be filtered by Site and Department.
o Employees tags without access Report displays all employees that have valid tags in the system, but no Tag Holder Access group assigned to them. Must be filtered by Site and Department.
o Tags Not Used Report displays tags that have not been used since a specific date.
o Tagholder Configuration displays detailed information on Tag Holder Access Groups.
o Visitors Report displays all visitors that have valid tags in the system. Must be filtered by Site and Department.
o Visitors without tags Report displays all visitors that don't have valid tags in the system. Must be filtered by Site and Department.
o Visitors tags without access Report displays all visitors that have valid tags in the system, but no Tag Holder Access group assigned to them. Must be filtered by Site and Department.
o Tag Expiry Report displays tags that have expired and tags that will expire. Must be filtered by Start and End Dates.

o Tagholder Access Group Configuration Report displays all areas, zones and locations within a tagholder access group. Grouped by tagholder access groups.

Custom Reports
o The "ACS" software shall provide the option to the System Administrator to write Custom Reports that meet additional reporting requirements. This feature shall include a set of Controls that allows Scripts to be run on the Database and Produce results in a web-based Format and the resulting reports shall be exportable to a CSV file.
Select Database
o In the Event that the database has been archived this tab must be able to browse to the Archived database to view Archived Transactions.

10.15. Operator Security

The "ACS" must provide configurable security options to limit system users' activity within it. Such operator security must be configurable on a per user group basis. Each password protected application or utility must have the options to do the following.

Provide a user group with one of the following:
o Full access—user is granted full access to everything in the application
o Denied access –user is denied access to everything in the application
o Customized access—user can be configured to access designated features only
Grant or deny access to the following elements and specific items within them
o Main menu
o Tree Diagram
o Dialog screens
o Popup menus
o Toolbars

The operator security function must contain presets to allocate default security permissions to users. A user must be able to create new presets by using an existing preset as a template.

10.16. Biometric Module

The "ACS" shall have a fully integrated Biometric module that shall provide Ethernet communications to Biometric devices connected to the corporate LAN/WAN. The Biometric module shall enable the user to AUTODETECT all Biometric devices on the LAN/WAN and automatically update the "ACS" database with the Biometric Devices MAC address and related information.
The "ACS" Biometric module shall be an online module that scans the "ACS" database for any new Biometric Templates and automatically upload the template to the relevant Biometric device.
The "ACS" configuration module shall provide a site whereby each individual biometric device can be associated with any specific door in the access control system. This shall provide the means by which distributed templates are sent only to the relevant biometric devices.
The Biometric Device shall physically connect to an "ACS" 3rd party interface board which shall in turn connect via RS485 to the "ACS" controllers.

10.17. Graphical Integration Module

A Graphical Integration module is required to graphically represent the "ACS" in an easy to use format. This shall be accomplished by the use of a combination Graphics and Text based "ACS" transactions. The Graphical Integration module shall display all the "ACS" hardware, as well as 3rd party systems hardware used in the implementation of the total "ACS".

The Camera Icons shall allow the operator the following functionality via the Graphical integration module:
View Live feed from multiple cameras
Trigger snapshot storage
Trigger recording storage
View Playback of individual or multiple cameras
View alarm footage
The Fire Zone icons shall allow the operator to initiate an Emergency Unlock sequence
The Alarm Zone icons shall allow the operator to arm and disarm select panels from the software user interface

The 3rd Party hardware shall be monitored via a series of "ACS" Integration Modules.
The Integration shall provide the following base functions:
(a) An Integration module shall be used to set up each CCTV system with its relevant settings.
(b) An integration Wizard shall be used to create user defined CCTV system actions that each CCTV system shall perform upon initiation by the Integration server. These User defined actions shall include, but not be limited to the following:
Snapshot storage
Recording Storage
Email to user
Initiate presets on PTZ cameras
(c) An Integration wizard shall be used to link the user defined CCTV system actions with "ACS" system events. This shall enable the recording of CCTV footage for any "ACS" system event that is generated. The recording shall occur on a single event, or a combination of events based on the following selection criteria:
"ACS" Event
"ACS" cardholder
"ACS" Zone
"ACS" location
"ACS" reader
"ACS" Tag used
(d) A Ziton Integration Server that shall interrogate the ZP3 and ZP5 Fire panels for all panel configuration and automatically populate the "ACS" database with the relevant data. The Fire Zones shall be represented on the Graphical integration module x by Zone Icons.
(e) A Cadix Integration Server that shall interrogate the NX-8E panels for all panel configuration and automatically populate the "ACS" database with the relevant data. The alarm Zones shall be represented on the Graphical integration module x by Zone Icons.

The Graphical Integration module shall be used to graphically display the following standard "ACS" information via a plan-view schematic:
(a) A Base Map of the "ACS" installation site
(b) Buildings
(c) Building floors
(d) Access control hardware
(e) Configured Alarm inputs

(f) User Configured relays
(g) Events
Transactions
Alarms
Messages
Door Status

Upon selecting an "ACS" hardware device and right-clicking it, there shall be menu items facilitating the following
Open doors
Trigger locked mode
Trigger emergency mode
Monitor door
The Graphical Integration module shall allow the operator to perform the following functions via the module menu
(a) Translate the software
(b) Define alarm response criteria by the following of a combination of the following:
Acknowledge by tag
Acknowledge by password
Acknowledge by entering an operator response
Search for tag holder via the following fields:
First name
Last name
Department

Displayed Events

Transactions

Transaction shall be displayed on a tab that includes the following fields:
Type
Time
Event
Terminal
Name
Tag Number

Alarms

Alarms shall be displayed on a tab that includes the following fields:
Status
Time
Event
Zone
Location
Terminal
Input name
Acknowledged by

Protocol Messages

Messages must be displayed on a tab that includes the following fields.
Time
Message
Result

Door Status

Door Status must be displayed on a tab that includes the following fields:
Terminal
Zone
Location
Status Duration

10.18. System Diagnostic modules

The "ACS" system software shall provide a hardware diagnostic tool that shall provide the following functionality:
System Tools
- System PING – a report of all currently connected "ACS" devices including RS485 devices or Ethernet devices
- Communications test to measure the responsiveness of all "ACS" devices

Firmware Upgrade Tools for upgrading the "ACS" hardware in the field.
Miscellaneous tools – Set logical address, reset memory and set communications port.
SMS module on the EC" Controller to facilitate pro- emotive support and to send or receive event driven messages/instructions.

10.19. Employee management

An Employee management module shall provide an interface allowing users to manage all data pertaining to Employees.

10.20. Employee control

Administrators shall be able to assign control of any Employee Group to any user Group. A user's ability to control cardholder records and Access Control permissions shall be controlled by permissions set for the user Group(s) of which that user is a member. Duly authorized operators shall be able to assign zone and Reader access permissions simultaneously to the members of an entire Employee Group.

10.21. Employee data

Data accessible from the Employee management module shall include the following types of information:

(a) Personal Details (e.g., title, first names, surname, Employee number, ID number, gender)
(b) Personal Identification Numbers (PINs) assigned to the Employee
(c) Photographs
(d) Contact Details
(e) Company and Department to which Employee is assigned

(f) Zones to which Employee has access
(g) Readers at which Employee is allowed access
(h) Groups to which Employee belongs or Multiple Groups
(i) Schedules specifying the periods during which an Employee will be granted access at a specific zone or Reader
(j) In addition to these standard data fields, the Employee record shall provide at least five (5) additional fields for the entry of user-definable data.

10.22. Image capture

It shall be possible to capture or import digitized video images and associate them with cardholder records. The system shall provide support for the capturing of images at any resolution that is supported by the hardware used to capture the images. At a minimum, the software shall provide functionality enabling operators to crop and resize captured or imported images. Image enhancement functionality is not required.

10.23. Card printing

Card printing functionality shall be accessible directly from the application software.
Systems that require specialized manipulation or export of data for the issuing of cards shall not be acceptable.

10.24. Employee take-on stations

The software vendor shall provide a cardholder take-on module that enables users with limited computing experience to view, edit and add records to the Employee and Visitor database, and to assign cards to Visitors or Employees. The personnel take-on module shall provide functionality that allows operators to:

Enter detailed information about Visitors and Employees using a set of administrator-configurable data entry screens.
Preview input from a video camera connected to the take-on station, capture a frame and link it to a Visitor or Employee data record.
Ascertain the location of any Visitor or Employee by displaying a list of all cardholders who have passed through access points.
Capture images at any size ranging from 320x240 pixels to 800x600 pixels and any aspect ratio between 8:01 and 1:800. (Administrators shall have the capability to specify limits for both the pixel resolution and aspect ratio of captured images.)
Specify that a Visitor shall be accompanied by a specific Employee or any member of a specific Group of Employees (such as a company or department).
Restrict a Visitor to specified areas by assigning an Access Control template defining permissions for that Visitor (as described in the section dealing with Access Control templates).
Specify the period for which a Visitor card is valid.
Define templates for Visitor or Employee cards and select a different template for each card
Print personalized Visitor and Employee cards to a suitable printer connected to any workstation on the local area network.
Control precisely the placement of multiple cards on a page.
The functionality available on a personnel take-on station shall depend on permissions and configuration data assigned to a user Group by the system administrator.

Operators shall be required to log on to the system by typing in a username and password, presenting their access cards, or by presenting a biometric print at a card Reader or biometric Reader which has been designated as the log-on Reader for a specific workstation (These Readers shall be attached directly to the workstation via USB or serial interface).

10.25. Off-line functionality

The ACS shall incorporate a module that enables administrators to set the system up for Access Control in offline mode. The offline management module shall interface with the ACS database to extract a subset of data required to ensure continued Access Control functionality if the communication between a Door Controller and the host computer is interrupted for any reason.
While the line of communication between the host computer and the Door Controller remains operational, the data required for offline Access Control shall be downloaded to Door Controllers according to user-definable schedules. Download schedules shall provide the capability to control the update interval for each Door Controller.
As mentioned in the section of this specification pertaining to hardware, the Door Controller shall have the capability to detect a break in the line of communication to the host computer, switch automatically to offline mode, and switch back to online mode as soon as communication with the host is restored.
When communication between the host computer and a Door Controller is restored, the offline Access Control management module shall retrieve the transaction logs maintained by the Door Controller in offline mode, and upload the retrieved data to the central ACS database.

10.26. User interface

- **Search**

The SMS shall provide a simple search for all Events on the Access Control Server(s). The user selects the required search period.
Once the time criterion is entered, the "search" is selected. Events during the selected period will be returned by the search. The user shall be able to search on combinations of doors, sensors or cameras by clicking on an "Advanced Search" icon as described in the next section.
Search functionality shall be available in each viewer window.

10.27. Reporting

- **Report generation**

It shall be possible for authorized users to extract detailed reports from the ACS without running the main software application. The software vendor shall provide a separate reporting module for this purpose. The reporting module shall be able to be executed from any PC with a TCP/IP connection to the host computer on which the SMS is installed.

10.28. Fingerprint readers

The readers shall be installed in the locations as indicated on the associated drawings.

A power supply unit shall be installed to cover the equipment power requirements of every door, viz each door must be equipped with a separate in-and-out card and/or finger print readers. The contractor shall ensure that the power supply has a continuous rating and is adequately rated for the duty. Each power supply shall be equipped and fitted with a local battery back-up site. The power supplies shall be installed above the ceiling void. The power supply unit/s shall be fed from 240 V mains plug.
The power shall be provided by the electrical contractor, in the position as indicated on the associated drawings.

10.29. Electromagnetic locks

The doors that will be controlled by the access control system shall be fitted with electromagnetic locks as indicated on the drawings.
The contractor shall be responsible for providing all the required fixing materials, cackets, coordination etc. to mount the locks aesthetically and securely on the secure side of the door/s. The contractor shall obtain the engineers approval in writing for mounting detail and arrangement/s before installation commences. No claims in this regard shall be considered after installation if approval of the Engineer's approval has not been obtained in accordance with the aforementioned proviso. The renderer shall allow for brackets in this tender. The contractor shall ensure that mounting arrangement proposed and used shall not lessen the overall magnetic sheer or hold strength capability of the electro-magnet specified above.
In this instance, the integral door monitor feature within the electromagnetic lock shall not be used.
The new magnetic lock shall have a holding force of at least 300kg

10.30. Door closers

All the doors that are controlled by the access control system shall be fitted with automatic door closers. The contractor shall be responsible for ensuring that the automatic door closer units close and latch the doors closed without excessive force, wear and tear on the door hinges and excessive door frame warping.

10.31. Door position switches

The contractor shall supply and install recessed magnetic switches in the positions indicated on the associated drawings as described below.

The open and close condition of every door that is controlled by the access control system shall be monitored by means of a flush mounted magnetic type micro switch. The magnetic switch shall be a high security bias balanced magnetic read switch with an operating and release distance of 12mm and 15mm respectively. These switches will be installed on top of the doors. The contractor shall be responsible for locating and installing the door switches so that they are able to resist defeat by means of an external magnet. The contractor shall demonstrate and validate this capability to the satisfaction of the Engineer.

10.32. Green break glasses

Green break glass units, with back boxes, shall be installed on the secure side of some doors that are controlled by the access control system. The break glass unit shall be wired to release the power between the fingerprint readers and electromagnetic locks in the event that it is activated. This operational functionality shall be demonstrated and validate through simulation to the satisfaction

of the Engineer. The contractor shall note that the break glass unit shall not be wired to the fingerprint readers as a pushbutton release input. The new break glass unit/s shall have a transparent hinged lid with a seal. The units must be able to be reset.

11. INTERCOM SYSTEM

11.1. General

i. Fully digital, distributed network-based IP-intercom system (LAN/WAN). Easy setup/update/maintenance via PC software or Web browser with password.

ii. Connection of standard receivers from a two-wire cable to the mediation unit or the IP stations across the network.

iii. Links a low quantization with a sampling rate of 16 kHz for a 16-bit a high-quality sound with a frequency range of 300 Hz to 7 kHz at full-duplex conversations. Hands-free calling is possible through ECHO suppression in this quality.

iv. Programmable intercom functions:

v. Call, announcements, speed dial, manual call forwarding, automatic call forwarding, time-based call forwarding, adjustable time limitation for discussions, announcements and ringtone, manual activation of control outputs, automatic activation of control outputs (E.g. camera activation with reputation), automatic call activation control input, group call, call forwarding to "Busy", Office - call forward unconditional (time adjustable), auto answer, classic answer, automatic direct dial at the receiver, priority call, call Priority announcement priority, choice of up to 8 sources of background music, adjustable microphone sensitivity, Ringer volume, speaker volume.

vi. Distribution of stations in up to 160 zones. Call announcement up to 160 call zones / 1279 receivers at the same time possible. Grouping with customizable access rights regarding call and announcement permissions of the groups themselves.

vii. Ability to customize the bandwidth of a connection of 48.5 kbps up 130 kbps on the available network capacity.

viii. Automatic system diagnosis (every 20 seconds) of receivers, teaching units, IP Intercoms and universal interface for the network status, CPU errors, synchronization problem and missing receivers.

ix. Error signalling by freely programmable control output.

x. Monitoring / system information via Web browser: Access / change network settings, monitor network status, status / action monitoring receivers, operational log (LOG), data stream Protocol (LOG), firmware update, reboot, change system name and password

xi. Possibility of recording conversations through establishment of a PC-based recording software.

xii. Remote control of receivers with a PC through a software setup.

xiii. Depending on the system configuration, receivers, 1280 control inputs, 1280 control outputs, 160 audio inputs and 160 audio outputs can be operated up to 1280

11.2. Audio Server

i. Fully digital IP mediation unit with connections for 16 stations. Connection to other teaching units, universal interface and IP intercom stations on a network. Connecting the stations in 2-wire technique.

ii. No separate power supply of needed receivers. 1 internal and 2 external communication channels are also available

Programmable functions.

iii. Call, announcements, speed dial, manual call forwarding, automatic call forwarding, time-based call routing, adjustable time limitation for discussions, announcements and ringtone, automatic activation of control outputs (E.g. call door intercom - CCTV via contact output activation), automatic call activation control input, group call, call forwarding to "Busy", Office - call forward unconditional (time adjustable), auto answer, classic answer, automatic direct dial at the receiver, priority call, choosing from up to 8 sources of background music, adjustable microphone sensitivity, ringer volume, speaker volume.

iv. Additional grouping with customizable access rights regarding call and announcement permissions of the groups themselves.

v. 3 Status LED indicators for: operation, status, network.

11.3. IP Desktop Master Station with Display & Handset

i. Multifunctional master station with handset and speakerphone with ECHO compensator, LCD display with 16 characters, 2 lines, 8 programmable direct dial keys, connection for headset connection of external speaker, menu functions.

ii. 10 Buttons, 4 programmable speed dial buttons, 2 function keys, talk priority button, delete button, call button (for announcement), answer key (for announcement), hold-down button, transfer button (normal call forwarding), redial.

iii. Function call button for activation control output, call forwarding, Office transfer, time-based call forwarding, busy forwarding, background music

iv. Programming the direct dial keys (follow)

v. Indicator connected stations at mediation unit

vi. Up late function of the operation log (log file), change the IP address, subnet mask, default gateway of the mediation unit with password protection. Setting the system clock, system restart.

11.4. Sub-station IP with 1 Button

i. IP door intercom for direct connection to the network, speakerphone with echo cancellation, call button, control output (E.g. the door opening), dust and water protection com. IP54, extended working temperature range

12. EMERGENCY VOICE COMMUNICATIONS

12.1. Performance Requirements

i. The EVC System shall provide reliable two-way, full duplex communication between a permanently manned control room and key points on the site in a fire emergency.

ii. The EVC System shall be suitable for disabled refuge and fire telephone applications.

iii. The EVC System shall be designed and installed to comply with Fire detection and alarm systems for buildings (SANS 10139).

iv. The system shall have fully monitored hardware and software.

v. In the event of Mains failure, operation shall be maintained for 24 hours (standby) and 3 hours (in use) using 2 x 12 V, 7 AHr batteries.

vi. The EVC System shall have an 'auto-learn' facility which shall automatically detect connected system components during configuration.

vii. It shall be possible to create user-defined names for all extensions on the EVC System.

viii. The EVC System shall have the facility to be disabled. This shall prevent unauthorized (or malicious) use of the system. When disabled, the system shall continue to check for faults but the system shall be suppressed from making or receiving calls until an external trigger is applied.

ix. The EVC System shall retain a record of incoming calls to the main control unit (MCU) for up to 24 hours after the system was last used. This shall assist the operator in returning calls to outstations. The recent calls list shall be manually cleared by the operator or set up by an technician to automatically clear the list after a set time period.

x. The EVC System shall incorporate a simple to operate keypad enabling operators to access the various built-in functions and interact with the information displayed on the LCD.

xi. The EVC System shall be configured either as a standalone system or have network capability.

12.2. Standalone MCU System

i. A standalone MCU system shall have up to 8 extension lines with each line connected to either a Type A, or Type B outstation.

ii. Each MCU shall be expandable to 16 extension lines by the addition of a separate 8-line Extender Unit. The Extender Unit shall derive its power from the MCU.

iii. It shall be possible for a technician to perform an automatic configuration of the system.

12.3. Networked MCU System

i. A network protocol shall allow the interconnection of up to four MCUs with each MCU having 8 extension lines, providing up to 32 lines in total. Each extension line shall connect to either a Type A or Type B outstation.

ii. It shall be possible to extend a networked MCU system up to 64 extension lines by the addition of one Extender Unit for each MCU.

iii. Each MCU shall have a network communication card installed to enable it to be connected on a communication network. The communication network card shall be mounted inside the MCU enclosure and transmit both speech audio and digital data.

iv. All networked MCUs shall monitor both the network wiring and each other for faults (open and short circuits).

v. The network shall be fault tolerant whereby the system continues working in the event of cable breaks. Speech audio shall be transmitted via one wiring loop and digital data via two linear RS485 networks.

vi. It shall be possible to program each networked MCU with the following configuration:

- One MCU shall be configured as the 'controlling' MCU and shall have control over the entire EVC System. Each of the other MCUs shall be able to take control from the controlling MCU when a security code is entered, either at the controlling MCU, or any other MCU. For example, control can be transferred from one control point in a building to another to cater for different day/night shift patterns or to a fire access point in an emergency.
- The controlling MCU shall display the location of incoming calls and the description of faults on the EVC System. Faults on other MCUs shall be displayed at the controlling MCU as a General Fault as a minimum.
- Calls from any outstation, regardless of which MCU they are connected to, shall be automatically routed to the controlling MCU. Other MCUs shall indicate that outstations are calling the controlling MCU and shall be able to take control of the system by lifting their handsets and entering a security PIN code.
- It shall be possible to give control from the controlling MCU to any other MCU (when there are no calls on the system) by entering a security PIN code.
- It shall be possible to take control from the controlling MCU at any other MCU (when there are no calls on the system) by entering a security PIN code.

- Changes made at the controlling MCU (e.g., security PIN codes, extension names, addition/removal of an outstation, or MCU) shall be automatically updated on all other MCUs
- The controlling MCU shall be automatically dialled to by other MCUs when their handsets are picked up (when there are no calls on the system).

vii. It shall be possible for a technician to perform an automatic configuration of the system.

viii. For networked systems that do not require multiple control points, Master Controllers without handsets shall be used (Expansion unit)

12.4. Master Control Unit (MCU)

Each MCU shall have an integral handset, indicators, controls, backlit LCD display, PSU, batteries and 8 extension lines.

A. Indicators

The MCU shall incorporate the following LED indicators as a minimum:

LED Label	LED Colour	Description
Disablement	Yellow	Lit steady when the system is powered up and checking for faults but the MCUs are suppressed from making or receiving calls, until an external trigger is applied, e.g. from a fire alarm panel. This is to stop nuisance/malicious use of the EVC System until it is required.
System Fault	Yellow	Lit steady when a problem with the microprocessor has occurred. Also, lit when a watchdog fault occurs at initial power up.
PSU Fault	Yellow	Lit steady when there is Mains power failure, or battery not connected, or battery failure.
General Fault	Yellow	Lit steady if any fault is present. The LCD shall display more information.
Power	Green	Lit steady to indicate that power (Mains or battery) is present.

B. LCD Display

i. In addition to the LED indications detailed in section A, the EVC System shall also have an integral graphical backlit LCD alphanumeric display that acts as an operator interface. The display shall use different symbols to denote different system components, e.g. Type A outstation, Type B outstation, MCU, etc.

ii. The LCD shall provide detailed information (in graphical and textual formats) and display system status for the following conditions:

- Normal 'system healthy' conditions
- Incoming and outgoing calls (extension name is displayed)
- Full directory of extensions
- List of recent calls made on the system
- Fault status (location & type of fault is displayed)
- Operator menu functions.
- Installer menu functions.

iii. The LCD shall display both inactive and active status, e.g. 'Extension 1' is shown normal text when inactive but reversed text when active 'Extension 1'. The graphical symbol shall also flash when an extension is calling an MCU, or the MCU is calling an extension.

iv. The LCD backlight shall flash red when an extension calls an MCU and revert to normal when the call is answered.

v. For a networked system the LCD shall display if an MCU is a controlling, or non-controlling MCU.

C. Controls

i. The MCU shall incorporate the following external keypad pushbutton controls, as a minimum:

Button Label	Description
Scroll Up ▲/Down ▼	Dependent on the status of the panel, these buttons shall: • scroll vertically through phone lists, menus, or fault conditions • scroll vertically through operator and engineer menus • alter settings, e.g., set values, time settings, edit extension names.
Hold	Dependent on the status of the panel, this button shall: • disconnect the current caller, when the handset is off-hook • move back one level up the menu structure, when the handset is on-hook • perform a lamp and buzzer test.
Call/Accept	Dependent on the status of the panel, this button shall: • scroll horizontally through operator and engineer menus • select options in the operator menus • show details of faults on the system • clear faults on the system • make an outgoing call to an extension, or accept an incoming call from an extension, when the handset is off-hook.
Function	Dependent on the status of the panel, this button shall: • edit extension names • provide access to the 'User Options' menu.
Directory	Dependent on the status of the panel, this button shall: • toggle between a list of all extensions and a list of recent calls (if any).
Silence Buzzer	Silences the panel's internal sounder.
Four numbered buttons, i.e., 1, 2, 3, 4	Used for entering security PIN codes (by responsible persons only).

ii. The MCU shall incorporate the following internal pushbutton control for an installer, as a minimum:

Note: This button shall not be accessible to the operator.

Button Label	Description
Installer Mode	Enables access to the installer's menus for engineering and test purposes
Reset	Manually initiates a clean restart to the system.

D. Operator Functions

i. The EVC System shall incorporate the following operator functions, as a minimum:

- Perform a lamp and buzzer test
- Manually select which extension to answer first when there are multiple incoming calls to the MCU (when Auto-Answer feature is disabled)
- Automatically answer an incoming call by picking up the handset at an MCU (when Auto Answer feature is enabled)
- Make outgoing calls to extensions
- Allow conference calls, i.e., able to talk to two extensions at the same time from an MCU
- Take control from the controlling MCU at any other MCU when there is an incoming call on the system (networked system only).

ii. An Auto-Answer feature shall be set up by an engineer and shall be available to the operator as an option. When enabled, the MCU shall automatically answer an incoming call when its handset is picked up, rather than the operator picking up the handset and manually selecting the extension of the incoming call before answering.

iii. Additional functions (User options menu) shall be available to an operator by pressing the Function button when the MCU's handset is on-hook. These shall include the following, as a minimum:

Menu Option	Description
Clear recent calls	Enables the incoming call log, held by the system, to be manually cleared.
System reset	Performs a clean restart to the system and is used for emergency recovery. This function shall require a security PIN code.
About	Displays the firmware version installed on the system
Alter controlling master (networked system only)	Gives control from the controlling MCU to any other MCU (when there are no calls on the system). This function shall require a security PIN code
Take control (networked system only)	Takes control from the controlling MCU at any other MCU (when there are no calls on the system). This function shall require a security PIN code.

E. Installer Functions

i. An engineer shall have access to all the operator functions previously listed in section D.

ii. Additional functions (Installer options menu) shall be available to an installer by pressing the MCU's internal Installer Mode button. These shall include the following, as a minimum:

Menu Option	Description
Edit Phonebook	Allows a user-defined name for all connected extensions to an MCU. Names shall be up to 15 characters in length.
About	Displays the firmware version installed on the system.
System Configuration	Enables automatic configuration of a standalone MCU and networked MCU system. This feature shall utilise an 'auto learn' facility which allows the system to automatically detect the number of MCUs and connected extensions on a system
Change PIN	Sets the security PIN code used by the operator.
Harmonise Names	Globally updates outstation names
Reset Names	Reverts the names in the phonebook back to default settings, i.e., Extension 1, Extension 2, etc.
Factory Defaults	Clears the panel's memory back to its default factory settings.
Latch Faults	Used for fault diagnosis purposes, e.g., identifying intermittent faults.

Menu Option	Description
Clear recent calls	Enables the incoming call log, held by the system, to be automatically cleared after a set time period. This function shall be set at hourly increments from 6 to 24 hours (default shall be 24 hours).
Auto-Answer	Enables, or disables the Auto-Answer feature used by an operator. See section 4.8.2. **Note**: As a rule, when Auto-Answer is enabled, the lowest system numbered extension shall be answered first by the MCU.

F. Auxiliary Inputs

i. The MCU shall provide the following auxiliary inputs, as a minimum:

- 1 x disable controls. Disables the controls until a trigger is received from a fire alarm panel. This shall prevent unauthorised use of the system and shall be enabled by an installer
- 2 x spare.

G. Auxiliary Outputs

i The MCU shall provide the following auxiliary outputs, as a minimum:

- 1 x fault output. Provides a fail-safe relay output that can be connected to a fire alarm panel.
- 1 x +24 V (@ 200 mA). Provides a local source for the open collector outputs.
- 1 x 0 V. Provides a return if the relay uses an external 24 V source.
- 1 x open collector output. Operates when there is an incoming call on the system

H. Fault Reporting

i. The EVC System shall monitor all critical system components for faults. When a fault occurs, the MCU shall respond by activating its internal buzzer intermittently, illuminating the General Fault LED and other LEDs relating to the fault.

ii. The EVC System's fault output shall also be activated (providing it has not been disabled). The active fault shall also be displayed on the LCD and provide text messages to indicate the precise location of where a fault has occurred on the system.

iii. The following faults shall be reported in the manner described in sections H (i) and H (ii):

- Extension line short-circuit
- Extension line open-circuit (absence of an outstation constitutes open-circuit)
- Aux 24 V output
- Handset off-hook. See section H (iv)
- Mains failure
- Battery fault
- Microprocessor fault
- Earth fault
- Digital comms failure (networked system only)
- Speech comms open and short circuit (networked system only).

iv. The system shall be able to detect off-hook handsets and jammed buttons at outstations.

- Off-Hook Detection (at Type A outstations)

Scenario. A call has been made from a Type A outstation, the call has been answered and ended at the MCU, but the handset at the outstation has been left off-hook for longer than 2 minutes.

- Jammed Button Detection (at Type B outstations)

Scenario. A call has been made from a Type B outstation, the call has been answered and ended at the MCU, but the button at the outstation has pressed/jammed for longer than 2 minutes.

- For both of the two scenarios above, after the 2 minutes have elapsed, the fault buzzer at the MCU shall sound, the General Fault LED shall light and the LCD shall display details of the off hook extension.

I. Wiring

i. All wiring shall be installed in accordance with the current edition of the Wiring Regulations and/or other relevant national standards.
ii. The MCU shall be connected to the Mains using 3-core, fixed wiring (no less than 0.75 mm^2 and no more than 2.5 mm^2) fed from an isolating un-switched fused spur, fused at 3 amps
iii. Cables used between EVC System components shall be enhanced fire-resistant screened cables.
iv. The wiring for the EVC System components shall be as follows:

- Each extension line from MCU to outstation – 2-core, size 1 mm^2, or 1.5 mm^2 up to 1000 m. The maximum cable resistance shall be 40 Ω.
- MCU to Extender Unit – Two Cat 5 patch cables.
- MCU to MCU (networked system only) – 4 x 2-core, 1.5 mm^2 up to 1000 m. *

* Two separate cable paths shall be run with each path containing a single speech and data cable (which shall not be mixed in the same cable). This shall ensure integrity of the cable paths. The length on the speech wiring loop or digital linear wiring shall be up to 1000 m.

v. Connector blocks at the MCU shall be plug-on type and accept cables up to 1.5 mm^2.
vi. As an option, a line tester shall be available to check for cable faults prior to equipment connection.

J. Power Supply Specification

i. Each MCU shall house two 12 V, 7 AHr VRLA batteries connected in series. The batteries shall provide an autonomy of 24 hours in standby mode and 3 hours in use mode.
ii. The power supply and batteries shall be monitored for failure.

12.5. Type B Green Disabled Refuge Outstations

i. Type B 'Disabled Refuge' – Disabled refuge systems shall be used by untrained people communicating with a trained operator and shall be stainless steel or green. Each shall offer true duplex, hands-free, speech. They shall be an intercom-style unit with a single 'call/answer' button, 'call in progress' LED and built-in microphone and loudspeaker. They shall be wall-mounted, either flush, or surface-mountable. Communication with an operator at the MCU shall be activated by the touch of a button.

a) To make a call at an outstation to the MCU:

i. For Type A outstations – Lift the handset. A ringing tone shall sound. The operator at the MCU shall receive and answer the call
ii. For Type B outstations – Press the 'call/answer' button. A ringing tone shall sound in the loudspeaker and the 'call in progress' LED shall be lit steady. The operator at the MCU shall receive and answer the call.

b) To answer a call from the MCU at an outstation:

i. For Type A outstations – A ringing tone shall be heard at the outstation. Lift the handset to answer the incoming call
ii. For Type B outstations – A ringing tone shall be heard at the outstation. Press the 'push/call' button to answer the incoming call.

c) Type A outstations shall be located at entrances and fire-fighting lobbies and shall normally be mounted 1.3 m to 1.4 m above floor level.
d) Type B outstations shall be located in disabled refuges at each storey exit and shall normally be mounted 0.9 m to 1.2 m above floor level.
e) As an option, it shall be possible to connect a 12 V dc flashing xenon strobe light and/or sounder to an outstation which shall operate when the outstation receives a call.

12.6. Xenon Strobes

a) The strobes shall be interfaced to a Type A or Type B outstation to provide visual indication of incoming calls
b) Amber and Blue versions shall be available
c) Each strobe shall require an SDM Driver Module

12.7. Driver Module

a) The module shall be connected across an outstation's line to sense when it is ringing and activate a xenon strobe

12.8. 8 Line Expansion Unit

a) It shall be connected to a master controller to increase its line capacity to 16 lines
b) It shall not require a separate mains supply or batteries

12.9. Network Communication Card

a) The network communication card shall allow the interconnection of up to 4 master controllers over a 1KM network
b) One card shall be required per networked master controller
c) It shall allow systems of up to 64 lines (four master controller units each with a slave expansion unit) to be easily set-up
d) Any MCU shall take control of the system at any time by the input of a special code.

13. RAISED ACCESS FLOOR SYSTEM

13.1. System Description

i. Assemblies shall be composed of modular and self-supporting floor sub-structure bolted together, having gravity placed floor panels on top not connected to the pedestal supports.
ii. Lateral strength of floor system shall be independent from floor panels being in place, or fully removed.

13.2. Performance Requirements

Structural Performance

i. Provide access flooring system capable of withstanding the following loads and stresses within limits and under conditions indicated, as determined by testing manufacturer's current standard test procedures:

- Concentrated Loads
  - Provide 600x600mm floor panels, including those with cutouts, capable of withstanding a concentrated design load of 5000N, with a top-surface deflection under load and a permanent set not to exceed, respectively, 3.3 mm and 0.2 mm.
  - If custom size floor panels are provided with a span of less or equal to 800 mm between secondary support beams, they need to comply with the above deflection and permanent set values as well, except if located under installed equipment cabinets or racks.
- Rolling Loads
  - Provide 600x600mm floor panels, capable of withstanding a rolling load of 6350N, with a top-surface deflection under load and a permanent set not to exceed, respectively, 3.3 mm and 0.2 mm.
- Uniform Distributed Loads
  - Provide self-supporting floor structure, without panels in place, capable of withstanding a minimum 10 kN/m2 uniform distributed load.
  - For heavy equipment, which requires higher loading in accordance with the engineering drawing, the floor structure shall provide a uniform distributed loading capable of supporting the equipment for each individual case to avoid using separate equipment stands under Server racks or cabinets
- Ultimate* Loads
  - Provide access flooring sub-structure system capable of withstanding a minimum ultimate concentrated load of 9070 N and a minimum ultimate distributed load of 39 kN/m2 without failing

* = max deflection of L/360 of span between beam sections

- Pedestal Axial Load Test:
  - Provide structure and pedestal assemblies, without panels in place, capable of withstanding a 40 500 N axial load per pedestal.

- Recycled content:
  - Understructure system and floor panel shall be required to have a minimum recycled content of 75%.

ESD-Control Properties

i. Provide floor coverings with ESD-control properties indicated as determined by testing identical products per test method indicated by an independent testing and inspecting agency.

ii. Antistatic Floor Covering Properties

- Electrical Resistance: Test per BN 14041:, 2004.
- Greater than 50,000 ohms and an average value of less than 50,000 megohm when test specimens and installed floor coverings are tested surface to ground resistivity at a relative humidity of 50%
- . Static Generation: Max 100 V when tested at 50 percent relative humidity with conductive footwear.
- ESD: Electrostatic discharge. The transfer of electric charge between bodies at different potentials, from panel surface to ground.

13.3. PRODUCTS

i. Floor Panels, General: Provide modular panels complying with the following requirements that one person, using a portable lifting device, can interchange with other field panels without disturbing adjacent panels or understructure:

ii. Nominal Panel Size: 600x600 mm. Custom size panels to be as specified based on engineering drawing.

iii. Fabrication Tolerances:

- Fabricate panels to the following tolerances with square ness tolerances expressed as the difference between diagonal measurements from corner to corner:

iv. Size and Square ness:

- Plus or minus 0.38 mm of required size, with a squareness tolerance of plus or minus 0.38 mm, unless tolerances are otherwise indicated for a specific panel type.

v. Flatness:

- Plus or minus 0.50 mm, measured on a diagonal on top of panel.

vi. Panel attachment to Understructure:

- By gravity.

vii. Wood-Core Panels with metal backside:

- Fabricate from 38 mm thick, V313 moist resistant and E1 type particleboard core, made with <10 ppm urea formaldehyde.
- Laminate bottom aluminum face sheet with a direct laminate process using heat and pressure, providing a flame-spread index of 25 or less per ASTM E84 or NFPA 266.
- Provide tapered core edges including direct laminated surface finish of M335 Granite decor.
- All panel edges should be enclosed with a 0.45 mm glued perimeter ABS edge trim.
- Edge trim shall be applied so it covers the tapered panel edges, including surface finish. Provide custom panel sizes under equipment unless "open bottom access" is specified using a 38 mm steel tube under front and back of the equipment if shown on engineering drawings.
- Provide custom panels if shown on engineering drawings to assure all panels in service aisles or cooling aisles are fully removable.

viii. Perforated Airflow Panels:

- Perforated Triad steel airflow panels designed for static loads of. shall be interchangeable with standard field panels and shall have 25% to 56% open surface area with the following air distribution capability.

ix Floor understructure:

- Assembly shall consist of 80x40 mm primary and secondary layer tube steel beam sections bolted together 90 degrees perpendicular to each other with angle clips and self-tapping screws.
- Tube steel sections shall provide a yield and a tensile strength to meet the max allowed temporary deflection of L/360 of span.
- *A distributed and concentrated static load calculation report shall be furnished for approval by certified structural engineer.*
- All primary sections shall have a tension screw plate mounted to one side for tension against the perimeter wall.
- Provide "open bottom access" under the equipment racks using a square 38 mm steel tube under front and back of the equipment aisle if shown on engineering drawings.

x. Pedestals:

- Assembly consisting of base 80x40 mm tube column and head cap including head bracket with provisions for height adjustment, made of steel.
  - Base: Rectangular base with not less than 75 cm2. of bearing area.
  - Column: Of height required to bring finished floor to elevations indicated, less 200 mm. Pressed securely into base plate and head cap
- Provide vibration-proof leveling mechanism for making and holding fine adjustments in height over a range of not less than +/- 25 mm and for locking at a selected height, so deliberate action is required to change height setting and vibratory displacement is prevented.

xi. Head:

- Designed to support head bracket indicated which is attached to primary stringer.

xii. Rust corrosion, metal components:

- All parts of the Floor under structure including Pedestal components shall be hot-dipped galvanized to ensure that no zinc particles will erode into the atmosphere.

xiii. Floor Panel Coverings

- General: Provide factory-applied direct laminate by raised access flooring manufacturer to top surface of floor panels.
- Standard Direct Laminate: Manufactured from phenolic and melamine resin impregnated papers, using a separate, high-wear type melamine glass overlay.
- Wear resistant to >6000 cycles according to EN 438-2.6 1991.
- Fabricate to cover each panel face prior to applying edge trim

xiv. Accessories

- Nail plugs: Manufacturer's standard nail plugs for securing pedestal bases to sub floor if nothing else is shown on the engineering drawings. Glue should not be used.
- Cutouts: Provide cutouts in floor panels for cable grommets and service outlets. Provide reinforcement or additional support, if needed, to make custom size panels or cutouts to comply with standard performance requirements.
- Fit cutouts with manufacturer's standard grommets in sizes indicated or, if size of cutouts exceeds maximum grommet size available, trim edge of cutouts with manufacturer's standard plastic molding or edgetrim. Furnish removable covers for grommets if specified.

- Ramps: Manufacturer's standard ramp construction of width and slope indicated but not steeper than 1:12, with non-slip floor covering to match the same performance and construction requirements as of the access flooring, or as indicated on the engineering drawings.
- Railings: Standard extruded-aluminum railings, at ramps and open-sided perimeter of access flooring where indicated. Include handrail, intermediate rails, posts, brackets, end caps, wall returns, wall and floor flanges, plates, and anchorages where required, or as indicated on the engineering drawings.
- Panel Lifting Device: Manufacturer's standard portable lifting device of double type required for specified panels. Provide one lifting devices including wall mounted panel lifting bracket or a number as otherwise specified
- Perimeter Support. Where indicated, provide manufacturer's standard method for supporting panel edges and forming transition between access flooring and adjoining floor coverings. Perimeter support covering shall match floor panel finish(es), or as indicated on the engineering drawings.

13.4. EXECUTION

a) Examination
   i. Examine substrates, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
   ii. Verify that substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, foreign deposits, and debris. Verify that concrete slab sub floor has been sealed.
   iii. Proceed with installation only after unsatisfactory conditions have been corrected

b) Preparation
   i. Lay out floor panel installation to keep the number of cut panels at floor perimeter to a minimum. Avoid using panels cut to less than 200 mm.
   ii. Complete any necessary sub floor preparation, and vacuum clean sub floor to remove construction debris before beginning installation.

c) Installation
   i. Install access flooring system and accessories under supervision of access flooring manufacturer's authorized and certified representative to produce a rigid, firm installation that complies with performance requirements and is free of instability, rocking, rattles, and squeaks.

13.5. Installation, Phase I

i. Install primary beam sections supported by and mounted to pedestal assemblies so that no interference with feeder cables to and from equipment racks or cabinets occurs.
ii. Set pedestals with nail plugs as recommended by access flooring manufacturer to provide full bearing of pedestal base on sub floor.
iii. Level sub structure pedestals supporting primary beam sections to permit panels be level and to proper height as set out in engineering drawings
iv. Secure the leveling by tightening the locking nuts on all pedestals.
v. Install secondary beam sections supported by primary beam sections using angle clips and self-tapping screws, so that they line up center to center with all panels in accordance with the manufacturers floor layout drawings.

vi. Before installation phase II starts, perform cable management, electrical and HVAC installations under the floor substructure to prevent floor panels to be removed and reinstalled by subcontractors.
vii. By following this procedure, project schedule can be shortened and damage of floor panels be avoided.

13.6. Installation, Phase II

i. Install floor panels securely in place, properly seated with panel edges flush
ii. Do not force panels into place.
iii. Verify if custom size panels are to be located in rows where equipment racks or cabinets of different depths are to be installed, to allow for service aisle panels to be fully removable.
iv. Scribe perimeter panels to provide a close fit with adjoining construction using foam tape between perimeter panel and wall, with no voids greater than 6 mm where panels abut vertical surfaces.
v. Cut and trim access flooring and perform other dirt-or-debris-producing activities at a remote location, or as required to prevent contamination of sub floor under access flooring already installed.
vi. Ground flooring system as recommended by manufacturer and as needed to comply with performance requirements for electrical resistance of floor system and coverings.
vii. Clean dust, dirt, and construction debris caused by floor installation, and vacuum sub floor area, as installation of floor panels proceeds.
viii. Install access flooring without change in elevation between adjacent panels and within the following tolerances:
    - Plus, or minus 1.5 mm in any 3-meter distance.
    - Plus, or minus 3 mm from a level plane over entire flooring area.
ix. Adjusting, Cleaning, And Protection.
x. Prohibit traffic on access flooring structure unless floor panels have been installed, or floor structure is covered by secure means to prevent accidents.
xi. After completing installation, vacuum clean access flooring and cover with continuous sheets of reinforced paper or plastic if required.
xii. Maintain protective covering until time of Substantial Completion.
xiii. Replace access floor panels that are stained, scratched, or otherwise damaged or that do not comply with specified requirements.
xiv. After completed installation, inspect completed raised access floor installation together with customer using manufacturers standard "completed inspection form" and sign off for approval.
xv. Provide one copy to the customer and return one copy to manufacturer as a proof of completion and acceptance.
xvi. After receipt of "completed inspection form", manufacturer shall provide customer with a detailed warranty document dated and signed by authorized officer of the manufacturer.
xvii. All direct buried ground connections shall be cad-weld type connections.

13.7. EARTHING

The metal structures of the floor must be grounded.

14. INTEGRATION SPECIFICATIONS

14.1. CCTV SYSTEM

a) Integration into Access Control System

Any attempt by an unauthorized person to access an access-controlled door, video from a camera associated with that door must be displayed on the spot monitor and a snapshot must be taken and stored

b) Integration into Fire Detection System

On activation of a fire alarm, video from cameras associated with fire doors and escape routes must be displayed on the spot monitor.

c) Integration into Alarm System

On activation of an alarm zone, video from a camera associated with that zone must be displayed on the spot monitor.

d) Integration into Intercom System

On activation of an intercom station, video from a camera associated with that station must be displayed on the spot monitor.

14.2. ACCESS CONTROL SYSTEM

a) Integration into Fire Detection System

All fire doors shall be part of access control system. These doors shall be locked electrically with electromagnetic locks. *They shall be equipped with green break glass units.* On activation of a fire alarm, these doors shall release automatically. They shall remain open until the fire alarm has been acknowledged / reset at the fire panel.

b) Integration into Emergency Voice Alarm Communication System

In the event of any emergency (e.g., announcement via the call station), all access-controlled doors including fire doors shall release automatically. They shall remain open until the threat has been validated and the situation has returned to normal.

14.3. FIRE DETECTION SYSTEM

a) Integration into Emergency Voice Alarm Communication System

In the event of a fire alarm condition (automatic detection or manual activation), an evacuation message shall be played automatically on the speakers. Fire alarm sirens sound level shall lower than that of the speakers.

b) Integration into Lifts System

In the event of a fire alarm condition (automatic detection or manual activation), all lifts shall home on the ground level.

c) Integration into Air Conditioning System

In the event of a fire alarm condition (automatic detection or manual activation), all air conditioners shall be switched off.

d) Integration into Smoke Extraction System

In the event of a fire alarm condition (automatic detection or manual activation), all smoke extraction fans shall be activated.

e) Integration into Fire Suppression System

In the event of a fire alarm condition (automatic detection or manual activation), the fire suppression system in protected areas shall be activated.

PART C6.1.5: EQUIPMENT SPECIFICATION

1. CCTV SYSTEM

1.1 Video Management Software (VMS) Server

a) **Form Factor:**	• 1U rack
b) **Processors:**	• 1 processor from the following: ➢ Intel Xeon E-2200 product family, ➢ Intel Pentium ➢ Intel Core i3 ➢ Intel Celeron
c) **Storage controllers:**	• Internal controllers: PERC H730P, H330, HBA330 (non-RAID) • Software RAID: PERC S140
d) **Memory:**	• 4 x DDR4 DIMM slots, Supports UDIMM, up to 2666MT/s, 64GB Max. Supports registered ECC
e) **Internal boot:**	• Boot Optimized Storage Subsystem (BOSS): 2 x M.2 240GB (RAID 1 or No RAID) or 1 x M.2 240GB (No RAID only) • Internal Dual SD Module 3: 2x microSD (16GB, 32GB or 64GB) or 1x microSD (16GB, 32GB or 64GB)
f) **Drive bays:**	• Up to 4 x 3.5 cabled SATA • Up to 4 x 3.5 or 2.5 hot-plug SATA
g) **Embedded management:**	• iDRAC9 with Lifecycle Controller • iDRAC Direct • iDRAC RESTful API with Redfish
h) **Tools:**	• iDRAC Service Module • Open Manage Server Administrator • Repository Manager • System Update • Server Update Utility • Update Catalogs • RACADM CLI • IPMI Tool
i) **Security:**	• TPM 1.2/2.0 optional • Cryptographically signed firmware • Silicon Root of Trust • Secure Boot • System Lockdown (requires Open Manage Enterprise) • System Erase
j) **I/O & Ports**	• x 1GbE LOM Network Interface Controller (NIC) ports

	• 1x USB 2.0, 1 x IDRAC micro USB 2.0 management port
	• 2 x USB 3.0, VGA, serial connector
k) **Power Supply:**	• Single 250W (Bronze) or 450W (Platinum) power supply
l) **Operating Systems:**	• Microsoft Windows Server with Hyper-V (2016 and 2019)
	• Red Hat Enterprise Linux
	• Ubuntu Server LTS
	• SUSE Linux Enterprise Server
	• VMware ESXi
	• Citrix XenServer

1.2 Network Video Recorder (NVR)

a) **Processor:** (@4.5Ghz)	Intel Xeon Processor E2136 (6 Cores / 12 Threads
b) **Operating System:**	Windows Server 2012 R2 Windows Server 2016 Windows 10 Professional Linux CentOS, Ubuntu, Debian
c) **Memory:**	32 GB DDR4 2132Mhz ECC Registered Unbuffered RAM
d) **Possible Raw Storage Config:**	48TB, 72TB, 96TB, 120TB, 144TB, 168TB
e) **Video Outputs:**	VGA
f) **Networking:**	4 x 1GbE LAN Ports, 1 x 1000Mbps Management
g) **RAID Level Support Option:**	0, 1, 5, 6, 10, 50, 60
h) **Firmware:**	Hypervisor, RAID Engine and iSCSI
i) **Form Factor:**	Form Factor 2U
j) **OS Drive Bays:**	2 x 2.5"
k) **DATA Drive Bays:**	12 x 3.5" Hot-swappable
l) **Power Supply:**	1+1 Redundant 1200W Power Supplies
m) **Ambient Operating Temp:**	+5°C to +35 °C
n) **Operating Relative Humidity:**	8 to 90% (non-condensing)
o) **Storage capacity:**	Up to 128TB

1.3 2.8-13mm, Day/Night HD 2 Mega Pixels IP vari-Focal IR Dome camera with PoE

a) **Input voltage:**	12 VDC ±5%, 24VAC ±10% or Power-over-Ethernet (48 VDC nominal)
b) **PoE IEEE standard:**	802.3af (802.3at Type 1) Power level: Class 3
c) **Power consumption PoE:**	9.2 W
d) **Sensor:**	1/2.9-inch CMOS
e) **Active Pixels:**	1920 (H) x 1080 (V), 2MP (approx.)
f) **Dynamic range:**	120 dB WDR
g) **Video Streaming:**	Multiple configurable streams in H.264 H.265 and M-JPEG, configurable frame rate and Bandwidth.

	Regions of Interest (ROI)
h) **Video compression:**	H.265; H.264; M- JPEG
i) **Camera processing latency:**	<55 ms (max. average at 1080p30)
j) **Video Resolution:**	1080p HD: 1920 x 1080
k) **Day/Night:**	Colour, Monochrome, auto (adjustable switch points).
l) **Signal-to-noise ratio (SNR):**	>55 dB
m) **Intelligent defog:**	Intelligent Defog automatically adjusts parameters for best picture in foggy or misty scenes (switchable)
n) **Video Analysis:**	Essential Video Analytics
o) **Night vision (IR):**	Distance: 30m LED: 10 LED high efficiency array, 850 nm IR intensity: Adjustable
p) **Varifocal Lens:**	**2.8** - 13 mm: Automatic Varifocal (AVF) lens, IR Corrected
q) **Day/Night:**	Switched mechanical IR filter
r) **Protocols:**	IPv4, IPv6, UDP, TCP, HTTP, HTTPS, RTP/ RTCP, IGMP V2/V3, ICMP, ICMPv6, RTSP, FTP, ARP, DHCP, APIPA (Auto-IP, link local address), NTP (SNTP), SNMP (V1, V3, MIB-II), 802.1x, DNS, DNSv6, DDNS (DynDNS.org, selfHOST.de, no-ip.com), SMTP, iSCSI, UPnP (SSDP), DiffServ (QoS), LLDP, SOAP, Dropbox™, CHAP, digest authentication
s) **Ethernet:**	10/100 Base-T, auto-sensing, half/full duplex
t) **Interoperability:**	ONVIF Profile S; ONVIF Profile G; GB/T 28181
u) **Operating temperature:**	-40 °C to 150 °C for continuous operation
v) **Operating Humidity:**	5% to 93% RH non-condensing 5% to 100% RH condensing
w) **Impact protection:**	IK10
x) **Ingress protection:**	IP 66

1.4 1.8-3mm, Day/Night HD 2 Mega Pixels IP vari-Focal Dome camera with PoE

a) **Power Supply:**	24 VAC 50/60 Hz 12 VDC Power-over-Ethernet 48 VDC nominal
b) **PoE:**	IEEE 802.3af (802.3at Type 1)
c) **Power consumption:**	12 W
d) **Current consumption:**	1 A (12 VDC) 0.8 A (24 VAC) 0.3 A (PoE 48 VDC)
e) **Sensor:**	1/3-inch CMOS HD
f) **Pixels:**	2048 x 1536 (3MP)
g) **Video compression:**	H.264 (ISO/IEC 14496-10), M-JPEG, JPEG
h) **Video Streaming:** configurable frame rate and bandwidth.	Multiple configurable streams in H.264 and M-JPEG,
	Regions of Interest (ROI)
i) **Video Resolution (H x V):**	1080p HD: 1920 x 1080
j) **Day/Night:**	Colour, Monochrome, Auto

k) **Noise reduction:**	Intelligent Dynamic Noise Reduction with separate temporal and spatial adjustments
l) **Dynamic range:**	90 dB HDR
m) **Video Motion Analysis:**	Intelligent Video Analysis
n) **Signal-to-noise ratio (SNR):**	>55 dB
o) **Protocols:**	IPv4, IPv6, UDP, TCP, HTTP, HTTPS, RTP/RTCP, IGMP V2/V3, ICMP, ICMPv6, RTSP, FTP, Telnet, ARP, DHCP, APIPA (Auto-IP, link local address), NTP (SNTP), SNMP (V1, MIBII), 802.1x, DNS, DNSv6, DDNS (DynDNS.org, selfHOST.de, no-ip.com), SMTP, iSCSI, UPnP (SSDP), DiffServ (QoS), LLDP, SOAP, Dropbox, CHAP, digest Authentication
p) **Ethernet:**	10/100 Base-T, auto-sensing, half/full duplex
q) **Connectivity:**	ONVIF Profile S, Auto-MDIX
r) **Lens:**	**1.8 to 3 mm** Varifocal SR (Super Resolution) **3.8 to 13 mm** Varifocal SR (Super Resolution) **9 to 40** mm Varifocal SR (Super Resolution)
s) **Operating temperature:**	-50 °C to +50 °C for continuous operation
t) **Operating Humidity:**	20% to 100% RH
u) **Impact protection:**	IK10
v) **Ingress protection:**	IP67

1.5 2.8-13mm, Day/Night HD 2 Mega Pixels IP vari-Focal door Starlight Dome camera with PoE

a) **Input voltage:**	Power-over-Ethernet (48 VDC nominal) and/ or +12 VDC ±10% (auxiliary)
b) **PoE IEEE standard:**	802.3af (802.3at Type 1) Power level: Class 3
c) **Power consumption:**	7.2 W
d) **Current draw (PoE):**	200 mA max.
e) **Current draw (12 VDC):**	600 mA max.
f) **Sensor:**	1/2.7-inch CMOS
g) **Effective Pixels:**	1920 (H) x 1080 (V); 2MP (approx.)
h) **Dynamic range:**	120 dB WDR
i) **Video Streaming:**	Multiple configurable streams in H.264 and MJPEG, configurable frame rate and bandwidth.
j) **Video compression:**	H.264 (MP); M- JPEG
k) **Video Resolution (H x V):**	1080p HD: 1920 x 1080
l) **Camera processing:**	Latency
m) **Day/Night:**	Auto (adjustable switch points), Colour, Monochrome
n) **Signal-to-noise ratio (SNR):**	>55 dB
o) **Noise reduction:**	Intelligent Dynamic Noise Reduction with separate temporal and spatial adjustments
p) **Intelligent defog:**	Intelligent Defog automatically adjusts parameters for best picture in foggy or misty scenes (switchable)
q) **Video content analysis:**	Intelligent Video Analytics
r) **Tamper detection:**	Maskable
s) **Protocols:**	IPv4, IPv6, UDP, TCP, HTTP, HTTPS, RTP/RTCP, IGMP

	V2/V3, ICMP, ICMPv6, RTSP, PTP, Telnet, ARP, DHCP, APIPA (Auto-IP, link local address), NTP (SNTP), SNMP (V1, MIB II), 802.1x, DNS, DNSv6, DDNS (DynDNS.org, selfHOST.de, no-ip.com), SMTP, iSCSI, UPnP (SSDP), DiffServ (QoS), LLDP, SOAP, Dropbox, CHAP, digest Authentication
t) **Ethernet:**	10/100 Base-T, auto-sensing, half/full duplex
u) **Interoperability:**	ONVIF Profile S; GB/T 28181
v) **Varifocal Lens:**	**2.8 to 13** mm Automatic Varifocal (AVF) SR lens (IR corrected) **10 to 23** mm Automatic Varifocal (AVF) SR lens (IR corrected)
w) **Operating temperature:**	-30 °C to +50 °C for continuous operation
x) **Operating Humidity:**	5% to 93% relative humidity
y) **Impact protection:**	IK10
z) **Ingress protection:**	IP 66

1.6 IP License Plate Camera

a) **Operational Range:**	5.8 to 28.0 m
b) **IR Illumination:**	Pulsed LED array, 850 nm
c) **Usable Plate Width:**	100–170 pixels (with 4CIF encoding over capture range)
d) **Maximum Capture Speed:**	225 km/h (140 mph). Must meet 30° mounting criteria.
e) **Sensor Type:**	1/3-inch CCD, monochrome
f) **Active Pixels (PAL):**	752 x 582
g) **Video Compression:**	H.264 (ISO/IEC 14496-10); M-JPEG, JPEG
h) **Pixels CCIR:**	795 x 596 (IIxV), EIA: 811 x 508 (IIxV)
i) **Data Rate:**	9.6 Kbps to 6 Mbps
j) **Resolution:**	Horizontal x vertical: 4CIF: 704 x 576
k) **Frame Rate (per stream):**	1 to 25 (PAL H.264) 1 to 25 (PAL M-JPEG)
l) **Dynamic Range:**	120 dB (20-bit image processing)
m) **Lens:**	5-50 mm varifocal, calibrated for optimal capture distance
n) **PoE supply:**	IEEE 802.3at compliant
o) **Input Voltage:**	11-30 VDC, or 24 VACS ± 10%, Power over Ethernet+ (IEEE 802.3at, class 4)
p) **Power Consumption:**	PoE+: 13 W, maximum 11 W, typical
q) **Weatherproofing:**	IP 67
r) **Operating temperature:**	PoE+: -20 °C to +50 °C
s) **Cold Start-up Temperature:**	-40°C, typically requires a 15- minute warm up prior to operation
t) **Operating Humidity:**	0% to 100% relative, condensing
u) **Wind Load:**	144 km/h
v) **ONVIF conformant:**	Yes

1.7 1/2.8" 2.8 - 13mm Day/Night HD 2 Mega Pixels IP vari-Focal IR Bullet camera with PoE

a)	**Input voltage:**	Power-over-Ethernet (48 VDC nominal) or 24 VACS ±10% / ÷12 VDC ±10%
b)	**PoE:**	802.3cT (802.3at Type 1) Power level: Class 3
c)	**Power consumption:**	950 mA (12 VDC) 750 mA (24 VAC) 260 mA (PoE)
d)	**Sensor:**	1/2.8 inch CMOS
e)	**Active Pixels:**	1937 (H) x 1097 (V); approximately 2.12MP
f)	**Video performance - Sensitivity:**	Colour: 0.0225 lux Mono: 0.0051 lux With: IR 0.0 lx
g)	**High Dynamic Range:**	134 dB WDR
h)	**Video compression:**	H.265; H.264; M-JPEG
i)	**Streaming:**	Multiple configurable streams in H.264 and MJPEG, configurable frame rate and bandwidth. Regions of Interest (ROI).
j)	**Camera processing latency:**	<65 ms (1080p60)
k)	**Video Resolution (H x V):**	1080p HD: 1920 x 1080
l)	**IR intensity:**	Adjustable
m)	**Night vision:**	Distance 60 m LED 4 LED high efficiency array, 850 nm
n)	**Intelligent defog:**	Intelligent Defog automatically adjusts parameters for best picture in foggy or misty scenes (switchable)
o)	**Signal-to-noise ratio (SNR):**	>55 dB
p)	**Video content analysis:**	Essential Video Analytics
q)	**Lens Types:**	Automatic Varifocal 2.8 to 12 mm, DC Iris
r)	**Protocols:**	IPv4, IPv6, UDP, TCP, HTTP, HTTPS, RTP/ RTCP, IGMP V2/V3, ICMP, ICMPv6, RTSP, FTP, Telnet, ARP, DHCP, APIPA (Auto-IP, link local address), NTP (SNTP), SNMP (V1, MIBII), 802.1x, DNS, DNSv6, DDNS (DynDNS.org, selfHOST.de, no-ip.com), SMTP, iSCSI, UPnP (SSDP), DiffServ (QoS), LLDP, SOAP, Dropbox, CHAP, digest Authentication
s)	**Ethernet:**	10/100 Base-T, auto-sensing, half/full duplex
t)	**Interoperability:**	ONVIF Profile S; ONVIF Profile G; GB/T 28181
u)	**Operating temperature:**	-40 °C to 160 °C for continuous operation
v)	**Operating Humidity:**	20% to 90% relative humidity (non-condensing)
w)	**Ingress Protection:**	IP67
x)	**Mechanical impact:**	IK10

1.8 1/2.8" Day/Night HD 2 Mega Pixels IP vari-Focal Starlight box cameras with PoE (WDR)

a)	**Input voltage:**	Power-over-Ethernet (48 VDC nominal) and/or

		12 VDC ±10% (auxiliary)
b)	**PoE:**	802.3af (802.3at Type 1) Power level: Class 3
c)	**Power consumption:**	7.2 W max
d)	**Current draw (PoE):**	200 mA max
e)	**Current draw (12 VDC):**	600 mA max
f)	**Sensor:**	1/2.8-inch CMOS
g)	**Active Pixels:**	1920 (H) x 1080 (V); 2MP (approx.)
h)	**Starlight Sensitivity:**	Colour: 0.0069 lx Mono: 0.0008 lx
i)	**Dynamic range – HDR mode:**	120 dB WDR
j)	**Video compression:**	H.264 (MP); M-JPEG
k)	**Streaming:**	Multiple configurable streams in H.264 and MJPEG, configurable frame rate and bandwidth. Regions of Interest (ROI).
l)	**Camera processing latency:**	<55 ms (max. average at 1080p60)
m)	**Video Resolution (H x V):**	1080p HD: 1920 x 1080
n)	**Day/Night:**	Auto (adjustable switch points), Colour, Monochrome
o)	**Signal-to-noise ratio (SNR):**	>55 dB
p)	**Video content analysis:**	Essential Video Analytics
q)	**Tamper detection:**	Maskable
r)	**Alarm rules:**	Object in field, Line crossing, Condition change, etc
s)	**Protocols:**	IPv4, IPv6, UDP, TCP, HTTP, HTTPS, RTP/ RTCP, IGMP V2/V3, ICMP, ICMPv6, RTSP, FTP, Telnet, ARP, DHCP, APIPA (Auto-IP, link local address), NTP (SNTP), SNMP (V1, MIBII), 802.1x, DNS, DNSv6, DDNS (DynDNS.org, selfHOST.de, no-ip.com), SMTP, iSCSI, UPnP (SSDP), DiffServ (QoS), LLDP, SOAP, Dropbox, CHAP, digest authentication
t)	**Ethernet:**	10/100 Base-T, auto-sensing, half/full duplex
u)	**Interoperability:**	ONVIF Profile S; GB/T 28181
v)	**Lens Mount:**	CS mount (C-mount with adapter ring)
w)	**Lens Types:**	Manual and DC Iris auto-detect with: Override DC-iris drive: max. 50 mA continuous
x)	**Operating temperature:**	-20 °C to 155 °C
y)	**Operating Humidity:**	20% to 93% relative humidity

1.9 CS Mount 2 Mega Pixels Lenses Day / Night Corrected (No Focus Shift)

a)	**Maximum sensor format:**	1/2-inch
b)	**Optical resolution:**	5 Megapixels
c)	**Focal length:**	1.8 – 3mm, 3.8 – 13 mm and 5 – 55mm
d)	**Iris range:**	F1.4 to F8
e)	**Min object distance:**	0.3 m
f)	**Lens mount:**	C
g)	**4:3 Angle of view (HxV):**	97 x 72° Wide, 28 x 21° Tele
h)	**Operation:**	Focus: Manual Zoom: Manual

	Iris: 6 pin, DC control
i) **Application range:**	Day/night
j) **IR corrected:**	Yes
k) **Mount:**	CS Mount (Adjustable Lens Position)
l) **Flange Back:**	12.5mm
m) **Operating Temperature:**	-10°C ~ +50°C
n) **Operating Humidity:**	Up to 93% non-condensing

1.10 Indoor Day /Night HD 2 Mega Pixels IP IR Panoramic camera

a) **Power Supply:**	Power-over-Ethernet 48 VDC nominal
b) **Power consumption:**	200 mA
c) **Sensor:**	1/2.3-inch CMOS
d) **Total sensor pixels:**	12MP
e) **Video resolution (H x V) – 360°:**	Corridor 1600 x 1200
f) **Day/Night:**	Colour, Monochrome, auto (adjustable switchover points)
g) **Intelligent defog:**	Intelligent Defog automatically adjusts parameters for best picture in foggy or misty scenes (switchable)
h) **Video content analysis:**	MOTION+, Essential Video Analytics
i) **Lens (360° version):**	1.6 mm fixed-focus lens (IR corrected), F2.8
j) **Minimum object distance:**	0.1m
k) **Day/Night:**	Switched mechanical IR filter
l) **Signal-to-noise ratio (SNR):**	>50 dB
m) **Protocols:**	IPv4, IPv6, UDP, TCP, HTTP, HTTPS, RTP/ RTCP, IGMP V2/V3, ICMP, ICMPv6, RTSP, FTP, Telnet, ARP, DHCP, APIPA (Auto-IP, link local address), NTP (SNTP), SNMP (V1, MIBII), 802.1x, DNS, DNSv6, DDNS (DynDNS.org, selfHOST de, no-ip.com), SMTP, iSCSI, UPnP (SSDP), DiffServ (QoS), LLDP, SOAP, Dropbox, CHAP, digest authentication
n) **Ethernet:**	10/100 Base-T, auto-sensing, half/full duplex
o) **Interoperability:**	ONVIF Profile S; GB/T 28181
p) **Operating temperature:**	-20 °C to +40 °C
q) **Operating Humidity:**	20% to 93% RH

1.11 Outdoor Day/Night 2 Mega Pixels IR IP PTZ camera

a) **Imager:**	1/2.8" progressive scan CMOS
b) **Effective Picture Elements:**	1944 x 1212 (2.35 MP)
c) **Lens:**	30x zoom (4.3 mm - 129 mm)
d) **Digital Zoom**	12x
e) **Video performance Sensitivity:**	Colour: 0.0077 lx Monochrome: 0.0008 lx
f) **Wide Dynamic Range (WDR):**	120 dB WDR
g) **Signal to Noise Ratio:**	> 55 dB
h) **Intelligent Defog:**	Automatically adjusts parameters for best picture in foggy or misty scenes (Auto/Off)

i)	**Day/Night:**	Mechanical switchable IR filter (Auto/On/off) Monochrome
j)	**Video content analysis:**	Essential Video Analytics
k)	**Alarm rules:**	Line crossing, Loitering, Condition change, etc.
l)	**Input voltage:**	24 VAC and PoE+
m)	Power consumption:	25 W (IR on)
n)	**Video compression:**	H.265, H.264, M-JPEG
o)	**Standards:**	H.264 (ISO/IEC 14496-10), M-JPEG, JPEG
p)	**Streaming:**	Multiple configurable streams in H.265, H.264, and M-JPEG; configurable frame rate and bandwidth.
q)	**Ethernet:**	10BASE-T/100BASE-T, auto sensing, half/full duplex
r)	**Interoperability:**	ONVIF Profile S, ONVIF Profile G, ONVIF Profile T GB/T 28181
s)	Power:	PoE+ (IEEE 802.3at, class 4 standard) 24 VACS (High PoE
t)	Power Consumption:	19.2 W/33.6 VA 51.0 W / 54.0 VA (heaters on)
u)	**Ingress Protection:**	IP66
v)	**Operating temperature:**	-40 °C to +60 °C
w)	**Operating Humidity:**	Up to 90% RH, non-condensing

1.12 IR ILLUMINATOR

a)	**LEDs:**	High efficiency LED array with current limited integral power circuit
b)	**Number of LEDs:**	18 high efficiency surface mount LEDs
c)	**Wavelength:**	850 nm or 940 nm
d)	**Vertical angles:**	10°
e)	**Power consumption:**	26 to 45 W (45 W max power)
f)	**Input Voltage:**	12 to 24 VDC or 24 VAC, 50/60 Hz
g)	**Temperature Range:**	-50 °C to +50 °C
h)	**Environment:**	IP67
i)	**Power Cable:**	To be supplied with IP67 power connector and 5 m of connecting lead
j)	**Colour:**	Black anodized heat sink with black front fascia
k)	**Construction:**	Robust, aluminum construction with acrylic front fascia

1.13 Box Camera Housing

a)	**Construction:** hardware	Aluminum casing, silicone gaskets, all stainless steel
b)	**Window:**	3 mm glass
c)	**Locking clasps:**	Tamper-resistant screws
d)	**Camera mounting:** screws	Removable camera/lens tray, mounted with two
e)	**Operating temperature - External:**	-30 °C to +50 °C
f)	**Operating temperature – Internal:**	-20 °C to +50 °C
g)	**Enclosure protection:**	IP67

h) **Power supply:** Power over Ethernet Plus (PoE+) IEEE 802.3at, 48 VDC nominal; or 12 VDC (switchable)

i) **Power consumption (housing only):** 14 W max.

j) **Power handling (housing + camera):** 30 W max.

Supplied with a built-in heater and fan

1.14 Box Camera Brackets

(a) Mounting Head: Adjustable 360° pan, 180° tilt

i. Pendant Pipe Mount Bracket Pendant pipe mount bracket for HD Domes

(a) Construction material: Aluminum alloy

(b) Finish: RAL 9003 signal white

ii. Wall mount bracket for HD Domes

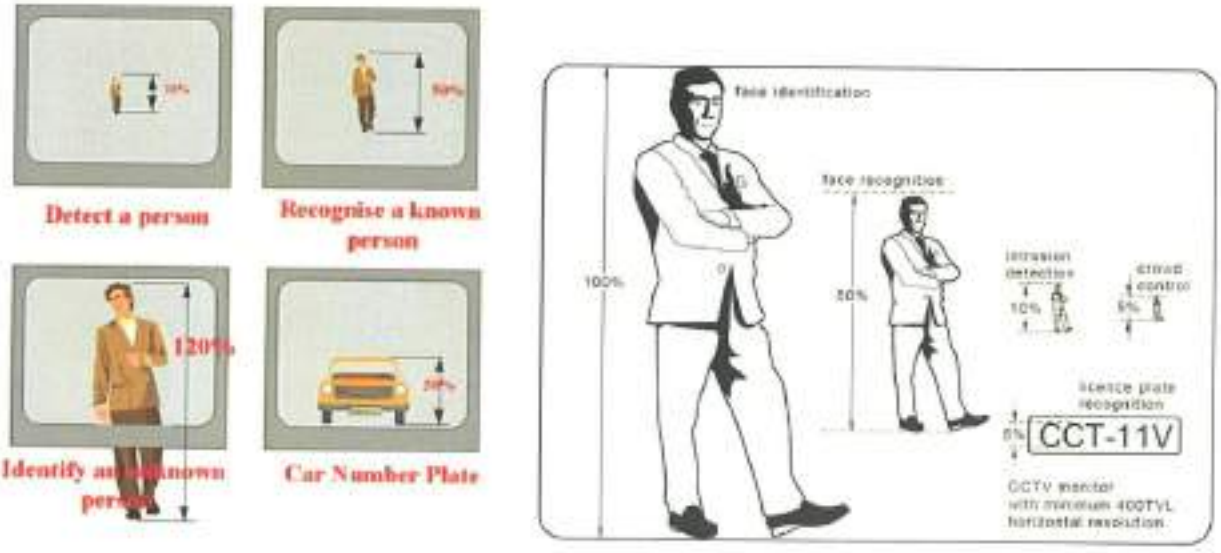
(a) Construction material: Aluminum alloy

(b) Finish: RAL 9003 signal white

iii. SMB Surface Mount Box for IP panoramic MP cameras

Construction material: Aluminum alloy

1.15 CCTV System Operational Requirements



Monitor Screen Heights

a) **Monitor and Control:** A figure occupies at least 5% of the screen height and the scene portrayed is not unduly cluttered. From this level of detail, an observer should be able to monitor the number, direction and speed of movement of people across a wide area, providing their presence is known.

b) **Detect:** At 10% of available screen height, after an alert an observer would be able to search the display screens and ascertain with a high degree of certainty whether or not a person is present
c) **Observation:** A figure shall occupy between 25% and 30% of the screen height allowing characteristics such as distinctive clothing to be seen, while monitoring activity surrounding an incident.
d) **Recognition:** A figure shall occupy at least 50% of screen height so that operators can say with a high degree of certainty whether or not an individual shown is the same as someone they have seen before.
e) **Identify:** A figure shall occupy 120% of the screen height, picture quality and detail should be sufficient to enable the identity of an individual to be established beyond reasonable doubt

iv. Commissioning using the Rotakin Test Target

The installed system shall be subjected to Objective performance tests during commissioning.
The tests shall be carried out as per SANS 10222-5-1-4.
A Rotakin (Rotastat) test target including colour charts shall be used to test the performance of all installed cameras during the day and night.

ROTASTAT

ROTAKIN

ROTASTAT(NONE ROTATING VERSION) is to be used for when setting up (Automatic Number Plate Recognition) ANPR cameras or number plate reading cameras with the added extra of a colour chart and focus chart for addition use when setting up cameras.

The Rotakin is a rotating target board tool, to be used where moving objects or individuals in various positions could be more easily identified.

2. SYSTEMS CONTROL

2.1 Control Room Workstation

A. Performance

i.	**Processor:**	Intel Core i7-8700 6-Core
ii.	**Base Clock Speed:**	3.2 GHz
iii.	**Maximum Boost Speed**	4.6 GHz
iv.	**L3 Cache**	12 MB
v.	**System Bus**	8 GT/s Direct Media Interface
vi.	**Chipset**	Intel Z370
vii.	**Total Installed Memory**	16 GB
viii.	**Maximum Memory Capacity**	64 GB
ix.	**Memory Type**	DDR4 SDRAM
x.	**Memory Speed**	2666 MHz
xi.	**Memory Slot Type**	288-Pin DIMM
xii.	**Graphics Type**	Dedicated
xiii.	**GPU**	NVIDIA GeForce GT 1030 with 2 GB GDDR5 VRAM

B. Drives

i.	**Storage Drive:**	Installed: 2 TB 7200 rpm HDD Type: SATA
ii.	**Optical Drive:**	Tray-Load SuperMulti DVD Burner
iii.	**Drive Expansion:**	3 x 3.5" (Internal)
iv.		1 x M.2 (Internal)

C. Inputs / Outputs

i.	**Ports:**	1 x USB 3.1 Gen 2 Type-C 1 x USB 3.1 Gen 2 Type-A 3 x USB 3.1 Gen 1 Type-A 2 x USB 2.0 Type-A
ii.	**Display:**	1 x HDMI 1 x DisplayPort
iii.	**Audio**	1 x 1/8" / 3.5 mm Headphone Output 1 x 1/8" / 3.5 mm Microphone Input 3 x 1/8" / 3.5 mm Line-Out
iv.	**Flash Media Slot:**	

	SD
	SD/SDHC
	SD/SDHC/SDXC

D. Communications

i.	**Network:**	1 x 10/100/1000 Mb/s Gigabit Ethernet (RJ45)
ii.	**Wi-Fi**	Wi-Fi 5 (802.11ac)
iii.	**Bluetooth**	Bluetooth 4.2

E. Keyboard & Mouse

i.	**Keyboard:**	Type: Full-Size
ii.	**Mouse**	USB

F. Power Ratings

i.	**Type:**	460W
ii.	**Input voltage:**	220 VAC
iii.	**Input frequency:**	50 Hz
iv.	**Input current (maximum):**	8A

G. Computer Environment

i.	**Relative humidity (maximum):**	10% to 90% (non-condensing)
ii.	**Operating Temperature:**	5°C to 50°C

2.2 24-inch High Performance HD LED Monitors

a)	**Viewable image size (diagonal):**	60.96 cm (24 inches)	
b)	**Pre-set display area:**	Horizontal:	518.4 mm (20.2 inches)
		Vertical	324.0 mm (12.7 inches)
c)	**Maximum resolution:**	1920 x 1200	
d)	**Aspect Ratio:**	16:9	
e)	**Pixel pitch:**	0.270 mm	
f)	**Brightness (typical):**	300 cd/m²	
g)	**Colour gamut (typical):**	82%	
h)	**Colour depth:**	16.7 million colours	
i)	**Contrast ratio (typical):**	1,000:1	
j)	**Dynamic contrast ratio (estimate):**	2 million:1	
k)	**Viewing angle (typical):**	(vertical/horizontal):	178°/178°
l)	**Response time (typical):**	5ms (gray to gray)	
m)	**Panel type:**	IPS (In-plane switching)	
n)	**Panel life:**	30 000 hours	
o)	**Backlight:**	LED	
p)	**Connectors:**	VGA, USB, DVI-D (HDCP), DisplayPort	
q)	**AC input (voltage/frequency/current):**	220 VAC/50 Hz/1.5A (maximum)	
r)	**Power consumption:**	Normal operation, typical:	38W

s)	**Operating Temperature:**	0°C to +50°C
t)	**Humidity:**	0% to 90% Relative

2.3 42-inch High Performance HD LED Monitors

a)	**Rated Voltage:**	220VAC, 50Hz
b)	**Power at Rated Voltage:**	150 W
c)	**Sync Format:**	PAL
d)	**LCD Panel:**	LED
e)	**Viewable Picture Area (Diagonal):**	42 inch (wit; narrow bezel 5.3mm)
f)	**Active Display Area (H x V):**	930.24 x 523.26 mm (36.6 x 20.6 in.)
g)	**Pixel Pitch (H x V):**	0.4845 x 0.4845 mm
h)	**Resolution:**	1920 x 1080
i)	**Aspect Ratio:**	16:9
j)	**Display Colours:**	1,073 million
k)	**Response Time:**	8 ms (typical)
l)	**Backlight:**	50,000 hours
m)	**Luminance:**	500 cd/m^2 (typical)
n)	**Contrast Ratio:**	4000:1 (typical)
o)	**Viewing Angle:**	Horizontal/Vertical: 178°, typical
p)	**Connectors:**	VGA, HDMI, DVI-D
q)	**Operating Temperature:**	0°C to +50°C
r)	**Humidity:**	0% to 90% Relative

2.4 Dual View KVM Extenders (Receivers)

a)	**Max. Video Resolution:**	WUXGA (1920 x 1200) UXGA (1600 x 1200)
b)	**Extension Distance:**	200m
c)	**Unit Connection:**	CAT5-RJ45 Female x 1 (VGA+KB/MS) CAT5-RJ45 Female x 1(VGA Keyboard USB-A x 1 Mouse USB-A x 1 Monitor HDB15-Female x 2 (Blue) Audio Jack (Speaker + Mic) 1 Set Serial DTE x 1
d)	**Mask Hotkey Switch:**	x 1

2.5 Dual View KVM Extenders (Transmitters)

a)	**Max. Video Resolution:**	WUXGA (1920 x 1200) UXGA (1600 x 1200)
b)	**Extension Distance:**	200m
c)	**Unit Connection:**	CAT5-RJ45 Female x 1 (VGA+KB/MS) CAT5-RJ45 Female x 1(VGA HDB15 Female x 1 (Grey: VGA+KB/MS) HDB15 Female x 1 (Blue: VGA only)Audio Jack (Speaker + Mic) 1 Set Serial DCE x 1

d) **Mask Hotkey Switch:** x 1

2.6 KVM Extenders (Quad View – Receivers)

i.	**Resolution:**	Up to 1920 x 1200 @ 50Hz, 1080p
ii.	**Extension Distance:**	140m
iii.	**Unit Connection:**	4 × DVI-I socket 4 x USB-A 4 × RJ 45 socket Audio: 2 x 3.5mm Serial: 1 x DB9(M)
iv.	**Power:**	220VAC, 50Hz, 5.0VDC / 4A
v.	**Temperature Operating:**	5°C – 45°C
vi.	**Humidity Operating:**	80% non-condensing max.

2.7 KVM Extenders (Quad View – Transmitters)

i.	**Resolution:**	Up to 1920 x 1200 @ 50Hz, 1080p
ii.	**Extension Distance:**	140m
iii.	**Unit Connection:**	4 × DVI-I socket 2 x USB-B 4 × RJ 45 socket Audio: 2 x 3.5mm Serial: 1 x DB9(F)
iv.	**Power:**	220VAC, 50Hz, 5.0VDC / 4A
v.	**Temperature Operating:**	5°C – 45°C
vi.	**Humidity Operating:**	80% non-condensing max.

2.8 ISMS Server

a) **Form Factor:**	• 1U rack
b) **Processors:**	• 1 processor from the following: ➢ Intel Xeon E-2200 product family. ➢ Intel Pentium ➢ Intel Core i3 ➢ Intel Celeron
c) **Storage controllers:**	• Internal controllers: PERC H730P, H330, HBA330 (non-RAID) • Software RAID: PERC S140
d) **Memory:**	• 4 x DDR4 DIMM slots, Supports UDIMM, up to 2666MT/s, 64GB Max. Supports registered ECC
e) **Internal boot:**	• Boot Optimized Storage Subsystem (BOSS): 2 x M.2 240GB (RAID 1 or No RAID) or 1 x M.2 240GB (No RAID only) • Internal Dual SD Module 3: 2x microSD (16GB, 32GB or 64GB) or 1x microSD (16GB, 32GB or 64GB)
f) **Drive bays:**	• Up to 4 x 3.5 cabled SATA

g) **Embedded management:**	• Up to 4 x 3.5 or 2.5 hot-plug SATA • iDRAC9 with Lifecycle Controller • iDRAC Direct • iDRAC RESTful API with Redfish
h) **Tools:**	• iDRAC Service Module • Open Manage Server Administrator • Repository Manager • System Update • Server Update Utility • Update Catalogs • RACADM CLI • IPMI Tool
i) **Security:**	• TPM 1.2/2.0 optional • Cryptographically signed firmware • Silicon Root of Trust • Secure Boot • System Lockdown (requires Open Manage Enterprise) • System Erase
j) **I/O & Ports**	• x 1GbE LOM Network Interface Controller (NIC) ports • 1x USB 2.0, 1 x IDRAC micro USB 2.0 management port • 2 x USB 3.0, VGA, serial connector
k) **Power Supply:**	• Single 250W (Bronze) or 450W (Platinum) power supply
l) **Operating Systems:**	• Microsoft Windows Server with Hyper-V (2016 and 2019) • Red Hat Enterprise Linux • Ubuntu Server LTS • SUSE Linux Enterprise Server • VMware ESXi • Citrix XenServer

2.9 Large Video Wall Controller

(a) Processor:	Dual Intel Xeon E5410 Quad Core, 2.33GHz, 12MB, 1333MHz
(b) **Memory:**	4096MB, 667MHz DDR2 Quad Channel FBD
(c) **Hard Drive:**	500GB, 7200 Rpm, Serial ATA II (Excl recording)
(d) Optical Drive:	16X DVD+/-RW Drive
(e) Graphics Adapter:	Dual Port SLI 768MB Quadro FX4600 Display Card
(f) Max Monitors/Server:	9
(g) **Max Images/Server:**	50
(h) Max CPU Usage:	50% with 50 simultaneous Images

2.10 Small Video Wall Controller

a)	**Processor:**	Single Intel Xeon W3505, 2.53 GHz, 4MB, 1066MHz
b)	**Memory:**	2048MB, 1066MHz DDR3, Non ECC
c)	**Hard Drive:**	500GB, 7200 Rpm. Serial ATA II (Excl recording)
d)	**Optical Drive:**	16X DVD +/-RW Drive
e)	**Graphics Adapter:**	Dual Port 768 MB Quadro FX1800 Display Card
f)	**Max Monitors/Controller:**	4
g)	**Max Images/Controller:**	25
h)	**Max CPU Usage:**	50% with 25 simultaneous Images

2.11 2 X 2 Free Standing Video Wall Mount

a)	**Screen array configuration:**	2 screens wide x 2 screens high.
b)	**Centre of Display to Floor/Table Range:**	609.6mm (minimum bottom row) 2214mm (maximum top row)
c)	**Colour:**	Black
d)	**Manual Height Adjustment:**	Micro-adjustment up to 19 mm per screen
e)	**Orientation:**	Landscape
f)	**Plumb Adjustment:**	Micro-adjustment up to 19 mm
g)	**Solution Type:**	Universal
h)	**Typical Screen Sizes:**	42 - 50inch screens

3. EMERGENCY VOICE COMMUNICATION (REFUGE PLACE)

3.1 Master Control Unit (MCU)

a) **Power Supply**

i.	**Mains supply:**	230 VAC, 50 Hz
ii.	**Power supply output 1:**	24 VDC
iii.	**Power supply output 2:**	5 VDC
iv.	**Output current @ 24 VDC:**	0.5 A max
v.	**Standby battery requirements (size and type):**	2 x 12 V, 7 AH VRLA (Valve Regulated Lead Acid) connected in series
vi.	**Max. current draw from battery (Mains failed):**	500 mA (16 Type B outstations fitted (8 via an ECU-8S), one outstation connected, 15 outstations calling in)

b) **Line specification**

i.	**Max. number of lines:**	8(expandable to 16 using ECU-8S expansion unit)
ii.	**Number of outstations per line:**	1
iii.	**Outstation cabling requirements:**	2 core 1.5mm^2 enhanced fire rated cable, up to 1km per line. Max cable resistance = 40 ohms

c) **Output ratings**

i.	**OP1, OP2, OP3 open collector outputs:**	24 V, 50 mA max
ii.	**Change-over relay:**	30 V, 1 A max
iii.	**24 V output:**	200 mA max

d) **Network specification**

i.	**Max no. of master controllers per network:**	4
ii.	**Connection:**	Via ECU721 network communication card, one required per networked master
iii.	**Network cabling requirements:**	4 x 2 core 1.5mm2 enhanced fire rated cable, up to 1km in length

3.2 Type B Green Disabled Refuge Outstations

i.	**Input voltage (from controller):**	5 VDC in use, 10.7 VDC quiescent;
ii.	**Current consumption @ 24 VDC:**	25 mA in use, 3 mA quiescent
iii.	**Frequency response**	250 Hz to 5 kHz +3 dB (microphone), 250 Hz to 4kHz ±3 dB (loudspeaker)
iv.	**Audio output level**	0 dB (775 mV) balanced line level
v.	**Switch output**	Opto-isolated normally open open-collector, max 24 VDC 3 mA
vi.	**External indicators**	Red call in progress LED
vii.	**Controls**	External Push to Call or Answer button (Off Hook); Internal Loudspeaker volume & Engineer's On Hook pins

4. CABLING

4.1 Category 6 or Cat 6 cable

a)	**Speed:**	10/100/1000MbE, 10GbE (Shorter Distances or Cat6a Required for 10GbE)
b)	**Frequency:**	Up to 550 MHz
c)	**Performance:**	SNR higher

5. FIRE DETECTION SYSTEM

5.1 4-Loop Analogue Addressable Fire Alarm Panel

a)	**Loop capacity:**	127 addresses
b)	**Power Requirements:** of	Panel (Quiescent at 24 VDC) 4 loops 420mA Load panel only, excluding any external devices Panel (Alarm at 24 VDC) 820mA 25% of zones in alarm Per Loop (Quiescent at 24 VDC) 70mA Fully loaded loop, with 127 ZP devices, not in alarm
c)	**Power Supply:**	Input 220 Vac 50 Hz + or -10% 0.75 Amps Optional input DC 24 to 30 volts load dependent User output 24 Vdc (nominal) up to 3.0 Amps Battery charge 28.2 Vdc 1.2 Amps
d)	**Wiring:**	2 core screened (to local codes and standards)
e)	**Monitoring:**	Loop wiring Open and short circuit fault, earth

		Leakage, sensor removed and wrong device type
f)	**Switched outputs (standard):**	Sounder circuits (programmable) 2 x dual (monitored) Fire (common) 1volt free N/O or N/C 1volt free N/O or N/C Fault (common) 1volt free N/O or N/C (software set) Remote manned centre (fire) 1 monitored Remote manned centre (fault) 1 monitored
g)	**Switched I/O (optional & programmable):**	Non-loop devices, sounder circuits, relay outputs, transistor outputs monitoring inputs 768 total max
h)	**Indicators:**	System status 87 light emitting diodes, text display 4 line, 160-character, LCD (back lit)
i)	**Printer:**	24 character (built into front door)
j)	**Software:**	Firmware and site configuration programming – Flash memory
k)	**Communications ports:**	Port 1 Planner, RS 232 Port 2 Network, RS 485 / fibre optic
l)	**Selectable features:**	Common sounders, Coincidence alarm, RMC fire, RMC fault, Zone walk test, Control output, Output delays, Alarm counter, Sounder silence delay, Alarm verification
m)	**Standby batteries:**	2 x 12-volt sealed lead acid - up to 28 Ah accommodated inside panel enclosure
n)	**Temperature range:**	-5°C to +40°C
o)	**Humidity range:**	10% to 90% RH (non-condensing)
p)	**Environmental:**	IP30 (indoor installation)

5.2 Analogue Addressable Optical Smoke Detectors

a)	**Mounting:**	Plugs into surface or semi recessed base
b)	**Area coverage:**	Optical: 101/m^2, subject to local codes
c)	**Wiring:**	2-core loop
d)	**Monitoring:**	Open and short circuit fault. Sensor removal and device type.
e)	**Indication:**	Alarm LED (red)
f)	**Operating voltage:**	19.5 to 20.5V max. line loss 4V
g)	**Current consumption:**	Quiescent: 600µA Alarm: 700µA
h)	**Addressing method:**	7-way DIP switches in head
i)	**Detection principle:**	Smoke: Photo electric light scatter
j)	**Environmental:**	IP32
k)	**Application:**	Indoor use
l)	**Temp range:**	-10°C to +75°C
m)	**Humidity range:**	20% to 95% RH (non-condensing)

5.3 Analogue Addressable Heat Detectors

a)	**Mounting:**	Plugs into surface or semi recessed base
b)	**Area coverage:**	Up to 21.3 m spacing

c)	**Wiring:**	2 wire zonal
d)	**Monitoring:**	Open and short circuit by end of line resistor
e)	**Indication:**	Alarm LED (red)
f)	**Operating voltage:**	15 - 30 volts DC
g)	**Current (quiescent):**	<60µA
h)	**Current (alarm):**	Max 50mA (limited by panel) (excluding base)
i)	**Environmental:**	IP32
j)	**Application:**	Indoor use
k)	**Temp range:**	0°C to +58°C
l)	**Humidity range:**	20% to 95% RH (non-condensing)

5.4 Analogue Addressable Loop Isolators

a)	**Mounting:**	Plugs into surface or semi recessed base
b)	**Wiring:**	2 core "Class-A" return loop. Total loop = 75 ohms maximum. Between isolators = 18 ohms maximum
c)	**Monitoring:**	Loop Short circuit protection
d)	**Indication:**	LED (red)
e)	**Operating voltage:**	16-22 volts DC
f)	**Current (quiescent):**	600µA
g)	**Current (fault):**	800µA
h)	**Addressing method:**	Soft addressed (does not require an address number)
i)	**Application:**	Indoor use
j)	**Temp range:**	-10°C to +75°C
k)	**Humidity range:**	20% to 95% RH (non-condensing)

5.5 Analogue Addressable Manual Call Points (Indoor)

a)	**Mounting:**	Addition of back-box for surface or single gang socket box for flush fixing
b)	**Wiring:**	2 core loop
c)	**Monitoring:**	Open/short circuit, removal & device type
d)	**Indication:**	Alarm LED (red)
e)	**Operating voltage:**	Loop 19.5 to 20.5 V
f)	**Current:**	Quiescent: 600µA Alarm 700µA
g)	**Operating principle:**	Micro switch
h)	**IP Rating:**	IP24D
i)	**Application:**	Type A - Indoor installation
j)	**Environment:**	Indoor
k)	**Addressing method:**	7-way dipswitch
l)	**Operating principle:**	Micro switch
m)	**Temperature range:**	-10°C to +55°C
n)	**Colour:**	Red
o)	**Humidity range:**	20% to 95% RH (non-condensing)

5.6 Analogue Addressable Loop Powered Beacon Sounders

a) **Sound Projection Level [dBA/1m]:** 102 dBA

b) **Sound types:**	User configurable	
c) Visual indicator:	Light source:	Red LED array
	Light output:	1J
	Flash frequency:	0.8 Hz
d) **Mounting:**	Surface mount with plug in base	
e) **Wiring:**	2-core loop	
f) **Monitoring:**	Open/short circuit, sound output, removal, device type	
g) **Operating voltage:**	Loop powered:	19.5 - 20.5V
	Externally powered:	18 - 30VDC
h) **Loop current:**	Quiescent (when loop powered):	820µA
	Active (when loop powered):	9.6mA
	Quiescent (when externally powered):	470µA
	Active (when externally powered):	500µA
i) **Devices per loop (max):**	20 (1km loop of 1.5mm² cable, 50 m to first device)	
j) **Addressing method:**	7-way dipswitch	
k) **Environmental:**	Application:	Indoor
	IP rating:	IP21C
l) **Operating temperature:**	-10°C to 60°C	
m) **Humidity range:**	10% to 60% RH (non-condensing)	
n) **Colour:**	Red	

5.7 Addressable Line Interface Unit / Line Rely Module

a) **Mounting:**	Equipment cabinet DIN rail, or SMB-DIN1, SMB-DIN2 surface boxes	
b) **Wiring:**	2 core loop (screened)	
c) **Indication:**	LED (red) flashing on operation	
d) **Operating voltage:**	Pulsed loop (19.5 – 20.5V)	
e) **Current:**	Quiescent:	600µA
	Alarm:	700µA
f) **Relay contacts:**	Single pole, change over	
g) **Max switching current:**	1.0A	
h) **Max switching voltage DC:**	30VDC	
i) **Max switching voltage AC:**	40VAC	
j) **Application:**	Indoor installation	
k) **IP rating:**	IP20	
l) **Temp range:**	-10°C to +75°C	
m) **Humidity range:**	20% to 95% RH (non-condensing)	

5.8 Remote Indicator

a) **Operating voltage:**	8.5 to 33 V DC	
b) **Current consumption:**	11 to 14 mA	
c) **Display medium:**	2 LEDs	
d) **Operating temperature:**	0 °C to +65 °C	
e) **Relative humidity:**	< 95% (non condensing)	
f) **Ingress Protection:**	IP 40	

5.9 Network Interface Card

a)	**Mounting:**	Plug and socket-fixes to allotted space on panel main control board
b)	**Comms protocol:**	RS 485
c)	**Baud rates:**	57600, 38000, 33600, 28800,19200,14400. 9600, 4800, 2400, 1200. 600, 300
d)	**Wiring:**	Two cores twisted screened pair - 0.5mm2 minimum
e)	**Current consumption:**	70 mA (total effective load from 24V supply)
f)	**Indication LEDs:**	Green - power on Red (x3) Transmission
g)	**Temp range:**	-10°C to +60°C
h)	**Humidity range:**	10% to 90% RH (non-condensing)

5.10 FIRE RESISTANT CABLE – PH30 (STANDARD)

a)	**Conductor:**	1.5mm² High conductivity annealed stranded plain bunched copper w plain copper wire
b)	**Insulation:**	High temperature fire resistant core wrapping with halogen free comp
c)	**Insulation Colour:**	DIN VDE colour code
d)	**Make-up:**	Multi cores and Multi-pairs
e)	**Screening:**	Overall aluminium foil screen
f)	Sheath:	Non-toxic halogen free low smoke flame retardant compound
g)	**Sheath Colour:**	Red as a standard colour (alternative colours on request)
h)	**Required Standard:**	Fire resistance meeting the test requirements of BS EN 50200 for a 30 survival time at 840°C, which complies to SANS 10139 standard.
i)	**Voltage:**	300/500V
j)	**Performance:**	PH30 burns for 30 minutes at 840°C

5.11 Remote Radio (Ramred) Unit

A. Central Control Unit

i.	**Enclosure:**	Fire resistant and weatherproof (wall-mounted) steel cabinet Painted in grey baked enamel
ii.	**Processor Assembly:**	Z80 microprocessor CPU Telecommunications Control Unit 5 slot expansion chassis
iii.	**Back-up Power Supply:**	12 volt, 18amp/hour battery Provides up to 24hrs backup in the event of mains failure
iv	**Lightning protection:**	All connections taken in or out of the CCU are to be lightning spike protected to ensure failsafe operation
v.	**PSU (Power Supply Unit):**	Mains failure detection Battery low detection and cut-out Battery-fail detection Watchdog timers to monitor CPU failure
vi.	**Telecommunications Control Unit:**	Allows connection of Desktop Telecommunications Unit 8 contact type inputs from Fire Alarm Panel (expandable to 64) RS232 asynchronous computer terminal port

vii.	**Transceiver:**	Two-way transceiver 30 watt FM two-way radio to provide approximate 30 kilometre range

B. Desktop Telecommunications Unit

i.**Enclosure:**	PVC Housing (face-plate and back-box)
ii **Push Button Operations:**	Fire / Ambulance / Request Speech / System Check
iii **Intercom Unit:**	Allows direct two-way communication with the Fire / Emergency Centre

6. FIRE SUPPRESSION SYSTEM

6.1 FM200 Gas

a) **Product name:**	FM 200
b) **Chemical Formula:**	CF_3CHFCF_3
c) **Tradename:**	FE-227 2-Hydroperfluoropropane Propane, 1,1,1,2,3,3,3-Heptafluoro- HFC-227eaHP 2-Hydroheptafluoropropane Heptafluoropropane 2-H-heptafluoropropane 1,1,1,2,3,3,3-Heptafluoropropane R-227 R227 HFC-227ea
d) **Product Use:**	Fire extinguishing agent
e) **Form:**	Liquefied gas
f) **Odour:**	None
g) **Melting point/range:**	-131 °C
h) **Boiling Point:**	-16.4 °C
i) **Vapour Pressure @ 20°C:**	3.91 bar
j) **Vapour Density @ 20°C:**	31.18 kg/m³
k) **Liquid Density @ 20°C:**	1407 kg/m³
l) **Ozone Depletion Potential:**	0
m) **Molecular Weight:**	170.03
n) **Critical Temperature:**	102.8°

6.2 Extinguishant Release Control Panel

a) **INPUTS:**	Supply Voltage:	24 V DC
	Door Contact:	To monitor the state of a door leading to the protected area
	Hold:	To hold off on the automatic discharge, if so desired
	Knock 1:	EOL @ 3k3 Ohm, activation resistor @ 680 Ohm

		Knock 2:	EOL @ 3k3 Ohm, activation resistor @ 680 Ohm
b)	**POWERED OUTPUTS:**	24v CI/O (on 1st Knock):	24 V DC
		Bell (on 1st Knock)	24 V DC
		Initiate (on 2nd Knock):	24 V
		Discharge:	24 V DC, 1 A fused (24 V DC is on temporarily for either 5 seconds or 5 minutes – depending on link P14 setting)
c)	**POTENTIAL FREE OUTPUTS:**	Initiate:	1x potential free changeover contact
		Discharge:	1x potential free changeover contact
		Auto/Man:	2x potential free changeover contact
		Fault:	1x potential free changeover contact
d)	**REPEATER OUTPUTS:**	Repeater RS485 Comms	
e)	**CURRENT CONSUMPTION:**	Quiescent current in Auto mode:	40.2 mA
		Quiescent current in Manual mode:	58 mA

6.3 Emergency / Evacuation Illuminated Sign

a)	**Power Supply:**	24 V DC
b)	**Alarm current:**	350 mA
c)	**Construction:**	Powder coated metal enclosure
d)	**Dimensions:**	Height: 210 mm
		Width: 298 mm
		Depth: 45 mm

7. INTERCOM SYSTEM

7.1 Audio Server

a)	**Power:**	220VAC, 4W max.
b)	**Temperature range:**	-15°C - +55°C
c)	**Relative humidity:**	95%
d)	**Processor subsystem:**	NXP LS1043
e)	**Storage subsystem:**	Solid state (1048 MB Flash), MicroSD, USB
f)	**Memory:**	1048 MB SDRAM, 1048 MB NAND Flash, 128 MB NOR Flash
g)	**Subscriber Capacity:**	552 intercom stations per server
h)	**IP Telephones:**	552 IP telephones per server
i)	**IP security:**	Hardware root of trust, SSH, HTTPS, firewall
j)	**SIP:**	RFC 3261, SIP INFO, RE-Invite, RFC 2833, RFC 4733,
k)	**VoIP Internal Networking:**	125 channels
l)	**VoIP External Networking:**	125 channels
m)	**Configuration:**	Over IP, Web
n)	**Monitoring and logging:**	SNMP trap, SNMP MIB, syslog, Web, e-mail, SqLite
o)	**VoIP Audio:**	HD Audio - 16 kHz, HD Voice G.722 (7 KHz),

		Telephone Audio - G.711 (3.4 KHz)
p)	**Open Duplex Conference:**	20 open duplex conferences can be configured A maximum of 16 subscribers can participate in conference simultaneously
q)	**Push to Talk Conference:**	50 conference channels Unlimited number of participants Priority features
r)	**Group Call 250 groups:**	Unlimited number of participants Priority features
s)	**Call Modes:**	Open mode, Ringing mode, Call request mode Priority features
t)	**Audio messaging:**	PA broadcasting, Auto-attendant, Voice guidance (doors, elevators) Security voice response

7.2 IP Desktop Master Station with Display & Handset

a)	**Ethernet:**	1 x RJ45 10/100 Mbps with PoE
b)	**IP protocol:**	IP v4 – TCP – UDP – HTTPS – TFTP – RTP – RTCP DHCP – SNMP – DiffServ – TOS – STENTOFON CCoIP - SIP
c)	**LAN protocol:**	Power over Ethernet (IEEE 802.3 a-f) VLAN (IEEE 802.1pq) / network access control (IEEE 802.1x) STP (IEEE 802.1d) / RSTP (IEEE 802.1d-2004)
d)	**Audio:**	Wideband 200Hz – 7kHz (G.722) / telephony 3.4kHz (G.711) Acoustic echo canperimetering / open duplex / adaptive jitter filter / Active noise filtering 1.5W speaker output @ 8 Ohm
e)	**Video:**	Only supported in AlphaCom environments Codecs supported: MJPEG Resolution: 320 x 240 (qVGA)
f)	**Management:**	HTTPS (web interface) DHCP and static IP Automatic remote update Centralized monitoring Status LEDs
g)	**Display:**	3.5" Transmissive TFT with touchscreen panel Active area 70 x 52.5mm 320 x 240 dots 262,000 colors LED backlight (white)
h)	**Operational voltage:**	Power over Ethernet: IEEE 802.3 a-f, class 0
i)	**Power input:**	Circa 10 W
j)	**Environmental conditions"**	-20°C to +55°C

7.3 SIP Phone

a)	**Audio Features:**	HD voice: HD handset, HD speaker Wideband codec: G.722 Narrowband codec: G.711(A/μ), G.723.1, G.729AB,G.726, iLBC DTMF: In-band, Out of-band (RFC 2833) and SIP INFO Full-duplex hands-free speakerphone with AEC
b)	**Phone Features:**	2 VoIP accounts Call hold, mute, DND

	One-touch speed dial, hotline
	Call forward, call waiting, call transfer
	Group listening, SMS, emergency call
	Redial, call return, auto answer
	Local 3-way conferencing
	Direct IP call without SIP proxy
	Ring tone selection/import/delete
	Set date time manually or automatically
	Dial plan
c) **IP-PBX Features:**	Busy Lamp Field (BLF)
	Anonymous call, anonymous call rejection
	Message Waiting Indicator (MWI)
	Voice mail, call park, call pickup
	Intercom, paging, music on hold, emergency call
	Call completion, call recording, hot-desking
d) **Display and Indicator:**	2-line keys with LED
	6 features keys: message, headset, redial, tran, mute, hands-free speakerphone
	6 navigation keys
	Volume control keys
e) **Interface:**	2xRJ45 10/100M Ethernet ports
	Power over Ethernet (IEEE 802.3at), class 2
	1xRJ9 (4P4C) handset port
	1xRJ9 (4P4C) headset port
f) **Power consumption (PSU):**	1.2-1.9W
g) **Power consumption (PoE):**	1.8-2.3W
h) **Operating humidity:**	10--95%
i) **Operating temperature:**	-10 to +50°C

7.4 Sub-station IP with 1 Button

a) **Protection:**	Vandal resistant design 2 mm stainless steel front plate
	Tamper proof fastening screws, buttons and loudspeaker grills
b) **Call button:**	16 mmØ stainless steel
c) **Power:**	Power over Ethernet, IEEE 802.3 a-f
	Local power (9-27 VDC)
	Max. 8W
d) **Connectors:**	2xRJ45 (Ethernet) 10/100 Mbit/sec.
	Pluggable screw terminals.
e) **IP protocols:**	IP v4 - TCP - UDP - HTTP - RTP - RTCP -
	DHCP - DiffServ - TOS – STENTOFON CCoIP
f) **Audio technology:**	Wideband 200 Hz - 7 kHz (G.722)
	Telephony 3.4kHz (G.711)
	Acoustic echo compensation
	Open duplex
	Adaptive jitter filter
	1.5Watt audio output

		External audio output (0 dB, 600 ohm)
g)	**Installation:**	Remote automatic software upgrade
		Centralized provisioning
		DHCP and static IP
		Integrated web server
h)	**Operation:**	Network supervision
		VoIP statistics
		Centralized monitoring, Tone test
i)	**Advanced features:** and	Dual port Ethernet switch for connecting CCTV cameras
		other IP stations.
		Programmable inputs, (closing contact) to monitoring door status and alarms if not used for call buttons.
		Programmable relay output for door control, switch on beacon, etc. (1A at 24V DC)

7.5 Rainshield Stainless steel

a)	**Construction:**	Stainless Steel
b)	**Installation:**	Gooseneck / Surface Mount

7.6 Stainless Steel Intercom Gooseneck with Baseplate

a)	**Construction:**	Stainless Steel gooseneck for superior durability in coastal areas
		Universal mounting plate
b)	**Dimensions:**	51mm diameter x 1355mm total height x 280mm overhang

8. ACCESS CONTROL SYSTEM

8.1 Fingerprint Processing Unit – Take-ons

(a) **Fingerprint sensor:**	Single fingerprint optical sensor
	500 dpi resolution, 256 grey levels
	(23mm x 25 mm) acquisition area
(b) **Authentication:**	< 0.7 sec
(c) **Identification:**	< 0.9 sec in 1:1000 mode
(d) **Internal database:**	From 500 to 5000 users
(e) template & image formats:	ISO 19794-2, ANSI/INCITS 378
	ISO 19794-4, WSQ compressed image
(f) **Interface:**	USB

8.2 Fingerprint reader: Indoor (Type 1)

(a) **CPU:**	ARM Cortex A9 core 1GHz
(b) **Contactless reader options:**	Prox, iClass, MIFARE/MIFARE Plus/DESFire/NFC
(c) **Network/Communication:**	Ethernet, RS485, USB
	Wi-Fi option
(d) **Power supply:**	12V 24V DC, Power over Ethernet (PoE)

(e) Up to 10,000 users (30,000 templates) in 1: N identification mode

(f) 1:10,000 user matching in 3 second
(g) Up to 250,000 users in 1:1 verification mode
(h) **Inputs/outputs:** Wiegand In & Out (customizable up to 512 bits), Door Relay, 2 General Purpose Inputs (including Door monitoring), 2 General Purpose Outputs
(i) Tamper switches
(j) **Internal storage capacity:** 512MB Flash, 512MB RAM
- 1: N mode: 3,000 user records, extendable to 10,000 with license (3 templates each, including 1 duress)
1:1 mode: 250,000 user IDs
- 1 Million transaction logs
(k) **Anti-fraud features:** Fake finger detection
Duress finger
Timed anti-pass back function
Banned/authorized user lists
(l) **Operating temperature:** -20° to +55°C
(m) **Humidity:** 10% to 80% (non-condensing)
(n) **Ingress protection:** IP65
(o) **Mechanical impact protection:** IK08

8.3 Fingerprint reader: Indoor

(a) **CPU:** ARM Cortex-A9 core 1GHz
5" WVGA color Touchscreen, VGA Camera
(b) **Contactless reader options:** Prox, iClass, MIFARE/MIFARE Plus/DESFire
(c) **Network/Communication:** Ethernet, RS485, RS422, USB Wi-Fi and 3G options
(d) **Internal storage capacity:** 512MB Flash, 512MB RAM +, 8GB microSD Card
5000 user records (2 fingers + 1 duress each), extendable up to 100 000 with licenses
250,000 IDs in authorized user list
1 Million transaction logs
10,000 face picture logs
(e) **Inputs/outputs:** Wiegand In & Out (customizable up to 512 bits),
Door Relay, 3 GPI (including Door monitoring), 3 GPO
(f) **Operating temperature:** -20° to +60°C
(g) **Humidity:** 10% to 80% (non-condensing)
(h) **Ingress Protection:** IP65
(i) **Power supply:** 12V-24V DC
Power over Ethernet (PoE)
(j) Tamper switches

8.4 Fingerprint reader: Outdoor

(a) **CPU:** ARM Cortex-A9 core 1GHz
5" WVGA color capacitive touchscreen with ambient light sensor
(b) **Contactless reader options:** Prox, iClass, MIFARE/MIFARE Plus/DESFire
(c) **Internal storage capacity:** 512MB Flash, 1GB RAM + 8GB microSD Card
5000 user records (2 fingers + 1 duress each), extendable up to 100,000 with licenses

	250,000 IDs in authorized user list 1 Million transaction logs 10,000 face picture logs
(d) Network/Communication:	Ethernet, RS485, RS422, USB Wi-Fi option
(e) Inputs/outputs: Relay, 3	Wiegand In & Out (customizable up to 512 bits), Door GPI (including Door monitoring), 3 GPO
(f) Operating temperature:	-20° to +60°C
(g) Relative humidity:	10 to 95% (non condensing)
(h) Power supply:	12 to 24 V DC (1A min @12V) Power over Ethernet (PoE)
(i) Tamper switches	
(j) Ingress protection:	IP65
(k) Mechanical impact protection:	IK09

8.5 Multi-function Single-door Controllers with backup batteries

(a) Input Voltage:	10 V DC to 30 V DC, polarity sensitive,	
(b) Power Requirements:	Current (mA)	Power (W)
12 V DC with no peripherals connected and relays off	37	0.44
(c) Processor:	Type: ARM Cortex M0 operating at 45MHz Total RAM: 4 K Byte Flash: 48 K Byte	
(d) Anti-tamper Switch:	Micro-lever Switch	
(e) Relays:	Relay Output: 2 Relays Contact Ratings: 10 A at 28 V DC, 5 A at 220 V AC, 10 A at 120 V AC Operations: 100 000 Minimum.	
(f) Digital Inputs:	2 Dry-contact inputs with End-of-line (EOL) Sensing and 2 Dry-contact inputs without End-of-line (EOL) Sensing	
(g) Communications:	Direct: (Baud Rate 115 200) S-Bus: (Baud Rate: 9600)	
(h) Operating Temperature:	-25°C to +60°C	
(i) Humidity Range:	0 to 95% relative humidity at +40°C non-condensing	

8.6 Cluster / Network / Master Controllers

(a) Processor:	32-bit ARM Cortex M3 operating at 180MHz	
(b) Memory:	200 KB RAM, 16 MB Flash Memory	
(c) Buffered transfers:	100 000	
(d) Communications Ports:	Clustering Feature:	(Baud Rate 115 200)
	S-Bus (Host):	(Baud Rate 7 600)
	Host Computer:	Standard Ethernet RJ45 connector, 10/100 Base T, half or full duplex, Proprietary Protocol

	RS485 Door Controller:	RS485, 38 400 Baud, 8 data bits, no parity
	RS485 System Controller:	RS485, 38 400 Baud, 8 data bits, no parity.
(e) **Input voltage:**	12 - 15 VDC, polarity sensitive	
(f) **Power requirements at 12 VDC:**	140 mA current 1.7 W power	
(g) **Operating:**	-20°C to +60°C	
(h) **Humidity Range:**	0 to 75% relative humidity at +40°C noncondensing	
(i) **IP Rating:**	IP20.	
(j) **Anti-tamper Protection:**	PCB mounted switch	
(k) **RTC:**	1 x 3 V, CR2032 Lithium cell battery. 2 yrs. operating life, 5 yrs. storage life	

8.7 Electromagnetic locks

A. 300KG Mortice mount

i. Slim-line, Mortise Mount type.
ii. Handle a minimum force of 3000N (300Kg).
iii. Input voltage 12/24VDC.
iv. Current drawn between 250mA and 500mA.
v. Finish – Anodized Aluminium
vi. Typical dimensions: 230 (L) x 40 (W) x 25 mm (D).
vii. Monitoring – relay.
viii. All bolts and nuts used for this installation shall be tamperproof. None of these bolts must be visible from secured side of the door.
ix. The magnetic lock shall furthermore be installed in such a way that no wires of the magnetic lock are visible.

B. 300KG standard surface mount

Slim-line, standard surface mount type
(a) Handle a minimum force of 3000N (300Kg).
(b) Input voltage 12/24VDC.
(c) Current drawn between 250mA and 500mA.
(d) Finish – Anodized Aluminium.
(e) Typical dimensions: 270 x 50 x 25 mm.
(f) Monitoring – relay.
(g) All bolts and nuts used for this installation shall be tamperproof. None of these bolts must be visible form secured side of the door.
(h) The magnetic lock shall furthermore be installed in such a way that no wires of the magnetic lock are visible

8.8 Electromechanical locks

A. Exterior doors

i. **Operating Voltage:**	12-24 VDC (-10%/+15%)

ii.**Current consumption:** max 270 mA (24 VDC) idle 240 mA (12 VDC) max 270 mA (24 VDC) idle 110mA (24 VDC)	max 550 mA (12 VDC)
iii.**Monitoring:** (deadlock status)	Microswitch 0.4A 30V AC
iv.**Operational temperature range:**	-20°C to +60°C
v.**Case/Cover:**	High Purity zinc alloy
vi.**Forend:**	25mm
vii.**Adjustable Backset:**	25, 30, 35mm
viii.**Latchbolts:**	Bolt throw 14.5mm
ix.**Door Clearance:**	3-5 mm
x.**Cylinder:**	ABLOY classic or ABLOY Disklock Pro
xi.**Cabling Recommended cable:**	0.82mm^2 cable runs up to 30m
xii.**Standard Finishes:**	Chrome plated forend, lock case yellow chrome plated

B. Interior doors

i.**Voltage:**	12-24 Vdc -10%/ +15% STAB
ii.**Current:** 270mA (max) 110mA holding @24Vdc	550mA (max) 240mA holding @12Vdc
iii.**Monitoring:** (deadlock status)	Microswitch 0.4A 30V AC
iv.**Operational temperature range:**	-20°C to +60°C
v.**Case/Cover:**	High Purity zinc alloy
vi.**Forend:**	25mm
vii.**Backset:**	25, 28, 30, 33, 35mm (adjustable)
viii.**Latchbolts:**	Double action latch 14.5mm
ix.**Door Clearance:**	3-5 mm
x.**Cylinder:**	ABLOY classic or ABLOY Disklock Pro
xi.**Cabling Recommended cable:**	0.82mm^2 cable runs up to 30m
xii.**Standard Finishes:**	Chrome plated forend, lock case yellow chrome plated

C. Double Cylinder

CONSTRUCTION

i.**Cylinder housing:**	Brass outside cylinder housing of case-hardened steel
ii.**Cylinder plug:**	Brass
iii.**Discs and washers:**	Tin bronze
iv.**Number of discs:**	11

8.9 Heavy duty door closer

(a) Adjustable spring size 1–4.

(b) The closer must allow for disabled persons and be adjustable to meet 4 kg maximum opening force requirements for exterior doors.

(c) Compact closer body and cement case maximum 50mm deep suited for thin slab concrete construction.
(d) Accommodates doors weighing up to 120 kg and measuring up to 1080 mm wide interior and 910 mm exterior.
(e) Shall handle mechanical back check of approximately 70°.
(f) Dual thermostatic control valves combined with special hydraulic fluid provide controlled closing from 175°
(g) Have a pressure relief valve protects closer from damage caused by forced closing.
(h) Closer adjustment in cement case provides 10mm lateral,
(i) 6 mm longitudinal, and 4mm height adjustment
(j) Shall have optional sealing compound SC-1 to prevent water or cleaning solvent from entering the cement case
(k) Valve adjustment 15° 0°.
(l) Valve adjustment 175° 15°.
(m)Mechanical back check at approximately 70°.
(n) Single point hold open units available at 90° and 105°.

8.10 Green break glass

a) The break glass shall be able to switch 50VAC or 30 VDC @ 8A.
b) The break glass shall be able to switch 50VDC @ 3A.
c) Environmental Conditions:
d) Temperature Range: -40°C – +85°C.
e) Relative Humidity: 0 – 90% Non-Condensing Relative Humidity.
f) The break glass shall be operable with a glass lens or a resetable lens.
g) The break glass shall have surface and flush mounting options.
h) The break glass shall have a high quality micro switch.
i) The break glass shall have the standard EN54 symbols on it.
j) Accept hinged cover as a standard.
k) The break glass shall have a built in key test site.
l) Break glass units shall be in accordance with BS 5839-2.
m) The unit shall be large enough to cover 65 mm o/ conduit draw box when the unit is surface mounted.
n) Flush mounted units shall be provided with a special flush mounting box, which can accept electrical conduit terminations.
o) Surface mounted units shall be deep enough to terminate 20 mm ø conduits into the unit, and shall be mounted solidly on the wall by means of their back plates.
p) The wiring terminals of the unit shall be able to accept wiring lugs, and shall be of the screw and clamp plate type to hold a lug firmly pressed against its contact surface. Spring loaded push-in contacts will not be acceptable.
q) The glass shall not be damaged when it is pressed.
r) The glass shall be resettable with a standard break glass key
s) The glass shall be marked with the standard EN54 symbols and/or a "PRESS HERE" indication.

8.11 Door position switch/door status monitor (Recessed)

(a) Operating gap (minimum) 10 mm.
(b) Connection via 4 wires.
(c) Contact type must be NC or NO.

(d) Typical Dimensions Ø72 x 40 mm to Ø76 x 40 mm
(e) Colour: White.
(f) Minimum Contact switching rating: 100V @ 0.5A
(g) Environmental Conditions:

- Operating Temperature Range: -40 to +65° C
- Relative Humidity: 5 – 95 % Non-Condensing

8.12 Overhead Mounted Magnetic Switches

a)	**Contact Rating:**	10W/VA
b)	**Switching Voltage (Max.):**	200 VDC
c)	**Switching Current (Max.):**	0.5 Amp.
d)	**Contact Resistance (Min.):**	150 milli ohms
e)	**Life Expectancy:**	10x 10 6 Operations
f)	**Insulation Resistance:**	10 9 ohms
g)	**Shock Resistance:**	30G for 11mSec.
h)	**Vibration Resistance:**	20G (10 to 1000) Hz)
i)	**Armour Jacket:**	Stainless Steel (Type 304)
j)	Ideal for use on metal doors	

8.13 Roller Shutter Door Contacts

a)	**Contact type:**	3 Single-pole NO contact
b)	**Operating distance:**	34mm +/- 5mm
c)	**Power input Max:**	40V DC
d)	**Switching current Max:**	500mA
e)	**Contact capacity Max:**	6W
f)	**Transition resistance Max:**	0,15 W
g)	**Breakdown voltage:**	>250 V
h)	**Connecting cable:**	4 x 0,14 mm² Cu tinned, suitable for LSA technique
i)	**Outer cable colour:**	Grey
j)	**Inner conductor:**	Blue, green, yellow, red
k)	**Cable dimension:**	Ø 3,2mm
l)	**Metal hose:**	1. 1 m, ø6 x 9 mm steel galvanized, PVC coated
m)	**Magnet:**	Ø 12 x 55mm AlNiCo 5, axial polarized
n)	**Housing colour:**	grey
o)	**Temperature range:**	-40°C to +70°C
p)	**Ingress Protection:**	IP67

8.14 Override key switch

a) Three (3) high security keys, with key certificates.
b) Electrical Contacts:
c) Double Change-Over Contact.
d) Minimum Contact Rating: 100V @ 0 5A.
e) Mounting Accessories

8.15 Reports Printers.

a) **Print speed:** Black: Up to 17 ppm
Color: Up to 4 ppm
b) **Print technology:** Laser
c) **Print resolution technologies:** 600 x 600
d) **Print cartridges number:** 4 (1 each black, cyan, yellow, magenta), 1 imaging drum
e) **Printer management:** Windows: Device Toolbox, Status Alerts (default install); Mac: Utility
f) **Scan type:** Flatbed, ADF
g) **Print speed:** Up to 7.5 ipm (b&w), up to 5.5 ipm (color)
h) **Scan resolution Enhanced:** Up to 1200 dpi; Hardware: Up to 1200 x 1200 dpi; Optical: Up to 1200
i) **Scan technology:** Contact Image Sensor (CIS)
j) **Scan file format:** Windows Scan SW supports file format: JPG, RAW(BMP), PDF, TIFF, PNG; Mac Scan SW supports file format. TIFF, PNG, JPEG, JPEG-2000, PDF, PDF Searchable, RTF, TXT
k) **Bit depth/Grayscale Levels:** 24-bit/256
l) **Standard connectivity:** Hi-Speed USB 2.0 port; built-in Fast Ethernet 10/100Base-TX network port, Wireless
m) **Network capabilities:** Via built-in 10/100Base-T TCP/IP networking
n) **Network Ready:** Standard (built-in Fast Ethernet, WiFi 802.11 b/g/n)
o) **Wireless capability:** Yes, built-in WiFi 802.11b/g/n, WPA/WPA2
p) **Modem:** 33.6 kbps
q) **Memory:** 128 MB
r) **Processor speed:** 600 MHz
s) **Duty cycle (monthly):** Up to 20,000 pages
t) **Control panel:** 3.0 in 960 x 240 pixel backlit graphical display; touchscreen buttons (Home, Cancel, Help, Right/Left Arrows, Back); LED indicator lights (Ready, Error, Wireless)
u) **Display:** 3.0-in LCD (color graphics)
v) **Power supply required:** Input voltage: 220VAC (+/- 10%), 50 Hz
w) **Power consumption:** 290 watts
x) **Operating:** 15°C to 30°C
y) **Relative Humidity:** 20 – 80% RH

8.16 Webcam

A. Basic requirements

i.1 GHz
ii.512 MB RAM or more
iii.200 MB hard drive space
iv.Internet connection
v.USB 1.1 port (2.0 recommended)

B. For HD 720p video calling and Full HD 1080p video recording:

i.2.4 GHz Intel® Core™2 Duo
ii.2 GB RAM
iii.200 MB hard drive space

iv. USB 2.0 port
v. 1 Mbps upload speed or higher
vi. 1280 x 720 screen resolution

C. **Technical Specifications**

i. Full HD 1080p video capture (up to 1920 x 1080 pixels) with recommended system
ii. HD video calling (1280 x 720 pixels) with recommended system
iii. Logitech Fluid Crystal™ Technology*
iv. Autofocus
v. Photos: Up to 8 megapixels (software enhanced)
vi. Built in mics with automatic noise reduction
vii. Hi-Speed USB 2.0 certified (recommended)
viii. Universal clip fits laptops, LCD or CRT monitors

8.17 Programmable Logic Controllers

a)	**Processor:**	Intel® Atom™ Z510, 1.1 GHz or equivalent
b)	**Flash memory:**	64 MB
c)	**Main memory:**	512 MB RAM
d)	**Interfaces:**	2 x RJ 45, 10/100/1000 Mbit/s, DVI-D, 2 x USB 2.0
e)	**Diagnostics LED:**	1 x power, 1 x TC status, 2 x bus status
f)	**Clock:**	Internal battery-backed
g)	**Operating system:** Standard	Embedded Linux, Windows CE or Windows Embedded
h)	**Power supply:**	15-30 V DC
i)	**Dielectric strength:**	500 V (supply/internal electronics)
j)	**I/O Current:**	1A
k)	**Operating Temperature:**	-15°C to +60°C
l)	**Relative Humidity:**	95 %, no condensation

8.18 Door Control Modules

a)	**Interfaces:**	2 x RJ 45 Ethernet, 10/100 Mbit/s (Autosensing)
b)	**Diagnostics LED:**	1 x Power, 1 x TC status, 2 x Bus Status
c)	**Operating system:** Standard	Embedded Linux, Windows CE or Windows Embedded
d)	**Power supply:**	15-20 V DC
e)	**Dielectric strength:**	500 V (supply/internal electronics)
f)	**I/O Current:**	500 mA
g)	**Operating Temperature:**	-15 to +60 °C
h)	**Relative humidity:**	95 %, no condensation
i)	**Digital Inputs:**	8
j)	**Digital Outputs:**	4

8.19 Control Modules

a)	**Interfaces:**	2 x RJ 45 Ethernet, 10/100 Mbit/s (Autosensing)
b)	**Diagnostics LED:**	1 x power, 1 x TC status, 2 x bus status

c)	**Operating system:** Standard	Embedded Linux, Windows CE or WinDows Embedded
d)	**Power supply:**	15-30 V DC
e)	**Dielectric strength:**	500 V (supply/internal electronics)
f)	**I/O Current:**	500 mA
g)	**Operating Temperature:**	-15 to 160 °C
h)	**Relative humidity:**	95 %, no condensation
i)	**Digital Inputs:**	16
j)	**Digital Outputs:**	16

9. ALARM SYSTEM

9.1 Zones Control Panel Expandable to 48 zones

c)	**Zones:**	8-48
d)	**Zone expansion (Star, Bus or Wireless):**	22
e)	**Number of expansion buses:**	1
f)	**Partitions/Areas:**	4
g)	**Groups per partition:**	4
h)	**User Codes:**	60
i)	**Programmable Outputs:**	6-38
j)	**Output Expansion Modules:**	4
k)	**Supervised Power Supplies:**	8
l)	**Digital Key Readers:**	16
m)	**Keypads:**	12
n)	**Account numbers:**	8
o)	**Weekly time schedules:**	16
p)	**Event Log:**	250 to 512
q)	**Main Power:** AC	16.5VAC - 25VAC transformer from 220V
r)	**Auxiliary Power:**	12V DC - 1.5A
s)	**Battery - maximum allocatable:**	12V DC - 17 AH
t)	**Programmable outputs on main board:** and four 70 mA O.C.	6 - one 3A relay, one 500mA open collector
u)	**Operating Temperature:**	0°C-55°C

9.2 8 Zone wired bus expander module

a) Switched auxiliary power output
b) 22 Programmable zone types
c) Programmable loop response for each zone from 10ms to 4 hours
d) Zone termination - N/C, N/O, end-of-line resistor and double end-of-line resistor

9.3 Outdoor Dual Technology Detectors

a)	**Detection method:**	Two microwave and Two, PIR channels
b)	**Wide angle coverage:**	15m 90°
c)	**Long-range coverage:**	23m 5°
d)	**Barrier coverage:**	15m 5°

e) **Mounting height:** 1m to 2.7m
f) **Pet immunity:** Animals up to 70cm head height with no weight limitation
g) **Anti-mask and dirty lens indications:** Via 4 active IR channels
h) **Operating voltage:** 9-16 VDC
i) **Current consumption Relay mode at 12V:** 45mA typical, 70mA maximum
j) **Current consumption bus mode at 12V:** 30mA typical, 55mA maximum
k) **Alarm contact:** NC, 100mA, 24 VDC
l) **Tamper contact:** NC, 100mA, 24 VDC
m) **Anti-mask contact:** NC, 100mA, 24 VDC
n) **Dirty lens output:** 70mA open collector
o) **RF immunity:** 40V/m from 30MHz to 2 GHz
p) **Environment rating:** IP 65
q) **Operating temperature:** -30°C to 60°C

9.4 Indoor Dual Technology Detectors

a) **Pet Immunity:** Yes
b) **Current Consumption:** 12mA
c) **Alarm Contacts:** NC, 100mA, 24VDC maximum
d) **Tamper Contacts:** NC, 100mA, 24VDC maximum
e) **Alarm Time:** 2,2 seconds, minimum
f) **Adjustable Pulse Count:** 1,2,3
g) **Temperature Compensation:** Automatic, thermister controlled
h) **Swivel adjustment:** Horizontal ±35° Vertical: +5°,-20°
i) **Optical filtering:** White light protection, pigmented lens
j) **RF Immunity:** (10MHz to 1GHz)
k) **Operating Temperature:** -10°C to 50°C

9.5 Dual Technology Detectors (360 deg)

a) **Detection technologies:** Dual element PIR + Microwave
b) **Operating voltage:** 9 to 16VDC
c) **Current consumption:** 15mA at 12V
d) **Alarm contacts:** 100mA, 24V, N.C
e) **Tamper contacts:** 100mA, 24V, N.C.
f) **PIR lens coverage:** 110° angle, 360° overview
g) **Detection zones 60:** 30 Fresnel facets arranged in 3 optical levels; 12 external, 12 middle and 6 internal facets
h) **Optical filtering:** White light protection
i) **Selectable pulse count:** 1,2 (alternate polarity)
j) **Temperature compensation:** Microprocessor controlled
k) **RF immunity:** 30V/m from 10MHz to 1GHz
l) **Walk Test:** Display 3 LEDs
m) **Operating temperature:** 0°C to 55°C
n) **Installation Height:** Up to 4m

9.6 Fixed Word LCD Keypad

(a) Low profile touchscreen keypads with proximity available in black or white
(b) Intuitive menu-driven user interface
(c) Proximity Key Readers for easy arm/disarm operation
(d) Program Transfer Module for program backup and copying

9.7 LED Keypad

a) **LCD Viewable Area:**	99 mm x 24 mm	
b) **Current Draw:**	125 mA (Max)	
c) **Voltage:**	12 VDC Nominal	
d) **Operating Environment:**	0° to 49°C	
e) **Relative Humidity:**	5% to 93%	

9.8 VHF Transmitter

a) **Frequency Range:**	132 - 174 MHz	
b) **Channel Spacing:**	12.5 KHz	
c) **Operating Voltage:**	10.5 to 13.8 Volts DC	
d) **Modulation Method:**	FM	
e) **Frequency tolerance:**	5 ppm	
f) **Narrow Bandwidth Spurious Emissions:**	a) Harmonic	> 60 dB
	b) Non-harmonic	> 70 dB
g) **Deviation:**	Adjustable between 1.5 and 2.5 KHz	
	Nominal	Approximately 2 KHz
	Temperature range	-10 to + 60 C
	Class of Emission	F3E
	Antenna Impedance	50 Ohms
h) **Current Consumption:**	Standby	30 mA
	Transmit	1.8 Amps at 12V nominal
i) **Antenna Socket:**	Internal tamper proof antenna connection	
j) **Transmission Duration:**	90 - 360 mS	
k) **Telemetry Inputs:**	Output voltage range	
	Positive Trip - 10.8~14V	
	Negative Trip - Open Collector 0~0.5V	
	The transmitter inputs accommodate only the above alarm panel output voltage ranges	
	Alarm panels which do not meet this requirement will require a level converter interface.	

Reports a 4-digit code number, customer ID and 2hardwired telemetry conditions:

i. panic
ii. alarm
iii. TIP
iv. RING

Contact ID interface support:

i. Up to 4 partitions are supported / reported
ii. Up to 31 zones reported
iii. (zone 32 reserved for universal or unknown zone)
iv. Up to 15 users / key holders reported
v. (user 16 reserved for universal or unknown user)

9.9 Seismic/Safe detector

a) **Current Draw:** 16 mA (Max)
b) **Sensitivity Setting:** Dual Stage Potentiometer
c) **Latching/Non-Latching:** (SS-101) 1st + Subsequent or Any (SS-102) 1st + Subsequent or Any + 6 Wire
d) **Indicator:** Two Color LED
e) **Relay Contact Rating:** 150 mA, 24 V Resistive, 10 Ohm 1/4 Watt
f) **Time Relay Open in Alarm:** 1 Second (Min)
g) **Operating Environment:** -20° to 60° C
h) **Relative Humidity:** 0% to 90%
i) **Min sound Pressure Level:** 15 mA
j) **Operating Voltage:** 9 – 15 VDC
k) **Alarm Output:** 28 VDC, 500 mA
l) **Tamper Protection:** Dual tamper alarm for cover and base plate
m) **Low-voltage Alarm:** Voltage drops below 7.5 V
n) Up to 3-meter range, sensitivity adjustments, UL & CE approved

9.10 Door Contacts - Flush mounted

a) **Contact Rating:** 10W/VA
b) **Switching Voltage (Max.):** 200 VDC
c) **Switching Current (Max.):** 0.5 Amp.
d) **Contact Resistance (Min.):** 150 milli ohms
e) **Life Expectancy:** 10 x 106 Operations
f) **Insulation Resistance:** 10 9 ohms
g) **Shock Resistance:** 30G for 11mSec.
h) **Vibration Resistance:** 20G (10 to 1000Hz)
i) **Armour Jacket:** Stainless Steel (Type 304)

9.11 Fixed Panic Transmitter Panic Buttons

a) **Electrical Rating:** 230 VDC, 4 Amp.
b) **Operating temperature:** -20degree C to +80 degree C
c) **Switching current:** 1.25A
d) **Product type:** Panic Switch
e) **Emergency Button:** Glows in the dark
f) **Operating voltage:** 12VDC

9.12 Wireless detector receiver module for remote arm / disarm functions

A. Description

i. Up to 128 users
ii. Full user identification
iii. Programmable from the keypad
iv. 2 relay outputs with 1A contacts
v. More receivers for more partition control

vi Excellent remote range
vii.Communicates with the Alarm Panel via a keypad bus
viii.Secure code hopping functionality
ix The receiver can learn most rolling code transmitters
x.Remote buttons can be programmed to arm/disarm; stay arm, panic, relay1, relay2, or no action
xi.3 Second any button panic option
xii.Receiver shall have two outputs ideal for gate/garage or light control
xiii.Dedicated tamper zone

9.13 1,2, 4 & 6-Button Remote Transmitters

A. Description

i.Code-Hopping Encryption
ii.Unique antenna design incorporating the Keyring increases operating range by 50%
iii Crystal frequency-controlled within +/- 100KHz
iv.Frequencies available are 403.55MHz and 433.92MHz
v.12V Battery operation - GP23A Alkaline Cell
vi.Typically 2 years battery life expected under normal use
vii.LED flashes when there is a low battery condition
viii.Rubber buttons are easy to press and click positively

9.14 15Watt, 12V Outdoor Siren

A. Key features

i. 2 Tones: Steady or Yelp
ii. High Impact ABS Plastic
iii. Weather Resistant
iv. IP65 outdoor siren
v. 108 dB @12V
vi. 600mA @ 12VDC

10.EMERGENCY VOICE ALARM COMMUNICATION SYSTEM

10.1 Fireman's Microphone

a)	**Power Source:**	24V DC
b)	**Current Consumption:**	100mA (RM-300MF), 550mA (with 3 RM-320F connected) 150mA max. (in terms of RM-300MF)
c)	**Frequency Response:**	200 – 15,000 Hz
d)	**Distortion:**	Under 3%
e)	**S/N Ratio:**	Over 55 dB
f)	**Microphone:** compressor	Unidirectional dynamic microphone with talk key. (on/off switchable)
g)	**Volume Control:**	Microphone volume control / Buzzer volume control
h)	**Connection Cable:** lines,	Main line: shielded CPEV cable (each one pair of Audio Data line

		Power supply line) or Category 5 Shielded Twisted Pair cable for LAN (CAT5 STP), M3 screw terminal
i)	**No of Function Keys:**	20
j)	**Operation:** key,	Emergency key, Evacuate key, Alert key, Emergency reset
		CPU switch, Reset switch
k)	**Operating Temperature:**	5°C to 45°C
l)	**Operating Humidity:**	5% to 95% RH (no condensation)

10.2 Voice Alarm System Amplifier

(a) Power Supply:	230VAC ± 10%, 50Hz
(b) Power Consumption:	600W
(c) Rated output:	240W
(d) Frequency Response.	50 – 20,000 Hz, 3dB (at 1/3 rated output)
(e) Distortion:	Under 0.8% (at rated output, 1kHz)
(f) S/N Ratio:	Over 85dB
(g) RM Link 1.2 in:	2 RJ45 female connector for connecting the RM-300MF/RM-200M — Remote Microphone. Maximum distance: RM1.2 Total 800 m Link cable: Category 5 Shielded Twisted-Pair straight cable (CAT5-STP)
(h) Network I/F:	RJ45 female connector for switching hub or PC — 10 BASE-T/100 BASE-TX Circuit (Selectable by automatic negotiation) Maximum distance: 100m between this unit and a switching hub or PC Link cable: Category 5 Shielded Twisted-Pair straight cable (CAT5-STP)
(i) VM Link:	RJ45 female connector Maximum distance of 800m Link cable: Category 5 Shielded Twisted-Pair straight cable (CAT5-STP)

10.3 Voice Alarm System Controller

a)	**Power Supply:**	230V ± 10%, 50Hz
b)	**Battery Voltage:**	24Vdc
c)	**Performance Distortion:**	<1%@rated output power, 1 kHz
d)	**Inputs Mic / Line Sensitivity:**	1mV / 1V
e)	**S/N (flat max volume):**	63 dB
f)	**S/N:**	75 dB (flat at min volume/muted)
g)	**Limiter:**	Automatic
h)	**BGM and PC call station Input type:**	Cinch stereo (converted to mono)
i)	**Impedance:**	22 kOhm
j)	**S/N (flat at max volume):**	70 dB
k)	**Activation:**	Programmable
l)	**Supervision:**	On EMG inputs, programmable
m)	**Supervision method:**	Series / parallel resistor
n)	**Power handling capacity:**	120/240/480 Watts
o)	**Operating temperature range:**	+5°C to +55°C
p)	**Relative humidity:**	<95%

q)	**Acoustic noise level of fan:**	<48 dB SPL @ 1m, at max speed
	temperature	
		controlled 0 to max speed
r)	**MESSAGES**	
	Distortion.	<0.1% @ 1 kHz
	S/N (flat at max volume):	>80 dB
	Memory capacity:	16 MB Flash ROM
	Number of messages:	Max. 255
	Data retention time:	>10 years

10.4 Voice Alarm Call Station Keypad with 6 zone call buttons

a)	**Voltage range:**	18 – 24V
b)	**Current consumption:**	<30 mA Call Station
		<15 mA Key Pad
c)	**Nominal sensitivity:**	85 dB SPL (gain preset 0dB)
d)	**Nominal output level:**	700 mV
e)	**Maximum input sound level:**	110 dB SPL
f)	**Operating temperature range:**	-10°C to +55°C
g)	**Relative humidity:**	<95%

10.5 1600/480/240/120 Watt Amplifier

a)	**Power Supply:**	230V ± 10%, 50Hz
b)	**Distortion:**	<1%@rated output power, 1 kHz
c)	**S/N:**	(flat at max volume) >90 dB
d)	**Sensitivity:**	1 V
e)	**Impedance:**	20 kOhm
f)	**CMRR:**	>25 dB (50 Hz - 20 kHz)
g)	**100 V Input (Screw, unbalanced)**	
	Sensitivity:	100 V
h)	**Impedance:**	330 kOhm
i)	**Outputs**	
	Nominal Level:	1 V
	Impedance:	Direct connection to line input Loudspeaker Outputs (Screw, floating)
j)	**Max/rated Output Power**	
	70 / 100 V Output:	720 W / 480 W
	8 ohm Output:	62 V (480 W)
k)	**Output Power @ 24 V**	
l)	**Operating Temperature:**	-10 to +55°C
m)	**Relative Humidity:**	<95%
n)	**Acoustic Noise Level of Fan:**	<48 dB SPL @ 1 m

10.6 CD/MP3/Tuner Player (BGM Source)

a)	**Power Supply:**	230V ± 10%, 50Hz
b)	**TUNER**	
	Tuning range:	87.5 - 108 MHz

		530 - 1610 kHz
c)	**Sensitivity:**	FM 2 µV (26 dB S/N) AM 30 µV (20 dB S/N)
d)	**Performance:**	Frequency response: 30 Hz - 15 kHz (-1/-3 dB, FM)
e)	**Distortion:**	<1%
f)	**S/N:**	>63 dB (1 m V, FM)
g)	**CD-PLAYER**	
	Audio CD:	**Frequency response 20 Hz - 20 kHz (+1/-3 dB)**
	Distortion:	<0.1%
	S/N:	>80 dB
h)	**MP3 CD/CD-R**	
	Supported bit rates:	CBR 32 kbps - 320 kbps and VBR, mono and stereo
i)	**Data buffer (shock protection):**	8 MByte
j)	**Lifetime:**	>10.000 CD play cycles
k)	**Memory for track selection:**	999 tracks (MP3), 99 tracks (audio CD)
l)	**Operating temperature range:**	15 to +55°C
m)	**Relative humidity:**	<95%

10.7 Evacuation Ceiling Speakers with Fire Dome

(a)	Max. power:	9 W
(b)	Rated power (PHC):	6 W (6 - 3 - 1.5 - 0.75 W)
(c)	Sound pressure level at 6 W/1 W:	98 dB/90 dB (SPL) (at 1 kHz, 1 m)
(d)	Effective frequency range:	90 Hz to 20 kHz (-10 dB)
(e)	Opening angle:	180° / 50° (at 1 kHz/4 kHz, -6 dB)
(f)	Rated voltage:	100 V
	Rated impedance:	1667 Ω
(h)	Speaker size:	152.4 mm
(i)	Ambient temperature range:	-25°C to +55 °C
(j)	Connection:	3 pole screw connector
(k)	Dimensions (dia x max. depth):	216 x 70 mm
(l)	Mounting cut-out dia.:	196 mm
(m)	**Rated Input:**	6W (100V line), 3W (70V line)
(n)	**Rated Impedance:**	100V line: 1.7 kΩ (6W), 3.3 kΩ (3W), 6.7 kΩ (1.5W), 15 kΩ (0.8W) 70V line: 1.7 kΩ (3W), 3.3kΩ (1.5W), 6.7 kΩ (0.6W), 13 kΩ (0.4W)
(o)	**Sensitivity (1W, 1m):**	90 dB (500 – 5,000Hz, pink noise
(p)	**Frequency Response:**	55 – 18,000 Hz (peak -20dB)
(q)	**Speaker Component:**	12cm cone-type

10.8 35Watt Evacuation Horn Speakers

a)	**Max. power:**	52.5 W
b)	Rated power (PHC):	35 W (35-17.5-8.75 W)
c)	**Sound pressure level at Rated Power/1 W (at 1 kHz, 1m):**	127 / 112 dB (SPL)
d)	**Effective frequency range:**	380 Hz to 5 kHz (-10 dB)

e) **Opening angle:** 50° / 25° (at 1 kHz/4 kHz, -6 dB)
f) **Rated input voltage:** 100 V
g) **Rated impedance:** 286 Ω
h) **Ambient temperature range:** -25°C to +55 °C

10.9 Panel Loudspeakers

a) **Maximum power:** 9 W
b) **Rated power:** 6 / 3 / 1.5 / 0.75 W
c) **Sound pressure level at 6W / 1 W (1 kHz, 1 m):** 96 / 88 dB
d) **Opening angle at 1 kHz / 4 kHz (-6 dB):** 160° / 85° (horizontal)
180° / 100° (vertical)
e) **Rated voltage:** 100 V

(a) **Dimensions:** 2200mm (H) x 1000 mm (W) x 1100 mm(D)

11.WALK THROUGH METAL DETECTOR

11.1 General Specifications

The metal detector shall consist of a free-standing walk-through frame with an integral control unit, and shall be suitable to detect metallic objects on a person by means of the magnetic field principle.
The metal detector shall be capable of detecting ferrous and non-ferrous metals, as well as mixed alloy metals.
The metal detector shall be equipped to eliminate false alarms, such as belt buckles, keys and coins.
The metal detector shall scan the entire area of the walk-through area and detect metal objects on a person passing through to the levels as specified
The metal detector shall incorporate a self-test function to confirm that the system is operating correctly. The self-test function shall be easily activated and deactivated.
The metal detector shall be completely tamper-proof
The program and sensitivity push buttons shall be so arranged that tampering by unauthorized persons is entirely eliminated. Programming panels shall be lockable (with a key) and pin/password protected.
The metal detector shall not be adversely affected by stationary metal bars or structures in the vicinity of the unit or moving metal near the archway.
The metal detector shall be capable of operating adjacent to X-Ray inspection units and/or other metal detectors at a distance of 5cm apart.
The detector is intended for indoor use at an altitude of up to 1800m above sea level.
The operation of the metal detector shall not be adversely effected by re-positioning of the frame within certain limits of its original adjusted position
The metal detector shall have multi-zone vertical detection zones for the full height of a person. Each zone shall have a display bar with proportional indication on the vertical sides of the metal detector.

11.2 Construction

(a) The metal detector shall comprise a free standing walk through frame containing the detector coils and the control unit, complete with a 3m length of flexible cable and 16A RED dedicated 3-pin plug top. The cord and plug top shall comply with the relevant SABS specifications.
(b) The frame and the control unit shall be of robust construction and the base of the frame shall be designed to ensure rigidity.
(c) The unit shall be able to execute a full body scan (multiple zone scanning) and detect metal objects down to the lower feet level within the settings specified.
(d) The finish shall be durable and maintenance free. The panels shall be fully washable.
(e) The panels shall be equipped with shock absorbent edges to protect them against damages.
(f) The type of material used for the construction of the frame and control unit must be stated by tenderers.
(g) The colour range in which the metal detectors are available must be stated by tenderers. The client shall then select a colour finish to suit the environment.
(h) All material consisting of metal shall be treated against corrosion. All non-visible parts may be galvanized, while all visible parts shall be powder coated.
(i) The approximate internal dimensions of the frame shall be as follows.
- Walk-through height 2m
- The walk-through width: 820mm.

11.3 Control System

The system shall operate by means of automatic level control adjustable to environmental changes, without the need to reset.
The system shall not require initial or periodic calibration.
The control unit shall be equipped with the following:

- "ON-OFF" main switch and "MAINS ON" indicator light.
- Selector switch with at least ten sensitivity settings, with a maximum sensitivity to consistently detect metal at least the size of a R5.00 coin.

The detector shall be capable of operating at high detection speeds of up to 15 meters/second.
Visual indication in the form of vertical display bars shall give an indication of the volume of metal on a person in accordance with the sensitivity settings. When the "ALARM" zone is activated it shall simultaneously activate an audible alarm having a continuous tone and adjustable volume. The alarm system will automatically reset after the metal has passed through the frame.
The visual alarm shall also indicate the position (height above the ground) of the metal passing through the detector.
The system shall be modular to facilitate easy maintenance and repairs.

11.4 Safety Features

(a) All electronic and electrical components shall be protected by lockable panels.
(b) The detectors shall not have any effect on heart pacemakers, defibrillators or any other vital life supporting systems.
(c) The detector shall not affect magnetic storage media or camera film.

11.5 Electricity Supply

(a) The detectors shall be designed for connection to a 230V ± 10%, 50Hz, single phase, three wire (phase, neutral and earth) power supply.
(b) The maximum power consumption shall not exceed 30VA.

(c) A suitable and efficient battery back up / UPS system to facilitate power failures of minimum 60 minutes must be incorporated in the detector

11.6 Throughput

(a) The system shall accept a passage of at least 50 persons per minute without functional overload

11.7 Technical

(a) **Safety Standards:**	Safe for wearers of heart pacemakers, pregnant women and magnetic recording materials.
(b) **Temperature:**	10 °C to 70 °C
(c) **Humidity:**	0 to 95%, no condensation
(d) **Protection:**	IP 41
(e) **Alarm:**	Audible: High acoustic intensity alarm signal. Visible: Multi-zone display bar for "height on person" localization
(f) **Alarm Time:**	Adjustable
(g) **Sensitivity:**	100 sensitivity steps in each program
(h) **Calibration:**	Automatic or manually set.
(i) **Network Connections:**	Remote Security Monitoring System compatible (RS422 and Ethernet)

12.X-RAY MACHINE

12.1 The X-ray inspection unit shall be supplied complete with:

(a) Dual Energy Detector system (Multi Energy Imaging)
(b) Colour monitor (remotely operated)
(c) Conveyor belt
(d) Screening for full profile of inspection tunnel.
(e) Discharge roller table
(f) UPS

12.2 Construction Details

(a) The unit must incorporate a facility to be controlled either from the right or the left-hand side.
(b) In addition, a facility must be incorporated so that the operating keyboard and monitor can be operated remotely, at least 5m from the unit.
(c) Maximum height including the tunnel shall not exceed 1400mm from the floor level
(d) The unit must be quiet when in operation.
(e) X ray high voltage generator, shall be rated at 160kV and operate at 140kV
(f) Ambient conditions, under which the unit must operate

- 0°C to 50°C
- Relative humidity 95%, non-condensing

(g) Control elements (pushbuttons, switches, etc.) are to be of sturdy design, selected for severe operating conditions.
(h) The unit must be of steel base construction on roller castors and not exceeding 700kg in total weight.
(i) Discharge rollers to be included with the unit. The discharge roller platform shall be long enough to prevent articles being X-rayed from falling off before it is recovered by the owner.

(j) The conveyor belt must be designed for 24 hour, heavy-duty operation
(k) The unit shall not be more than 900mm wide and 2600mm in overall length, including the conveyor belt platform.

12.3 Power Ratings

(a) The unit has to operate from 230V ±10%, 50 Hz, single phase power supply.
(b) The maximum running current shall be less than 5A.
(c) A suitable power point will be provided on the site by others

12.4 Image Presentation

(a) Objects of the following dimensions must be able to be passed through the tunnel without any obstruction:
- Height: at least 400mm
- Width: at least 600mm
- Length: unlimited

(b) Monitor display shall cover not less than 500mm of the object length.
(c) Full scan volume must be seen on the screen, without any corner cut-off. **This is a firm requirement.**
(d) Imaging scale of all objects should be constant with the minimum distortion.
(e) A zoom facility is essential. The optimum requirement is for the push-button selection of at least 9, independent zoom sectors. The selected sector must be identified by light frame before zoom is activated.
(f) A colour monitor (non-interlaced), screen size of at least 54cm, is required. **Parallel operation of additional monitors, without modification to the unit, must be available.**
(g) The image on the monitor screen must be flicker free.
(h) Control of brightness and of contrast must be provided on the front panel of the monitor.
(i) Possibility of switching over from "POSITIVE" to "NEGATIVE" image should be available as an option.
(j) A digital memory is essential
(k) The capacity of the digital memory must exceed 1Mbyte.
(l) The number of solid-state detectors shall be not less than 1152.
(m)Dual (Multi) energy colour system with a four (4) colour (Industry Standard) is a firm requirement.
(n) Organic/inorganic colour stripping.
(o) High and low penetration.
(p) Variable colour stripping and variable gamma edge enhancement.
(q) Automatic density (variable) threat alert.
(r) Automatic organic material threat alert.
(s) Operator log-in identification facility
(t) Video output capabilities for recording of images shall be included.
(u) Voltage stabilizer must be included.
(v) UPS shall be included to provide minimum 60 minutes back-up.

12.5 Resolution and Penetration

(a) A sample wire with diameter of 0.16mm (AWG 34) must be distinguished on a monitor, and 30AWG wire must be visible behind 24mm of aluminium.
(b) The image quality on the monitor must be uniform, without distortion in the centre or

the edges
(c) Penetration of 25mm steel minimum must be guaranteed.
(d) A pre-selectable density threat level must be a feature of the equipment, with a visual and/or audible alarm if any item being screened exceeds that pre-selected density.
(e) The x-ray dose shall not exceed 0.7μSv (0.07mrem)

12.6 Controls

(a) A mains key switch for 230V ±10% main power supply is required.
(b) Push button – power "ON".
(c) Push buttons for conveyor control, "GO", "STOP" & "REVERSE".
(d) As a minimum, 9 push button key board for zoom sector selection and a separate push button for zoom activation is required.
(e) A robust, RED, emergency stop push button, fitted in a prominent position on the keyboard, as well as on the X-ray unit (entry and exit points).
(f) Light symbols indicating "X-ray on".
(g) X-ray warning signs, in accordance with the requirements of the SA Radiation Board, must be attached to each end of the tunnel in a visible position.
(h) Easy operation of the unit is essential.
(i) The system shall not require initial or periodic calibration.

12.7 Passage of luggage through X-Ray unit

(a) Objects must be able to be conveyed through the unit in any orientation.
(b) All objects, also those which are only partially lying flat on the conveyor belt (e.g. guitars, etc.) must be fully screened

12.8 Object orientation and presentation

(a) The conveyor belt speed should be such that each point of an object, when passing through the unit, will be visible for at least 5 seconds
(b) Objects must be able to be conveyed through the unit in any orientation.
(c) All objects, also those which are only partially lying flat on the conveyor belt (e.g. guitars, etc.) must be fully screened.

12.9 Conveyor belt

- **Loading**

(a) At least 75kg overall weight
(b) The conveyor belt must be driven by an almost noiseless drum-motor.

- **Dimensions**

(a) Belt length: ± 2100mm
(b) The height of the top of the conveyor belt above floor level shall be not less than 600mm, but shall not exceed 800mm.

- **Speed and duty cycle**

(a) Conveyor belt speed: approximately 0.2 m/sec.
(b) Up to 2400 objects must be screened per hour.

- **Operation**

(a) Normal: Continuous operation in forward direction.
(b) Stop:
(c) Reverse: Intermitted operation by pressing the reverse button.
(d) Duty cycle: No warm-up period will be accepted.

12.10 Safety features

(a) All electronic and electrical components shall be protected by lockable panels.
(b) Tenderers must guarantee the unconditional safety of photographic material of professional quality. Film safety must be guaranteed up to ISO 1600 (33 DIN).
(c) Typical standards must allow for highly sensitive films of 1000 ASA to be irradiated at least 30 times without damage.
(d) The feed and discharge ends of the conveyor belt are to be of such design that fingers, etc. cannot be caught during normal operation.
(e) The X-ray tube shall be automatically de-energized when conveyor belt is stopped.
(f) X-ray radiation shall only be switched on with the moving conveyor belt, before the object passes through the unit.
(g) X-ray radiation shall be automatically switched off if the radiation shielding covers are removed.

12.11 On-board computer

(a) Video Memory: at least 2 GB RAM
(b) Processor Speed: at least 3.2 GHz
(c) Storage Capacity: At least 160 GB
(d) Video Card: At least 256 MB VGA
(e) The screen shall be able to lock in order to stop personnel from misusing the PC for other purposes than the intended.

12.12 Search Area/Reception Unit.

This type of x-ray inspection unit shall comply with the following specifications:

(a) Typical Dimensions:
- Tunnel Dimensions: Approximately 654 mm (W) X 455 mm (H).
- Items placed on the conveyer belt can have an unlimited length.
- Conveyor Height: Approximately 700 mm.
- Conveyor Speed: Approximately 13.7m/min

Typical Weight allowed on the conveyer belt Approximately – 165kg distributed load

13.BOOM AND SPIKE BARRIER COMBINATION

(a) The height of the barrier above ground level shall be 50mm to 70mm.
(b) The length of the exposed spikes shall be 90mm.
(c) The thickness of the spikes shall be 10mm.
(d) The distance between the spikes shall be 90mm to 120mm.
(e) Activation of the spikes shall be one second or faster.
(f) The width of the barrier shall be 3m.
(g) The boom arm shall be manufactured from aluminum and white powder coated with red reflective tape every 250mm.
(i) A traffic signal light with a red and green light shall be provided.
(j) The diameter of the lights shall be 150mm or more.
(k) As the boom lowers the spike barrier will raises to its full height and the traffic signal light shall be red. When the spikes are recessed and the boom is lifted the traffic signal light shall be green. The boom arm shall lower and raise time shall be less than 4 seconds.
(l) All electrical equipment shall be installed in IP 54 enclosures. Full electrical isolation and overload protection shall be provided. In case of power or mechanical failure it shall be possible to manually override the spike boom barrier. An isolator shall be provided in the control room from where the system shall be operated / monitored. All cabinets shall be powder coated in red and white. Electric motors shall be of standard 220V AC, 100% duty cycle, and instant reverse torque drive. Sleeves shall be installed for all data and electrical cabling. Data and electrical cabling shall be installed in separate sleeves.
(m) The spikes lower before the boom arm opens. This ensures a safe passage for the vehicle to pass through. The boom arm can't open unless the spikes have lowered completely by means of an inter-lock.
(n) The spike barrier shall be capable of being interfaced with single or multiple remote triggering devices
(o) The spike barrier foundation box shall be constructed to handle 20 tons of axle load.

14.NETWORK BACKBONE

14.1 L3 Gigabit Fibre switch with 24 Gigabit SFP slots and 2 combo ports (RJ45/SFP)

a) **Physical Ports:**	24 1000Base-X ports 2 Combo G (RJ-45/SFP) ports (2 10/100/1000Base-T) 1 RJ-45 console port
b) **Performance:**	Switching Capacity: 48Gbps Forwarding Rate: 35.7Mpps MAC Address Table Size: 8K Packet Buffer Size: 0.75MB
c) **L2 Features:**	Auto-negotiation for port speed and duplex mode Flow Control: IEEE 802.3x & Back-Pressure Spanning Tree Protocol: ▪ IEEE 802.1D Spanning Tree Protocol (STP) ▪ IEEE 802.1w Rapid Spanning Tree Protocol (RSTP) ▪ IEEE 802.1s Multiple Spanning Tree Protocol (MSTP) ▪ Spanning Tree Fast Forwarding

- Loopback detection
- Auto edge port
- BPDU filtering/guard
- Root guard

VLANs:

- Support 4K IEEE 802.1Q VLANs, port-based VLANs, protocol-based VLANs, IP-subnet based VLAN, GVRP
- Private VLAN

Link Aggregation:

- Static Trunk, IEEE 802.3ad Link Aggregation Control Protocol
- Trunk groups, 8
- Trunk links: 2~8 for Gigabit Ethernet port
- Trunk links: 2~4 for 10 Gigabit Ethernet port

IGMP Snooping

- v1/v2/v3
- Immediate leave
- IGMP SNP leave proxy

d) L2 Features:

2K IP Address entries
64 static routes and 512 net table
32 IP interface support
IP ARP RARP
Super-netting (CIDR)
RIPv1, RIPv2, and OSPF
IGMP v1/v2, PIM-DM , PIM-SM, DVMRP*
VRRP

e) Management:

Switch Management:

- CLI via console port or Telnet
- WEB GUI management
- SNMP v1, v2c, v3
- IP clustering

Firmware & Configuration.

- Dual firmware images
- Firmware upgrade via TFTP/FTP/Xmodem
- Multiple configuration files
- Configuration file upload/download via TFTP/FTP server
- Supports RMON (groups 1, 2, 3 and 9)
- Supports BOOTP client

LLDP & LLDP-MED

f) IPv6 Features:

IPv4/IPv6 Dual Protocol stack
IPv6 address type (unicast/multicast)
ICMPv6 and ICMPv6 redirect (host)
IPv6 neighbour discovery
Stateless and statefull auto configuration
SNMP, HTTP, SSH, Telnet over IPv6
IPv6 syslog and TFTP support

g) Temperature:

0°C to 45°C (Standard Operating)

h) Humidity:

5% to 95% (Non-condensing)

14.2 **Industrial 10-Port Managed PoE Ethernet Switch with 8* 10/100TX 802.3af PoE + 2*Gigabit combo SFP port**

a)	**Standards:**	IEEE 802.3 10Base T Ethernet; IEEE 802.3u 100Base TX/FX; IEEE802.3ab 1000Base-T, IEEE802.3z Gigabit fibre; IEEE802.3x Flow Control and Back Pressure; IEEE802.3ad Port trunk with LACP, IEEE802.3af Power over Ethernet; IEEE802.1d Spanning Tree/IEEE802.1w Rapid Spanning Tree; IEEE802.1p Class of Service; IEEE802.1Q VLAN Tag; IEEE 802.1x User Authentication (Radius); IEEE802.1ab LLDP
b)	**Switch Architecture:**	Back-plane (Switching Fabric): 5.6 Gbps Packet throughput ability (Full-Duplex): 8.3M pps@64 bytes
c)	**Transfer Rate:**	14,880 pps for Ethernet port 148,800 pps for Fast Ethernet port 1,488,000 pps for Gigabit Ethernet port
d)	**Packet Buffer:**	1 Mbits
e)	**MAC address:**	8K MAC address table
f)	**Flash ROM:**	4 Mb
g)	**DRAM:**	32 Mb
h)	**Connector:**	10/100TX: 8 x RJ-45 10/100/1000T: 2 x RJ-45 SFP Combo ports: 2 x 100/1000 SFP RS-232 connector; RJ-45 type
i)	**PoE Pin Assignment:**	RJ-45 port # 1~# 8 support IEEE 802.3af End-point, Alternative A mode. Per port provides 15.4W ability.
j)	**Protocol:**	CSMA/CD
k)	**Power Supply:**	External Power Supply: DC 48V, Redundant power DC 48V, removable terminal block
l)	**Power Consumption:**	136 Watts (Full Load)
m)	**Operating Humidity:**	5% to 95% (Non-condensing)
n)	**Wide Operating Temperature:**	(-40°C ~ 65°C)

14.3 **L3 Gigabit Fibre Core Switch with 24 Gigabit SFP slots and 2 combo ports (RJ45/SFP)**

a)	**Switch layer:**	L3
b)	**Basic switching RJ-45 Ethernet ports qty:**	24
c)	**Basic switching RJ-45 Ethernet ports type:**	Gigabit Ethernet (10/100/1000)
d)	**SFP+ module slots quantity:**	2
e)	**Console port:**	RJ-45
f)	**Copper Ethernet cabling technology:**	1000BASE-T, 100BASE-TX, 10BASE-T
g)	**USB 2.0 ports quantity:**	1
h)	**Networking standards:**	IEEE 802.1ab, IEEE 802.1D, IEEE 802.1p, IEEE 802.1Q, IEEE 802.1s, IEEE 802.1v, IEEE 802.1w, IEEE 802.1x, IEEE 802.2, IEEE 802.3, IEEE 802.3ab, IEEE 802.3ac, IEEE 802.3ad, IEEE 802.3ae, IEEE 802.3az, IEEE 802.3u, IEEE 802.3x, IEEE 802.3z

i)	**Full duplex:**	Yes
j)	**10G support:**	Yes
k)	**VLAN support:**	Yes
l)	**Port mirroring:**	Yes
m)	**Link aggregation:**	Yes
n)	**Switching capacity:**	212 Gbit/s
o)	**Throughput:**	158 Mbps
p)	**Management protocols:**	SNMP v1/v2/v3
q)	**Form factor:**	1U
r)	**Internal memory:**	1024 MB
s)	**Operating temperature:**	0° to 45° C
t)	**Operating relative humidity:**	5% - 85%
u)	**Power supply:**	100-240VAC, 50-60Hz voltage
v)	**Power consumption (typical)**	52.8 W

14.4 **PoE Smart Managed 24 Port 10/100/1000 with PoE + 2*Gigabit combo SFP port Field Switch**

a)	**Port types:** Gigabit SFP	24 x 10/100/1000 + 2 x 10 Gigabit SFP+ + 2 x combo
b)	**Power Over Ethernet (PoE):**	PoE+
c)	**Capacity:**	MAC addresses : 16384 IPv4 routes (static) : 1024 IPv6 routes (static) : 1024 IPv4 routes (dynamic) : 8160 IPv6 routes (dynamic) : 4096 Maximum member ports per LAG : 8 Maximum dynamic ports per switch stack : 144 LAG groups : 128 OSPF routes : 8160 RIP routes : 512 ECMP next hops per route : 4 ECMP groups : 64 VLAN routing interfaces : 128 VLANs supported : 4094 Multicast entries (IPv4) : 512 Multicast entries (IPv6) : 256 ARP entries : 6144 NDP entries : 400 ACL : 160 Maximum rules per ACL : 1023 Max ACL rules system-wide : 4096 Maximum ACL rules per interface (IPv4) egress rules : 1024 Maximum ACL rules per interface (IPv4) ingress rules : 3072 Maximum ACL rules per interface (IPv6) egress rules : 512

		Maximum ACL rules per interface (IPv6) ingress rules : 1021 Maximum VLAN interfaces with ACLs applied : 24
d)	**RAM:**	1 GB
e)	**Flash Memory:**	256 MB
f)	**MAC Address Table Size:**	**16K entries**
g)	**Routing Protocol:**	OSPF, RIP-1, RIP-2, IGMPv2, IGMP, VRRP, PIM-SM, PIM-DM, IGMPv3, OSPFv3, MLDv2, MLD
h)	**Advanced Switching:**	Layer 3
i)	**Features:**	Broadcast Storm Control, Dynamic VLAN Support (GVRP), Protocol based VLANs support, Quality of Service (QoS), Rapid Spanning Tree Protocol (RSTP) support, Weighted Round Robin (WRR) queuing, auto-negotiation, dual firmware images, flow control, layer 2 switching, layer 3 switching, port forwarding, Energy Efficient Ethernet, port mirroring, redundant fans, stackable, tagged VLAN, Generic VLAN Registration Protocol (GVRP), LLDP support, Link Aggregation Control Protocol (LACP), MDI/MDI-X switch, Multiple Spanning Tree Protocol (MSTP) support, Network Access Control (NAC), Per-VLAN Rapid Spanning Tree (PVRST)
j)	**Compliant Standards:**	IEEE 802.1D, IEEE 802.1Q, IEEE 802.3, IEEE 802.3ab, IEEE 802.3ac, IEEE 802.3ad (LACP), IEEE 802.3ae, IEEE 802.3az, IEEE 802.3u, IEEE 802.3x, IEEE 802.3z, IEEE 802.1ab (LLDP), IEEE 802.1ag, IEEE 802.1p, IEEE 802.1s, IEEE 802.1v, IEEE 802.1w, IEEE 802.1x, IEEE 802.2
k)	**Remote Management**	Protocol HTTP, RMON, SNMP, SNMP 2, SSH
l)	**PORTS (2ND):**	2 x 10 Gigabit SFP+
m)	**PORTS (3RD):**	2 x combo Gigabit SFP

14.5 Multi-mode Fibre SFP Transceiver

a)	**Capacity:**	100Mbps half-duplex (200Mbps full-duplex)
b)	**Fibre Type:**	62.5/125um Multi-mode
c)	**Maximum Cable Distance:**	2km
d)	**Wave Length:**	1310nm
e)	**IEEE:**	802.3u 100BASE-FX
f)	**Temperature Operating:**	-40°C ~ 70°C
g)	**Humidity Operating:**	10% to 90% Non-condensing
h)	**Power Budget:**	13dB
i)	**Power Voltage:**	3.3V
j)	**Output Optical Power:**	Max: -14dBm Min: -19dBm

14.6 Fibre Optic Patch Panel / Splice Box

a)	**Capacity:**	Maximum 12/24/48 cores
b)	**Adapters output:**	12/24/48 core
c)	**Environment temperature:**	-10°C ~ +60°C
d)	**Humidity:**	0-90%, non-condensing
e)	**Multimode Insertion Loss:**	0.2dB Maximum

f)	**Single mode Insertion Loss:**	0.2dB Maximum
g)	**Multimode Adaptor Wavelength:**	850 to 1300nm
h)	**Single-mode Adaptor Wavelength:**	1310 to 1550nm
i)	**Connector Type:**	ST/SC/LC
j)	**Panel Type:**	Sliding
k)	**Single/Multimode:**	Single/Multimode
l)	**Simplex/Duplex:**	Simplex/Duplex
m)	**Rack Height:**	1U

14.7 Low Count Duct Optic Fibre Cable

i. The cables shall be specifically designed for employment of low fibre counts in the duct environment.
ii. These cables shall be suitable for duct applications, both long haul and for LAN backbone in the industrial environment.
iii. A non-metallic construction shall ensure lightning immunity.
iv. The cables shall be finished with high modulus glass strength members, applied contra-helically, to withstand high installation tensions, and to eliminate torsional stresses.
v. The tough water-resistant outer sheath as well as the gel filled loose tube shall ensure the cables' suitability for the duct environment.
vi. The cables shall be available in either flame retardant PVC or Low Smoke Zero Halogen (LSZH), fire retardant, non-toxic sheaths to comply with the strictest building regulations
vii. This cable shall be small and lightweight, and tolerate a small bend radius for ease of installation. The small cable size also makes it possible to efficiently utilise duct space.

14.8 Low Loss Single Mode Optic Fibre

i. The cables shall be ideally suited for industrial applications, specifically designed for short haul duct installations.
ii. A non-metallic construction shall ensure lightning immunity.
iii. These cables shall be robust and provide experimenterent protection from crushing forces.
iv. They shall provide sustained reliability over a wide temperature range.
v. They shall remain relatively stress free while the cable contracts and expands with temperature differences.
vi. The tough water-resistant sheath and gel filled tubes ensure its suitability for the duct environment.
vii. In addition, the cable shall be available with a Low Smoke Zero Halogen (LSZH) sheath to comply with the strictest building regulations.

15.RACKS

15.1 Floor Standing 19" Racks

a)	**Nominal height:**	21U, 24U, 27U, 33U, 38U, 42U or 47U (1U = 44.45mm).
b)	**Outer width:**	800mm
c)	**Outer depth:**	1000mm
d)	**Maximum load capacity:**	1000kg
e)	**Protection class:**	IP40
f)	**Front doors:**	Perforated steel curved front doors
g)	**Back doors:**	Two-leaf perforated steel back doors

h)	**Side panels:**	Full steel dismounted on latches with a lock assembly option
i)	**Cable ducts:**	Five brush ducts in the ceiling Eight cable ducts in the floor
j)	**Cable organizer:**	2 pcs - mounted on rack rails
k)	**Frame thickness:**	1.5mm
l)	**Mounting rail thickness:**	2.0mm
m)	**Door thickness (steel):**	1.2mm
n)	**Side panel thickness:**	1.2mm
o)	**Base thickness:**	1.2mm
p)	**Top cover thickness:**	1.2mm
q)	**Shelf:**	2 pcs
r)	**Vertical organizer.**	2 pcs
s)	**Power strip):**	1 pc
t)	**Fans:**	4 pcs
u)	**Lock:**	2 pcs
v)	**Wheels:**	4 pcs
w)	Feet:	4 pcs
x)	Protection against rust, oxidation, scratches, corrosion	

15.2 Wall Mount 19" Swing Rack

a)	**Nominal height:**	4U, 6U, 9U, 12U, 15U, 18 (1U = 44.45mm).
b)	**Outer width:**	600mm
c)	**Outer depth:**	600mm
d)	**Mounting depth:**	275mm
e)	**Maximum load capacity:**	60kg
f)	**Protection class:**	IP20
g)	**Front doors:**	Glass with a lock
h)	**Side panels:**	Full steel dismounted on latches with a lock assembly option
i)	**Cable ducts:**	2 pcs - ceiling and floor
j)	**Frame thickness:**	1.2mm
k)	**Mounting rail thickness:**	1.5mm
l)	**Door thickness (steel):**	1.2mm
m)	**Glass thickness:**	5.0mm
n)	**Side panel thickness:**	1.2mm
o)	**Base thickness:**	1.2mm
p)	**Cover thickness:**	1.2mm
q)	**Fans:**	2 pcs
r)	**Earth points:**	2
s)	Protection against rust, oxidation, scratches, corrosion	

15.3 19" Rack Accessories

A. Cooling fan Unit

Performance:	195m³/h
Noise level:	<48dB
Height:	38mm
Width:	120mm

Depth:	120mm
Colour:	Black
Housing:	Aluminium housing

B. Brush Panels

Construction

Panel: 0.060 Aluminum
Finish: Black Powder Paint
Brush: Nylon
50mm Base plate

C. Cat6/6e Brush Panels

24-Port Patch Panel:	16 GA CRS
Jack Housing:	High Impact, Flame Retardant Plastic, UL 94V-0
Spring Wire:	Phosphor Bronze
110 Connector:	Phosphor Bronze Alloy with 100 micro-inch Alloy
Gold Rating:	50 Micro-inches of Gold over 100 micro inches of Nickel
Surface Finish:	Black Powder Coat
Mating Force:	100 Grams MIN/Contact
Temperature Range:	-40° ~ 70°C
Plug Retention in Jack:	50N (11 LBS SQ)
Current Rating:	1.5 AMP DC
Contact Resistance:	2.5 MILOHMS MAX

D. Cable Routing Panels.

i.Product Type:	Rack cable management panel (horizontal)
ii.Product Material:	Steel
iii.Colour:	Durable black powder coated finish
iv.Rack Size:	19inch

E. Cable Routing Rings.

No. of Rack Spaces	1	
Material	Steel	
Colour	Black	
Width (mm)	483	
Height (mm)	43.7	
Depth (mm)		86

F. Cable Jumper Ring Bracket.

Accessory Type	D-ring

Height (mm)	43.18
No. of Rack Spaces	1
Material	Polycarbonate
Colour	Black
Width (mm)	222
Depth (mm)	143.7

G. Shelves.

Frame Type:	Steel
Mounting Options:	Front Mount (Front and Rear)
U Height:	1U
Weight Capacity (Stationary):	79.6 kg
Colour:	Black
Enclosure Type:	Steel
External Depth:	700 mm
External Height:	43.7 mm
External Width:	482 mm
Maximum Mounting Depth:	974 mm
Minimum Mounting Depth:	495 mm
Rail Thickness:	1.2 mm

H. Blank Panels.

U Height:	1U / 2U / 3U / 4U
Colour:	Black
Enclosure Type:	Steel – Vented or Solid
External Depth:	15 mm
External Height:	88.1 mm
External Width:	482 mm

I. Power Strips (Multi Plugs)

i.	**Nominal Output Voltage:**	230V
ii.	**Maximum Total Current Draw:**	16A
iii.	**Output Connections:**	(12) IEC 320 C13 (Battery Backup)
iv.	**Nominal Input Voltage:**	230V
v.	**Input frequency:**	50Hz
vi.	**Input Connections:**	IEC-320 C20
vii.	**Cord Length:**	2.5meters
viii.	**Number of Power Cords:**	1
ix.	**Load Capacity:**	3680VA

x.	**Maximum Input Current:**	16A
xi.	**Rack Height:**	1U
xii.	**Operating Temperature:**	0° – 45°C
xiii.	**Operating Relative Humidity:**	0 – 95 %

15.4 Field Node Box (Kiosk) – Weatherproof Metal Cabinets

a)	**Door Lock Type:**	Double Bar
b)	**Gland Plate:**	Yes
c)	**Fixing Kit:**	Yes
d)	**External Dimensions:**	1000 x 800 x 300mm
e)	**Ingress Protection:**	IP 66
f)	**Impact Resistance:**	IK 10
g)	**UV Resistance:**	UL 508
h)	**Flammability Rating (UL 746 C 5):**	UL 94 5V
i)	**Electrical Insulation:**	Totally Insulated
j)	**Temperature:**	-40°C to 70°C
k)	**Fire retardant:**	Polypropylene RAL 7035
l)	**Loading Capacity:**	1200kgs
m)	**Materials:**	High-quality cold rolled steel
n)	**Thickness:**	Cabinet: 1.6mm mild steel Mounting rails: 2mm 304 grade steel Doors: 1.6mm mild steel
o)	**Cooling Fans:**	Four standard 120mm AC cooling fans
p)	**Doors:**	Front and rear with built-in washable air filter
q)	**Surface finish:**	Degreasing, pickling, phosphating powder coating

6 mm² earth connection

16.POWER SUPLIES (Industrial DIN Rail Mounted Power Supplies)

16.1 **Primary switched power supply, 1-phase, output current: 5 A**

a) Input data

i.**Input nominal voltage range:**	220 V AC
ii.**AC frequency:**	50 Hz
iii.**Current consumption:**	0.9 A (230 V AC)
iv.**Inrush current limitation:**	< 15 A
v.**Power failure bypass:**	> 110 ms (230 V AC)
vi.**Typical response time:**	< 1 s
vii.**Protective circuitry:**	Transient surge protection Varistor
viii.**Input fuse, integrated:**	3.15 A (slow-blow, internal)

b) Output data

i.**Nominal output voltage:**	24 V DC ±1%
ii.**Setting range of the output voltage:**	22.5 V DC to 29.5 V DC
iii.**Output current:**	5 A (-25°C to 55°C)
iv.**Current limitation:**	Approx. 10 A (for short circuit)

v Max. capacitive load:	Unlimited
vi.Surge protection against internal surge voltages:	Yes, < 35 V DC
vii.Degree of protection:	IP20
viii.Ambient temperature (operation):	-25 °C to 70 °C (> 55° C derating)
ix.Max. permissible relative humidity (operation):	95 % (at 25°C, no condensation)

16.2 48 VDC power supplies

i.Operating Temperature:	-10 to 60°C
ii.Relative Humidity:	20 to 90% RH
iii.Input power:	75 W
iv Input nominal voltage range:	220 V AC
v.AC frequency:	50 Hz
vi.Output current:	1.6 A
vii.Output voltage:	48 V DC
viii.Output power:	76.8 W

17.SURGE PROTECTION DEVICES (SPDs)

17.1 Class 1 high energy Metal Oxide Varistor (MOV) - (Power Protection: Lightning Protection;)

For protection against partial direct and indirect lightning strikes.

a)	**Certified under; tested to:**	UL 1449, (UL file E213469): IEC - 61643-1
b)	**Class (IEC):**	I, II
c)	**Max permitted operating voltage:**	275/350V
d)	**Nominal discharge current (8/20) In:**	70kA
e)	**Max discharge current (8/20) Imax:**	150kA
f)	**Max discharge current (10/350) Iimp:**	25kA
g)	**Protection level Up-at Iimp (10/350):**	1.2kV
h)	**Response time tA:**	<25 ns
i)	**Back-up fuse (if mains is > 250A):**	250AgI
j)	**Short - circuit capability to:**	25kA / 50Hz
k)	**Temperature range:**	-40°C to +80°C
l)	**Location of use:**	Main distribution boards (First incoming point).

17.2 Class 2 Silicon Avalanche Diode (SAD) - (Power Protection: Critical Electronic)

For protection of sensitive digital equipment.

a)	**Certified under; tested to:**	IEC 61643-1
b)	**Class (IEC):**	Class II
c)	**Max permitted operating voltage:**	250 VRMS
d)	**Nominal discharge current (8/20) In:**	15kA
e)	**Max discharge current (8/20) Imax:**	20kA
f)	**Protection Level UP:**	480V
g)	**Response time tA:**	<5 ns
h)	**Temperature range:**	-40°C to +80°C
i)	**Degree of Protection:**	IP 20

j) **Location of use:** Sub-distribution boards or as close as possible to a protected device (Internal Distribution Point)

18 PANIC / DURES ALARM SYSTEM

19.1 Wireless Mimic Base Station

a) **Encryption:**	Code-Hopping
b) **Operating Range:**	500m (Open air), 75m (Indoors)
c) **Frequency:**	403MHz or 433MHz
d) **Memory Capacity:**	2000 Remotes
e) **Events memory:**	2000 Time/Date
f) **Outputs:**	2 Dry Relays 1 x SIREN (800mA) 1 x AC Fail (150mA)
g) **Connectivity:**	1 x USB 2.0 1 x microSD (FAT32) GSM & LAN (UARTS) RS-485
h) **Inputs:**	
i) **Voltage Input:**	9.8V - 16VDC
j) **Current draw:**	80mA
k) **Operating Temp:**	-3°C to 60°C

19.2 Code-Hopping Pendant Chain Remote

a) **Encryption:**	Code-Hopping
b) **Operating Range:**	500m (Open air), 75m (Indoors)
c) **Frequency:**	403MHz or 433MHz
d) **Voltage Input:**	10V - 13VDC
e) **Current draw:**	32mA
f) **Operating Temp:**	-7°C to 65°C

g) Large button for ease of use in emergency.
h) Moisture proof inner membrane.
i) Button illuminates when pressed
j) Antenna design incorporating the pendant chain to increase transmitting range by up to 50%.
k) LED flashing indication when battery is low indicating that replacement is required.

19.3 Code-Hopping Repeater

a) **Encryption:**	Code-Hopping
b) **Transmit Range:**	800m (Open air), 75m (Indoors)
c) **Receive Range:**	500m (Open air), 120m (Indoors)
d) **eEprom Memory:**	4000 codes
e) **Frequency:**	403MHz or 433MHz
f) **Voltage Input:**	9.8V - 16VDC
g) **Current on TX:**	>60mA
h) **Sleep mode:**	>10mA
i) **Operating Temp:**	-3°C to 60°C

j) Auto Learning of signals to memory
k) Auto Masking of repeated signals
l) AC Fail RF Signal Output

19.4 Wall Mount Transmitter

a) **Encryption:**	Code-Hopping
b) **Operating Range:**	500m (Open air), 75m (Indoors)
c) **Frequency:**	403MHz or 433MHz
d) **Frequency stability controlled:**	+/- 75KHz
e) **Activations:**	60 000
f) **Voltage Range:**	2.2V – 4.5VDC
g) **Current on TX:**	+/-12mA
h) **Sleep mode:**	+/-400nano A
i) **Operating Temp:**	-3°C to 65°C

j) Weather-proof / Splash-proof housing
k) 3V Long Life Lithium battery

19.5 3.2A Battery Backup Supply Unit

a) **Input Voltage:**	220V AC 50Hz
b) **Output Voltage:**	13V – 14.4V Adjustable
c) **Max Current output:**	3.2A DC
d) **Power:**	40Watts
e) **Relay contact rating:**	10A
f) **AC Fail output rating:**	140mA Positive switching
g) **Operating Temp:**	-3°C to 60°C

h) The unit shall be supplied complete with a 12V – 9AH battery.

PART C6.1.6: BILLS OF QUANTITIES

1. GENERAL

The tenderer must complete the Bills of Quantities and detail unit rates and total amount for each item. All rates and prices exclude VAT.

The "Total" shall constitute the tender for adjudication.

NOTE

Tenderers are advised to check their item extensions and total additions as arithmetical errors occurring in the priced Bills of Quantities cannot be considered as having an effect on the tender amount.

No alteration, erasure or addition is to be made in the text of the Bills of Quantities. Should any alteration, erasure or addition be made it will not be recognized but the original wording of the Bills of Quantities will be adhered to.

The Employer will check the completed Bills of Quantities and reserves the right to adjust any individual price and to rectify and discrepancy whilst the total tender price as quoted remains unaltered.

The quantities given in the Bills for video cables, power cables, cable markers, and data cables cannot be regarded as exact and are subject to measurement on site after completion of the installation and adjustments will be made according to the unit rates given in the Bills.

The quantities given in the Bill of Quantities are estimates only, and subject to re-measuring during the execution of the work. The Contractor shall obtain the Engineer's detailed instructions for all work before ordering any materials or executing work or making arrangements for it.

The Works as finally completed in accordance with the Contract shall be measured and paid for as specified in the Bill of Quantities and in accordance with the General and Special Conditions of Contract, the Specifications and Project Specifications and the Drawings. Unless otherwise stated, items are measured net in accordance with the Drawings, and no allowance has been made for waste.

The validity of the contract will in no way be affected by differences between the quantities in the Bill of Quantities and the quantities finally certified for payment.

1. IP CCTV SYSTEM

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	LOWER LEVEL				
1	**1/2.8" Day/Night HD 2 Mega Pixels IP vari-Focal Starlight box cameras with PoE (WDR)**				
	(a) Supply	ea	13		
	(b) Install	ea	13		
2	**2.8-13mm, C Mount 2 Mega Pixels Lenses Day / Night Corrected (No Focus Shift)**				
	(a) Supply	ea	3		
	(b) Install	ea	3		
3	**5-55mm, CS Mount 2 Mega Pixels Lenses Day / Night Corrected (No Focus Shift)**				
	(a) Supply	ea	10		
	(b) Install	ea	10		
4	**Outdoor Wall Mount brackets for Box cameras**				
	(a) Supply	ea	13		
	(b) Install	ea	13		
5	**Outdoor CABLE MANAGED HOUSING with sunshield, IP66 for Box cameras**				
	(a) Supply	ea	13		
	(b) Install	ea	13		
6	**1/2.8" 2.8-13mm. Day/Night HD 2 Mega Pixels IP vari-Focal IR Starlight Dome camera with PoE**				
	(a) Supply	ea	8		
	(b) Install	ea	8		
7	**1/2.8" 1.8-3mm, Day/Night HD 2 Mega Pixels IP vari-Focal Starlight Dome camera with PoE**				
	(a) Supply	ea	9		
	(b) Install	ea	9		
Subtotal Carried To The Next Page					

Subtotal From The Previous Page					
8	**1/2.3" 1.6 mm Day/Night HD 2 Mega Pixels IP Panoramic IR camera with PoE**				
	(a) Supply	ea	2		
	(b) Install	ea	2		
9	**RJ45 connectors including boots**				
	(a) Supply	ea	64		
	(b) Install	ea	64		
10	**CAT6 Cable (Blue)**				
	(a) Supply	m	2400		
	(b) Install	m	2400		
11	**IR ILLUMINATOR**				
	(a) Supply	ea	6		
	(b) Install	ea	6		
12	**VMS Sever**				
	(a) Supply	ea	1		
	(b) Install	ea	1		
13	**Network Video Recorder**				
	(a) Supply	ea	1		
	(b) Install	ea	1		
14	**Video Management Software and Map edition**	Sum	1		
15	**Recording License (Software)**	ea	32		
16	**Graphoplast labelling and sundries**	Sum	1		
17	**System Configuration and Testing**	ea	32		
	(Objective performance tests after commissioning to be carried out as per SANS 10222 5-1-4. Rolatest using Rotakin test target to be performed on all the installed cameras - day & night)				
Subtotal Carried To The Next Page					

Subtotal From The Previous Page			
	GROUND LEVEL		
1	**1/2.8" Day/Night HD 2 Mega Pixels IP vari-Focal Starlight box cameras with PoE (WDR)**		
	(a) Supply	ea	16
	(b) Install	ea	16
2	**2.8-13mm , C Mount 2 Mega Pixels Lenses Day / Night Corrected (No Focus Shift)**		
	(a) Supply	ea	8
	(b) Install	ea	8
3	**5-55mm , CS Mount 2 Mega Pixels Lenses Day / Night Corrected (No Focus Shift)**		
	(a) Supply	ea	8
	(b) Install	ea	8
4	**Outdoor Wall Mount brackets for Box cameras**		
	(a) Supply	ea	16
	(b) Install	ea	16
5	**Outdoor CABLE MANAGED HOUSING with sunshield, IP66 for Box cameras**		
	(a) Supply	ea	16
	(b) Install	ea	16
6	**1/2.8" 2.8-13mm, Day/Night HD 2 Mega Pixels IP vari-Focal Starlight Dome camera with PoE**		
	(a) Supply	ea	14
	(b) Install	ea	14
7	**1/2.8" 1.8-3mm, Day/Night HD 2 Mega Pixels IP vari-Focal Starlight Dome camera with PoE**		
	(a) Supply	ea	8
	(b) Install	ea	8
Subtotal Carried To The Next Page			

Subtotal From The Previous Page			
8	**1/2.8" Day/Night HD 2 Mega Pixels IP vari-Focal Starlight IR Bullet cameras with PoE (WDR)**		
	(a) Supply	ea	2
	(b) Install	ea	2
9	**1/2.3" 1.6 mm Day/Night HD 2 Mega Pixels IP Panoramic IR camera with PoE**		
	(a) Supply	ea	1
	(b) Install	ea	1
10	**IP License Plate Camera (3.8m to 28m range)**		
	(a) Supply	ea	2
	(b) Install	ea	2
11	**Dual Face capturing camera and reader stands powder-coated white**		
	(a) Supply	ea	2
	(b) Install	ea	2
12	**RJ45 connectors including boots**		
	(a) Supply	ea	82
	(b) Install	ea	82
13	**CAT6 Cable (Blue)**		
	(a) Supply	m	3500
	(b) Install	m	3500
14	**IR ILLUMINATOR**		
	(a) Supply	ea	2
	(b) Install	ea	2
15	**CCTV Warning Signs** (A4 Sized - Yellow Colour - Reflective Coating - Unbranded)		
	(a) Supply	ea	2
	(b) Install	ea	2
Subtotal Carried To The Next Page			

Subtotal From The Previous Page				
16	**Recording License (Software)**	ea	41	
15	**License plate software**	Sum	1	
16	**Graphoplast labeling and sundries**	Sum	**1**	
17	**System Configuration and Testing** (Objective performance tests after commissioning to be carried out as per SANS 10222-5-1-1. Rotatest using Rotakin test target to be performed on all the installed cameras - day & night)	ea	41	
Total amount carried forward to summary page				

2. BACKBONE NETWORK

	LOWER LEVEL				
1	**4 Core Multimode Optic Fibre Cable**				
	(a) Supply	m	300		
	(b) Install	m	300		
2	**Multimode Fibre SFP Gigabit Transceivers**				
	(a) Supply	ea	6		
	(b) Install	ea	6		
3	**Layer 3 24 Ethernet 10/100/1000 ports, 2x SFP+ Ports, 2x GbE Combo Ports Head End Switch**				
	(a) Supply	ea	1		
	(b) Install	ea	1		
4	**L3 Gigabit Fibre Core Switch with 24 Gigabit SFP slots and 2 combo ports (RJ45/SFP)**				
	(a) Supply	ea	1		
	(b) Install	ea	1		
5	**Smart Managed 24 Port 10/100/1000 with PoE + 2*Gigabit combo SFP port Field Switch**				
	(a) Supply	ea	2		
	(b) Install	ea	2		
6	**6U 19" Wall-mount Racks**				
	(a) Supply	ea	2		
	(b) Install	ea	2		
7	**BRUSH PANELs**				
	(a) Supply	ea	6		
	(b) Install	ea	6		
8	**CAT6 PATCH PANELs**				
	(a) Supply	ea	6		
	(b) Install	ea	6		
	Subtotal Carried To The Next Page				

Subtotal From The Previous Page				
9	**MULTI- PORT FIBRE PATCH PANELs**			
	(a) Supply	ea	3	
	(b) Install	ea	3	
10	**FIBRE SPLICE BOXes**			
	(a) Supply	ea	3	
	(b) Install	ea	3	
11	**2m ST-ST Fibre Optic Patch Leads**			
	(a) Supply	ea	3	
	(b) Install	ea	3	
12	**ST Fibre Optic Tails**			
	(a) Supply	ea	3	
	(b) Install	ea	3	
13	**Fibre Optic Midcouplers**			
	(a) Supply	ea	3	
	(b) Install	ea	3	
14	**42U 19" Floor Standing Racks (1000mm deep)**			
	(a) Supply	ea	1	
	(b) Install	ea	1	
15	**450mm Deep 19" Shelf including all fixing materials**			
	(a) Supply	ea	2	
	(b) Install	ea	2	
16	**1U 19" Blank Panel Including all fixing material**			
	(a) Supply	ea	2	
	(b) Install	ea	2	
17	**2U 19" Blank Panel including all fixing material**			
	(a) Supply	ea	2	
	(b) Install	ea	2	
Subtotal Carried To The Next Page				

Subtotal From The Previous Page			
18	**19" Rack Cable Routing Rings including all fixing materials**		
	(a) Supply	ea	2
	(b) Install	ea	2
19	**Fibre Splicing**	ea	5
20	**Fibre Testing**	ea	5
21	**System Configuration and Testing** (OTDR Testing & Test Reports With an EXFO FTB -200 & FIS Multi Mode & Single Mode OTDRs, Pre Fibre Cable Installation Testing. Post Fibre Cable Installation Testing, Final Site Testing and Multi Mode Fusion Splicing.)	Sum	1
22	**RJ45 connectors including boots**		
	(a) Supply	ea	50
	(b) Install	ea	50
23	**CAT6 Cable**		
	(a) Supply	m	100
	(b) Install	m	100
Subtotal Carried To The Next Page			

Subtotal From The Previous Page				
	GROUND LEVEL			
	All equipment as specified, complete with brackets, fitting screws, mounting bases and accessories to complete the installation.			
1	**4 Core Multimode Optic Fibre Cable**			
	(a) Supply	m	200	
	(b) Install	m	200	
2	**Multimode Fibre SFP Gigabit Transceivers**			
	(a) Supply	ea	4	
	(b) Install	ea	4	
3	**Smart Managed 24 Port 10/100/1000 with PnE + 2^Gigabit combo SFP port Field Switch**			
	(a) Supply	ea	2	
	(b) Install	ea	2	
4	**6U 19" Wall-mount Racks**			
	(a) Supply	ea	3	
	(b) Install	ea	3	
5	**BRUSH PANELs**			
	(a) Supply	ea	6	
	(b) Install	ea	6	
6	**CAT6 PATCH PANELs**			
	(a) Supply	ea	6	
	(b) Install	ea	6	
7	**MULTI- PORT FIBRE PATCH PANELs**			
	(a) Supply	ea	3	
	(b) Install	ea	3	
8	**FIBRE SPLICE BOXes**			
	(a) Supply	ea	3	
	(b) Install	ea	3	
Subtotal Carried To The Next Page				

Subtotal From The Previous Page				
9	**2m ST-ST Fibre Optic Patch Leads**			
	(a) Supply	ea	6	
	(b) Install	ea	6	
10	**ST Fibre Optic Tails**			
	(a) Supply	ea	6	
	(b) Install	ea	6	
11	**Fibre Optic Midcouplers**			
	(a) Supply	ea	3	
	(b) Install	ea	3	
12	**4U 19" Wall-mount Racks**			
	(a) Supply	ea	1	
	(b) Install	ea	1	
13	**450mm Deep 19" Shelf including all fixing materials**			
	(a) Supply	ea	3	
	(b) Install	ea	3	
14	**Fibre Splicing**	ea	5	
15	**Fibre Testing**	ea	5	
Total amount carried forward to summary page				

3. SYSTEMS CONTROL

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	LOWER LEVEL				
1	**Control Room Workstation PCs** (including a 22" LED Monitor, mouse and keyboard) with 4 channel dual graphics cards.				
	(a) Supply	ea	2		
	(b) Install	ea	2		
2	**24-inch High Performance HD LED Monitors**				
	(a) Supply	ea	2		
	(b) Install	ea	2		
3	**42-inch High Performance HD LED Monitors**				
	(a) Supply	ea	8		
	(b) Install	ea	8		
4	**Desktop vertical pole dual monitor brackets for 24" LCD Flat Screens**				
	(a) Supply	ea	2		
	(b) Install	ea	2		
5	**FREE STANDING VIDEO WALL MOUNT** Video Wall Stand with 4 Screens (2 x 2) screen array with full cable management, capable of mounting all 42" screen on a single floor standing unit				
	(a) Supply	ea	2		
	(b) Install	ea	2		
6	**2 - Operator Control Room Desk**				
	(a) Supply	ea	1		
	(b) Install	ea	1		
	Subtotal Carried To The Next Page				

	Subtotal From The Previous Page			
7	**Control Room Operators Orthopaedic Chair for 12-hour shifts**			
	(a) Supply	ea	2	
	(b) Install	ea	2	
8	**KVM EXTENDERS CAT6 (TRANSMITTER)**			
	(With Dual head DVI/HDMI, USB 2.0)			
	(a) Supply	ea	2	
	(b) Install	ea	2	
9	**KVM EXTENDERS - CAT6 (RECEIVER)**			
	(With Dual head DVI/HDMI, USB 2.0)			
	(a) Supply	ea	2	
	(b) Install	ea	2	
10	**USB Active EXTENDERS (SENDER - RECEIVER PAIRS)**			
	(a) Supply	ea	2	
	(b) Install	ea	2	
11	**High Speed HDMI Cable with Ethernet 10m**			
	(a) Supply	ea	4	
	(b) Install	ea	4	
12	**2 X 2 Video wall Server**			
	(a) Supply	ea	2	
	(b) Install	ea	2	
14	**KVM EXTENDERS - CAT6 (TRANSMIT)**			
	(With Quad head DVI/HDMI, USB 2.0)			
	(a) Supply	ea	2	
	(b) Install	ea	2	
14	**KVM EXTENDERS - CAT6 (RECEIVER)**			
	(With Quad head DVI/HDMI, USB 2.0)			
	(a) Supply	ea	2	
	(b) Install	ea	2	
	Total amount carried forward to summary page			

4. SYSTEMS INTEGRATION

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	LOWER LEVEL				
1	**Smoke detection System integration to Air conditioning system**	Sum	1		
2	**Smoke detection System integration to EVAC**	Sum	1		
3	**Smoke detection System integration to Smoke Extraction system**	Sum	1		
4	**Smoke detection System integration to Lift system**	Sum	1		
5	**Integration of CCTV into Access Control System**	Sum	1		
6	**Integration of CCTV into Alarm System**	Sum	1		
7	**Integration of CCTV into Fire Detection**	Sum	1		
8	**Integration of CCTV into Intercom System**	Sum	1		
9	**Fire doors Integration to Access control system**	Sum	1		
10	**Integration of CCTV into Panic Alarm System**	Sum	1		
	Total amount carried forward to summary page				

5. INTEGRATED SECURITY MANAGEMENT SOFTWARE

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	LOWER LEVEL				
1	**Security Management Software (SMS)** For the integration of all the security sub-systems under one security management platform with a once-off license fee				
	(a) Supply	ea	1		
	(b) Install	ea	1		
2	**SMS Server**				
	(a) Supply	ea	2		
	(b) Install	ea	2		
	Total amount carried forward to summary page				

6. ACCESS CONTROL SYSTEM

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	All equipment as specified, complete with brackets, fitting screws, mounting bases and accessories to complete the installation.				
	LOWER LEVEL				
1	**Indoor Fingerprint readers (500 Users)**				
	(a) Supply	ea	6		
	(b) Install	ea	6		
2	**Fingerprint Processing Unit – Take-Ons**				
	(a) Supply	ea	1		
	(b) Install	ea	1		
3	**Verification Dongle**				
	(a) Supply	ea	1		
	(b) Install	ea	1		
4	**Webcam**				
	(a) Supply	ea	1		
	(b) Install	ea	1		
5	**Reports Printer**				
	(a) Supply	ea	1		
	(b) Install	ea	1		
6	**Door Position Switch - Flush Mount**				
	(a) Supply	ea	12		
	(b) Install	ea	12		
7	**Electromagnetic Locks**				
	(a) Supply	ea	9		
	(b) Install	ea	9		
8	**Break Glass Units** (Supplied with resettable lenses and front covers)				
	(a) Supply	ea	6		
	(b) Install	ea	6		
	Subtotal Carried To The Next Page				

Subtotal From The Previous Page			
9	**Override Key Switches**		
	(a) Supply	ea	4
	(b) Install	ea	4
10	**Heavy duty door closers**		
	(a) Supply	ea	16
	(b) Install	ea	16
11	**Single door Controllers** (Supplied with back up batteries)		
	(a) Supply	ea	3
	(b) Install	ea	3
12	**Master / System Controllers**		
	(a) Supply	ea	1
	(b) Install	ea	1
13	**Sounders-Mini Sound bombs**		
	(a) Supply	ea	3
	(b) Install	ea	3
14	**RJ45 connectors**		
	(a) Supply	ea	15
	(b) Install	ea	15
15	**CAT6 Cable (Green)**		
	(a) Supply	m	120
	(b) Install	m	120
16	**Mylar cable 0.25mm2 x 8 core**		
	(a) Supply	m	40
	(b) Install	m	40
17	**Wiegand Surge Protection and TCP/IP Surge Protection serialised per reader**		
	(a) Supply	ea	2
	(b) Install	ea	2
Subtotal Carried To The Next Page			

Subtotal From The Previous Page			
18	**Enrolment Workstation PCs** (Including a 24" LED Monitor, mouse and keyboard)		
	(a) Supply	ea	1
	(b) Install	ea	1
19	**Software for hardware capable of controlling all Access Controlled Doors and monitor door positions**	Sum	1
20	**System Configuration and Testing**	Sum	1
21	**Electromechanical morticed dead latch locking device for swing doors inclusive of all brackets, clamps, bolts, screws, and connectors etc. to make this installation complete.**		
	(a) Supply	ea	4
	(b) Install	ea	4
22	**PLC: Door Controller with a single Ethernet port including 8 digital inputs and 8 digital outputs**		
	(a) Supply	ea	4
	(b) Install	ea	4
23	**Door Controller additional I/O Board with a minimum of 4 inputs and 2 outputs**		
	(a) Supply	ea	4
	(b) Install	ea	4
24	**Roller Shutter Door Mag Switch,**		
	(a) Supply	ea	3
	(b) Install	ea	3
26	**2.5mm2 x 3 core Cabtyre fire retardant multi-strand cable**		
	(a) Supply	m	50
	(b) Install	m	50
	Subtotal From The Previous Page		

Subtotal From The Previous Page			
GROUND LEVEL			
1	**Indoor Fingerprint readers (500 Users)**		
	(a) Supply	ea	12
	(b) Install	ea	12
2	**Door Position Switch - Flush Mount**		
	(a) Supply	ea	19
	(b) Install	ea	19
3	**Electromagnetic Locks**		
	(a) Supply	ea	16
	(b) Install	ea	16
4	**Break Glass Units** (Supplied with resettable lenses and front covers)		
	(a) Supply	ea	7
	(b) Install	ea	7
5	**Override Key Switches**		
	(a) Supply	ea	9
	(b) Install	ea	9
6	**Heavy duty door closers**		
	(a) Supply	ea	16
	(b) Install	ea	16
7	**Multi-function Single door Controllers** (Supplied with back up batteries)		
	(a) Supply	ea	6
	(b) Install	ea	6
8	**Sounders-Mini Sound bombs**		
	(a) Supply	ea	2
	(b) Install	ea	2
Subtotal Carried To The Next Page			

Subtotal From The Previous Page			
9	**RJ45 connectors**		
	(a) Supply	ea	15
	(b) Install	ea	15
10	**CAT6 Cable (Green)**		
	(a) Supply	m	120
	(b) Install	m	120
11	**Mylar cable 0.25mm2 x 8 core**		
	(a) Supply	m	60
	(b) Install	m	60
12	**Roller Shutter Door Mag Switch, with Armoured Cable**		
	(a) Supply	ea	1
	(b) Install	ea	1
13	**2.5mm2 x 3 core Cablyre fire retardant multi-strand cable**		
	(a) Supply	m	50
	(b) Install	m	50
114	**Indoor Fingerprint readers (500 Users)**		
	(a) Supply	ea	12
	(b) Install	ea	12
	Total amount carried forward to summary page		

7. FIRE DETECTION SYSTEM

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	All equipment as specified, complete with brackets, fitting screws, mounting bases and accessories to complete the installation.				
	LOWER LEVEL				
1	**FH30, Fire resistant 2 core cable 1.5mm, 30 minutes**				
	(a) Supply	m	700		
	(b) Install	m	700		
2	**Analogue Addressable Optical Smoke Detectors**				
	(a) Supply	ea	31		
	(b) Install	ea	31		
3	**Analogue Addressable Heat Detectors**				
	(a) Supply	ea	3		
	(b) Install	ea	3		
4	**Analogue Addressable Manual Call Points**				
	(a) Supply	ea	13		
	(b) Install	ea	13		
5	**Analogue Addressable Line Relay Units** (For wiring to control interfaces)				
	(a) Supply	ea	4		
	(b) Install	ea	4		
6	**Analogue Addressable Loop Powered Beacon Sounders**				
	(a) Supply	ea	11		
	(b) Install	ea	11		
7	**4-Loop Analogue addressable Fire Alarm Panel**				
	(a) Supply	ea	1		
	(b) Install	ea	1		
	Subtotal Carried To The Next Page				

Subtotal From The Previous Page			
9	**Interfacing smoke detection system with Sol Plaatjie Municipality's fire department (REMRAD)**		
	(a) Supply	ea	1
	(b) Install	ea	1
10	**Remote LED Indicator units**		
	(a) Supply	ea	4
	(b) Install	ea	4
11	**Signage**		
	Provide zone diagram and associated signage.	Sum	1
	GROUND LEVEL		
1	**PH30, Fire resistant 2 core cable 1.5mm, 30 minutes**		
	(a) Supply	m	800
	(b) Install	m	800
2	**Analogue Addressable Optical Smoke Detectors**		
	(a) Supply	ea	102
	(b) Install	ea	102
3	**Analogue Addressable Heat Detectors**		
	(a) Supply	ea	2
	(b) Install	ea	2
4	**Analogue Addressable Manual Call Points**		
	(a) Supply	ea	13
	(b) Install	ea	13
5	**Analogue Addressable Line Relay Units** (For wiring to control interfaces)		
	(a) Supply	ea	4
	(b) Install	ea	4
Subtotal Carried To The Next Page			

Subtotal From The Previous Page				
6	**Analogue Addressable Loop Powered Beacon Sounders**			
	(a) Supply	ea	13	
	(b) Install	eb	13	
7	**Remote LED Indicator units**			
	(a) Supply	ea	2	
	(b) Install	eb	2	
8	**Signage**			
	Provide zone diagram and associated signage.	Sum	1	
Total amount carried forward to summary page				

8. FIRE SUPPRESSION SYSTEM

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	LOWER LEVEL				
1	**Control Room** FM200 double knock gas suppression system complete with all cylinders, actuators, lock offs, break glass units, piping and fittings, brackets, fixing accessories as well as all other accessories to make the installation complete for an area of L_6.4m x W_5.5m x H_3m with concrete ceiling and 300mm raised floor void. (Supplied and Installed).	Sum	1		
2	**Equipment Room** FM200 double knock gas suppression system complete with all cylinders, actuators, lock offs, break glass units, piping and fittings, brackets, fixing accessories as well as all other accessories to make the installation complete for an area of L_6.4m x W_2.8m x H_3m with concrete ceiling and 300mm raised floor void. (Supplied and Installed).	Sum	1		
4	**System Configuration and Testing**	Sum	1		
3	**Room Integrity Testing** Provide documentation indicating potential areas of leakage and retention period report (**Third Party Testing**)	Sum	1		
	GROUND LEVEL				
1	**Server Room** FM200 double knock gas suppression system complete with all cylinders, actuators, lock offs, break glass units, piping and fittings, brackets, fixing accessories as well as all other accessories to make the installation complete for an area of L_4.2m x W_1.5m x H_3m with ceiling and 300mm raised floor area (Supplied and Installed).	Sum	1		
Total amount carried forward to summary page					

9. BUILDING ALARM SYSTEM

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	All equipment as specified, complete with brackets, fitting screws, mounting bases and accessories to complete the installation.				
	LOWER LEVEL				
1	**8 - Zone Control Panel Expandable to 48 zones**				
	(a) Supply	ea	1		
	(b) Install	ea	1		
2	**8 zone wired bus expander module**				
	(a) Supply	ea	4		
	(b) Install	ea	4		
3	**Dual Technology Detectors** (Ceiling Mount Detectors with 360° view)				
	(a) Supply	ea	5		
	(b) Install	ea	5		
4	**Dual Technology Detectors**				
	(a) Supply	ea	8		
	(b) Install	ea	8		
5	**12V 9Ah Back-up Battery**				
	(a) Supply	ea	1		
	(b) Install	ea	1		
6	**Fixed Word LCD Keypad**				
	(a) Supply	ea	2		
	(b) Install	ea	2		
7	**15Watt , 12V Siren**				
	(a) Supply	ea	2		
	(b) Install	ea	2		
8	**Cable Solid White 6 Core**				
	(a) Supply	m	700		
	(b) Install	m	700		
	Subtotal Carried To The Next Page				

Subtotal From The Previous Page			
9	**Cable Solid White 2 Core**		
	(a) Supply	m	500
	(b) Install	m	500
10	**Transformer**		
	(a) Supply	ea	1
	(b) Install	ea	1
11	**Door Contacts**		
	(a) Supply	ea	15
	(b) Install	ea	15
12	**System Configuration and Testing**	Sum	1
	GROUND LEVEL		
1	**Dual Technology Detectors**		
	(a) Supply	ea	8
	(b) Install	ea	8
2	**Seismic Detectors**		
	(a) Supply	ea	8
	(b) Install	ea	8
3	**Fixed Panic Buttons**		
	(a) Supply	ea	0
	(b) Install	ea	0
4	**Mobile Panic Buttons**		
	(a) Supply	ea	0
	(b) Install	ea	0
5	**Cable Solid White 6 Core**		
	(a) Supply	m	800
	(b) Install	m	800
	Total amount carried forward to summary page		

10.BOOM AND SPIKE BARRIERS

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	GROUND LEVEL				
1	**High Security Automated Boom and Spike Barriers**				
	3,5m Spike Boom Barrier Combinations (Not surface mount) Complete spike barrier with housing, logic, safety loop detectors, IR beams, boom arms with traffic lights and warning signs				
	(a) Supply	ea	2		
	(b) Install	ea	2		
2	**System Configuration and Testing**	Sum	1		
	Total amount carried forward to summary page				

11. EMERGENCY VOICE ALARM COMMUNICATION SYSTEM

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	All equipment as specified, complete with brackets, fitting screws, mounting bases and accessories to complete the installation.				
	LOWER LEVEL				
1	**Fire Resistant Loud Speaker Cable, 30 Minutes**				
	(a) Supply	m	400		
	(b) Install	m	400		
2	**6Watt Evacuation Ceiling Speakers with Fire Dome**				
	(a) Supply	ea	6		
	(b) Install	ea	6		
3	**Fire Rated Metal Wall Speakers**				
	(a) Supply	ea	13		
	(b) Install	ea	13		
4	**Voice Alarm System Controller**				
	(a) Supply	ea	1		
	(b) Install	ea	1		
5	**Fireman's Panel**				
	(a) Supply	ea	1		
	(b) Install	ea	1		
6	**240 Watt Amplifier**				
	(a) Supply	ea	2		
	(b) Install	ea	2		
7	**Voice Alarm Router**				
	(a) Supply	ea	1		
	(b) Install	ea	1		
	Subtotal Carried To The Next Page				

Subtotal From The Previous Page			
8	Voice Alarm Call Station, with 6 zone call buttons		
	(a) Supply	ea	1
	(b) Install	ea	1
9	Emergency Power supply unit		
	(a) Supply	ea	1
	(b) Install	ea	1
10	12 VOLT 100 A/H BATTERY		
	(a) Supply	ea	2
	(b) Install	ea	2
11	System Configuration and Testing	Sum	1
	GROUND LEVEL		
1	Fire Resistant Loud Speaker Cable, 30 Minutes		
	(a) Supply	m	600
	(b) Install	m	600
2	6Watt Evacuation Ceiling Speakers with Fire Dome		
	(a) Supply	ea	32
	(b) Install	ea	32
3	Fire Rated Metal Wall Speakers		
	(a) Supply	ea	8
	(b) Install	ea	8
4	Projection / Horn Speaker - 30W		
	(a) Supply	ea	1
	(b) Install	ea	1
	Total Amount carried forward to summary page		

12.METAL DETECTION & X-RAY SCANNING

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	GROUND LEVEL				
1	**X-Rty Machine with UPS, trays and rollers** (Supplied with UPS, trays, entry & exit roller beds and exit table)				
	(a) Supply	ea	1		
	(b) Install	ea	1		
2	**Walkthrough Multizone Metal Detectors**				
	(a) Supply	ea	1		
	(b) Install	ea	1		
3	**System Configuration and Testing**	Sum	1		
	Total amount carried forward to summary page				

13. INTERCOM SYSTEM (IP)

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	All equipment as specified, complete with brackets, fitting screws (rotx), mounting bases and accessories to complete the installation.				
	LOWER LEVEL				
1	**IP Dusktop Master Station with Display & Handset**				
	(a) Supply	ea	1		
	(b) Install	ea	1		
2	**Master Station License**	Sum	1		
3	**Audio Server**				
	IP Server for max of 552 points				
	(a) Supply	ea	1		
	(b) Install	ea	1		
4	**Handset with armored cables and cradle**				
	(a) Supply	ea	6		
	(b) Install	ea	6		
5	**CAT6 Cable (Grey)**				
	(a) Supply	m	100		
	(b) Install	m	100		
6	**IP One Button IP66 Intercom Station Including back box**				
	(a) Supply	ea	4		
	(b) Install	ea	4		
7	**Gooseneck, Rainshield with vandal proof bracket and base plate- Hot dip galvanised**				
	(a) Supply	ea	2		
	(b) Install	ea	2		
	Subtotal Carried To The Next Page				

Subtotal From The Previous Page			
8	**Software capable of taking or making calls from a desktop PC**	ea	1
9	**System Configuration and Testing**	Sum	1
	GROUND LEVEL		
1	**CAT6 Cable (Grey)**		
	(a) Supply	m	200
	(b) Install	m	200
2	**IP One Button IP66 Intercom Station including back box**		
	(a) Supply	ea	4
	(b) Install	ea	4
	Total amount carried forward to summary page		

14.TURNSTILES

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	GROUND LEVEL				
1	**Bi-directional Full Height Turnstiles**				
	Powder coated - Gray				
	(a) Supply	ea	1		
	(b) Install	ea	1		
2	**System Configuration and Testing**	Sum	1		
	Total amount carried forward to summary page				

15.ELECTRICAL & CIVILS

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	LOWER LEVEL				
1	**Ø20mm galvanized conduit inclusive of all suspension brackets, bolts, screws, nuts, round boxes, end boxes and suspension material to make the installation complete**				
	(a) Supply	m	340		
	(b) Install	m	340		
2	**Ø20mm galvanized flexible conduits**				
	(a) Supply	m	20		
	(b) Install	m	20		
3	**Floor duct Fully recessed, inclusive of all accessories; elbows, end caps, to make the installation complete**				
	(a) Supply	m	15		
	(b) Install	m	15		
4	**P8000 trunking inclusive of all suspension brackets, bolts, screws, nuts, bends, T-pieces, joints, covers and suspension material to make the installation complete**				
	(a) Supply	m	250		
	(b) Install	m	250		
	GROUND LEVEL				
1	**Ø20mm galvanized conduit inclusive of all suspension brackets, bolts, screws, nuts, round boxes, end boxes and suspension material to make the installation complete**				
	(a) Supply	m	500		
	(b) Install	m	500		
2	**Ø20mm galvanized flexible conduits**				
	(a) Supply	m	30		
	(b) Install	m	30		
	Subtotal Carried To The Next Page				

	Subtotal From The Previous Page				
3	**Floor duct Fully recessed, inclusive of all accessories; elbows, end caps, to make the installation complete**				
	(a) Supply	m	20		
	(b) Install	m	20		
4	**P8000 trunking inclusive of all suspension brackets, bolts, screws, nuts, bends, T-pieces, joints, covers and suspension material to make the installation complete**				
	(a) Supply	m	450		
	(b) Install	m	450		
5	**50mm diameter sleeve**				
	(a) Supply	m	35		
	(a) Install	m	35		
6	**Junction box**				
	(a) Supply	ea	3		
	(b) Install	ea	3		
7	**Stakbox** 2 x 2 way with tilting galvanized lockable lid				
	(a) Supply	ea	4		
	(a) Install	ea	4		
8	**Excavations and backfilling of trenches for sleeves (400mm wide x 600mm deep)**	m^3	8		
9	**Compact earth to 90% Mod AASHTO density and dispose of surplus material - 300 x 600mm**	m^3	9		
	Total amount carried forward to summary page				

16.EMERGENCY VOICE COMMUNICATION (REFUGE PLACE)

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	All equipment as specified, complete with brackets, fitting screws, mounting bases and accessories to complete the installation.				
	LOWER LEVEL				
1	**8 Line Controller c/w Handset**				
	(a) Supply	ea	1		
	(b) Install	ea	1		
2	**Disable Refuge Outstation, Flush**				
	(a) Supply	ea	1		
	(b) Install	ea	1		
4	**Audio Frequency Induction Loop**				
	(a) Supply	ea	1		
	(b) Install	ea	1		
5	**Blue Xenon Strobe**				
	(a) Supply	ea	1		
	(b) Install	ea	1		
6	**12V 1A PSU**				
	(a) Supply	ea	1		
	(b) Install	ea	1		
7	**Strobe Driver Module – 12V**				
	(a) Supply	ea	1		
	(b) Install	ea	1		
8	**2 core 1.5mm2 enhanced fire rated cable**				
	(a) Supply	m	80		
	(b) Install	m	80		
9	**System Configuration and Testing**	Sum	1		
	Subtotal Carried To The Next Page				

Subtotal From The Previous Page				
	GROUND LEVEL			
4	**Disable Refuge Outstation, Flush**			
	(a) Supply	ea	1	
	(b) Install	ea	1	
4	**Audio Frequency Induction Loop**			
	(a) Supply	ea	1	
	(b) Install	ea	1	
5	**Blue Xenon Strobe**			
	(a) Supply	ea	1	
	(b) Install	ea	1	
6	**12V 1A PSU**			
	(a) Supply	ea	1	
	(b) Install	ea	1	
7	**Strobe Driver Module – 12V**			
	(a) Supply	ea	1	
	(b) Install	ea	1	
8	**7 core 1.5mm2 enhanced fire rated cable**			
	(a) Supply	m	120	
	(b) Install	m	120	
Total amount carried forward to summary page				

17.MISCELLANEOUS

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
1	**Training of Client's staff**	ea	10		
2	**3 x Full sets of operating and maintenance manuals**	Sum	1		
3	**3 x sets of As built drawings** (Drawings to show the exact positions of cables, equipment, etc etc to be issued in Hard copies and CDs)	Sum	1		
4	**Control Room Raised Access Floor** Raised Access Floor inclusive of all stringers, struts, bolts, floor panels, perforated airflow panels, floor under-structure, pedestals, perimeter Support, self-levelling epoxy coating, brackets and fixing materials and all other accessories to make the installation complete (Supplied, Installed, Tested and Commissioned L_6.4m x W_5.5m with a floor void of 300mm).	m²	35,2		
4.1	**Copper cable joints for 1 Ω earth for every second raised floor stand.** (a) Supply (b) Install	ea ea	20 20		
5	**Equipment Room Raised Access Floor** Raised Access Floor inclusive of all stringers, struts, bolts, floor panels, perforated airflow panels, floor under-structure, pedestals, perimeter Support, self - levelling epoxy coating, brackets and fixing materials and all other accessories to make the installation complete (Supplied, Installed, Tested and Commissioned L_6.4m x W_2.8m with a floor void of 300mm).	m²	17,9		
	Subtotal Carried To The Next Page				

Subtotal From The Previous Page					
5.1	**Copper cable joints for 1 Ω earth for every second raised floor stand.**				
	(a) Supply	ea	10		
	(b) Install	ea	10		
6	**Equipment Room Raised Access Floor**				
	Raised Access Floor inclusive of all stringers, struts, bolts, floor panels, perforated airflow panels, floor under-structure, pedestals, perimeter Support, self-levelling epoxy coating, brackets and fixing materials and all other accessories to make the installation complete (Supplied, Installed, Tested and Commissioned L. 6.4m x W. 2.8m with a floor void of 300mm).	m²	10,5		
6.1	**Copper cable joints for 1 Ω earth for every second raised floor stand.**				
	(a) Supply	ea	5		
	(b) Install	ea	5		
Total amount carried forward to summary page					

18.MAINTENANCE

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
1	Scheduled Preventative Maintenance for the entire Installation on a monthly basis during the guarantee / warrantee period.	Month	12		
	Total amount carried forward to summary page				

19.WIRELESS PANIC / DURESS ALARM SYSTEM

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	All equipment as specified, complete with brackets, fitting screws, mounting bases and accessories to complete the installation.				
	GROUND LEVEL				
1	**Wireless Mimic Base Station**				
	(a) Supply	ea	1		
	(b) Install	ea	1		
2	**Code-Hopping Repeater**				
	(a) Supply	ea	2		
	(b) Install	ea	2		
3	**Wall Mount Transmitter**				
	(a) Supply	ea	15		
	(b) Install	ea	15		
4	**Code-Hopping Pendant Chain Remote**				
	(a) Supply	ea	6		
	(b) Install	ea	6		
5	**3.2A Battery Backup Supply Unit**				
	(a) Supply	ea	1		
	(b) Install	ea	1		
	Total amount carried forward to summary page				

20.SUMMARY

SUMMARY: PART C6.1 – ELECTRONIC AND SECURITY SYSTEMS		
NO.	DESCRIPTION	AMOUNT CARRIED FORWARD
1	IP CCTV SYSTEM	
2	BACKBONE NETWORK	
3	SYSTEMS CONTROL	
4	SYSTEMS INTEGRATION	
5	INTEGRATED SECURITY MANAGEMENT SOFTWARE	
6	ACCESS CONTROL SYSTEM	
7	FIRE DETECTION SYSTEM	
8	FIRE SUPPRESSION SYSTEM	
9	IBUILDING ALARM SYSTEM	
10	BOOM & SPIKE BARRIERS	
11	EMERGENCY VOICE ALARM COMMUNICATION SYSTEM	
12	METAL DETECTION & X-RAY SCANNING	
13	INTERCOM	
14	TURNSTILES	
15	ELECTRICALS & CIVILS	
16	EMERGENCY VOICE COMMUNICATION (REFUGE PLACE)	
17	MISCELLANEOUS	
18	MAINTENANCE	
19	WIRELESS PANIC / DURESS ALARM SYSTEM	
20	SUB TOTAL: PART C6.1 – ELECTRONIC AND SECURITY SYSTEMS CARRIED TO THE MECHANICAL SECTION SUMMARY (EXCLUDING VAT)	

PART C6.1.7: SCHEDULE OF MATERIAL OFFERED BY THE TENDERER

1. FIRE DETECTION SYSTEM							
Item	Equipment	Make And Trade Name	Catalogue No.	Is Material To Specification Y/N	Mark SABS Y/N	Supplier	Supplier Contact Details
1	PH30, Fire resistant 2 core cable 1.5mm, 30 minutes						
2	Analogue Addressable Optical Smoke Detectors						
3	Analogue Addressable Heat Detectors						
4	Analogue Addressable Manual Call Points						
5	Analogue Addressable Loop Isolators						
6	Analogue Addressable Line Relay Units						
7	Analogue Addressable Loop Powered Beacon Sounders						
8	4 Loop Analogue addressable Fire Alarm Panel						

2. CCTV SYSTEM

Item	Equipment	Make And Trade Name	Catalogue No.	Is Material To Specification Y/N	Mark SABS Y/N	Supplier	Supplier Contact Details
1	1/2.8" Day/Night HD 2 Mega Pixels IP vari-Focal Starlight box cameras with PoE (WDR)						
2	2.8-13mm , C Mount 2 Mega Pixels Lenses Day / Night Corrected (No Focus Shift)						
3	5-55mm, CS Mount 2 Mega Pixels Lenses Day / Night Corrected (No Focus Shift)						
4	1/2.8" 2.8-13mm, Day/Night HD 2 Mega Pixels IP vari-Focal Starlight Dome camera with PoE						
5	1/2.8" 1.8-3mm, Day/Night HD 2 Mega Pixels IP vari-Focal Starlight Dome camera with PoE						
6	1/2.3" 1.6 mm Day/Night HD 2 Mega Pixels IP Panoramic IR camera with PoE						

7	IR ILLUMINATOR						
8	VMS Sever						
9	Network Video Recorder						
10	Video Management Software and Map edition						
11	1/2.8" Day/Night HD 2 Mega Pixels IP vari-Focal Starlight IR Bullet cameras with PoE (WDR)						
12	IP License Plate Camera (3.8m to 28m range)						

1. EVAC SYSTEM							
Item	Equipment	Make And Trade Name	Catalogue No.	Is Material To Specification Y/N	Mark SABS Y/N	Supplier	Supplier Contact Details
1	Fire resistant 2 core cable 1.5mm, 30 minutes						
2	Fire Rated Metal Wall / Panel Speakers						
3	Wide Range Horn Speakers - 30W						
4	6Watt Evacuation Ceiling Speakers with Fire Dome						
5	Voice Alarm System Controller						
6	Voice Alarm Router						
7	Voice Alarm Cal. Station Keypad with 6 zone call buttons						
8	Fireman's Panel						
9	240Watt Amplifier						
10	Emergency Power supply unit						

4. INTRUDER ALARM

Item	Equipment	Make And Trade Name	Catalogue No.	Is Material To Specification Y/N	Mark SABS Y/N	Supplier	Supplier Contact Details
1	8 – Zone Control Panel Expandable to 48 zones						
2	8 zone wired bus expander module						
3	Outdoor Dual Technology Detectors						
4	Dual Technology Detectors						
5	(Ceiling Mount Detectors with 360° view)						
6	Fixed Word LCD Keypad						
7	Seismic Detectors						
8	Mobile Panic Buttons						
9	Fixed Word LCD Keypad						
10	15Watt. 12V Siren						

5. AUDIO INTERCOM

Item	Equipment	Make And Trade Name	Catalogue No.	Is Material To Specification Y/N	Mark SABS Y/N	Supplier	Supplier Contact Details
1	Master station						
2	IP One Button IP66 Intercom Station including back box						
3	Handset with armoured cables and cradle						
4	IP Desktop Master Station with Display & Handset						
5	Audio Server						

6. INTEGRATED SECURITY MAMAGEMENT SOFTWARE

Item	Equipment	Make And Trade Name	Catalogue No.	Is Material To Specification Y/N	Mark SABS Y/N	Supplier	Supplier Contact Details
1	Security Management Software						
2	SMS Server						

7. NETWORK

Item	Equipment	Make And Trade Name	Catalogue No.	Is Material To Specification Y/N	Mark SABS Y/N	Supplier	Supplier Contact Details
1	4 Core Multimode Optic Fibre Cable						
2	Multimode Fibre SFP Gigabit Transceivers						
3	Layer 3 24 Ethernet 10/100/1000 ports, 2x SFP+ Ports. 2x GbE Combo Ports Head End Switch						
4	L3 Gigabit Fibre Core Switch with 24 Gigabit SFP slots and 2 combo ports (RJ45/SFP)						
5	Smart Managed 24 Port 10/100/1000 with PoE + 2*Gigabit combo SFP port Field Switch						
6	MULTI PORT FIBRE PATCH PANELs						
7	Fast Ethernet Media Converters						

8. SYSTEMS CONTROL

Item	Equipment	Make And Trade Name	Catalogue No.	Is Material To Specification Y/N	Mark SABS Y/N	Supplier	Supplier Contact Details
1	Control Room Workstation PCs						
2	24-inch High Performance HD LED Monitors						
3	42-inch High Performance HD LED Monitors						
4	FREE STANDING VIDEO WALL MOUNT						
5	KVM Extender - Transmitter (Dual View – Cat6 Cable Link)						
6	KVM Extender - Receiver (Dual View – Cat6 Cable Link)						
7	USB Active EXTENDERS (SENDER - RECEIVER PAIRS)						
8	High Speed HDMI Cable with Ethernet 10m						
9	KVM Extender - Transmitter (Quad View – Cat6 Cable Link)						

10	KVM Extender - Receiver (Quad View Cat6 Cable Link)				
11	2 X 2 Video wall Server				

9. EMERGENCY VOICE COMMUNICATION SYSTEM

Item	Equipment	Make And Trade Name	Catalogue No.	Is Material To Specification Y/N	Mark SABS Y/N	Supplier	Supplier Contact Details
1	8 Line Controller c/w Handset						
2	Type B Green disabled refuge outstations						
3	Xenon Strobes						
4	Driver module						
5	Audio frequency induction loop kit						

10. FIRE SUPPRESSION SYSTEM

Item	Equipment	Make And Trade Name	Catalogue No.	Is Material To Specification Y/N	Mark SABS Y/N	Supplier	Supplier Contact Details
1	Gas Extinguishant						
2	Extinguishant Release Control Panel						

11. ACCESS CONTROL SYSTEM

Item	Equipment	Make And Trade Name	Catalogue No.	Is Material To Specification Y/N	Mark SABS Y/N	Supplier	Supplier Contact Details
	Indoor Fingerprint readers						
2	Outdoor Fingerprint readers						
3	Fingerprint Processing Unit – Take-Ons						
4	Reports Printer						
5	Webcam						
6	Electromagnetic Locks						
7	Override Key Switches						
8	Heavy duty door closers						
9	Multi-function Single door Controllers						
10	Master / System Controllers						
11	Roller Shutter Door Contacts						
12	Electromechanical morticed dead latch locking device						

13	PLC: Door Controller with a single Ethernet port						
14	Door Controller additional I/O Board						

12. BOOM AND SPIKE BARRIER COMBINATION

Item	Equipment	Make And Trade Name	Catalogue No.	Is Material To Specification Y/N	Mark SABS Y/N	Supplier	Supplier Contact Details
1	Boom and Spike-barrier combination						

13. X – RAY SCANNING

Item	Equipment	Make And Trade Name	Catalogue No.	Is Material To Specification Y/N	Mark SABS Y/N	Supplier	Supplier Contact Details
1	X – ray machine						

14. METAL DETECTORS

Item	Equipment	Make And Trade Name	Catalogue No.	Is Material To Specification Y/N	Mark SABS Y/N	Supplier	Supplier Contact Details
1	Walk through metal detector						

15. TURNSTILES							
Item	Equipment	Make And Trade Name	Catalogue No.	Is Material To Specification Y/N	Mark SABS Y/N	Supplier	Supplier Contact Details
1	Bi-directional Full Height Turnstiles						

16. PANIC / DURESS ALARM SYSTEM							
Item	Equipment	Make And Trade Name	Catalogue No.	Is Material To Specification Y/N	Mark SABS Y/N	Supplier	Supplier Contact Details
1	Wireless Mimic Base Station						
2	Code-Hopping						
3	Wall Mount Transmitter						
4	Code-Hopping Pendant Chain Remote						
5	3.2A Battery Backup Supply Unit						

PART C6.1.8: DRAWINGS ISSUED FOR TENDER PURPOSES

Item	Drawing Number	Drawing Title	Revision
1	ME159/WCS046363/0	LOWER LEVEL : SECURITY LAYOUT PLAN	0
2	ME159/WCS046363/1	GROUND LEVEL: SECURITY LAYOUT PLAN	1

PART C6.1.9: SCHEDULE OF SUB-CONTRACTORS TO BE EMPLOYED

The tenderer must state below the sub-contractors he intends to employ on this Contract.

SUB-CONTRACTOR/SUPPLIER	NATURE OF WORK/EQUIPMENT

DATE: SIGNATURE: _____
TENDERER

BILL OF QUANTITIES, SPECIFICATION AND DRAWINGS
FOR
PROPOSED NEW MAGISTRATES COURT ON ERF 253, JAN KEMPDORP FOR THE DEPARTMENT OF PUBLIC WORKS & INFRASTRUCTURE FOR MECHANICAL ENGINEERING WORKS

WCS 046363

PART C6:
PART C6.2: HVAC SYSTEMS:
SUPPLY, INSTALLATION, COMMISSIONING AND 12 MONTHS FREE MAINTENANCE OF HVAC SYSTEMS

Prepared for:	**Prepared by:**
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JULY 2021

Contents

PART C6.2.1: NOTICE TO TENDERERS

1. The quantities given in the Bill of Quantities are estimates only, and subject to re-measuring during the execution of the work. The Contractor shall obtain the Engineer's detailed instructions for all work before ordering any materials or executing work or making arrangements for it.
2. The Works as finally completed in accordance with the Contract shall be measured and paid for as specified in the Bill of Quantities and in accordance with the General and Special Conditions of Contract, the Specifications and Project Specifications and the Drawings. Unless otherwise stated, items are measured net in accordance with the Drawings, and no allowance has been made for waste.
3. The validity of the contract will in no way be affected by differences between the quantities in the Bill of Quantities and the quantities finally certified for payment.

PART C6.2.2: SCOPE OF WORK

1. GENERAL

The installation work to be carried out under this project consists of the following.

(a) Air Conditioning system
(b) Ventilation
(c) Extraction
(d) Control and monitoring equipment

The air conditioning system is comprising of split inverter units and mini-Variable Refrigerant volume types. serving different areas.

The tender drawings are not to be used as a working drawing as the tenderer will have to submit the workshop drawing for scrutinization, together with the equipment submittal for the engineer approval prior to carry any work.
The ventilation system will be of introducing of filtered fresh air into the building space as per tender drawing.

PART C6.2.3: PROJECT INSTALLATION REQUIREMENTS

1. GENERAL

The Contractor shall provide skilled attendance to train personnel in plant and controls operations, after all items have been fully tested, commissioned and put into operation. He shall allow a minimum of 3 members of his staff for 1 week for the training of the Client staff. Training shall include a formal presentation on all aspects of the systems including explanatory/layman's documentation on the installed systems and their operation

2. STANDARD SPECIFICATION

a) Standard Specifications and codes of Practice issued by the South African National Standards and British Standards Institute.
b) SANS 10132 – 2008 The installation and operation of refrigerated milk tanks
c) SANS 10140-3 – 2003: Identification colour marking Part 3: Contents of pipelines
d) SANS 10142-1 – 2009: The wiring of premises Part 1: Low-voltage installations
e) SANS 10147 – 2009: Refrigerating systems including plants associated with air-conditioning systems
f) SANS 347 – 2010: categorisation and conformity assessment criteria for all pressure equipment
g) SANS 10173 – 2003: The installation, testing, and balancing of air-conditioning duct work
h) SANS 10191 - Acoustics - Determination of sound power levels of noise sources - Guidelines for the use of basic standards for the reparation of noise test codes
i) SANS 10250-2 – 2010: The minimization of environmental pollution during the servicing and repair of automotive air-conditioning equipment Part 2: Servicing and repairs using refrigerant recycle equipment
j) SANS 193 – 2004: Fire AC unit
k) SANS 1238 – 2005: Air-conditioning ductwork
l) SANS 1366 – 2008: Rigid urethane and isocyanurate foams for use in thermal insulation
m) SANS 1424 – 2008: Filters for use in air-conditioning and general ventilation
n) SANS 1445-3 – 2008: Thermal insulation materials for industrial applications Part 3: Bonded preformed mineral fibre pipe sections
o) SANS 1470-3 2008: Sound power labelling Part 3: Rotating electrical machinery
p) SANS 1498 2007 Algaecides for use in industrial cooling water
q) SANS 1508 – 2007 Expanded polystyrene thermal insulation boards
r) SANS 60335-2-24, IEC 60335-2-24, 2010 Safety of household and similar electrical appliances Part 2-24 Particular requirements for refrigerating appliances, ice-cream appliances and icemakers
s) SANS 60335-2-30, IEC 60335-2-30; 2008: Safety of household and similar electrical appliances Part 2-30: Particular requirements for room heaters

t) SANS 60335-2-40, IEC 60335-2-40; 2006: Safety of household and similar electrical appliances Part 2-40: Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers
u) SANS 60335-2-41, IEC 60335-2-41; 2010: Safety of household and similar electrical appliances Part 2-41: Particular requirements for pumps 1996-7 Safety of household and similar electrical appliances Part 2-51: Particular requirements for stationary circulation pumps for heating and service water installations
v) SANS 60335-2-88, IEC 60335-2-88; 2003: Safety of household and similar electrical appliances Part 2: Particular requirements for humidifiers intended for use with heating, ventilation, or air conditioning systems
w) SANS 60335-2-98, IEC 60335-2-98; 2010 Safety of household and similar electrical appliances Part 2-98: Particular requirements for humidifiers
x) SANS 60335-2-104, IEC 60335-2-104: 2003: Particular requirements for appliances to recover and/or recycle refrigerant from air conditioning and refrigeration equipment
y) SANS 60598-2-19, IEC 60598-2-19; 2000: Luminaries Part 2: Particular requirements Section 19: Air-handling luminaries (safety requirements)
z) SANS 60730-2-9, IEC 60730-2-9, 2008: Automatic electrical controls for household and similar use Part 2-9: Particular requirements for temperature sensing controls
aa) SANS 60730-2-11, IEC 60730-2-11; 2007: Automatic electrical controls for household and similar use Part 2-11: Particular requirements for energy regulators
bb) SANS 14644-1, ISO 14644-1, 2 and 3; 2001: Clean rooms and associated controlled environments Part 1: Classification of air cleanliness

3. DEFINITIONS & ABBREVIATIONS

Definitions of terms used in these documents shall mean:

"Approved" / "Satisfactory" / "Accepted" : As approved, satisfactory, accepted by the Employer or his agent.

"Balancing" : Work adjustments and checks necessary to proportion the flow within the distribution system, sub-mains, branches and terminals of a system in accordance with specified quantities and to achieve specified performance

"Contractor" "Tenderer" : The contractor or tenderer is the party, persons or company successful in their bid return as part of this contract.

"Commissioning". Work necessary to place the installation and work covered by this specification into normal operating conditions to the satisfaction of the Employer or his agent.

"Indicated": As indicated, shown or noted on drawings and/or specifications

"Shown" or
"Noted."

"Install": To erect, mount, fix and connect complete with all related accessories to enable the desired function

"Provided": To supply, install, connect up and commission into regular and safe operation of particular item referred to.

"Testing": Work and checks necessary to determine quantitative performance of equipment installation and workmanship.

"ASHRAE" American Society of Heating, Refrigerating and Air Conditioning Engineers

"ARI": Air Conditioning Refrigeration Institute (USA)

"BS": British Standard Specification

"BSI": British Standards Institute

"SANS": South African National Standards

"SMACNA": Sheet Metal and Air Conditioning Contractors National Association (USA)

Any discrepancies, misunderstandings, concerns or clarification requirements shall be made in accordance with this specification.

4. REGULATORY FRAMEWORK

The sub-contractor shall ensure that the air conditioning and ventilation installations, including all associated works and methodologies, comply with all the latest statutory requirements and regulations, and in particular with the following.

a. The Occupational Health & Safety Act, Act No. 85 of 1993, as amended.
b. The Construction Regulations
c. The pressure equipment regulations (PER 2009) as amended. Special note shall be made of the requirements for all persons working with and handling pressurized refrigerant gasses to be suitably registered as "competent" persons.
d Government, Provincial and Local Authorities, Ordinances, Regulations, by-laws, Rules and other legal instructions.
e. All works shall be executed to satisfy the National Building Regulations as applied through SANS 10400, The Application of the National Building Regulations, as amended. Particular attention is drawn to SANS 10400 – O - 2011: National building regulations Part O ventilation, SANS 10400 – V – 2010: National building regulations Part V – space heating

f. Commissioning shall be executed in accordance with the CIBSE Commissioning guides M or ASHRAE Guideline 1 1996.

At all times works shall be executed in accordance with Good Engineering Practice.

In the case of conflicting statements in the above specifications the SANS specification shall take precedence.

The standards to be complied with and listed above shall be made available to the Engineer on request by the Tenderer.

All references to standards and regulations shall be deemed to apply to the latest, current and as amended standard.

5. CONTRACT MANAGEMENT AND CONTROL

5.1 RESOURCES

The tenderer shall make available suitably competent, experienced and capable resources for the timely execution of the works in accordance with the project specification.

Attendance at meetings shall be provided as requested by the Engineer, Principal Contractor and Employer.

Upper-level management attendance shall be provided at regular site, contract, commercial and engineering meetings.

The tenderer is to submit an organogram of supervisory staff (with names) that will be involved on the project, showing the time in a month that each individual will be committing to the project against the project program (i.e. a resourced program).

The tenderer is to submit CV's of his key staff indicating relevant experience.

All resources on site shall be certified via appropriate organisations demonstrating competence in their ability to perform the tasks required.

5.2 PROGRAM AND COMPLETION

The tenderer shall provide a resourced program of the works, in accordance with the directives herein and in compliance with the form of contract.

This program shall be provided within **one** week of appointment and shall clearly indicate all interdependencies related to works by others.

The tenderer shall ensure their program of works is co-ordinated with others and satisfies the requirements of the main contractor and the principle building contract

The program of works shall be updated bi monthly to indicate progress on site and remediate any potential delays.

The Contractor shall submit a detailed works program and anticipated cash flow estimate of his/her Tender

Suitable time shall be allocated to perform commissioning, validation and hand-over to the approval of the engineer. Particular attention must be made to the required completion dates and penalties as described within the contract conditions.

5.3 LEAD TIME GUARANTEE

The contractor shall submit with the Tender return a guarantee that all equipment and corresponding supply (lead times), delivery, installation and commissioning of all equipment can be achieved within the project time frame.

5.4 QUALITY MANAGEMENT

The tenderer shall maintain an ISO9000 series compliant quality management system for the duration of the contract. The quality file shall be kept on site and shall be made available for inspection by the Engineer, Employer or his agents.

Signed off quality control checklists, commissioning schedules and test certificates shall be provided prior with all invitations for inspection by the contractor.

The Engineer reserves the right to charge the contractor at the prevailing Engineering Council rates for abortive inspections.

Only the highest possible standards of workmanship will be accepted. No inferior quality of workmanship will be accepted.

5.5 SCRUTINY OF DRAWINGS

All drawings, circuit or schematic diagrams prepared by or on behalf of the Contractor for submission to the Engineer in terms of the requirements of this specification shall have been thoroughly checked, corrected where necessary and signed as approved by the Contractor, prior to such submission.
The Engineer's scrutiny of any drawings will cover the arrangement, type and operational suitability of the equipment in general only. Such approval will not release the Contractor from his responsibility for the proper operation of the installation or for its full compliance with the specification, drawings, local authority and statutory requirements, or for ensuring that the equipment can be physically accommodated within the space and via the access provided.

6. DOCUMENTATION

Documentation shall be provided to demonstrate compliance with all applicable Quality, Regulatory and specified requirements.

The following list of documentation will be required, as a minimum, in order to complete the commissioning phase of the project. All will be subject to approval by the Engineer before implementation:

a) Contract particulars including contact details and company details of all parties to the contract
b) Emergency contact details for use in case of emergency and service callout
c) Functional design specification
d) P&IDs
e) Calibration certificates for each type of probe, sensor, gauge or measuring instrument
f) General arrangement drawings, approved workshop drawings and As-builts
g) Critical spares list
h) Full parts list including component manufacturers part numbers and contact details
i) Component manufacturers datasheets
j) Equipment configuration details (details of the fixed damper positions, air flow balance data, filter pressure drops etc as configured during pre-commissioning)
k) Inventory List with Serial and Part Numbers and drawing references
l) Electrical and control panel layout drawings and wiring diagrams
m) HVAC System diagrams, suitably laminated and indicating the design criteria of each area
n) Safety certification for the complete system
o) Operating and maintenance manuals Factory acceptance test report – where applicable
p) Commissioning report and training documentation
q) Product, equipment and material Warranties
r) Escalation steps and basic troubleshooting guide

6.1 LIST OF CLOSEOUT DOCUMENTATION

KEY for 'Responsibility' Column: , M = HVAC Consultant, E = Electrical Consultant, F = Fire Consultant, A = Architect, PM = Project Manager,
Note: All fields below are to be checked / signed or marked where not applicable

Item	Designation	Responsibility	Qty
1	O & M manuals with As-built drawings (Hard copy together with one CD containing its soft copy)	M, E & F	4
2	Certificate of Compliance, in pdf as well	M, E & F	4
	For Each DB	M, E & F	4
	- For the entire wiring	M, E & F	4
	- Laminated Final Electrical single line schematic for each DB	M, E & F	4
	• Lock up Key DBs/Control panels	M, E & F	4
3	A full report and Test results of all systems after commissioning	M, E & F	4
4	All air flow balancing results for each area wherever applicable	M, E & F	4
5	Proof/ Certificate for training of End user personnel achievement	M, E & F	4
6	Certificate of commitment for the 12 / 24 Months maintenance & guarantee period	M, E & F	4
7	HVAC interlink certificate to fire control panel and guarantee	M, E & F	4

8	Test result for HVAC interlink to fire contro. panel	M. E & I	A

6.2 TESTING, BALANCING & COMMISSIONING

All safety devices shall be checked for effective operation by simulating the abnormal or overload conditions.

Performance of all equipment shall be measured and plotted on the supplier's graphs and compared with theoretical calculated conditions. If necessary, adjustment and alterations shall be made to achieve the desired operating conditions.

All tests and results shall be recorded and a test report shall be compiled for insertion in the operating and maintenance manual.

For all Green Buildings, Technical buildings, pharmaceutical facilities, Healthcare facilities and otherwise as requested the commissioning procedure shall conform to the requirements of ASHRAE Guideline 1-1996: The HVAC Comissioning Process and to CIBSE Commissioning Code M Commissioning Management.

Air balancing shall confirm to CIBSE Commissioning Guide A : 1996 as amended

The BSRIA Application Guide 3/89.3: 2001 – Commissioning Air Systems and BSRIA Application Guide 2/89.3 2002 – Commissioning Water Systems shall be referenced in the method statement and planning of commissioning activities.

6.2.1 VRV / VRF commissioning and Performance Testing - Methodology

A normal working test shall be carried out with the plant operating at its design working pressure and/or temperature. During this test all necessary adjustments and regulation of AC equipment shall be made to obtain the required system balancing and performance

When the systems have been set to work the Contractor shall employ the services of the commissioning Engineer to carry out the final balancing and commissioning of all services.

The final commissioning of the systems shall not take place until the building is complete with all its building works and process services in place or as directed by the Engineer and Employer.

Balancing results shall be recorded at every stage of the process including initial readings with all AC units open, provisional airflow balance with doors open, final balance with doors closed and pressure cascades set up.

All the tests and test schedules shall be drawn up by the Contractor in collaboration with the Engineer.

Testing and Commissioning shall be carried out to satisfy the following final design requirements

a) Temperature (and humidity where relevant) maintained within specified limits in all areas.
b) The correct operation of all control circuits, whether automatic or hand operation.
c) The correct operation of all safety systems.
d) Correct air flow rates and temperatures
e) Correct standard of filtration.

6.3 WORK ALLOCATION

The work allocation will consist of the following:

a) The end user will provide the necessary permanent electric power supply to a point required by the Mechanical Contractor. The client will NOT supply any distribution boards and equipment, or lighting, or power, or ventilation installations.

b) Alterations, which may be required by the contactor such as drilling of access holes, will need to be approved by the engineer and is for the contractors' account.

c) The Contractor shall provide a Site Instruction Book.

d) The Contractor shall provide his own tools, labour, temporary storage and accommodation, material, plant, transport and equipment and execute the contract with a minimal disturbance to the end user. Prefabrication must preferably and where possible be done at his own works.

e) The Contractor shall provide his own sheds and site offices if so required.

f) The Contractor shall prepare all working drawings and eventual "As Built" drawings, constituting the entire installation. Two sets of hard paper prints of working drawings are required for scrutiny before construction is commenced. Four set of hard prints and copies of the electronic files (preferably on C D) are required of the "As Built" at completion. See O&M specifications.

6.4 HANDLING OF MATERIAL

The Contractor shall be responsible for providing all the required equipment for the off-loading and proper handling of the material on site. He shall also be responsible for the installation in the correct position.

6.5 SETTING OUT OF WORK

The Contractor shall be responsible for the correct setting out of any holes, sleeves, penetrations, plinths, plant hangers and openings that may be required.

6.6 SHOP DRAWING SUBMITTAL.

The contractor shall submit detailed "shop" drawings indicating the works to be completed.

Shop drawings shall be provided to the Engineer within 14 days following confirmation of the intent to appoint or sooner as directed by the Employer, Engineer or agent.

Shop drawing submittals shall be made in triplicate, at full scale, and shall include a cover sheet, date stamp, and approval stamp.

Shop drawings shall clearly indicate works to be completed by others, i.e. power supplies, drains, water supplies, builders openings, sleeves and penetrations.

Shop drawings shall be compliance with ISO standards.

Shop drawings shall indicate the particulars of the parties responsible for the design drafting, review and approval of the drawings.

The scale, drawing size, revision number date and drawing particulars shall be clearly indicated on the drawings.

Drawings shall include all sections, 3D views, assembly views, plan views and layouts as required to fully understand the works to be executed

Works shall be executed strictly in accordance with shop drawings approved by the Engineer.

Three copies of the approved shop drawings shall be maintained on site for the inspection of the Engineer at all times.

6.7 WORKING DRAWINGS

One copy of the approved shop drawings shall be maintained up to date to reflect the as built conditions on site. This drawing shall be marked up with all deviations from the approved drawings and shall be highlighted to show installation progress. This marked up drawing shall be copied and issued to the Engineer on a monthly basis.

6.7.1 Scrutiny of drawings

All drawings, mechanical HVAC floor layouts or schematic diagrams prepared by or on behalf of the Contractor for submission to the Engineer in terms of the requirements of this specification shall have been thoroughly checked, corrected where necessary and signed as approved by the Contractor, prior to such submission.
The Engineer's scrutiny of any drawings will cover the arrangement, type and operational suitability of the equipment in general only. Such approval will not release the Contractor from his responsibility for the proper operation of the installation or for its full compliance with the specification, drawings, local authority and statutory requirements, or for ensuring that the equipment can be physically accommodated within the space and via the access provided.

6.8 EQUIPMENT SUBMITTAL

The contractor shall compile and submit three (3) booklets of the equipment selection and submittal to the Consulting Engineer within two weeks after appointment for approval.

Performance and construction specifications shall be provided for each type of equipment.

The equipment submittal booklet shall consist of;

a) Cover page stating the project name, the client, the consulting engineer and the contractor with contact persons and details
b) The index page stating the contents and sections of the submittal with page numbers
c) General: a brief description of the project and the equipment offered
d) Introduction: brief history of the contractor, experience, personnel proposed for the project with brief CV and project photos where the equipment proposed was used.
e) Table of the equipment capacity of all equipment contained in the submittal showing the following:
    i. Design conditions
    ii. Equipment name and designation
    iii. Area served
    iv. Operating capacity
    v. Dimensions (length, width, height and weight)
    vi. Starting current, running current and voltage
    vii. Noise level
    viii. Compliance with specification

f) Details of the equipment offered (this section is to be repeated for every single item of equipment offered).
   i. General: name of equipment offered, previous project where equipment was used with reference from the client
   ii. The Equipment: all technical specifications, photos where applicable, service interval and estimated operating life in years of the equipment. The technical specifications as a minimum shall state:
      - Capacities
      - Material of manufacture and type of finishes
      - Make
      - Model number
      - Manufacturer details
      - Estimated delivery date
      - Noise levels
      - Operating conditions and performance curves where applicable
      - Compliance with specifications
      - Electrical requirements and loading
      - Energy efficiency measures of the equipment offered
      - Any special sustainable design and details included in the equipment
      - The completed schedule of information in the tender document
      - Manufacturer's catalogues
      - Control system and electrical schematics for the equipment
      - Any other relevant information
g) Motivation for the proposed equipment
h) Conclusion
i) Approval page for signature and date:
   i. The contractors name and responsible person signature
   ii. The consulting Engineers name and responsible person signature
   iii. The client's signature and responsible person
   iv. Approval stamp by consulting engineer

6.9 OPERATION AND MAINTENANCE MANUAL SUBMITTAL

The contractor shall compile and submit one (1) booklet of the operation and maintenance manual to the Consulting Engineer two months prior to practical completion for approval.

On approval by the consulting Engineer, the contractor shall prepare and submit four (4) copies of the approved operation and maintenance manual on practical completion sign off in both hard cop and soft copies.

OPERATING MANUALS

Three complete sets of operating manuals for the complete system shall be supplied by the contractor together with a soft copy in form of USB or CD including As-Built drawing.

Manuals must be in English and compiled in layman's language, and shall be in the form of plastic display binders

At least one month before commissioning, a draft copy shall be submitted to the Engineer for comments and approval. Operating manuals as specified shall be supplied to the Engineer prior to the first delivery.

Operating manuals shall give a clear description of, and purpose of the installation.

a) Complete operating instructions,
b) Paper Copies of all approved drawings and diagrams.
c) Action to be taken during "Fault" and "Alarm" conditions.
d) Detailed description of the different components used in the installation.
e) Names, telephone numbers etc. of contact personnel.
f) On and off switching procedures as well as general separating procedures
g) The operating manual shall contain no technical information

EQUIPMENT LIST AND AREAS SERVED

The list below contains equipment and area it serves. refer to tender drawing.

The Operation and Maintenance booklet shall consist of:

a) Cover page stating the project name. the client, the consulting engineer and the contractor with contact persons and details
b) The index page stating the contents and sections of the submittal with page numbers
c) General information on the project:
    i. Name of project
    ii. Address of project
    iii. Start and completion date
    iv. The professional team and contacts
    v The contracting team and contacts
    vi. Emergency contact details of the contractor

vii. Maintenance start and completion date
viii. Major equipment suppliers and contact details

d) Description of the System
   i Design conditions and technical specification
   ii. Salient points of the installation
   iii. Detailed description of the systems
   iv. Health and safety considerations associated with the systems
   v. Detailed technical specification and description of all installed equipment and system

e) Table of the equipment capacity of all equipment and systems installed on the project showing the following:
   i. Equipment name and designation
   ii. Area served
   iii. Operating capacity
   iv Dimensions (length, width, height and weight)
   v. Starting current, running current and voltage
   vi. Noise level
   vii. Compliance with specification

f) Supplier details and catalogues/technical manuals for each major equipment installed on the project

g) Operating and Maintenance procedures
   i. Start and stop procedures
   ii. Emergency procedures
   iii. Procedures for the service, replacement and maintenance of all plant, equipment and systems.

h) Operating and maintenance schedules and checklists:
   i. Weekly maintenance
   ii. Monthly
   iii. 3 monthly
   iv Quarterly
   v. Yearly
   vi. Minor service
   vii. Major service
   viii. Every 5 years
   ix. Every 10 years
   x. others

i) Commissioning results and details of each equipment and system

j) Training of end user details and attendance register sign off

k) Recommended spares

l) As built drawings and documentation

m) Equipment submittal approved page

n) Conclusion

o) Approval page for signature and date:
   i. The contractors name and responsible person signature
   ii The consulting Engineers name and responsible person signature
   iii The client's signature and responsible person
   iv. Approval stamp by consulting engineer.

6.10 TRAINING

On completion of the entire sub-contract work, the contractor shall conduct a detailed training session on the installation works for the end user/client representatives. This training shall address the operations, maintenance and all other requirements to maintain a fully functional service to the client.

For the training to commence, the contractor shall compile and submit two (2) copies of the detailed training manual to the Consulting Engineer within three months prior to practical completion for approval by the Engineer and the end user client. The submission will include the agenda for the training, the requirements and qualifications for the training and the duration.

From the consulting engineer, the contractor shall allow a minimum period of two weeks to train the end user in the proper functionality of the system. The training shall consist of both formal class room training and hands on training on the completed project

Tenderers shall allow in their tender prices for a training course, to train on site at least four (4) persons, as nominated by the User Department from his own operating personnel. The training shall be adequate for the installation, to ensure that training staff adequately understand the system. During this period, the personnel shall be made fully conversant with the operation of, and daily maintenance required for each item of equipment of the system. The training, especially on computer equipment and control panels, shall be of such a standard that will enable the User Department to carry out his own in-house training of other personnel.

The training course shall start only after the first take-over inspection of the system.

The training course shall be carried out in the language medium chosen by the User Department.

6.11 REPORT TEMPLATE

The contractor is requested to give time to time a progress report about the work undergoing.

The report will be as per Principal Agent and or Mechanical Consulting Engineers template which will be provided during tender or site hand over meetings.

PART C6.2.4: PROJECT INSTALLATION SPECIFICATION

1. INSTALLATION DETAILS SCOPE OF WORK PROVISIONS

This specification covers the supply, installation testing, balancing and commissioning of air conditioning and ventilation systems installation

The contractor shall be responsible for selecting; purchasing and placing in position all equipment in the spaces shown.

All work shall be done in a first class workmanlike, manner and the contractor shall, at handing-over, provide a reliable and trouble-free air conditioning and ventilation installation, working without objectionable noise or drafts.

The drawings named on the Schedule of Tender Drawings only constitute outline drawings.

The Contractor will be required to compile and submit detailed working drawings to the Engineer together with all equipment selection submissions for scrutiny and approval prior to placing orders and commencement of any work.

1.1 HOURS OF WORK & SITE CONDITIONS

Refer to the Main Tender Documents.

1.2 ACCESS TO THE SITE

Refer to the Main Tender Documents.

2. SITE LOCALITY

The site for the installation is situated at ERF 253 Jan Kempdorp. NorthernCape Province.

Altitude	± 1 700 m
Ambient	
Summer	35,4°C db
	21,8°C wb
Winter:	-5,0°C db
	-1,9°C wb
Indoor	21°C - Air Conditioning Unless otherwise indicated on the drawing
Selection	For selection purposes of all air-cooled condensers, motors etc. an ambient dry bulb temperature of 38°C shall be used.

3. SITE MEETINGS

Site meetings will be held fortnightly or at such other intervals as necessary, for liaison between all parties concerned and for verification of progress measurements.

4. SECURING OF EQUIPMENT

The Contractor shall make his own arrangements for securing and safe-guarding of equipment and materials.

OTHER WORKS IN CONJUCTION WITH AIRCONDITIONING INSTALLATION

4.1 ELECTRICAL WORK

Site power shall be taken as 400V, 3 phases, 50 Hz, 4 wires.

Depending on each mechanical equipment power demand based on the mechanical drawings and manufacturer indication, each mechanical unit will require an isolator situated within 1.5m of the equipment its serves.

Power shall be brought by others to the outdoor unit with an isolating switch. Connecting to the unit and all other electrical work for a complete ready-to-use installation forms part of this contract.

The power and control cable between the indoor unit and the outdoor unit shall be installed together with the insulated refrigerant gas pipes in continuous galvanised sheet metal electrical trunking. The trunking shall be painted as specified. Should it be required, contractor must cover all pipes and cable to avoid any damaging weather condition

In the event of a power failure and restoration of the power supply all air conditioning if in the "on" position in the areas serviced shall agout start automatically.

Time delay shall be built into the compressor control circuiting to prevent short cycling.

Power to exhaust fans shall be brought to within one metres (1 m) of each fan by others. Connecting to this point forms part of this contract, including on/off remote switching, protection, etc. as applicable.

A relay must be provided to cut off from power all mechanical equipment in case of fire alert, this must be synchronised at the fire panel level.

4.2 BUILDING WORK

All building work relating to the mechanical and electrical work in this specification forms part of this contract, except where otherwise indicated.

That includes plinths for equipment, supports, cutting of openings in walls, roofing, sheet metal, etc, for pipe and cable penetrations as well as making good thereof.

Cutting and fitting ceiling panels around grilles will be done by others.

4.3 DRAINAGE

All drainage piping required is included in this contract and must be allowed for in the tender price.

4.4 CONTROLS

All controls and control wiring forms part of this contract. Control wiring shall be wired in trunking and/or conduit as applicable with controllers' flush mounted on draw boxes for each unit.

5. AIR CONDITIONING UNITS – CASSETTE, MIDWALL AND HIDE-AWAY SPLIT ROOM TYPE AIR CONDITIONERS

5.1 GENERAL

Ceiling Cassette, Console type, Midwall and hide-away split air conditioner types are required as indicated on the drawings.

Split type units shall be of the reverse cycle type for winter heating. Both indoor and outdoor units shall be completely factory wired, ready for site connection.

Table 1 of Standard Specification M.8 is applicable to the indoor units and table 2 to the outdoor units for noise vibration control

5.2 MIDWALL UNIT

Where required each indoor unit shall be properly and finally mounted on wall, using appropriate bracket in the full respect manufacturer instruction and shall operate without vibrations, noise etc. being carried over to the building structure. Drain water

pipe from the unit must have an acceptable fall to allow easy drain water flow toward the discharging point. Wireless/Infrared Remote on/off controllers serving the unit should be positioned next to the light switch as indicated on tender drawing.

5.3 CEILING CASSETTE

Where required each indoor unit shall be properly and firmly supported from the main roof beam and shall operate without vibrations, noise etc. being carried over to the building structure. Drain water pipe from the unit must have an acceptable fall to allow easy drain water flow toward the discharging point. Cassette units flush with the ceiling . Wireless/Infrared Remote on/off controllers serving the unit should be positioned next to the light switch as indicated on tender drawing.

5.4 HIDEAWAY UNIT

The room units shall be the manufacturer's standard with hide away units designed with discharge and return sides for the connecting of ducting and grilles designed with air outlets with adjustable blades and discharge pattern.

The hide-away units shall be neatly installed in the ceiling void and cassette units flush with the ceiling. with Wireless/Infrared Remote on/off controllers serving the unit should be positioned next to the light switch as indicated on tender drawing.

The positions for the supply air diffusers and return air grilles are provisional and shall be determined on site with the Engineer.

Each indoor unit shall be properly and firmly supported from the main roof beam and shall operate without vibrations, noise etc. being carried over to the building structure.

Ducting etc. shall supported from the roof overlap bolts with hangers (wire and/or rods).

The refrigerant charge and gas piping shall be finally determined on site and both gas pipes are to be insulated independently from the other and provided with proper vapour barriers to prevent dripping due to condensation.

Power cables and gas piping as well as drip pan drainage piping shall be installed in galvanised electrical type trunking between the indoor and the outdoor units. where the trunking is visible it shall be painted to the architect's standard.

The control cables for the remote on/off switching of the units shall be neatly installed in flush conduit, the controller approximately 1,7 metres above finished floor level.

Units shall be installed in such a manner that the filters, the unit and other components are easily accessible from below the ceiling for replacement, repairs and servicing.

The units shall be quiet in operation and shall be provided with at least two speed selector switches for the fan motor as well as the necessary adjustable thermostat, Eberle type controllers, thermostats are preferred.

Controllers/ thermostats shall be modern electronic type an no outdated or mechanical types will be accepted.

Units with LED indicator lights and self-diagnostic electronic system will be preferred.

Units shall be rated in accordance with BS2852 to meet the specified capacities as a minimum.

Hide-away units with less than 120 Pa external pressure will not be considered.

5.5 OUTDOOR UNIT (CONDENSING UNIT)

Each of the room units specified above shall be provided with its own air-cooled reverse cycle condensing unit, correctly selected and matched to the indoor unit.

The unit capacity shall be selected at an ambient temperature of not less than 38°C.

The unit shall be installed on custom-made support framework and concrete plinths as indicated on the drawings and all framework and supports painted as specified.

Refrigerant piping with sizes and oil traps strictly in accordance with the manufacturer's instructions shall be provided and routed as indicated

The unit shall be completely weather proof and suitable for permanent outdoor use. The cabinet shall be manufactured of galvanised sheet metal with baked enamel or epoxy powder coating

The condensing units shall be installed on support framework and concrete plinths with anti-vibration mountings to ensure that no vibrations or noises are transmitted to the building or building structure, refer Standard Specification M18.

5.6 DRAINAGE PIPE WORK

Each of the indoor units shall be fitted with its own drip pan drainage pipe as shown on the drawings.

The pipes must be properly supported at intervals not exceeding 1 metre with proper pipe clamps.

Cleaning points shall be provided where necessary

5.7 DUCTING

The Contractor shall provide and install all the necessary ducting for the air supply and extract purposes as shown on the drawings. The quantities of air specified on the drawings are fixed and the Contractor shall be responsible for balancing the system so that these quantities are obtained. Too much air as well as too little air will not be acceptable.

The ducting required shall be supplied, installed, insulated and commissioned in accordance with Standard Specification M20, SABS 1238 - 1979 and SABS 0137 - 1980.

All air conditioning ductwork shall be externally insulated, please note that the dimensions indicated on the drawings are clear internal dimensions after insulation. All flexible ducting shall be insulated externally. All ducting and refrigerant piping to be provided with proper vapour barriers.

Ventilation ductwork need not be insulated but shall be painted to the Architect's requirements where visible.

5.8 NOISE LEVELS

Proper attention shall be paid to the selection and installation of equipment to ensure that noise levels do not exceed the specified requirements.

The background noise level in the relevant rooms serviced by the air conditioning equipment must not exceed 30 dBA for the split type room units.

The applicable Standards are SABS 0103 of 1983 and Standard Specification M18 of the Consulting Engineers.

5.9 CAPACITY

The cooling capacity indicated on the drawings is the actual requirements (not nominal) at site conditions.

Tenderers to allow properly for the de-rating of units tendered to meet the specified capacities after de-rating. (NB, Altitude, ambient temperature)

6. VENTILATION

All ventilation fans used on this project must be of silent type as we cannot afford to accommodate noisy extractor or supply fan. Ventilation fans, ducting, weather louvers, grilles and diffusers are to be provided and installed as indicated on the drawings and in accordance with Standard Specification M70

Unless otherwise indicated on the drawings ducting shall be manufactured from galvanised sheet metal to SABS and the relevent Standard Specification.

The four axial flow fans supplying air to the ground floor general area shall be speed controlled with a temperature sensor.
When the inside temperature drop below 20°C the fans shall speed down to 50% of the total air and when the inside temperature rises above 24°C the fans shall speed up again to the design capacity.

PART C6.2.5: PROJECT TECHNICAL SPECIFICATION

1. GENERAL

This specification covers the detail requirements for the Heating, Ventilation and Air-Conditioning (HVAC) works at Jan Kempdorp New Magistrate Court Building.

This part of the specification should be read in conjunction with parts 1, 2, 3, 5 and 6 of the specification. In cases of discrepancy this part shall take precedence.

2. HVAC SYSTEM DESCRIPTION & DESIGN CONDITION

The site is a simple building.

The air-conditioning systems for the Jan Kempdorp New Magistrate Court building will be comprised of air-cooled normal Energy saving split unit systems, predominant with Console split units serving all perimeter offices and three mini VRF Heat Recovery system connected to their outdoors all units using acceptable and harmless refrigerant gas . The VRF system may be adjusted to meet the supplier requirement as the tender drawing does not reflect the final working drawing prior to the implementation.

There is an allowance of one extractor fan to serve the toilets situated at the ground floor level only.

To facilitate the ventilation process, a provision for the ventilation of enclosed individual toilet with a ceiling mounted single phase silent extractor fan are made

Undercut is to be provided by the main contractor to all doors, this to ease air movement into the building.

No fresh air supply fan is required as there will be enough air circulation into the building with transfer air grilles, openings at specific areas.

Outdoor design	(°C dry bulb/°C wet bulb):	38 °C db & 20 °C wb
Winter Outdoor	(°C dry bulb/°C wet bulb):	20 / 2
Indoor General	(°C dry bulb/% Rh) :	22.5/50 ± 1°C & 10 %
	Altitude above sea level :	1144 m
	Latitude/longitude: 27°54'27"S24°49'21"E	
	Decimal coordinates:	-27.9077 24.8226
NOISE LEVELS		General (NC) 30 to 54 dBA
		Indoor Unit: 40dB (A)@ 2m
		Condensing Unit: 58dB (A) @ 5m

Required Ventilation rate: 10 to 20 air changes/hour

3. TECHNICAL SPECIFICATIONS ON EQUIPMENT

3.1 HVAC AND THE BUILDING CONTRACT

The following work related to the Air Conditioning Contract will be executed by others:

3.2 THE ELECTRICAL SUBCONTRACT

Power Supply for connection to the ventilating fans. Isolator is to be provided within 1.5 meter of the mechanical equipment by the electrical sub-contractor and the final connection to the equipment from the isolator will be done by the mechanical contractor.

Power supply connection to the various AC units as indicated on the tender drawing will be the same as item 1 above.

3.3 HE BUILDING CONTRACT.

Concrete leveling basis under all equipment where required.

Building in of sleeves where pipes pass through brick walls and concrete slabs.

3.4 THE PLUMBING SUBCONTRACT.

Where required, the drain points for the AC condensate pipes have to be connected with respect to all other services.

4. DISTRIBUTION SYSTEM

4.1 AIR DUCT SYSTEM

The duct system shall be installed in accordance with the SANS Standard Specification for air-conditioning Ductwork. All main ducting shall be manufactured from galvanized sheet metal unless otherwise specified

The entire duct system shall be installed parallel to the building lines in a neat and workmanlike manner

The detail design of the duct installation shall be such that the airflow is without undue pressure drop and free from drumming for the complete range of operating conditions.

Bends and Tee pieces shall be of the radius type wherever possible and multi vane bends shall be used in cases where there are space limitations.

4.1.1 Workshop Drawing

Submit workshop drawings showing details of each piece of ducting to be manufactured prior to manufacturing. Individual pieces of ducting shall be numbered in a logical way on the shop drawings as well as on all ducting delivered to site to ensure that the installation proceeds as planned.

4.1.2 Testing

All duct installations shall be pressure tested and inspected for leaks. The maximum permissible leakage shall be 4% of the total supply air quantity to be delivered by that particular section of the installation.

4.1.3 Flexible Duct Connections

Ductwork shall be connected to fans, ceiling cassette units, supply air grilles and all other vibrating equipment by means of flexible duct connections

4.1.4 Flexible Ducting

All lay in type ceiling diffusers and mixing boxes shall be connected to duct work by means of insulated fire rated flexible ducting.

5. REFRIGERATION PIPING SYSTEM

The Air Conditioning Sub-contractor shall supply and install a refrigerant piping system in accordance with the layout as shown on the tender drawings.

In general, the refrigerant piping system shall be designed with the following features: Refrigerant piping shall be sized to allow the connected equipment to perform to the specified capacities.

Provision shall be made for lubricating oil to return to the compressor at the same rate at which it leaves under all load conditions.

Liquid refrigerant shall be prevented from draining into the compressor during shutdown periods.

5.1 SCHEMATIC

Submit detailed drawings showing all piping and equipment to be installed.
Submit documentation on all elements connected into the pipe system as well as detailed calculation showing the equivalent pipe length, pressure drop and cooling capacity that will be obtained

The refrigerant piping system and accessories shall be selected to ensure that the entire system will not leak refrigerant during its operational life. The minimum acceptable life under normal building environmental conditions shall be 15 years.

The refrigerant piping system shall not foul the access to other equipment for maintenance purposes.

The refrigerant piping shall be thoroughly insulated and must be run in cable trunking clearly labeled indicating the unit and area served

5.2 TESTING

The refrigerant piping system shall be tested by pumping up the system with nitrogen to a pressure of not less than 10 % of the maximum working pressure.

The Contractor shall ensure that all accessories in the system may be subjected to this test pressure without damage.

In general charging procedures as outlined in the manufacturer Manual will be adhered to.

5.3 COMMISSIONING

Commissioning shall include the final setting of all controls and checking that the system operates as designed.
A final check shall be done after the system has been in operation for 72 hours.

PIPING

Refrigerant piping shall be copper piping type "K" or "L". Connections to control devices of up to 10mm may be type "K" soft annealed with flared tube fittings suitable for high pressure.

Accessories connected to copper tubing shall have solder type ends or flanged ends and soldered flange adapters.

Where pipe fittings are soldered to piping silver solder shall be used During installation all open ends shall be blanked off to ensure that no dirt and debris collects in the piping. During soldering the piping shall be protected against oxidation during silver soldering by pumping dry nitrogen through the piping.

Piping shall be installed so as to allow for expansion and contraction. The first fixing point after a compressor shall be 6 pipe diameters from the compressor in any direction.

5.4 AIR DISTRIBUTION EQUIPMENT

5.4.1 In Line Extract Fans

Supply and install the extract silent type air fans as shown on the tender drawings and delivering air quantity at static pressure at acceptable noise level.
Fans shall be in line silent fan tube type as detailed on the tender drawings.
All silent fresh air fans shall work together with the air conditioning system.
Fans shall be current catalogued product and the manufacturer/supplier shall provide certified curves and detail selections for the expected operating conditions.
Fans shall be selected to perform on the stable part of the fan curves. Extrapolation of fan curves will not be accepted.

5.4.2 Workshop Drawing

Submit workshop drawings showing details of fan mounting prior to the installation. Individual hanger or bracket for the fan shall be defined logically on the shop drawings; this is to ensure that the installation proceeds as planned
Fans shall be easily accessible for maintenance purposes. All fans shall be furnished with a nameplate stating:
Make, type and model number as well as type and frequency of lubrication.
All necessary care shall be taken during transport, delivery, storage, installation and commissioning to ensure that the fans are in "as new" condition at handing over

5.4.3 Air Grilles

To Supply and install grilles as shown on Tender Drawings. The grilles shall be a fully catalogued product and documentation shall include performance curves or selection tables. Special care shall be taken during transport, storage and installation to ensure that the air terminals are in "as new" condition at handing over.
The grilles shall be natural anodized.

5.4.4 Round Disc Valve Air Terminal

Supply and install disc valves as shown on the Tender Drawings allowing the air extraction quantity at the stated duct static pressure, extract and maximum sound power level
The disc valves shall be a fully catalogued product and documentation shall include performance curves or selection tables. Submit marked-up curves or tables indicating the selected operating points.
The HVAC contractor shall provide a portable air-measuring device, specified by the air terminal manufacturer, to check the air quantity extracted by the air terminals.
The disc valves shall be finished in baked enamel to an approved color. Aluminum terminals shall be anodised to an approved color.

5.5 HIDEAWAY SPLIT UNITS' SYSTEMS WITH REMOTE AIR-COOLED CONDENSERS

To supply and install Hideaway air conditioning split units for the inverter systems with remote compact heat recovery condensers to provide the cooling capacity, with the maximum noise level, under specified design conditions stated in this tender document with wired infra-red remote controllers.

The evaporator and condensing unit shall be factory wired and suitable for the installation as shown on the drawings.

The condensing unit shall be of the air-cooled type suitable for outdoor installation.

The air conditioning units shall be a fully catalogued product and documentation shall include performance curves or selection tables.

The Tenderer shall state in the schedule of information in Section 5 the expected service life of the air conditioning units under normal operating conditions. The minimum acceptable service life shall be fifteen years.

The Engineer reserves the right to call for:

(a) Detailed calculations and materials selected for all parts.

(b) Test reports from an independent testing authority such as the SABS and the CSIR, and

(c) User's reports in order to check the claimed service life as stated in the Section 5.

The air conditioning units shall be installed on anti-vibration pads of the neoprene and cork sandwich type of correct size to suit the weight of the unit.

All necessary care shall be taken during transport, delivery, storage, installation and commissioning to ensure that the air conditioning units are in an "as new" condition at handing over.

The air conditioning units shall be provided with an isolator in order that the units may be switched off for service and repair.

The air conditioning installation shall comply with all Local Authority By-laws and with the Occupational Health and Safety Act No. 85 of 1993.

5.6 CONSOLE AC SPLIT UNITS

To supply and install console inverter split air conditioning units to provide the cooling capacity, with the maximum noise level, under specified design conditions stated in this tender document.
All necessary care shall be taken during transport, delivery, storage, installation and commissioning to ensure that the air conditioning units are in an "as new" condition at handing over.

The air conditioning units shall be provided with an isolator in order that the units may be switched off for service and repair.

The air conditioning installation shall comply with all Local Authority By-laws and with the Occupational Health and Safety Act No. 85 of 1993.

PART C6.2.6: BILLS OF QUANTITIES

1.GENERAL

The tenderer must complete the Bills of Quantities and detail unit rates and total amount for each item. All rates and prices exclude VAT.

The "Total" shall constitute the tender for adjudication.

NOTE

Tenderers are advised to check their item extensions and total additions as arithmetical errors occurring in the priced Bills of Quantities cannot be considered as having an effect on the tender amount.

No alteration, erasure or addition is to be made in the text of the Bills of Quantities. Should any alteration, erasure or addition be made it will not be recognized but the original wording of the Bills of Quantities will be adhered to.

The Employer will check the completed Bills of Quantities and reserves the right to adjust any individual price and to rectify and discrepancy whilst the total tender price as quoted remains unaltered.

The quantities given in the Bills for video cables, power cables, cable markers, and data cables cannot be regarded as exact and are subject to measurement on site after completion of the installation and adjustments will be made according to the unit rates given in the Bills.

The quantities given in the Bill of Quantities are estimates only, and subject to re-measuring during the execution of the work. The Contractor shall obtain the Engineer's detailed instructions for all work before ordering any materials or executing work or making arrangements for it.

The Works as finally completed in accordance with the Contract shall be measured and paid for as specified in the Bill of Quantities and in accordance with the General and Special Conditions of Contract, the Specifications and Project Specifications and the Drawings. Unless otherwise stated, items are measured net in accordance with the Drawings, and no allowance has been made for waste.

The validity of the contract will in no way be affected by differences between the quantities in the Bill of Quantities and the quantities finally certified for payment.

Item	Description	Unit	Qty	Rate	Total
	Supply, delivery, installation, commissioning and 12 months maintenance of the following Complete Inverter Split Units with their Outdoor Condensing units as shown on the tender drawings: with all accessories and fixing brackets/ hangers:				
1.1	**INDOOR AC UNITS**				
1.1.1	AC Inverter Console,2.28kW	no	10		
1.1.2	AC Inverter Console,2.29kW	no	1		
1.1.3	AC Inverter Console,3.74kW	no	1		
1.1.4	AC Inverter Console,3.7W	no	1		
1.1.5	AC Inverter Console,2.98kW	no	1		
1.1.6	AC Inverter Console,3.15kW	no	2		
1.1.7	AC Inverter Midwall,2.2W	no	1		
1.1.8	AC Inverter Midwall,2.28W	no			
1.1.9	AC Inverter Midwall,2.78W	no	2		
1.1.10	AC Inverter Midwall,7.1W	no	1		
1.1.11	AC Inverter Midwall,2.98W	no	1		
1.1.12	AC Inverter Midwall,3.15W	no	3		
1.1.13	AC Inverter Midwall,3.86W	no	2		
1.1.14	AC Inverter Midwall,3.7W	no	2		
1.1.15	AC Inverter Midwall,7.8W	no	1		
1.1.16	AC Hideaway unit, Ducted type slim,8kW	no	2		
1.1.17	AC Hideaway unit, Ducted type slim,10.1kW	no	2		
1.1.18	3.5 kw Midwall Inverter split unit complete with drip tray	no	1		
	Sub Total: AC units carried to Summary Page (A1)				

Item	Description	Unit	Qty	Rate	Total
1.2	**COMPLETE VRV INDOOR WITH THEIR OUTDOOR UNITS**				
	VRF SYSTEM 01				
1.2.1	AC Inverter Midwall Split Unit ,3kw	no	3		
1.2.2	AC Inverter Midwall Split Unit ,3.7kw	no	1		
1.2.3	AC Inverter Midwall Split Unit ,6.9kw	no	1		
	VRF SYSTEM 02				
1.2.4	AC Inverter Midwall Split Unit ,2.21kw	no	4		
1.2.5	AC Inverter Midwall Split Unit ,2.3kw	no	2		
1.2.6	AC Inverter Midwall Split Unit ,3.8kw	no	1		
	VRF SYSTEM 03				
1.2.7	AC Inverter Midwall Split Unit ,2.23kw	no	3		
1.2.8	AC Inverter Midwall Split Unit ,2.28kw	no	1		
1.2.9	AC Inverter Midwall Split Unit ,2.2kw	no	1		
1.2.10	**VRV OUTDOOR UNITS**	no	3		
1.3	**ACCESSORIES**				
1.3.1	Remote controller	no	16		
1.3.2	Refflet/pm/fixture	SUM	1		
1.3.3	Additional Mounting units	SUM	1		
	Sub Total: AC units carried to Summary Page (A2)				

Item	Description	Unit	Qty	Rate	Total
1.4	**COPPER PIPING COMPLETE WITH ARMAFLEX OR FRK INSULATION WITH ALL ACCESSORIES**				
1.4.1	PIPE ϕ 6.7	m	120		
1.4.2	PIPE ϕ 9.5	m	80		
1.4.3	PIPE ϕ 12.7	m	120		
1.4.4	PIPE ϕ 15.9	m	45		
1.4.5	PIPE ϕ 19.5	m	45		
1.4.6	Draining pipe ϕ 25	m	90		
1.4.7	Draining pipe ϕ 50	m	70		
1.4.8	Extra over for pipe fittings	lot	1		
Sub Total: AC units and Refrigerant piping carried to Summary Page (B)					

Item	Description	Unit	Qty	Rate	Total
1.5	**DUCTING (of galvanized sheet metal material with internal insulation)**				
1.5.1	Duct of 250X250	m^2	6.5		
1.5.2	Duct of 250X300	m^2	15		
1.5.3	Duct of 350X400	m^2	15		
1.5.4	Duct of 400X250	m^2	20		
1.5.5	Duct of 500X300	m^2	25		
1.5.6	Duct of ϕ 300	m^2	2.5		
1.5.7	ϕ 150 Flexible duct	m	30		
1.5.8	ϕ 200 Flexible duct	m	40		
	DUCTING (of galvanized sheet metal material without internal insulation)				
1.5.9	Duct of ϕ150	m^2	8		
1.5.10	Duct of ϕ 300	m^2	15		
1.5.11	Duct Fittings	no	40		
1.6	**TERMINALS**				
1.6.1	Variable slot diffuser VSD 01 100 l/s, 125x650	no	8		
1.6.2	Variable slot diffuser VSD 02 125 l/s, 125x650	no	8		
1.6.3	Disc Valve 200Diatu, 50l/s	no	10		
1.6.4	Complete Return air grille with air filter (600x1200)	no	2		
	Sub Total DUCT carried to Summary Page (C)				

Item	Description	Unit	Qty	Rate	Total
1.7	**COMPLETE VENTILATION FANS WITH THEIR ACCESSORIES**				
1.7.1	In line extractor fan 500 L/S @ 250 PA, complete with all accessories and connecting items	no	1		
1.7.2	Ceiling mounted Extractor Fan.50l/s	no	2		
Subtotal DUCT, DIFFUSERS & TOILETS Ventilation carried to Summary Page (D)					

Item	Description	Unit	Qty	Rate	Total
1.8	**ELECTRICAL WORK ASSOCIATED WITH HVAC INSTALLTION**	**lot**	**1**		
1.9	**ACCESSORIES**				
1.9.1	Remote controller	no	28		
1.9.2	Cable tray 300x50mm	m	60		
1.9.3	Cable tray 200x50mm	m	35		
1.9.4	Others mounting tools(Hanger, brackets…)	lot	1		
Sub Total: Electrical Work Associated with HVAC Installation Carried to Summary Page (E)					

Item	Description	Unit	Qty	Rate	Total
1.10.	**General Items – Training, Manuals, Commissioning, Workshop Drawings.**				
1.10.1	Training of personnel	Sum	2		
1.10.2	O&M manuals with as built drawings	no	4		
1.10.3	12 months maintenance & guarantee	Sum	12		
1.10.4	Programming of the works	Sum	1		
1.10.5	Workshop drawings & Equipment Submissions	Sum	1		
1.10.6	Site related costs	Sum	1		
1.10.7	Labelling of all AC equipment	Sum	1		
1.11	**PC Sum**				
1.11.1	HVAC Link to fire control panel	Sum	1		
1.11.2	**TESTING AND COMMISSIONING**				
1.12	Testing and commissioning of the complete work.	Item	1		
Sub Total: General Items – Training, Manuals, Commissioning and Workshop Drawings, carried to Summary Page (F)					

SUMMARY: PART C6.2 – HVAC SYSTEMS	
BOQ SUBTOTAL DESCRIPTION	AMOUNT
Sub Total: AC units (A1)	
Sub Total: AC units (A2)	
Sub Total: AC units and Refrigerant piping (B)	
Sub Total DUCT (C)	
Subtotal DUCT, DIFFUSERS & TOILETS Ventilation (D)	
Sub Total: Electrical Work Associated with HVAC Installation (E)	
Sub Total: General Items – Training, Manuals, Commissioning and Workshop Drawings (F)	
SUB TOTAL: PART C6.2 – HVAC SYSTEMS CARRIED TO THE MECHANICAL SECTION SUMMARY (EXCLUDING VAT)	

PART C6.2.7: SCHEDULE OF INFORMATION FOR MATERIALS PROPOSED

1. SCHEDULES OF INFORMATION

All schedules which accompany this specification form an integral part of it and shall be duly completed in every detail; FAILING which, the tender in question may be rendered ineligible for consideration.

Under no circumstances will statements such as: -
- see attached pamphlets,
- refer to catalogue,
- data to follow,
- as given by supplier, etc.

be acceptable to the Engineer & end user

Equipment offered and listed on the schedules shall be capable of performing the specified duties and complying with the specification requirements in all respects. **SHOULD** it transpire that such equipment, even when offered by make, model and/or type, is unsuitable or incapable of meeting, or performing in accordance with the specification requirements in any respect, the contractor or sub-contractor shall nevertheless be responsible for any additional costs incurred in providing the required or suitable equipment.

Whenever a specific make, model or type of equipment has been prescribed in the specification and the tenderer offers an alternative or equal make or type of equipment in his tender, the Engineer will on acceptance of such a tender inform the prospective contractor in writing as to make, and/or type of equipment accepted. **HOWEVER**, it should be noted that the use of words "OR EQUAL" by the tenderer is to be discouraged and lead to the disqualification of the tender.

REFRIGERATION PIPING & DUCTING SYSTEM	**PIPING**
DUCTING	
Name of suppliers	.....
Country of origin	.....
Type of material	.....
Material thickness	.....
Compliance with Standards	
Specification/Code	.....

CABLE TRAYS	
Name of suppliers	.....
County of origin	.....
Type of material	.....
Material thickness	.....
Compliance with Standards	
Specification/Code	.....

SPLIT AC MIDWALL UNITS CONDENSERS

Name of suppliers .....
Make .....
Type and model number
Total Cooling Capacity (kW) .....
Total Air Quantity (l/s) .....
Heat recovery Capacity (kW) .....
Country of origin .....
Service life years .....
Dimensions .....
Compressor type .....

SPLIT AC HIDEAWAY UNITS CONDENSERS

Name of suppliers .....
Make .....
Type and model number .....
Total Cooling Capacity (kW) .....
Total Air Quantity (l/s) .....
Heat recovery Capacity (kW) .....
Country of origin .....
Service life years .....
Dimensions .....
Compressor type .....

EXTRACTOR IN-LINE FAN

Name of suppliers .....
Make .....
Type and model number .....
Country of origin .....
Service life years .....

EXTRACTOR CEILING MOUNTED FANS

Name of suppliers .....
Make .....
Type and model number .....
Country of origin .....
Service life years .....

GRILLES

Name of suppliers .....
Make .....
Type and model number .....
Country of origin .....

DIFFUSSERS/CEILING DISC VALVES/SLOT DIFFUSERS

Name of suppliers .....
Make .....
Type and model number .....
Country of origin .....

PART C6.2.8: DRAWINGS ISSUED FOR TENDER PURPOSES

Item	Drawing Number	Drawing. Title	Revision
1	ME159/WCS04636/4	GROUND LEVEL: AIRCONDITIONING	T
2	ME159/WCS04636/5	LOWER LEVEL: VENTILATION	T

BILL OF QUANTITIES, SPECIFICATION AND DRAWINGS
FOR
PROPOSED NEW MAGISTRATES COURT ON ERF 253, JAN KEMPDORP FOR THE DEPARTMENT OF PUBLIC WORKS & INFRASTRUCTURE FOR MECHANICAL ENGINEERING WORKS

WCS 046363

PART C6:
PART C6.3: FIRE PROTECTION SYSTEMS: SUPPLY, INSTALLATION, COMMISSIONING AND 12 MONTHS FREE MAINTENANCE OF FIRE EQUIPMENT

Prepared for:	Prepared by:
public works & infrastructure Department: Public Works and Infrastructure REPUBLIC OF SOUTH AFRICA	Bakone Consulting Engineers
DEPARTMENT OF PUBLIC WORKS & INFRASTRUCTURE PRIVATE BAG X 5002, KIMBERLEY, 8301 CONTACT PERSON: MR J. P. MARJUS EMAIL: Hannes.marais@dpw.gov.za TEL: (053) 838 5288 FAX: (086) 489 7460 / 053 833 1153	BAKONE CONSULTING ENGINEERS CC 581 MENDELSSOHN STREET, CONSTANTIA PARK, PRETORIA, 0181 CONTACT PERSON: MR M.E. MATLALA EMAIL: edward.matlala@bakonegroup.co.za TEL: (012) 998 1225 / (087) 379 5110 FAX: (086) 672 9965

JULY 2021

Contents

PART C6.3.1: NOTICE TO TENDERERS

1. The quantities given in the Bill of Quantities are estimates only, and subject to re-measuring during the execution of the work. The Contractor shall obtain the Engineer's detailed instructions for all work before ordering any materials or executing work or making arrangements for it.
2. The Works as finally completed in accordance with the Contract shall be measured and paid for as specified in the Bill of Quantities and in accordance with the General and Special Conditions of Contract, the Specifications and Project Specifications and the Drawings. Unless otherwise stated, items are measured net in accordance with the Drawings, and no allowance has been made for waste.
3. The validity of the contract will in no way be affected by differences between the quantities in the Bill of Quantities and the quantities finally certified for payment.

PART C6.3.2: SCOPE OF WORK

This scope of work covers the supply, delivery, installation, commissioning and 12 months guarantee of the completely new fire protection installation for the protection of the building in the full respect to the national building requirement.

The required equipment for this installation shall be delivered to the New Magistrate Court Site on the date agreed with the Main Contractor.

All installation must comply SANS 10400-T:2020 Edition 4, SANS 10400-W and SANS 10252-1 in the full respect to Local Authority exigencies.

1 PREFACE

There is a new Magistrate Court to be built at **Jan Kempdorp**; where no existing fire system is in place.

The fire installation on this project will address the below factors;

This tender specification outlines the requirements for the supply, installation, commissioning and 12
months free maintenance of all new equipment part of the Fire system in all refurbishment phase related
to this project.

Below points are target for the full installation on this project:

a) To ensure protection of building occupants or users and to provide means for the safe evacuation of such occupants of users;
b) To minimize the spread and intensity of a fire within a building and the spread of fire to other areas and any other building;
c) To ensure that sufficient structural stability will be retained to ensure that such building will not endanger any other building;
d) The generation and spread of smoke will be minimized or controlled to the greatest extent reasonably practicable;
e) Adequate means of access and equipment for detecting, fighting, controlling, and extinguishing of a fire will be provided;
f) All materials, plant, and equipment will be installed with appropriate access for ease of operation, maintenance, and replacement,

The entire fire installation will have to comply with the following standards:

- SANS 10400-T :2020 : Edition 4
- SANS 10400-W
- SANS 10400-S

SANS 10252-1 and

- Bylaws

This document is a standard specification for the Plumbing, Drainage & Fire Protection Installations and it outlines the essential minimum requirements for the supply, installation, decommissioning, commissioning and 12 months' free maintenance of all installation part of the Fire Protection and Domestic water systems

2 THE BUILDING DESCRIPTION

Jan Kempdorp is an agricultural town situated in the centre of the Vaalharts Irrigation Scheme in the Northern Cape province of South Africa. It is situated 96 kilometres north of Kimberley
The Present New Magistrate Court will be a single Storey building Type.

This new facility will be fire protected with traditional fire protection system comprising of , fire extinguishers , hydrant and hose reels positioned in the full respect to SANS 10400-W and T requirements

3 FIRE MAIN SYSTEM

The fire main system shall be installed throughout the entire site and shall be fed from the combined domestic and fire water tank situated in the basement level within the site. The route of the fire mains which feed the control valves, hose reels and hydrant outlets are indicated on the tender drawing. Water storage tank is provided by Civil

Fire protections mains and valve locations shall be installed throughout the building as indicated on the drawings. The sizes of these pipes are indicated on the relevant drawings but must be confirmed during detailed design and workshop submission. Pipe, valve, and hydrant locations shall accessible and spaced according to the standards.

3.1 PRESSURE REDUCING VALVE STATIONS

Pressure reducing devices (PRD'S) are to be mounted in such a way their locations will be acceptable where required.

The pressure reducing devices shall be designed as such to ensure the New Municipal Building receives the maximum flow and pressure, stated under Technical Schedules, required for the fixed fire protection system under worst case conditions.

3.2 HYDRANT VALVES AND HOSE STATIONS

Where applicable, Hydrant valves shall comply with SABS 1128, be of the size and type stipulated in the Data Sheets, and manufactured from gunmetal. These valves shall have flanged connections and shall be fitted to mating flanges on the fire water main system. A clockwise closing cast hand wheel shall be fitted to the hydrant to enable the valve to be opened and shut.

At each installed hydrant valve there shall be a non-corrosive free-standing hydrant hose box, the doors of which can be secured by way of lock and key. The key shall be mounted in a break glass type key holder and shall be mounted on the side of the hose box.

Each hydrant hose box shall be fully equipped with: 1 x 30 metre (according to SANS 10400-T: 2008, Edition 4) lengths of high-quality non-percolating hose, each length to be fitted with alloy couplings
1 x adjustable spray type branch pipe which is electrically safe.

1 x spare hydrant valve rubber.

All hydrant hose boxes shall be painted red and shall be marked externally "Fire Hose "

3.3 PORTABLE FIRE EXTINGUISHERS

Fire extinguishers are to be located at positions close to potential fire risks and generally at a rate as per SANS 10400-T: 2000, Edition 4), based on the level of risk. The fire extinguisher types that will be supplied are as follows:
9 kg Dry Chemical Powder (DCP) fire extinguishers that shall be positioned in the majority of plant areas;
4.5 kg Dry Chemical Powder (DCP) fire extinguishers that shall be positioned mainly at office areas; and
5 kg CO2 (carbon dioxide) that essentially will be positioned in electrical switchgear rooms and control rooms.
Portable fire extinguishers shall comply with the requirements of SANS 1910.

4 FITTINGS

All fittings used on system pipe shall be either of the screwed galvanised malleable iron type as per SANS 14:1994, or galvanised Victaulic type joints which are used on pipes having grooved ends. Where welded pipe is required, this shall be undertaken using BS weld fittings of the appropriate wall thickness. All pipes with weld fittings shall be hot dipped galvanised after manufacture.

Pipe fittings 15mm – 25 mm where used shall be to SANS 14:1994, galvanised malleable iron screwed fittings or equivalent.
All valve flanges/drillings to be compatible with the flanges required on the pipes.

Weld fittings used on pipe above 25 mm in diameter shall be to BS1640 or JIS butt weld fittings with a wall thickness appropriate to the wall thickness of the pipe.

5 WELDED FLANGES

All flanges used on the fire protection system pipe assemblies shall conform to SANS 1123 for a nominal pressure rating for the system. Based on the design pressure, slip-on or weld neck flanges are to be used according to SANS 1123 Table 16/3 RF.

All valve flanges/drillings to be compatible with the flanges required on the pipes and shall be in accordance with the flange specifications required on the pipe work.

After fabrication all flanged and butt-welded pipe and fittings shall be hot dip galvanised prior to despatch to the station.
All welding of pipe, fittings, plate work etc., shall be in accordance with the PBO- 2-C31 General technical specification, contained in this Works Information.
Under no circumstances shall welding be permitted on fire protection range pipes below 50 mm diameter.

6 JOINTING

25 mm – 160 mm diameter – metal to metal joints shall be made using jointing paste or compound as required. PTFE tape shall be used on all small pipe and pipe fittings below 25 mm diameter.

Full face rubber gaskets to be installed between all flanges with the exception of wafer type valves where rubber insertion type rings may be used. Gaskets shall be asbestos free and of the appropriate thickness according to SANS standards.

All nuts, bolts and washers shall be metric of the appropriate size and to be galvanised.

7 PAINTING

All fire protection installation control valves and small drip valves and pipe valves shall be coated with three coats of epoxy paint which shall be applied in keeping with the paint manufacturers' application recommendations.

All pipe, fittings, hangers shall be left unpainted galvanised finish. All exposed threads on bolts and screwed joints shall be painted with two coats of zinc rich paint.
Refer to the General Technical Specification regarding the painting of pipes.

8 BUILDING OCCUPATION AND DESIGN POPULATION CALCULATION

The building occupation classification and design population calculation were done in accordance SANS 10400 – The Application of the National Building Regulations – Sub-section A20 – Classification and
Designation of Occupancies & Sub-section A21 – Population as shown in the table below:

At all times works shall be executed in accordance with Good Engineering Practice.

In the case of conflicting statements in the above specifications the SANS specification shall take precedence.

The standards to be complied with and listed above shall be made available to the Engineer on request by the Tenderer.

All references to standards and regulations shall be deemed to apply to the latest, current and as amended standard.

9 CONTRACT MANAGEMENT AND CONTROL

9.1 RESOURCES

The tenderer shall make available suitably competent, experienced and capable resources for the timely execution of the works in accordance with the project specification.

Attendance at meetings shall be provided as requested by the Engineer, Principal Contractor and Employer.

Upper-level management attendance shall be provided at regular site, contract, commercial and engineering meetings.

The tenderer is to submit an organogram of supervisory staff (with names) that will be involved on the project, showing the time in a month that each individual will be committing to the project against the project program (i.e. a resourced program).

The tenderer is to submit CV's of his key staff indicating relevant experience.

All resources on site shall be certified via appropriate organizations demonstrating competence in their ability to perform the tasks required.

9.2 PROGRAM AND COMPLETION

The tenderer shall provide a resourced program of the works, in accordance with the directives herein and in compliance with the form of contract.

This program shall be provided within one week of appointment and shall clearly indicate all interdependencies related to works by others.

The tenderer shall ensure their program of works is co-ordinated with others and satisfies the requirements of the main contractor and the principle building contract.

The program of works shall be updated bi-monthly to indicate progress on site and remediate any potential delays.

The Contractor shall submit a detailed works program and anticipated cash flow estimate of his/her Tender.

Suitable time shall be allocated to perform commissioning, validation and hand-over to the approval of the engineer. Particular attention must be made to the required completion dates and penalties as described within the contract conditions.

9.3 LEAD TIME GUARANTEE

The contractor shall submit with the Tender return a guarantee that all equipment and corresponding supply (lead times), delivery, installation and commissioning of all equipment can be achieved within the project time frame.

9.4 QUALITY MANAGEMENT

The tenderer shall maintain an ISO-9000 series compliant quality management system for the duration of the contract. The quality file shall be kept on site and shall be made available for inspection by the Engineer, Employer or his agents.

Signed off quality control checklists, commissioning schedules and test certificates shall be provided prior with all invitations for inspection by the contractor.

The Engineer reserves the right to charge the contractor at the prevailing Engineering Council rates for abortive inspections.

Only the highest possible standards of workmanship will be accepted. No inferior quality of workmanship will be accepted

9.5 SCRUTINY OF DRAWINGS

All drawings, circuit or schematic diagrams prepared by or on behalf of the Contractor for submission to the Engineer in terms of the requirements of this specification shall have been thoroughly checked, corrected where necessary and signed as approved by the Contractor, prior to such submission.
The Engineer's scrutiny of any drawings will cover the arrangement, type and operational suitability of the equipment in general only. Such approval will not release the Contractor from his responsibility for the proper operation of the installation or for its full compliance with the specification, drawings, local authority and statutory requirements, or for ensuring that the equipment can be physically accommodated within the space and via the access provided.

10 DOCUMENTATION

Documentation shall be provided to demonstrate compliance with all applicable Quality, Regulatory and specified requirements.

The following list of documentation will be required, as a minimum, in order to complete the commissioning phase of the project. All will be subject to approval by the Engineer before implementation

a) Contract particulars including contact details and company details of all parties to the contract
b) Emergency contact details for use in case of emergency and service callout
c) Functional design specification
d) P&IDs
e) Calibration certificates for each type of probe, sensor, gauge or measuring instrument
f) General arrangement drawings, approved workshop drawings and As-builts
g) Critical spares list
h) Full parts list including component manufacturers part numbers and contact details
i) Component manufacturers datasheets
jj) Equipment configuration details (details of the fixed damper positions, air flow balance data, filter pressure drops etc as configured during pre-commissioning)
k) Inventory List with Serial and Part Numbers and drawing references
l) Electrical and control panel layout drawings and wiring diagrams
m) Fire Zone diagrams, suitably laminated and indicating the design criteria of each zone
n) Safety certification for the complete system
o) Operating and maintenance manuals Factory acceptance test report – where applicable
p) Commissioning report and training documentation
q) Product, equipment and material Warranties
r) Escalation steps and basic troubleshooting guide
s) List of closeout documentation

KEY for 'Responsibility' Column:

M = Fire Protection Consultant.

Note. All fields below are to be checked / signed or marked where not applicable

Item	Designation	Responsibility	Qty
1	O & M manuals with As-built drawings (Hard copy together with one CD containing its soft copy)	M	4
2	Certificate of Compliance, in pdf as well	M	4
3	A full report and Test results of all systems after commissioning	M	4
4	All pressure test balancing results for each fire item whatever applicable	M	4
5	Proof/ Certificate for training of End user personnel achievement	M	4
6	Certificate of commitment for the 12 / 24 Months maintenance & guarantee period	M	4
7	Fire control panel **interlink certificate** to Fire Protection systems and guarantee	M	4
8	Test result for Fire System interlink to Fire Protection	M	4

11 PRESSURE TESTING, SYSTEM BALANCING & COMMISSIONING

All safety devices shall be checked for effective operation by simulating the abnormal or over load conditions

Performance of all equipment shall be measured and plotted on the supplier's graphs and compared with theoretical calculated conditions. If necessary, adjustment and alterations shall be made to achieve the desired operating conditions.

All Pressure tests and results shall be recorded and a test report shall be compiled for insertion in the operating and maintenance manual.

Application Guide 2/89.3: 2002 – Commissioning Water Systems shall be referenced in the method statement and planning of commissioning activities.

12 WORK ALLOCATION

The work allocation will consist of the following:

a) The end user will provide the necessary permanent water supply point and, where required an electric power supply to a point required by the Fire Installer Contractor. The client will NOT supply any distribution boards and equipment, or lighting, or power, or any other items for the installation of the fire protection system.

b) **It is compulsory to the contractor to inspect the entire site as there is an existing water line from which all new installation will be depending** on.

c) Alterations, which may be required by the contactor, such as drilling of access holes, will need, where necessary, to be approved by the engineer and is for the contractors account.

d) The fire contractor will have to make sure that all prerequisite requirement from Local Authorities are complying before to carry any work.

e) Any work done before by the client will require a prior discussion with the end user before to start any other work

f) The Contractor shall provide a Site Instruction Book.

g) The Contractor shall provide his own tools, labour, temporary storage and accommodation, material, plant, transport and equipment and execute the contract with a minimal disturbance to the end user. Prefabrication must preferably and where possible be done at his own works.

h) The Contractor shall provide his own sheds and site offices if su required.

i) The Contractor shall prepare all working drawings and eventual "As Built" drawings, constituting the entire installation. Two sets of hard paper prints of working drawings are required for scrutiny before construction is commenced. Two set of hard prints and copies of the electronic files (preferably on C D) are required of the "As Built" at completion. A detailed technical specification of the O&M submission is noted as Annexure D of this document

j) During test exercise, the contractor must make sure that its installation has reached the recommended water pressure at the furthest fire protection from stop valve position point of view.

13 HANDLING OF MATERIAL

The Contractor shall be responsible for providing all the required equipment for the off-loading and proper handling of the material on site. He shall also be responsible for the installation in the correct position.

14 SETTING OUT OF WORK

The Contractor shall be responsible for the correct setting out of any holes, sleeves, penetrations, plinths, plant hangers and openings that may be required

15 SHOP DRAWING SUBMITTAL

The contractor shall submit detailed "shop" drawings indicating the works to be completed.

Shop drawings shall be provided to the Engineer within 14 days following confirmation of the intent to appoint or sooner as directed by the Employer, Engineer or agent

Shop drawing submittals shall be made in triplicate, at full scale, and shall include a cover sheet, date stamp, and approval stamp.

Shop drawings shall clearly indicate works to be completed by others, i.e. power supplies, drains, water supplies, builders' openings, sleeves and penetrations.

Shop drawings shall be compliance with ISO standards.

Shop drawings shall indicate the particulars of the parties responsible for the design drafting, review and approval of the drawings.

The scale, drawing size, revision number date and drawing particulars shall be clearly indicated on the drawings

Drawings shall include all sections, 3D views, assembly views, plan views and layouts as required to fully understand the works to be executed.

Works shall be executed strictly in accordance with shop drawings approved by the Engineer.

Three copies of the approved shop drawings shall be maintained on site for the inspection of the Engineer at all times.

16 WORKING DRAWINGS

One copy of the approved shop drawings shall be maintained up to date to reflect the as built conditions on site. This drawing shall be marked up with all deviations from the approved drawings and shall be highlighted to show installation progress. This marked up drawing shall be copied and issued to the Engineer on a monthly basis.

17 EQUIPMENT SUBMITTAL

The contractor shall compile and submit three (3) booklets of the equipment selection and submittal to the Consulting Engineer within two weeks after appointment for approval.

Performance and construction specifications shall be provided for each type of equipment.

The equipment submittal booklet shall consist of

a) Cover page stating the project name, the client, the consulting engineer and the contractor with contact persons and details
b) The index page stating the contents and sections of the submittal with page numbers
c) General: a brief description of the project and the equipment offered
d) Introduction: brief history of the contractor, experience, personnel proposed for the project with brief CV and project photos where the equipment proposed was used.
e) Table of the equipment capacity of all equipment contained in the submittal showing the following:
    i Design conditions
    ii. Equipment name and designation
    iii Area served
    iv. Operating capacity
    v. Dimensions (length, width, height and weight)
    vi. Minimum and Maximum Pressure applicable to each component
    vii. Starting current, running current and voltage where applicable
    viii. Noise level where applicable

ix. Compliance with specification

f) Detailed of the equipment offered (this section is to be repeated for every single item of equipment offered).

i. General name of equipment offered, previous project where equipment was used with reference from the client

ii. The Equipment: all technical specifications, photos where applicable service interval and estimated operating life in years of the equipment. The technical specifications as a minimum shall state:

- Capacities
- Material of manufacture and type of finishes
- Make
- Model number
- Manufacturer details
- Estimated delivery date
- Pressure(maximum/Minimum)
- Noise Level, where applicable
- Operating conditions and performance curves where applicable
- Compliance with specifications
- Electrical requirements and loading, where applicable
- Energy efficiency measures of the equipment offered, where applicable
- Any special sustainable design and details included in the equipment
- The completed schedule of information in the tender document
- Manufacturer's catalogues
- Control system and electrical schematics for the equipment
- Any other relevant information

g) Motivation for the proposed equipment

h) Conclusion

i) Approval page for signature and date:

i. The contractors name and responsible person signature

ii. The consulting Engineers name and responsible person signature

iii. The client's signature and responsible person

iv. Approval stamp by consulting engineer.

18 OPERATION AND MAINTENANCE MANUAL SUBMITTAL

The contractor shall compile and submit one (1) booklet of the operation and maintenance manual to the Consulting Engineer two months prior to practical completion for approval.

On approval by the consulting Engineer, the contractor shall prepare and submit four (4) copies of the approved operation and maintenance manual on practical completion sign off in both hard cup and soft copies.

The Operation and Maintenance booklet shall consist of:

a) Cover page stating the project name, the client, the consulting engineer and the contractor with contact persons and details

b) The index page stating the contents and sections of the submittal with page numbers

c) General information on the project.

i. Name of project
ii. Address of project
iii. Start and completion date
iv The professional team and contacts
v. The contracting team and contacts
vi Emergency contact details of the contractor
vii Maintenance start and completion date
viii Major equipment suppliers and contact details

d) Description of the System
   i. Design conditions and technical specification
   ii. Salient points of the installation
   iii. Detailed description of the systems
   iv. Health and safety considerations associated with the systems
   v. Detailed technical specification and description of all installed equipment and system

e) Table of the equipment capacity of all equipment and systems installed on the project showing the following:
   i. Equipment name and designation
   ii. Area served
   iii. Operating capacity
   iv. Dimensions (length, width, height and weight)
   v. Starting current, running current and voltage
   vi. Noise level
   vii Compliance with specification
f) Supplier details and catalogues/technical manuals for each major equipment installed on the project
g) Operating and Maintenance procedures
   i. Start and stop procedures
   ii. Emergency procedures
   iii. Procedures for the service, replacement, and maintenance of all plant, equipment, and systems.
h) Operating and maintenance schedules and checklists:
   i. Weekly maintenance
   ii. Monthly
   iii. 3 monthly
   iv. Quarterly
   v. Yearly
   vi Minor service
   vii. Major service
   viii. Every 5 years
   ix. Every 10 years
   x. others
i) Commissioning results and details of each equipment and system
j) Training of end user details and attendance register sign off

k) Recommended spares
l) As built drawings and documentation
m) Equipment submittal approved page
n) Conclusion
o) Approval page for signature and date:
    i. The contractors name and responsible person signature
    ii. The consulting Engineers name and responsible person signature
    iii. The client's signature and responsible person
    iv. Approval stamp by consulting engineer

19 TRAINING

On completion of the entire sub-contract work, the contractor shall conduct a detailed training session on the installation works for the end user/client representatives. This training shall address the operations, maintenance and all other requirements to maintain a fully functional service to the client.

For the training to commence, the contractor shall compile and submit two (2) copies of the detailed training manual to the Consulting Engineer within three months prior to practical completion for approval by the Engineer and the end user client. The submission will include the agenda for the training, the requirements and qualifications for the training and the duration.

From the consulting engineer, the contractor shall allow a minimum period of two weeks to train the end user in the proper functionality of the system. The training shall consist of both formal class room training and hands on training on the completed project.

The training manual booklet shall consist of:

a) Cover page stating the project name, the client, the consulting engineer and the contractor with contact persons and details
b) The index page stating the contents and sections of the training manual with page numbers
c) General a brief description of the project and the equipment offered stating the start date and expected completion date
d) Introduction: brief system description of the project, salient training issues and brief of the maintenance checklist
e) Table of the equipment capacity of all equipment installed showing the following:
    i. Design conditions
    ii. Equipment name and designation
    iii. Area served
    iv. Operating capacity
    v. Dimensions (length, width, height and weight)
    vi. Starting current, running current and voltage
    vii. Noise level
    viii. Compliance with specification
f) Detailed training on the equipment offered (this section is to be repeated for every single item and systems installed on the project). The training will include but not limited to

i. General name and description of the system(s)
ii. Health and Safety Considerations
iii. Start and stop procedures
iv. Emergency procedures
v. Operating conditions and technical specifications including materials of manufacture
vi. Operating life and operational sequence
vii. Trouble shooting details
viii. Maintenance checklist
ix. Spare parts for the system and equipment
x. Drawings of the system and equipment
xi. Commissioning details of the equipment
xii. Manufacturer's requirements for training and maintenance
xiii. Any other relevant information i.e. frequency of training and retraining of end user

g) Training attendance register and certificate of attendance
h) Conclusion
i) Approval page for signature and date:
    i. The contractors name and responsible person signature
    ii. The consulting Engineers name and responsible person signature
    iii. The client's signature and responsible person
    iv. Approval stamp by consulting engineer.

The Contractor shall provide skilled attendance to train personnel in plant and controls operations, after all items have been fully tested, commissioned and put into operation. He shall allow a minimum of 3 members of his staff for 1 week for the training of the Client staff. Training shall include a formal presentation on all aspects of the systems including explanatory/layman's documentation on the installed systems and their operation.

20 REPORT TEMPLATE

The contractor is requested to give time to time a progress report about the work undergoing.

21 DEFECTS LIABILITY PERIOD

The defects liability period shall be in accordance with the form of contract but shall not be less than two years (24 months). During the defect's liability period all patent and latent defects shall be attended to by the contractor without cost to the client.
Any item which is repaired or replaced during the guarantee period shall be guaranteed for a further 12 months. The guarantee shall include parts, labour, shipping, transportation, consumables. No cost associated with equipment or workmanship failure or defect shall be attributed to the client during the defect's liability period.

22 WARRANTY

The contract works shall remain under warranty for 12 months following practical completion of the works. Sectionalized practical completion shall necessitate sectionalized warranty

A warranty schedule shall be provided for the installation and contained within the O&M manual.

23 MAINTENANCE

After first delivery of the installation (practical completion), there will follow a 12-month free maintenance and guarantee period,

No costs of maintenance shall be incurred by the client during the free maintenance period.

24 TEMPORARY USE OF EQUIPMENT

No equipment forming part of the permanent installation shall be operated or used, during the construction period without the Engineer's written permission.

Equipment shall be handed over to the Employer in an as new condition for the beneficial use of the client.

25 DIVISION OF WORK

The division of work between the Main-Contractor and the Fire protection Installer(Sub-contractor) together with other specialist contractors are as stated in the detailed technical specification.

26 STORAGE OF MATERIALS

Materials shall be stored in places allocated by the Main-contractor, Employer or his agent.
Stored equipment and materials shall be protected against damage, dust and dirt, corrosion, theft and vandalism.
Stored materials shall be safely stacked and shall not overload the construction beyond design limits.

27 SPARES

A full set of spares for types of consumable items, filters, strainers, belts, lubricating fluids, etc., shall be kept on site and a full set shall be handed over on the anniversary of the first hand over date

28 INSTRUMENTATION

Provide all necessary instrumentation for the successful monitoring and logging of the plant and equipment. Test certificates and correction graphs shall be obtained for all portable equipment prior to any site measurements being taken.

29 MATERIAL SELECTION

All materials shall be selected to ensure compatibility with local conditions, the environment of application and suitability with the fluid or service carried.

Where multiple materials are utilized in an assembly or construction the compatibility of the materials shall be ensured.

Galvanic corrosion risk shall be mitigated by the use of non-conductive spacers, cathodic protection or active protection.

Materials shall exhibit fire and smoke characteristics in accordance with the national fire design and National Regulations.

All insulation and cladding shall be applied by experts in the field. Joints shall be as far as possible below the piping and out of immediate view.

30 INSULATION

30.1 Fire Resistance of Insulation

Only non-combustible insulation materials will be acceptable on ducting and within occupied or enclosed building zones.

SABS class B1 insulation materials will be accepted on refrigerant piping.

There shall be no flaming droplets associated with any insulation materials utilized in any location.

The insulation materials shall exhibit low combustibility and low generation of toxic fumes.

Rockwool, mineral fibre Polyisocyanurate or equivalent insulation is preferred.

All insulation shall exhibit fire properties in accordance with the national fire design and local regulations.

31 PIPING

All piping shall be run straight and true.

Piping routes shall be coordinated to minimize pressure loss.

All piping shall be supplied with its ends fitted with rubber caps to prevent moisture or other contaminants entering.

31.1 STEEL PIPING

All piping shall be suitable for the pressure and type of fluid or gas transferred by the pipeline
Steel piping and fittings shall comply with SABS 62 medium or heavy duty or Schedule 40 in accordance with the working pressure specified.
All piping and fittings shall be installed in accordance with Good Engineering Practice and manufacturers guidelines.

General steel service piping for pressure up to 12bar shall be as follows;

Piping Up to and including 50mm	- SABS 62 medium weight screwed to BS
65mm up to 150mm	- SABS 62 welded
200mm to 300mm	- SABS 719 4.5mm wall
Minimum rating for Flanges	- Table E
Fittings - JIS	

Fittings should be cast steel and comply with JIS standards.

Flanges shall be the slip-on weld type and must comply with BS 10, BS 4504. The table used shall satisfy the working pressure.

On connections to equipment or valves the flanges must be DIN or the same standard as the equipment.

Clambon fittings and grooved piping shall comply with SANS 815 2 : 2004 as amended.

Elbows shall be of the long radius type.

Concentric reducers shall be used as far as possible. Eccentric reducers shall be used on

All pipes must be chamfered and have full penetration welds Multiple pass welding shall be used to ensure complete root and filler welds.

No caulking of leaks is permitted. Any faulty welds must be ground out, cleaned and re welded.

No welding will be permitted to malleable or cast-iron fittings including but not limited to valves, strainers, non-return valves, plant and equipment.

No "bull nosing" of flows is permitted. On index runs the pipes must have converging flows even if an extra elbow is used.

JIS tees are to be used. One inch and below pipes may be joined by use of a welded socket. When smaller pipes are connected via a socket the pipes must be ground to the correct shape and the socket must not penetrate the main pipe so as to interfere with the flow. Any work found defective will result in the system being condemned and all such work cut out Care must be taken to not let any of the "discs" from the cut-out fall into the pipe system as these will travel down the pipes and cause blockages at reducers or erosion.

Piping shall be pressure tested with water to 1.5 times operating pressure and not less than 10bar. The piping pressure testing shall include for flushing, relief of all air, all

temporary closures, safe isolation of any sensitive gauges and materials, a safety valve shall be fitted.
The pressure test including flushing shall be witnessed and signed off by the construction manager, contractor, responsible engineer and client representative.

The contractor shall make available shaded drawings indicating the extent of the test with the testing certificate to be signed.

Piping shall pass pressure testing prior to insulation.

32 SUPPORT OF PLANT, MATERIALS AND EQUIPMENT

Where services pass from building to building or have to be installed outside the building, the contractor must provide properly designed supports and hangers. If the overhead construction cannot carry the weight of all the services, additional approved framing shall be provided.

Support shall be provided with 500mm of all bends, fittings and penetrations through structure.

All equipment, plant and material shall be adequately supported from available structure.

The approval of the structural engineer shall be sought and obtained for all supports.

All fixings shall be installed within the safe loading limits specified by the fixing supplier.

Expansion and contraction, vibration, deflection, static and live weight shall be considered in the provision of supports.

Services shall be independently supported unless otherwise directed by the engineer. Supports shall not be shared. Mechanical and electrical services shall be divided by a physical barrier.

32.1 PIPING SUPPORT: SABS 62 M and SABS 719 4.5(

Piping support spacing shall not exceed the below maximum allowances.

Nominal Pipe Diameter	Maximum Support Spacing
15mm to 32mm	2,5m
40mm to 65mm	3,0m
80mm to 90mm	3,6m
100mm to 150mm	4,25m
200mm to 300mm	4,75m
350mm to 600mm	6,00m

32.2 CORROSION PROTECTION

32.2.1 High and moderate corrosion hazard zones;

High and moderate corrosion hazard zones include but are not limited to all areas within 25km of coastlines, major watercourses, rivers and all zones exposed to industrial fallout.

All condensing units, heat exchange equipment, pumps, fans and motors shall be supplied (pre delivery to site) with factory applied "marine environment" specification treatment. This shall include "Blu-Chem" (or equal and approved) treatment of the condenser coil fins, as well as stainless steel fasteners and epoxy spray of electronic circuit boards throughout. All electrical circuitry shall be extra protected.

All fasteners to be minimum hot dip galvanized.
All exposed outdoor fasteners to be SS304.
Exposed steel to be hot dip galvanized, passivated, etch primed and painted with a minimum two coat epoxy as per specification.
All air diffusion equipment and louvres to be passivated, corrosion protected and powder coated or anodized, aluminium or stainless steel.

32.2.2 Low hazard zones;

All condensing units, heat exchange equipment, pumps, fans and motors shall be supplied (pre delivery to site) with factory applied standard corrosion prevention treatment. This shall include corrosion treatment of the condenser coil fins, as well as electro-galvanized fasteners and epoxy painting throughout.

All fasteners to be minimum electro-galvanized.
All exposed outdoor fasteners to be electro-galvanized.
Exposed steel to be etch primed and painted with a minimum two coat zinc rich epoxy as per specification.
All air diffusion equipment to be passivated, aluminium, stainless steel, mild steel electro-galvanized, corrosion protected and powder coated.

32.2.3 Galvanic corrosion and corrosion due to potential difference

Galvanic corrosion risk shall be mitigated by the use of non-conductive spacers, cathodic protection or active protection.

Pipelines and materials shall be protected from corrosion due potential difference (especially where pipes enter or exit ground conditions) by active or passive cathodic protection and insulative spacers.

Piping below ground shall be protected against corrosion protection by wrapping with two coats tar impregnated denso tape or equal and approved physical protection systems.

32.2.4 Corrosion due to chemical attack

Plant, equipment, service reticulation and all materials shall be protected from chemical attack where such attack is reasonably anticipated
Chemical risk shall be identified and brought to the attention of the engineer.
Wherever possible materials shall be physically protected from contact with such chemicals.
Materials shall be selected to avoid corrosion by chemicals in close proximity or regularly in contact with such materials.

32.3 PAINTING

All unprotected surfaces shall be treated in accordance with the following procedure:

a) Surfaces shall be thoroughly cleaned in accordance with SANS 064.

b) Surfaces shall thereafter be primed with zinchromate primer.

c) Surfaces shall then be painted with two coats of colored enamel paint complying with Grade 12 of SANS 0630. Colors to be approved by the Engineer.

Where zinc coating is specified this shall mean hot dip galvanized or electrode deposited zinc coating. Where the zinc coating is damaged by cutting, drilling or punching the edges shall be painted with a zinc dust pigmented paint. Regular re-painting shall be reduced to a minimum by using galvanized steel wherever possible.

All piping, fittings and control panels within plantrooms and exposed runs in basement and on the roof shall be painted.
All black steel pipework and hangers shall be prime coated (even where concealed and even when the pipework is to be insulated).

Painting of air conditioning and ventilation plant and equipment shall be provided at the direction of the Engineer.

In addition, should any item of equipment in the opinion of the Engineer require painting due to lack of protection during erection, the subcontractor shall repaint the equipment as instructed.

Galvanized surfaces that are to be painted must be thoroughly scrubbed down with a galvanized iron cleaner and rinsed with water. This must be repeated until a 'water break free' surface is obtained - i.e. water does not separate in droplets on the surface.

All paintwork exposed outdoor shall be of the polyurethane coating system as follows:

Surface Preparation	: Degreased, passivated and etch primed
Prime Coat	Ethyl based inorganic zinc silicate - 75 microns
Intermediate Coat:	Polyamide cured epoxy undercoat - 30 microns
Final Coat :	Polyurethane enamel - 25 microns
Total Dry Film Thickness	130 microns

NOTES:

This specification shall be read in conjunction with the relevent sections of the document covering corrosion protection.

All surface coatings and paints shall be applied strictly in accordance with manufacturers instruction.

Patch priming after erection to be carried out using epoxy zinc rich.

Epoxy and polyurethane coatings to be free of mesityl oxide - samples to be submitted to SABS for
clearance prior to commencement of work.

Green buildings painting systems shall comply with the requirements of Greenstar SA.

Inorganic zinc primer to be allowed to cure at least 2 weeks prior to overcoating

Overcoating times between epoxy undercoat and polyurethane enamel – minimum 24 hours maximum 72 hours.

Provide all necessary instrumentation for the successful monitoring and logging of the plant and equipment. Test certificates and correction graphs shall be obtained for all portable equipment prior to any site measurements being taken.

32.4 FIRE SYSTEM DESCRIPTION & DESIGN CONDITION

The present project is a new building which will be entirely equipped with the traditional fire protection systems the full respect to comply with the local Authority Bylaws and SANS 10400:2020 4th Edition.

The present New Building will be comprised of single point of water supply which will have to be seconded with an additional Storage water Tank located in the basement, serving of a parallel supply to the local existing line provided by the local authority system.

Main water supply will be coming from a new fire plantroom situated in the basement and feeding the site as shown on the tender drawings.

The civil Engineer will provide the connecting point at the pressure not less than 4bars through an adequate pumping system.

The building has been designed architecturally in such a way it allow easy air movement to facilitate a natural air movement to allow a quick natural smoke extraction in case of fire signal. Air vent and louvers are used to allow smoke this to prevent the buildup of smoke in case of fire into the building, these will be connected directly to fire panel.

32.5 DRAWING LIST

The list of tender drawings is under section:

- PART C6.3.5: DRAWINGS ISSUED FOR TENDER PURPOSES

32.6 DETAILED SCOPE OF WORKS

This specification covers the supply, installation testing, pressure test, haluncing and commissioning of the entire new Fire Protection system.

The contractor shall be responsible for selecting; purchasing and placing in position all equipment in the spaces shown

All work shall be done in a first class workmanlike, manner and the contractor shall, at handing-over, provide a reliable and fire protection installation. working without objectionable leaks.

The drawings named on the Schedule of Tender Drawings only constitute outline drawings and indicative element to guide the sub-contractor, a site visit is required.

The Contractor will be required to compile and submit detailed working drawings to the Engineer together with all equipment selection submissions for scrutiny and approval prior to placing orders and commencement of any work.

From an Architectural and appearance point of view, the working drawings will be required to be scrutinized by the Architect and the end user representative.

32.7 HOURS OF WORK & SITE CONDITIONS

The site will remain in full operation during all Fire Protection works.

Fire Protection works shall be scheduled to minimize interruption to ongoing site activities.

Works shall be scheduled for completion during normal working hours.

In event of a need to work outside normal hours to avoid client disturbance overtime rates will become due.

In event of a need to work outside normal working hours in order to achieve program commitments such time shall not be recoverable as a variation to the contract

32.8 ACCESS TO THE SITE

All personnel will be required to adhere to the New Municipality Building, Jan Kempdorp terms and conditions of entry and security protocol

The New Municipality Building, Jan Kempdorp terms and conditions include but are not limited to.

a) Registration of all personnel entering the site by the contractor is required
b) All personnel entering the site may be required to be South African citizens
c) PIC criminal checks must be passed by all personnel entering the site, this is under contractor full responsibility
d) All personnel entering the site shall be free of criminal record
e) All personnel entering the site and exiting the site will be searched on entry, exit and during the course of their duties when required
f) Contractor to provide a demarcating barrier boundary without disturbing the Tshwane Centre daily activity by his personnel

Commissioning and balancing shall be executed in accordance with section 3 of this specification

Operating and maintenance manuals shall be provided in accordance with section 3 of this specification.

Training and handover shall be provided in accordance with section 3 of this specification.

PART C6.3.3: BILLS OF QUANTITIES

1. GENERAL

The tenderer must complete the Bills of Quantities and detail unit rates and total amount for each item. All rates and prices exclude VAT.

The "Total" shall constitute the tender for adjudication.

NOTE

Tenderers are advised to check their item extensions and total additions as arithmetical errors occurring in the priced Bills of Quantities cannot be considered as having an effect on the tender amount.

No alteration, erasure or addition is to be made in the text of the Bills of Quantities. Should any alteration, erasure or addition be made it will not be recognized but the original wording of the Bills of Quantities will be adhered to.

The Employer will check the completed Bills of Quantities and reserves the right to adjust any individual price and to rectify and discrepancy whilst the total tender price as quoted remains unaltered.

The quantities given in the Bills for video cables, power cables, cable markers, and data cables cannot be regarded as exact and are subject to measurement on site after completion of the installation and adjustments will be made according to the unit rates given in the Bills.

The quantities given in the Bill of Quantities are estimates only, and subject to re-measuring during the execution of the work. The Contractor shall obtain the Engineer's detailed instructions for all work before ordering any materials or executing work or making arrangements for it.

The Works as finally completed in accordance with the Contract shall be measured and paid for as specified in the Bill of Quantities and in accordance with the General and Special Conditions of Contract, the Specifications and Project Specifications and the Drawings. Unless otherwise stated, items are measured net in accordance with the Drawings, and no allowance has been made for waste.

The validity of the contract will in no way be affected by differences between the quantities in the Bill of Quantities and the quantities finally certified for payment

Item	Description	Unit	Qty	Rate	Total
	Supply, delivery, installation commissioning and 12 Months maintenance of all Fire Equipment to run the fire Protection system according to specifications of the SANS 10400 part W of the fire installation in the entire Building with Safety and Health consideration. The rates shall include material, labour, all mounting including connection with all electrical work. Rates for supply and installation as listed below and shown on the tender drawing:				
1.0	**WATER SUPPLY**				
1.1	Complete Combined 15 Kl Combined Domestic and Fire Protection Water High galvanized mild steel tank on placed on plinth high concrete u Storage Tank with all accessories, including water make up (Bracing, bolts, sealant, flanges...) for a full installation and connecting from main incoming to facility fire equipment. In the full respect to SANS 10252 requirement.	No	1		
1.2	**BOOSTER FIRE PUMPING SYSTEM**				
1.2.1	Pressure booster system comprising of 2 vertical multistage centrifugal pumps type CR 10-6 Delivered on a common base plate, completely assembled and tested before it leaves the factory and ready for connection of water and electricity. All pumps are CR pumps connected to frequency drives, all Pumps are connected in parallel, and operated in cascade. The booster maintains a constant pressure through continuous adjustment of speed of the pumps and starting and stopping the pumps to meet the required flow. Resulting head of the pump 40.15 m. Must have Dry-running protection and diaphragm tank, to be Easy to use HMI with 2 displays for set-point and process value -2 digital outputs, -Auto / manual control of pumps, -Optional bus communication.. -Optional Safe Tank filling sequence Installation. Maximum operating pressure: 16 bar, Manifold inlet: R 2 1/2", Manifold outlet: R 2 1/2", Pressure rating: PN16, System design: E Electrical data; Power (P2) main pump: 2.2 kW Mains frequency: 50 Hz Rated voltage: 3 x 3X380-415V, N, PE, 50HZ V Starting main direct-on-line, Rated current of system: 4.45 A, Enclosure class (IEC 34-5): IP54	No	1		
	Sub Total: Water Supply and Booster Fire Pump carried to Summary Page (A)				

Item	Description	Unit	Qty	Rate	Total
1.3	**FIRE FIGHTING EQUIPMENT**				
1.3.1	**HOSE REEL**				
1.3.1.1	Hose reel assembly with swinging and rolling arrangement together with 19mm dia x 30.0 mtrs long hose and 6.25mm nozzle, 19mm NB ball valve at tap-off etc., as per IS: 884, 30m Fire Hose Reel	No	15		
1.3.2	**FIRE EXTINGUISHERS**				
1.3.2.1	Supply, installation, testing and commissioning of approved make carbon di-oxide 4.5 Kgs capacity fire extinguisher, made of high-pressure steel with wheel type valve and one meter long braided high-pressure discharge hose which should have a minimum of bursting pressure of 140 Kg/Sq.cm and fitted with ABS discharge horn and handles (non-conductor), complete with bracket and steel handle on the body fully charged with ISI certification mark IS:2878/1976. Supply and install in position approved make Dry Chemical Powder Fire Extinguisher of 5 Kgs capacity complete with chromium plated gun metal union (cap), fitted with braided. Supply, Erection, Testing and Commissioning of MS hose cabinet stand mounted type, fabricated out of M.S sheet of 16 swg, with glass fronted (4mm thick glass with rubber beading) door and size of the cabinet shall be 600mm x750 mm x 250 mm Quoted rate shall be includes suitable stand for mounting as fasteners etc., and cabinet shall be powder coated of approved color both inside and outside.				
1.3.2.1.1	4.5kg dry chemical powder fire extinguisher	No	15		
1.3.2.1.2	75mm Pillar type hydrant	No	2		
	Sub Total: Fire Fighting Equipment carried to Summary Page (B)				

Item	Description	Unit	Qty	Rate	Total
1.4	**FIRE SIGNAGE**				
1.4.1	E1 sign	No	25		
1.4.2	E2 sign	No	20		
1.4.3	E3 sign	No	10		
1.4.4	E4 sign	No	20		
1.4.5	E6 sign	No	10		
1.4.6	F5 sign	No	12		
1.4.7	F6 sign	No	12		
1.4.8	F7 sign	No	15		
1.4.9	E17 sign	No	24		
1.4.10	F13 sign	No	15		
1.4.11	F14 sign	No	15		
1.4.12	F15 sign	No	2		
1.4.13	F16 sign	No	20		
1.5	**SMOKE VENTILATION SYSTEM**				
1.5.1	Complete Smoke Air Grille, Fire rated 120	No	2		
Sub Total: Fire Signage and Smoke Ventilation carried to Summary Page (C)					

Item	Description	Unit	Qty	Rate	Total
1.6	**CONDUIT PIPE**				
1.6.1	**COMPLETE PIPING INSTALLATION AND ACCESSORIES**				
1.6.1.1	Supply, Erection, Testing and Commissioning of floor piping carried out of MS class C Heavy duty pipe as per IS: 1239 for pipes up to 150mm NB and as per IS : 3589 with a wall thickness of 6.35mm for pipes 200mm NB and above together with fittings, valves and accessories as under Work will include painting for the above ground piping with one coat of primer and two coat of enamel paint of approved color. Work will include cleaning of pipe, degreasing, etc.				
1.6.1.1.1	Diam 25mm NB pipe	m	135		
1.6.1.1.2	Diam 32mm NB pipe	m	30		
1.6.1.1.3	Diam 50mm NB pipe	m	50		
1.6.1.1.4	Diam 80mm NB pipe	m	200		
1.6.1.1.5	Diam 100mm NB pipe	m	150		
1.6.1.1.6	Extra over pipes	Sum	1		
	Sub Total: Piping Installation and Accessories carried to Summary Page (D)				

Item	Description	Unit	Qty	Rate	Total
1.7	**ELECTRICAL WORK**	sum	1		
1.8	**ACCESSORIES**				
1.8.1	Flanges	Sum	1		
1.8.2	Control valves and Valves	Sum	1		
1.8.3	Elbows	Sum	1		
1.8.4	Couplings	Sum	1		
1.8.5	Hangers	Sum	1		
1.8.6	Pipe connection	Sum	1		
2.1	**GENERAL**				
2.1.1	Training of personnel	Sum	1		
2.1.2	O&M manuals with as built drawings	No	4		
2.1.3	12 Months maintenance & Guarantee	Sum	12		
2.1.4	Workshop drawings & Equipment Submissions	Sum	1		
2.1.5	Builder Works associated to Fire Installation	Sum	1		
2.1.7	Linking of fire system panel to Local Fire Department	Sum	1		
2.1.8	Commissioning	Sum	1		
Sub Total: Electrical Work, Accessories and General carried to Summary Page (E)					

SUMMARY: PART C6.3 – FIRE PROTECTION SYSTEMS	
BOQ SUBTOTAL DESCRIPTION	**AMOUNT**
Sub Total: Water Supply and Booster Fire Pump (A)	
Sub Total: Fire Fighting Equipment (B)	
Sub Total: Fire Signage and Smoke Ventilation (C)	
Sub Total: Piping Installation and Accessories (D)	
Sub Total: Electrical Work, Accessories and General (E)	
SUB TOTAL: PART C6.3 – FIRE PROTECTION SYSTEMS CARRIED TO THE MECHANICAL SECTION SUMMARY (EXCLUDING VAT)	

PART C6.3.4: SCHEDULES OF INFORMATION AND TECHNICAL SPECIFICATIONS ON EQUIPMENT PROPOSED

All schedules which accompany this specification form an integral part of it and shall be duly completed in every detail; **FAILING** which, the tender in question may be rendered ineligible for consideration.

Under no circumstances will statements such as: -

- see attached pamphlets,
- refer to catalogue,
- data to follow,
- as given by supplier, etc.

be acceptable to the Engineer & end user.

Equipment offered and listed on the schedules shall be capable of performing the specified duties and complying with the specification requirements in all respects. **SHOULD** it transpire that such equipment, even when offered by make, model and/or type, is unsuitable or incapable of meeting, or performing in accordance with the specification requirements in any respect, the contractor or sub-contractor shall nevertheless be responsible for any additional costs incurred in providing the required or suitable equipment.

Whenever a specific make, model or type of equipment has been prescribed in the specification and the tenderer offers an alternative or equal make or type of equipment in his tender, the Engineer will on acceptance of such a tender inform the prospective contractor in writing as to make, and/or type of equipment accepted **HOWEVER**, it should be noted that the use of words "OR EQUAL" by the tenderer is to be discouraged and lead to the disqualification of the tender.

STOP VALVE

Name of suppliers ....
Make .....
Type and model number .....
Country of origin .....

FIRE PROTECTION HEAD

Name of suppliers ....
Make .....
Type and model number .....
Country of origin ....

PUMP (Where applicable)

Name of suppliers ....
Make ....
Type and model number ....
Country of origin ....

PIPES, ELBOW, COUPLING, TE, HOSE REEL & VALVES

Name of suppliers .....
Make .....
Type and model number .....
Country of origin ....

PART C6.3.5: DRAWINGS ISSUED FOR TENDER PURPOSES

Item	Drawing Number	Drawing. Title	Revision
1	ME159/WCS046363/2	GROUND FLOOR: RATIONAL FIRE DESIGN	T
2	ME159/WCS046363/3	BASEMENT FLOOR: RATIONAL FIRE DESIGN	T
3	ME159/WCS046363/8	15KL COMBINED FIRE AND PROTECTION TANK AND WATER MAKE UP CONFIGURATION LAYOUT	C

BILL OF QUANTITIES, SPECIFICATION AND DRAWINGS
FOR
PROPOSED NEW MAGISTRATES COURT ON ERF 253, JAN KEMPDORP FOR THE DEPARTMENT OF PUBLIC WORKS & INFRASTRUCTURE FOR MECHANICAL ENGINEERING WORKS

WCS 046363

PART C6:
PART C6.4: PLUMBING AND WET SERVICES: SUPPLY, INSTALLATION, COMMISSIONING AND 12 MONTHS FREE MAINTENANCE OF FIRE EQUIPMENT

Prepared for:	Prepared by:
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DEPARTMENT OF PUBLIC WORKS & INFRASTRUCTURE PRIVATE BAG X 5002, KIMBERLEY, 8301 CONTACT PERSON: MR J. P. MARIUS EMAIL: Hannes.marais@dpw.gov.za TEL: (053) 838 5288 FAX: (086) 489 7460 / 053 833 1153	BAKONE CONSULTING ENGINEERS CC 581 MENDELSSOHN STREET, CONSTANTIA PARK, PRETORIA, 0181 CONTACT PERSON: MR M.E. MATLALA EMAIL: edward.matlala@bakonegroup.co.za TEL: (012) 998 1225 / (087) 379 5110 FAX: (086) 672 9965

JULY 2021

Contents

PART C6.4.1: NOTICE TO TENDERERS

1. The quantities given in the Bill of Quantities are estimates only, and subject to re-measuring during the execution of the work. The Contractor shall obtain the Engineer's detailed instructions for all work before ordering any materials or executing work or making arrangements for it.
2. The Works as finally completed in accordance with the Contract shall be measured and paid for as specified in the Bill of Quantities and in accordance with the General and Special Conditions of Contract, the Specifications and Project Specifications and the Drawings. Unless otherwise stated, items are measured net in accordance with the Drawings, and no allowance has been made for waste.
3. The validity of the contract will in no way be affected by differences between the quantities in the Bill of Quantities and the quantities finally certified for payment

PART C6.4.2: MECHANICAL INSTALLATION REQUIREMENTS

1. GENERAL

The standard specifications included define the standard of equipment and materials as well as the quality of the services required for the various sections of the installation. Not all the clauses in this section of the standard specification shall necessarily be applicable on the contract. Refer to the detailed or material specification for materials and equipment to be used.

The contractor shall at all times adhere to this specification unless otherwise specified on the drawings and/or in the detailed specifications.

The engineers' drawings show broad principles of design, general layouts, schematic arrangements and when read together with the specifications and the drawings of other disciplines and other contractors, they carry sufficient information to enable the contractor to determine how the installation is to be installed, operated, services and maintained.

Pipe sizes and possible positions are shown on the engineers' drawings Fittings, valves,
strainers etc must adapt to these pipe sizes.

The contractor shall submit workshop drawings, samples, catalogues, performance
characteristics etc., on all equipment, except when specifically included by the engineer.

The contractor shall take in situ measurements for installation of the equipment of the system and produce complete workshop drawings for fabrication and installation. These drawings shall be co-ordinated by the contractor with all other relevant equipment and services. Dimensions given on the engineers' drawings are only a guide and should be adapted to suit the relevant measurements of the specific fittings and/or equipment.

2. DEFINITIONS AND ABBREVIATIONS

2.1 DEFINITIONS OF TERMS USED HEREIN:

"Provide": to supply, install and connect up, complete and ready for safe and regular operation particular work referred to unless specifically indicated or specified otherwise.

"Install": to erect, mount and connect complete with all related accessories.

"Supply": to purchase, procure, acquire and deliver complete with all related accessories.

"Work": all labour, materials, equipment, apparatus, controls, accessories and other items required for proper and complete installation

"Concealed": embedded in masonry or other construction, installed in furred spaces within double partitions or hung ceiling, in trenches, in crawl spaces or in enclosures.

"Exposed": not installed underground or "concealed" as defined above.

"Indicated", "Shown" or "Noted": as indicated, shown or noted on drawings and / or specifications.

"Similar" or "Equal": of approved manufacture, equal in materials, weight, size, design and efficiency of specified product.

"Approved", "Satisfactory", "Accepted" or "Directed": as approved, satisfactory, accepted or directed by the Engineer

2.2 ABBREVIATIONS :

"SABS": The South African Bureau of Standards and the number following shall refer to the latest amendment of the relevant specification or Code of Practice as the case may be.

"BSS"	:	British Standard Specifications
"NB"	:	Nominal Bore
"WWP":	;	Water Working Pressure
"WOG":	;	Water, Oil, Gas
"PB"		: Polished Brass
"CP"		: Chromium Plated
"AASHTO"		: American Association of State Highway and Transportation Officials.
"AISI"		: American Institute of Steel Industries
"CKS"		Co-ordinating Specifications issued by the Central Co-ordinating Committee under the auspices of the South African Bureau of Standards.
"CSIR"		: Council for Scientific and Industrial Research

2.3 Diameters of Pipes

All diameters of pipes given are the nominal bore or external diameters in accordance with the normal conventions of the materials being used.

3. CODES OF PRACTICE, LAWS AND STANDARDS

All workmanship and materials used in the execution of the works shall be of the highest class and, where not fully covered by the Specification, shall be carried out in conformity with best modern practice, as determined by the Engineer.
It shall be the contractor's responsibility to ensure that the entire installation fully complying with all relevant requirements of governmental and Local Authorities whose jurisdiction embraces the location of the Site of the Works and the equipment provided for those installations which shall comply in every respect with the National Building Regulations and Building Standards Act, Act 103 of 1975 and the Occupational Safety Act, Act N°6 of 1983, both as amended to date, excepting only where exemption from any such regulations has first been obtained in writing from the said authorities, provided that the approval of the Engineer has been given prior to application for any exemption.

All materials and equipment supplied and installed shall carry the SABS or BS mark of approval unless otherwise specified or agreed to in writing by the engineer. Where alternatives are offered, the submission is to include full details of the item together with tests and compliances with any other standards.

All electrical wiring shall comply fully with the latest edition of the Standard Regulations for the wiring of Premises, SABS 0142 and the additional requirements of any local authority who has jurisdiction over the Site of Works, as well as being in accordance with best modern practice.
Wherever relevant, this Specification shall be understood to be amplified to embrace Codes of Practice and Standards promulgated by recognized authorities in the field of Plumbing and Drainage Technology and all other branches of engineering science applicable to this project.

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

It shall be the responsibility of the contractor to make the necessary arrangements at his own expense with the local supply authority and to supply the labour, equipment and means to inspect, test, commission and to hand over the installation.

The Subcontractor shall supply and install all Notices and Warning signs that are required by the appropriate laws, regulations and/or by this document.

4. ORGANISATION AND STAFF CONTRACT

In addition to the site supervisor and/or foreman, the contractor shall employ as many competent and experienced persons as may be necessary for the purpose of the contract and shall be bound to remove from the contract works any person to whom

the employer or his agent or the principal contractor may reasonably object by reason of any failure, neglect, incompetence or substandard work execution by or under the supervision of such person.

The duties and responsibilities of the contractor's management staff shall include but not be limited to the following.

Selection of equipment and components into working assemblies in conformance with the design concept in the subcontract specification.

Submission of equipment and installation drawings for approval in accordance with the required procedure.

Programming and planning of the work to fit in with the overall principal contractor's programme.

Attendance at routine site progress meetings and programme monitoring meetings organised by the principal contractor.

Conducting of all tests required. Expediting of the work.

Directing his employees to ensure efficient, timely and safe execution of the work, and co-operation with the principal contractor and other trades to ensure such execution.

Attendance at meetings from time to time with the engineer in order to discuss any technical matters that need clarification.

5. CO-ORDINATION WITH OTHER TRADES

The contractor shall acquaint himself with the general arrangement of all other services

and ensure that in fixing the work it will not obstruct the fixing or future maintenance of the contract works or other services.

He shall also fully co-operate with other trades and take all reasonable precautions to ensure that he does not impede the progress of, or damage their work.

6. TEST AND INSPECTION PRIOR TO COMPLETION

Except where otherwise provided in the contract, the contractor shall provide all labour, materials, power, fuel, accessories and properly calibrated and certified instruments necessary to carry out such tests. Arrangements for such tests shall be made by the contractor and he shall give at least 72 hours' notice to the engineer, in writing, of the test prior to commencement.

In the event of the plant or installation not passing the test, the employer shall be at liberty to deduct from the contract price all reasonable expenses incurred by himself or his agents attending the repeated tests.

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

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

After complete installation of the system all equipment shall be tested, adjusted and readjusted until it operates to the satisfaction and approval of the engineer and the client.

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

7. SHOP DRAWINGS

The subcontractor shall prepare at his own expense and shall submit copies of shop drawings for all fabricated work, working or setting out drawings, shop details and schedules to the Owner's representative for approval as stated below, and related work shall not be performed by the subcontractor until such approval has been given.

As soon as approval has been given, the subcontractor shall furnish the Owner's representative two prints of the approved shop drawings, setting out drawings and schedules. The subcontractor shall also furnish to the Works as many prints of the approved shop drawings and schedules as are required. No work shall be performed from shop drawings and/or catalogues not stamped with the Owner's representative's approval, and such stamped drawings and/or catalogues shall be kept available at the job site as evidence of such approval.

The subcontractor shall be responsible for dimensions, design of adequate connections, details for the satisfactory construction of all work and the furnishing of materials for work required by the subcontract even if not indicated on the submissions that have been approved by the Owner's representative.

The Owner's representative will check drawings for design only and approval of the drawings, schedules and catalogues by the Owner's representative shall not be construed as a complete check and shall not relieve the subcontractor of its responsibility as above stated. If the submissions differ from the requirements of the subcontract, the subcontractor shall make specific mention of such difference in his letter of transmission, with a request for substitution, together with his reasons for same, in order that, if acceptable, suitable action may be taken by the Owner's representative. Otherwise, the subcontractor will not be relieved of the responsibility for executing the work in accordance with the requirements of this subcontract.

Corrections of shop drawings by the Owner's representative are not intended to change the scope of work. Should any such corrections constitute a change of scope of work, the subcontractor shall notify the Owner's representative in writing, within not more than seven calendar days of such change and shall not proceed with the fabrication until so authorised by the Owner's representative. Claims for change of scope, made after performance of the work constituting the claimed change of scope, will not be considered.

8. "AS-BUILT" DRAWINGS AND MANUFACTURERS INFORMATION

The Subcontractor shall provide the Engineer with a complete signed transparent set of "as-built" drawings together with stored drawings in DXF electronic format as a pre- requisite to final payment; and the Engineer shall hand the set over to the Owner after having established their correctness. The "as-built" set shall include all mechanical and electrical work.

Where possible, a transparent copy of Architects or Engineers drawings shall be used and the Subcontractor may purchase copies of the necessary transparencies from the relevant party. If "as-built" variations cannot be clearly shown thereon, then the Subcontractor shall prepare supplementary transparent drawings that will properly impart the necessary information. Manufacturer's and Subcontractor's shop drawings shall be corrected to correspond with the "as-built" drawings and copies of each shall also be furnished to the Engineer.

"As-built" drawings shall be maintained on a current basis as work progresses, and all deviations in work as actually installed accurately entered, at least once a week, on paper prints of design drawings affected, with such prints kept available at the site for the inspection of the Engineer. At the end of each month, the record for the month, properly identified by notes, shall be transferred to the original drawings by competent draughtsmen. Within seven days after the end of each monthly period, submit to the Engineer one paper print of each drawing affected showing the latest corrections.

The contractor shall submit 3 (three) sets of comprehensive operating and maintenance manuals, to the engineer, after first obtaining his approval thereof.

The operating and maintenance manuals shall at least contain the following:

(i) A description of the system together with details and specifications of all equipment and items used in the works.
(ii) Detailed instruction in the operation of the system.
(iii) Details and schedules of how and when to maintain the plant and equipment.
(iv) List of spares to be carried, complete with part numbers and supplier(s) of equipment.
(v) Names and addresses of staff of the contractor or supplier(s) or subcontractor(s) to be contacted in case of an emergency etc.
(vi) Guarantees for all equipment and fittings etc.

9. QUALITY ASSURANCE SYSTEM

The contractor shall institute an approved Quality Assurance system (QA) which shall be submitted to the engineer for his approval. The records of this QA system shall be kept throughout the duration of the contract and shall be submitted to the engineer at regular intervals as required by the engineer

10. OPERATING AND COMMISSIONING OF PLANT AND INSTALLATION

The completed system shall be put into operation after all tests and adjustments have been carried out to the satisfaction of the engineer. The contractor shall run and operate the system for a period of time as specified by the engineer and train the staff of the client to operate and maintain the system for a period as required by the engineer, which will not exceed one month.

Logging of the operation of the installations shall commence immediately upon start-up. The contractor shall submit a full commissioning report.

11. GUARANTEE OF INSTALLATION AND EQUIPMENT

The contractor shall obtain guarantees from the manufacturer(s) and/or supplier(s) to the effect that each piece of equipment shall comply with the required performance and also that it will function as part of the complete system.

All equipment including the complete installation and the system guaranteed for a period of 12 (twelve) months after the written engineer of the completed and operational system.

12. MAINTENANCE OF THE INSTALLATION DURING THE PERFORMANCE GUARANTEE PERIOD

The contractor shall furnish, free of charge, all maintenance on the entire equipment supplied by him for the guarantee period. Maintenance shall include systematic examination and adjustment of all this equipment at least every 3 months. The contractor shall, in the course of such maintenance or on call during the maintenance period, repair or replace defective parts as required and shall use only genuine standard parts produced by the manufacturer of the original part. Renewals or repairs resulting from misuse of air wear and tear, however, shall not be made at the expense of the contractor where certified as such by the engineer. Specified spares shall not be used during this period. If any spares are used due to operational necessity and with the engineer's permission, such spares shall be replaced by the contractor.

The maintenance period shall only begin with completion of the Main Contract and when the engineer has certified the contract works as completed, unless otherwise specified.

13. COMPLETION OF CONTRACT WORKS

Completion of the contract works will only occur after the following procedure has been certified by the engineer as having been carried out in accordance with the specification

a) Physical completion of all systems has been reported to the principal contractor by the contractor, and all defects made good. The principal contractor to satisfy himself that all work has been completed satisfactorily before reporting to the engineer.

b) Acceptance tests have successfully taken place as specified and test results have been witnessed (where required), recorded and approved by the engineer.

c) "As-built" drawings, commissioning reports and maintenance and operations manuals have been submitted to and approved by the engineer.

d) The employer's nominated operator(s) has received instruction in the operation of the contract works by the contractor.

e) The installation or part of the installation shall only be deemed handed over when completed, tested and fully commissioned and then signed off by the Engineer.

PART C6.4.3: INSTALLATION SPECIFICATION AND SCOPE OF WORK

1. GENERAL

There is a new Jan Kempdorp New Magistrate Court under construction with existing defective water pumping system and existing defective fire system in place for which an upgrade and refurbishment is required as the new construction must be incorporated into the existing water system for both Services: Fire Protection and Domestic water usage.

This document is a standard specification for the Plumbing, Drainage & Fire Protection Installations and it outlines the essential minimum requirements for the supply, installation, de-commissioning, commissioning and 12 months' free maintenance of all installation part of the Fire Protection and Domestic water systems.

2. SCOPE OF WORK

This specification covers the supply, delivery, installation, decommissioning, commissioning and 12 months guarantee of the complete refurbished water pumping system.

The system is a combined, with domestic water reticulation and fire protection line

The required equipment for this installation shall be delivered to the Jan Kempdorp New Magistrate Court Site on the date agreed with the Main Contractor.

3. THE SITE

The site address is situated at Jan Kempdorp New Magistrate Court area,
The facility water supply and drainage MUST comply with Part 1: Water supply installations for
Buildings of SANS 10252-1 and the National Building Regulation. All work to comply with Act 103 of 1997

4. APPLICABLE SPECIFICATION CODES, ORDINANCES, PERMITS

The work covered in this contract is to be installed according to the specs. Codes, ordinances and requirements of the followings:

a) National Plumbing Code
b) The Code on Sanitation of the Republic
c) National Pollution Control Commission
d) Ordinances of concerned city or municipality
e) Statutory requirements Local codes and by-laws
    i. Local MUNICIPALITY – Fire Brigade and Emergency Services,

f) Codes of Practice: South African Bureau of Standards, British Standards and NFPA;
    ii. All work to comply with Act 103 of 1997 and SANS 10252-1:2012 Edition 3, Water supply and drainage for buildings Part 1: Water supply

installations for buildings

ii SANS 10252-2 (1992) (English): Water supply and drainage for buildings Part 2: Drainage installations for buildings

g) SANS 10400 : The application of the National Building Regulations.

All construction, permits, and fees required for the work shall be obtained by and at the expense of the Contractor. The Contractor shall furnish the Owner final certificates of inspection after the completion of the work.

5. WORKMANSHIP AND INSTALLATION

5.1 PIPING GENERAL

Materials and workmanship shall be the best of their respective kinds. Only new and undamaged materials shall be used in the Works. Materials to be permanently installed into the works shall not be used for any temporary purposes on site. Work shall be to the approval of the engineer and shall be executed in accordance with the relevant manufacturer's written recommendations and instructions.

Drawings are generally diagrammatic and indicative of work to be installed. Run and arrangements of piping shall be approximately as indicated, subject to modifications a required to suit conditions at building, to avoid interference with work of other trades, or for proper, convenience and accessible location of all parts of piping systems. Due to small scale of drawings all required offsets, fittings, valves, traps, drains etc., may not be indicated. Refer to and carefully check architectural, structural, electrical and mechanical drawings and details, noting locations where walls, partitions, ceilings, beams, columns and other surfaces are furred, location of beam cuts, location of pipe shafts and conflicts with work of other trades and arrange work accordingly, providing all offsets, fittings, valves, traps, drains etc., required to meet such conditions.

Run piping in wall chases, recesses, pipe shafts and hung ceilings where same are provided. No piping shall run in floor fill unless indicated or specifically approved. Exterior utilities are diagrammatic and exact location and invert elevations shall be as indicated or required to meet existing conditions. Install piping under buildings as high as possible. Do not permanently close up, fur in or cover piping before examination and test.

Run piping as straight and direct as possible, in general forming right angles with or parallel to walls or other piping and neatly spaced with risers erected plumb and true. Install piping so that there is clearance of at least 25mm between finished coverings (fitting hubs on uncovered piping) of piping and also between finished coverings or fitting hubs and adjoining work, hang piping at or in ceiling from construction above, as close as possible to bottom of slabs, beams etc., maintaining maximum headroom at all times. Obtain from Engineer approved ceiling heights and install work above this height.

No piping shall be run in elevator machine rooms (except where special ducts are provided), telephone rooms containing telephone equipment, relays and terminal strips, and electric rooms and closets containing exclusively equipment such as transformers, switchgear, motor control centres, panel boards, or similar items of equipment, and in emergency generator room. Elsewhere, no piping shall be run

within 1,75m laterally of such electrical apparatus as motor control panels, switchboards and electric motors, except for branch piping connecting to equipment

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

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

Exposed CP piping about fixtures and equipment shall not show tool marks or more than one thread at fittings. Fittings, valves and hangers on CP piping shall have CP finish.

Use reducing fittings for changes in pipe sizes. Use no bushings except with special permission.

Use extra heavy pipe for nipples where unthreaded portion is less than 40mm. Use no close nipples, except with special permission; use only shoulder nipples.

Provide unions or flanges in connections to risers, by-passes and equipment.

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

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

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

5.2 EXPANSION SWINGS

Make adequate provision for proper expansion and contraction of piping and for piping passing through building expansion joints. At connections of branches to water mains and risers and at connections to heaters, tanks, pumps, coolers and other equipment, provide sufficient number of elbow swings to allow for proper expansion and contraction of piping. Provide adequate elbow swings, or expansion loops, or approved type expansion joints, wherever indicated or required to allow for proper expansion and contraction of mains and risers.

Where flanged "Bellows" type expansion compensators are specified, they are to be installed as detailed and in accordance with the manufacturer's recommendations.

Should these compensators be specified for installation in wood truss roof structures the Contractor is to report to the engineer, who will provide details of the location and installation requirements

5.3 SLEEVES

Provide sleeves large enough to accommodate pipe and its covering passing entirely through floors, ceiling, walls, or partitions. Pack sleeves through firewalls or slabs in accordance with engineer's requirements.

Provide cast iron or steel pipe sleeves for pipes passing through exterior walls, footings or beams or through floors (interior) or machinery rooms containing Plumbing, Heating, Ventilation, or Air Conditioning equipment, and here extending 50mm above finished floor. Provide sleeves through exterior walls below grade and floors specified above with continuously welded centre flange buried in construction. At exterior walls, make pipe watertight in sleeve with oakum packing and caulked lead joints on both sides of wall.

Except as otherwise noted, provide 0,710mm galvanised iron sleeves for all pipes passing through roof slabs, interior floors, ceilings, walls or partitions, unless framed opening is provided in general construction.

Copper pipes shall have PVC sleeves or be covered with "Thermoflex" or equal protection strip where they pass through walls.

Sleeves shall extend 10mm beyond finished surface.

5.4 ESCUTCHEONS

Unless otherwise noted, provide exposed pipes, both bare and covered with approved type cast brass or cast-iron escutcheons where they pass through walls, partitions, floors, or ceilings; held in place by set screws or on covered pipes by internal spring tension. In toilet rooms, at tile walls and in connections with chromium plated piping, escutcheons shall have chromium plated finish.

Where sleeves, hubs or fittings project slightly from wall, partition, floor or ceiling, provide special deep type escutcheons to cover each case.

5.5 OFFSETS

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

6. MATERIALS

6.1 GENERAL

All materials, etc. specified herein under a trade name, catalogue number or reference shall be either exactly as described or, in the opinion of the Engineer, of equal quality, specification and mass in all respects to those described. Written approval shall be obtained for the use of any alternative to the specification before the submission of tenders, otherwise it will be assumed that the specified materials, etc. have been allowed for in the tender.

Materials shall be new, unused, best of their respective kinds and free from defects.

Galvanising shall be by hot process on both inside and outside of pipe with zinc coating averaging at least 600g/m² and free from defects.

For Chromium Plating, materials shall be cleaned and polished before plating and plated heavily, thoroughly and evenly and guaranteed not to strip or peel. Steel or cast iron shall be firstly copper plated. Brass, copper and copper plating shall be nickel plated before chromium plating. Finish shall be polished or satin as further specified.

6.2 COPPER PIPE INSTALLATIONS

The installation of copper piping systems shall be done in accordance with the manufacturer's Code of Practice and all relevant codes, standards and regulations.

Copper pipes shall only be installed downstream of galvanised mild steel pipes when applicable.

Where dissimilar metals are joined, di-electric or isolating couplings shall be used. This is not required where copper and brass dezincified alloys join.

Copper pipes shall be of the hard drawn type Class "O" according to SABS 460 and shall be joined by means of capillary soldered type fittings. Compression fittings should not be used unless specifically authorised by the engineer and only on Class 2 or 3 piping.

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

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

The heat source to be used shall be propane gas with induction air, at a temperature not higher than 240oC. The pipe ends and fittings shall be cleaned and wiped with an approved solder flux, before soldering. The pipe and fittings shall then be fitted together and heated to the correct temperature before the solder is applied. Care must be taken not to add too much or too little solder to the joint. Immediately after setting of the solder the joint shall be wiped clean with a wet cloth. Pipes shall be washed out as soon as possible after jointing and all traces of flux shall be removed.

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

Pipes chased or built into walls or floors shall be wrapped with 2 layers of building paper or similar approved material. Hot and cold water pipes running next to each other shall have a minimum clearance of 50mm.

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

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

Pipe hangers and brackets shall be installed according to the manufacturer's specification on the following maximum spacings. Vertical pipes shall be supported at least at every floor.

PIPE DIAMETER (mm)	HORIZONTAL (metre)	VERTICAL (metre)
15	1.3	1.9
22 & 28	1.9	2.5
35 & 42	2.3	2.8
54	2.5	3.9
67 – 108	2.8	3.9

All copper pipes open to structural damage shall be protected by steel sleeves or a structurally designed cover.

Where flanged fittings are used cadmium plated bolts, nuts and spring washer shall be used to join these flanges.

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

Shut-off valves shall be installed on all branch pipes, connections to equipment, sanitaryware and other fittings as indicated by the engineer.

All pipes shall be marked in accordance with SABS 0140 or as specified by the engineer.

6.3 GALVANISED STEEL PIPE INSTALLATIONS

All galvanised steel pipes shall, unless otherwise specified, be medium gauge mild steel screwed and socketed pipes to SABS 62 and shall be normalised and marked as such by the manufacturer. Pipes shall be hot dipped galvanised to SABS 763.

All fittings shall be malleable cast iron fittings to SABS 509 and galvanised to SABS 763.

All 100 diameter and larger pipes shall be joined with Class 16 flanged couplings to SABS 1123/1600. The bolts, nuts and washers to be used on these joints shall be cadmium plated.

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

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

NORMAL SIZE (mm)	HORIZONTAL (mm)	VERTICAL (mm)
15 Ø to 20 Ø	1.2m	1.8m
32 Ø to 40 Ø	1.8m	2.5m
50 Ø to 150 Ø	2.5m	3.0m

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

All pipes shall be marked according to SABS 0140 or as specified by the Engineer. All exposed pipes shall be painted to the required colour as specified by the architect.

Make joints in screwed piping with hemp and "Stag" jointing compound approved by the engineer and sparingly used with good quality hemp. For pipes larger than 80mm Ø a jointing compound such as Eperdemix 32 shall be used. Hemp and jointing compound

shall be used sparingly and applied to the male thread only.

Any pipe buried shall have at least 900mm cover and be coated and wrapped to SABS 1117 and tested in the presence of the engineer.

All pipework and fittings shall be pressure tested and sterilised to the engineer's specifications.

Valves shall be installed on all branch pipes and ball-o-stop valves on al connectors to basin pillar cocks, sink mixers, cistern type WCs and other fittings, as indicated by the engineer

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

6.4 UPVC UNDERGROUND PIPE INSTALLATIONS

Unless otherwise specified all underground pipework >50mm Ø shall be Class 12 uPVC to SABS 966 with rubber ring type joints.

All bends shall be uPVC Class 12 type fittings with rubber ring joints

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

No solvent weld type fittings will be allowed.

All cast iron fittings shall be coated and wrapped to SABS 1117.

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

All backfilling shall be to the engineer's specification and approval. Pipe trenching and bedding:

AREA	MINIMUM COVER	BEDDING TYPE	MAIN FILL
Vehicle Traffic	1100	Flexible pipe bedding as per SABS 1200 LB	Soilcrete
Under surface bed	600		Soilcrete
Other areas	900		90% MOD AASHTO

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

No concrete shall come into direct contact with the uPVC pipe. At the thrust blocks the end shall be wrapped with a "Densopol 80 HT Tape" or similar approved.

All pipes shall be laid with at least 900mm cover to the top of the pipe. Marker blocks shall be installed at all tees or changes of directions.

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

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

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

Suitably sized air release valves built into valve chambers shall be installed at all high points of the pipe line.

6.5 HDPE PIPE INSTALLATIONS

6.5.1 Underground Pipework

Unless otherwise specified all underground pipework <50mm Ø shall be Class 12 Type 4 HDPe pipe to SABS 533

All fittings shall be of "Plasson" compression type, conforming to ISO/DIS 3458.

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

All backfilling shall be to the engineer's specification and approval. Pipe trenching and bedding:

AREA	MINIMUM COVER	BEDDING TYPE	MAIN FILL
Vehicle Traffic	1100	Flexible pipe bedding as per SABS 1200 LB	Soilcrete
Under surface bed	600		Soilcrete
Other areas	900		90% MOD AASHTO

No concrete shall come into direct contact with the HDPe pipe. At these points the fittings shall be wrapped with "Denstopol 80 HT Tape" or similar approved

Marker blocks shall be installed at all tees or changes of directions.

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

All pipework shall be pressure tested with all joints uncovered to the satisfaction of the engineer.

Suitably sized air release valves built into valve chambers shall be installed at all high points of the pipe line.

6.5.2 Drainage Pipework

HDPe drainage pipework shall be "Geberit" or equal system utilising standard drainage fittings.

The pipe shall be annealed to eliminate residual manufacturing tension stresses.

The following jointing methods are acceptable for the pipe system depending on application:

Butt welding for general pipe joints

Electroweld sleeve coupling in areas of limited access Ring seal socket for individual prefabricated sections Expansion socket where movement is necessary Screw threaded joint for detachable connections Flange connections for connection to equipment

Joints shall be made with a smooth interior to ensure there is no restriction flow inside the pipes.

6.5.3 Vitrified Clay Pipe and Fittings

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

The jointing method to be used shall be polypropylene couplings with integral rubber seal similar or equal to "Vitrosleeve" according to SABS 974.70 allowing up to 2.5o angular movement per joint and 5mm. line displacement per joint. The joint shall retain an effective water seal with respect to the above conditions with a 6 metre water head.

Pipes shall be cut by an approved pipe cutter after which the end shall be trimmed by means of a pipe trimmer to remove any sharp edges.

All fittings underground shall be of vitrified clay and shall comply to SABS 559.

6.6 SUPERCAST CAST IRON PIPE AND FITTINGS

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

fittings to be sandblasted and coated on the inside and outside by submersion in a corrosion inhibited tuicle primer or bitumen paint.

The pipes and fittings shall be joined by means of stainless-steel neoprene couplings as supplied by the manufacturer of the pipe system. The coupling shall be installed according to the manufacturer's specification and be tightened with a torque wrench to a torque of 6.8 Nm.

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

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

6.7 UPVC SOIL AND WASTE PIPES AND FITTINGS

Where specified uPVC soil, vent and waste pipe systems can be used for underground and above ground drainage installations. This piping shall conform in all respects to SABS 791 for underground systems and to SABS 967 for above ground system.

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

6.8 STRUCTURAL WALL UPVC PIPES AND FITTINGS

Where specified a structural wall uPVC drainage pipe can be used for underground drainage systems. This piping system shall be used with standard underground uPVC pipe fittings as specified under item 3.4, equipped with rubber ring joints. The pipe shall be equipped with a z-lock type rubber ring joints.

7. VALVES FOR DOMESTIC WATER INSTALLATIONS

7.1 GATE VALVES UNDERGROUND IN VALVE CHAMBERS TO CONNECT TO UPVC PIPING (65 NB AND LARGER)

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

The valve shall conform to SABS 664 and/or 665, and shall be capable of withstanding a working pressure of 1600 kPa.

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

7.2 GATE VALVES UNDERGROUND IN VALVE CHAMBER TO CONNECT TO HDPE PIPING

The gate valves shall be of the dezincified brass type with brass gate, brass body, non-rising spindle and BSO threaded socket ends. The valve shall conform to SABS 776/1960 Class 125. The valve shall be able to withstand a working pressure of 1600 kPa. The valve shall be fitted with a handwheel on an extended spindle shaft of +/- 700mm to close in a clockwise direction and installed to detail.

7.3 GATE VALVES ABOVE GROUND FOR TEMPERATURE UP TO 400C TO CONNECT TO STEEL PIPING (65 NB AND LARGER)

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

The valve shall conform to SABS 664 and/or 665, and shall be capable of withstanding a working pressure of 1600 kPa.

The valves shall be fitted with flanged ends to SABS 1123/1600 (1977), hand wheel to close the valve in a clockwise direction and installed in an upright position or side ways to a maximum 90° from upright.

7.4 GATE VALVES ABOVE GROUND FOR TEMPERATURES ABOVE 400C TO CONNECT TO STEEL PIPING (65 NB AND LARGER)

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

The valve shall conform to SABS 665 and shall be capable of withstanding a working pressure of 1600 kPa and a temperature of 90o.

The valve shall be fitted with flanged ends to SABS 1123/1600 (1977), hand wheel to close the valve in a clockwise direction and installed in an upright position or sideways to a maximum 90° from upright.

7.5 GATE VALVES ABOVE GROUND TO FIT TO COPPER PIPES (65 NB AND LARGER)

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

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

7.6 GATE VALVES ABOVE GROUND TO FIT TO COPPER PIPES (65 NB AND LARGER) CONTINUED

The valve shall be equipped with flanges to SABS 1123/1600, hand wheel to close the valve in a clockwise direction and installed in an upright position or sideways to a maximum 90o from upright.

7.7 GATE VALVES ABOVE GROUND FOR TEMPERATURES UP TO 100OC (UP TO 50 NB)

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

The valve shall be able to withstand a working pressure of 1600 kPa.

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

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

7.8 BALL-O-STOP VALVES (15MM Ø – 25MM Ø)

Ball-o-stop valve shall be a full-way ballcock type with BSP threaded ends. These valves shall conform to SABS 1056 Part 3 and shall be rated for a test pressure of 2000 kPa. Valve shall be chrome finished when exposed.

7.9 ANGLE REGULATING VALVES

Angle regulating valve shall be a 15mm Ø chromium plated angle regulating valve with a 350mm chromium plated copper tube and capnuts where required.

7.10 VALVE TAG AND CHARTS

Provide on all valves and controls, identifying numbered metal tags, including letter to indicate system, fastened by heavy brass hooks or chain.

Tags: Not less than 50mm square, 1.25mm thick, aluminium with stamped numbers and letters filled in with black paint.

Provide separate diagrammatic charts showing essential features of each system with all valves and control lettered and numbered to correspond to designation on metal tags. Also furnish list of all valves and controls giving location and function.

Charts and lists: Type, size and character as approved. Mount in glazed metal frames permanently fastened in locations as approved by the consulting engineer.

8. STRAINERS

8.1 STRAINERS FOR CONNECTION TO STEEL OR UPVC PIPES (65 NB AND LARGER)

This strainer shall be of the Y-type with cast iron body, stainless steel or bronze strainer element and shall be equipped with flanged ends to SABS 1123/1600 (1977). The hole sizes of the strainer element shall be maximum 1mm Ø and be removable without dismantling of pipework. The strainer shall be suitable for a temperature of up to 90^{0}C at a 1000 kPa pressure rating and installed with the element facing downwards or a maximum of 45 ^{0} sideways.

8.2 STRAINERS FOR CONNECTION TO COPPER PIPES (65 NB AND LARGER)

This strainer shall be of the Y-type with bronze or dezincified brass body, stainless steel element and must be equipped with flanged ends to SABS 1123/1600 (1977) The hole sizes of the strainer element shall be maximum 1mm in diameter. The strainer element shall be removable without dismantling of pipework. The strainer shall be suitable for a temperature of up to 90^{0}C at a 1000 kPa pressure rating and installed with the element facing downwards or a maximum of 45 ^{0} sideways.

8.3 STRAINERS FOR CONNECTION TO STEEL AND COPPER PIPES (UP TO 50 NB)

The strainers shall be of the Y-type with bronze or dezincified brass body, stainless steel strainer element and must be equipped with BSP threaded socket ends. The hole sizes of the strainer element shall be maximum 0.8mm in diameter. The strainer shall be suitable for a temperature of up to 90^{0}C at a 1000 kPa pressure rating and installed with the element facing downwards or a maximum of 45 ^{0} sideways.

9. NON-RETURN VALVES

9.1 NON-RETURN VALVES FOR COLD WATER (65 NB AND LARGER)

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

The non-return valve shall be equipped with a cast iron body, aluminium bronze plates, stainless steel springs and neoprene seals on the plates. The valves shall be suitable for a working pressure of 1000 kPa.

9.2 NON-RETURN VALVES FOR HOT WATER (UP TO 100 Ø) AND COLD WATER (UP TO 50 NB)

The non-return valve shall be of the spring-loaded piston type, with bronze or dezincified brass body, stainless steel spring and bronze disc with neoprene seal fitted with BSP threaded socket ends. The valve shall be suitable for a working pressure of 1000 kPa and a temperature of up to 90^{0}C. All valves shall be installed so as to be removable without extensive pipework removal.

10. AIR RELEASE VALVES AND VACUUM BREAKERS

10.1 DOUBLE ORIFICE DOUBLE ACTING AIR RELEASE VALVES WITH SIZES FROM 50 NB TO 200 NB

The air release valve shall be fitted with small and large orifice. The air release valve shall be fitted with a cast iron body, stainless steel or fibre glass balls, integral shut off valve and flanged ends to SABS 1123/1600.

The valve shall be suitable for maximum pressure of 1600 kPa.

10.2 SINGLE ORIFICE AIR RELEASE VALVES FOR MAIN WATER LINES WITH SIZES FROM 25 NB TO 50 NB

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

When the valve is installed a shut off valve shall be installed on the inlet side. The valve shall be suitable for maximum pressure of 1600 kPa.

10.3 SINGLE ORIFICE DOUBLE PURPOSE AIR RELEASE VALVES FOR DOMESTIC WATER LINES UP TO 15NB

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

The valve shall be capable to withstand a working pressure of 1000 kPa at 110oC.

10.4 VACUUM BREAKER UP TO Ø 40MM

The vacuum breaker shall be fitted with neoprene seal, spring loaded disc in a dezincified brass or bronze body. The valve shall seat water tight and shall be designed to withstand a working pressure of 1000 kPa and a temperature of 90°C.

11. PRESSURE REDUCING VALVES

11.1 COMBINATION PRESSURE REDUCING STATIONS

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

11.2 LARGE PRESSURE REDUCING VALVES (65 NB AND LARGER)

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

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

The valve shall be equipped with flanged ends to SABS 1123/1600.

11.3 SMALL PRESSURE REDUCING VALVES (15 NB – 50NB)

The pressure reducing valve shall be equipped with brass body, balanced single seat and integral strainer. The valve shall be able to handle a wide range of incoming pressure while the downstream pressure stays constant with maximum inlet pressure of 1000 kPa and a maximum water temperature of 40oC.
The valve shall be equipped with BSP male threaded brass union couplings

12. WATER METERS

12.1 COMBINATION WATER METERS

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

12.2 WATER METERS (50 NB AND LARGER)

These water meters shall be of the dry type with all gears and transmission and roller counters in a dry head, and shall be equipped with flanged ends to SABS 1123, cast iron body with high quality corrosion proof coating. The meter must be protected from magnetic fields and must be sealed to prevent tampering with adjustments. The meter must be able to work up to a pressure of 1600 kPa under a maximum water temperature of 40oC. The scale of meter must be in m3 and equipped with needle indicators reading in litres. Accuracy of meter to be not less than 98%.

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

12.3 Water Meters (up to 50 NB)

The metre shall be of the volumetric rotary piston type with brass body equipped with union couplers. The meter shall have an accuracy of not less than 09%. The meter must be able to operate up to a water pressure of 1000 kPa at a water temperature of 40oC.

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

13. ADJUSTABLE BALANCING VALVES

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

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

On completion of the project the chart shall be handed to the maintenance manager.

The calibrated adjustable balancing valves shall be of the angle valve type equipped with bronze valve body, bronze disc, internal seals with BSP threaded ends. The valve shall b fitted with stop cock connection ends on inlet and outlet onto which the differential pressure gauge can be coupled to. The valve shall be equipped with an indicator on the valve handle to show the position of the valve opening. The valve shall be suitable for operating at a temperature of 90°C against a pressure of 1000 kPa.

14. DRAINAGE SYSTEMS

14.1 GENERAL REQUIREMENTS

The complete sanitary drainage systems, including connections to main outfall sewer and drainage connections to plumbing fixtures, kitchen and other equipment requiring same shall be installed in accordance with requirements of the Authorities having jurisdiction and the National Building Regulations and Building Standards Act of 1977 as amended.

The Subcontractor shall arrange with the local authorities for all inspections and tests.

Before any part of a drainage system is permanently covered or otherwise rendered inaccessible it shall be inspected and approved by the local Authority and the Engineer.

All equipment, materials and labour necessary for inspection and testing as required shall be made available by the contractor.

All plumbing and drainage work shall be carried out under the direct supervision of a registered plumber and drain layer in terms of the requirements of the local authority and Act. A copy of the registration certificate of all persons carrying out or supervising such work shall be kept on site for inspection at all times. The contractor shall in addition be registered by the local authority.

14.2 DRAINS

All drains shall be laid in a straight line between points where changes of direction or gradient occur.

Where drains pass under any wall other than a free-standing wall such drain shall be of cast iron pipe and shall be completely encased in concrete not less than 100mm thick measured at the hub.

Where any drain passes under a building or where indicated, the pipe shall be cast iron and shall be encased in concrete, along its entire length, not less than 100mm thick measured at the hub. The drain shall be so arranged that all junctions, bends and access eyes are readily accessible.

Access to drains shall be in accordance with the requirements of the local authorities and Act.

Horizontal drainage piping shall be installed at a gradient not less than that indicated, unless approved by the Engineer.

All exposed drainage pipe and pipework within the building shall be spun cast iron pipe or HDPe drainage pipe as specified.

Underground piping external to the building shall, unless otherwise specified or indicated, be vitrified clay pipe or structural wall uPVC as specified.

Vent pipes shall be spun cast iron using approved drainage fittings.

Connections to fixtures shall be provided with approved type reseal traps and shall be installed to be readily accessible.

All pipe laying is to be carried out in accordance with the procedure described in SABS 058.

Laying is to commence at the points of junction with existing drains or at points of discharge.

Before each pipe is laid, it shall be examined to ensure that the bore is clean and any foreign material removed. Plug open ends and junctions, whenever work is suspended, to prevent the entrance of rubbish during construction.

Gulley traps are to be finest quality salt glazed stoneware with outlet jointed to drain and with hopper head fitted with cast iron pierced grating and frame, the whole set on and encased in cement concrete 1:3:6 carried up 75mm high as kerb, finished on exposed places with 20mm granolithic with angles rounded including excavation and casing.

Cleaning eye covers shall be cast iron A.B.C. covers and frames, jointed to top of drain with Gaskin and T.O.K. strip grooved for and including stopper with raised letters "C.E", cast on same, bedding in tallow and screwed to frame with gunmetal set screws. The frame shall be encased in cement concrete 1:3:6 finished on top with untinted granolithic including excavation and casing.

Manholes, unless otherwise described, shall be constructed of precast reinforced concrete rings, with cast iron frames and covers, in accordance with the Drawings. The invert channels shall be smooth and semicircular in shape conforming to the inside of the adjacent sewer section. Changes in direction of flow shall be made with a smooth curve of as large a radius as the size of the manhole will permit. Changes in size and grade of the channels shall be made gradually and evenly. The invert channels shall be formed directly in the concrete of the manhole base, or shall be built up with mortar, or shall be half tile laid in concrete, or shall be constructed by laying full section sewer pipe through the manhole and breaking out the top half after the surrounding concrete has hardened. The floor of the manhole outside the channels shall be smooth and shall slope toward the channels not less than one inch per foot (1:12) nor more than (1:6). Free drop inside the manholes shall not exceed 450mm measured from the invert of the inlet pipe to the top of the floor of the manhole outside the channels, and drop manholes shall be constructed whenever the free drop would otherwise be greater than 450mm.

All manholes to be with stepirons fixed in the factory.

Where ground waters are suspected, a special concrete foundation must be built against the buoyancy forces. The calculation will be issued by the Engineer.

14.3 VENTS

The drainage system shall, unless otherwise specified, be of the one pipe system and all necessary vents and anti-syphonage pipe shall be provided in accordance with the system requirements and in accordance with the relevant bylaws.

Vents extending above the roof level shall be located at least 3m away from any window, door or air intake opening, and shall be properly flashed.

Vent piping shall be run with long radius bends at changes in direction and shall be graded back towards the drain.

When the "so vent" system is used, the fittings shall be Besaans du Plessis "nu vent" or equal and shall be provided with openings as indicated or required.

When back-to-back W.C. arrangement is used, a double bend shall be provided between the W.C. outlet and the "nu vent".

14.4 STAINLESS STEEL FLOOR TRAPS AND FLOOR CHANELS

14.4.1 Stainless Steel Floor Traps

Stairless steel floor traps shall be installed where indicated on drawings for kitchen, abattoirs, dining halls etc These units to be manufactured according to the details supplied in the detail specification. The units are to be manufactured from 304 stainless steel with a load capacity of 1500 kg. The floor traps shall have minimum flow capacity of

3 litre/second

14.4.2 Cast Iron Floor Traps

Cast iron floor traps shall be used where indicated on the drawings or specified. These units shall be manufactured out of cast iron as per detail supplied in the detail specification The units shall be fitted with a water seal and a large sludge box and lid to be easily removable for maintenance purposes. The units shall be designed in such a manner as to provide access to the drainage system and to be used as a cleaning point.

14.5 SOILCRETE

Soilcrete shall be used in trench backfilling where specified indicated and where sewer trench bottoms are below the 45o angle of building foundations.

The compaction of the soilcrete shall be as follows:

Soilcrete shall consist of an approved soil or gravel mixed in a concrete mixer with 5% of Portland demand (per volume) and only sufficient water to give a consistency that will permit the soilcrete to be placed. Concrete vibrators shall be used, so that all voids between the pipes and excavation sides and between culverts in the case of multi-barrel culverts are properly fitted. The height to which the soilcrete shall be filled, shall be determined by the engineer or be as show on the drawings and any remaining backfill shall be carried out as described above using a granular material.

The aggregate must consist of approved soil or gravel containing stones not bigger than 38mm and with a plasticity index not exceeding 10. Detrimental percentages of silt or clay must be avoided and the aggregate shall be obtained from an approved source.

14.6 TESTING OF THE DRAINAGE INSTALLATION

The contractor is to carry out all the tests on the drainage installation as required by the Local Authorities and shall receive their approval before requesting final payment and hand over of the installation.

The Engineer shall be informed when the tests are to be carried our in order that he may witness and approve these.

All drains are to be tested by passing a ball, 20mm smaller in diameter than the internal pipe diameter, through the drain and it shall pass without assistance.

15. DOMESTIC WATER SUPPLY SYSTEM

15.1 GENERAL

Provide complete domestic hot and cold-water supply systems, including connection to supply authority, hot water heating equipment and required hot and cold-water connection to plumbing fixtures, kitchen and other equipment requiring same all as indicated.

Run piping free of traps wherever possible, and grade and valve for complete control and drainage of system with drain cocks at low points and at base of risers.

Provide on main water branches to dishwashers, domestic washing machines and where noted, properly sized shock absorbers.

15.2 PREVENTION OF WATER CONTAMINATION

Wherever possible, provide over-rim water supplies to plumbing fixtures and equipment. Provide necessary below-rim connections, water closet and urinal flush valves, hose bibs and hose connections with approved vacuum breakers and/or check valves as noted or required.

Kitchen or other equipment supplied under other divisions of work and/or by owner, and having below-rim water supply connections, may not arrive on job in code approved condition, in which case Subcontractor shall provide missing vacuum breakers and/or check valves, or re-locate same to code approved positions

15.3 PIPE AND FITTINGS

Unless otherwise noted hot and cold-water pipe shall be copper tubing with cast bronze or wrought copper solder capillary fittings. Connection to valves and fittings shall be by means of copper to iron adapters male or female as required. Cold water piping above 65mm shall be galvanised mild steel.

Exposed piping at plumbing fixtures shall be CP copper pipe with CP threaded cast brass fittings.

Make connections to equipment with flanges or unions and with threaded adaptors used for swing connections. Terminate noted plugged or capped connections in threaded plug or threaded nipple and cap as required, unless otherwise noted

Provide insulating bushings, couplings, unions, or flanges where brass or copper piping connects to galvanised piping at location of equipment connection.

When copper pipe is built into walls, floors, etc. and when laid underground, the piping shall be wrapped for its entire built-in length with Denso tape or equal approved protective covering.

The use of brown paper or any building paper is forbidden.

15.4 INSULATION

The Subcontractor shall provide insulation as specified herein on all hot water pipes and hot water heaters.

The Contractor shall provide a suitable storage area for all insulation materials prior to fitment. He will be liable for replacement of same due to damage as determined by the Engineer, at his own expense

Where pipes are installed in service ducts, ceiling voids and where specified shall be insulated with: "Thermaflex" pre-formed pipe insulation sections. This insulation shall be used with pipe systems where the maximum temperature is 80oC, for temperature higher than 80oC pre-formed fibreglass sections shall be used with galvanised sheet metal muffs.

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

15.4.1 Thermaflex Thickness Table

Pipe Size (Steel)	Pipe Size (Copper)	Thermaflex Thickness
50mm Ø	54mm Ø	25mm Ø
40mm Ø	42mm Ø	25mm Ø
32mm Ø	35mm Ø	25mm Ø
25mm Ø	28mm Ø	20mm Ø
20mm Ø	22mm Ø	20mm Ø
15mm Ø	15mm Ø	20mm Ø

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

15.4.2 Fibreglass Section Thickness Table

Pipe Size Steel)	Pipe Size(Copper)	Thermaflex Thickness
100mm Ø	108mm Ø	65mm Ø
80mm Ø	76mm Ø	55mm Ø
65mm Ø	67mm Ø	55mm Ø
50mm Ø	54mm Ø	55mm Ø
40mm Ø	42mm Ø	55mm Ø
32mm Ø	35mm Ø	40mm Ø
25mm Ø	28mm Ø	40mm Ø
20mm Ø	22mm Ø	30mm Ø
15mm Ø	15mm Ø	30mm Ø

A protective coating equivalent to "Foster Scalfos Coating 30-36" or "Decadex Fire Check" shall be brush applied over the canvas. Coatings shall be applied in accordance with manufacturer's recommendations.

Exposed piping shall in addition be provided with 0,56mm thick galvanised sheet metal cladding over the insulation material. Bends shall be clad with Lobster Back

bends also of 0,5mm thick galvanised sheet metal. Cladding shall be secured by stainless steel bands or non-ferrous pop rivets every 50mm. Cladding shall be painted as previously specified for pipes.

15.5 AUTOMATIC AIR RELIEF VALVES

Provide automatic air relief valves, Sarco or equal, at all high points in hot water piping circuits and where indicated. Air relief valve shall be 15mm. suitable for a working pressure of 16 bar, with non-shock water. Drain piping shall be taken to discharge at a deep seal trap or point as indicated. A stopvalve is to be fitted on the upstream side of all air relief valves.

15.6 TRACE HEATER TAPE

Where indicated hot water piping shall be traced with electrical trace tape. "RAYCHEM HWAT" or equal and approved, which shall automatically maintain a constant temperature of 50°C. The tape shall be fixed to the pipe at least every 300mm with approved type adhesive tape capable of withstanding the rated temperature without damage.

The tape shall be installed in accordance with the manufacturer's instructions and shall be inspected and approved by the Engineer before insulation of the pipework.

The tape shall be rated for 220V and shall be limited in length to ensure a maximum of 15A supply. When this rating is exceeded, the system shall be divided in separate supplies to limit the current.

The Plumbing Contractor shall provide all trace heating tape, end caps, junction splices, junction boxes, and all necessary fittings for the trace heating system as recommended by the supplier and specified by the Engineer.

The complete system, up to and including the connection to the electrical supply point shall be installed, tested, and commissioned by the Contractor.

Install and test the system in stages if so ordered by the Engineer to facilitate work of others. Repair defects disclosed by tests, or if required by the Engineer, replace defective work.

15.7 HOT WATER CIRCULATORS

Provide and install where specified hot water circulating pumps, in-line type, with close-grained cast-iron casing, and bronze, balanced impellers. Pumps shall be of the capacity and head as indicated, and have spring loaded mechanical seals, with rubber ring rotating against stationary carbon seat.

15.8 IMMERSION THERMOSTATS FOR STARTING PUMPS

Provide for the automatic control of hot water circulators, immersion type thermostats in the return water line. Thermostat shall operate mercury switch, which shall start and stop the pump.

15.9 PRESSURE GAUGES

Provide a pressure gauge on each water service at meter location, on discharge headers, on house and hydropneumatic tank pumps, on inlet and outlet of each master pressure reducing valve assembly, and where noted.

Pressure gauges shall be 80mm diameter with black enamel cast iron case, brass ring with heavy glass, phosphor bronze single spring Bourdon tube, phosphor bronze bushed rotary precision movement and suitable dial range with at least 1% accuracy with brass tee handle cock. Pressure gauges shall be calibrated in bars or mb.

15.10 THERMOMETERS

Provide dial type thermometers in oversized tees and nipples on HW supply and return lines, and where noted.

Thermometers shall be 80mm diameter with CP brass case, threaded ring with heavy glass, vapour pressure or liquid actuated bronze single spring Bourdon connection with copper bulb.

15.11 TESTS

Test piping and prove tight as specified and/or required by Authorities having jurisdiction; in presence of Engineer and said Authorities, who shall be given 48 hours notice in advance before tests are made. Make preliminary tests and prove satisfactory before requesting witnessing of final tests. Make tests in stages if so ordered by the Engineer to facilitate work of others. Repair defects disclosed by tests or if required by Engineer, replace defective work.

Subcontractor shall be required to attend with the Engineer and give all assistance required and provide such tools, materials, implements and instruments as are necessary for tests. The Engineer reserves the right to call for such additional tests, such as dynamic tests, as he may consider necessary

Subcontractor shall be responsible for work of other Trades disturbed or damaged by tests or repair and replacement of work and shall cause work so disturbed or damaged to be restored to its original condition at own expense.

The pipe installation shall be hydraulically pressure tested by means of a suitable manually operated or mechanically driven pressure pump.

A pressure of at least 1.5 times the working pressure of the class rating of pipes, or fittings shall be applied for a period of time specified in the specifications or as recommended by the manufacturers.

Tests should not be performed against closed valves.

Leakage which occurs shall be measured and calculated and checked against the allowable losses.

If the completed section of pipe complies with all specifications and passes the tests and inspection, it could be approved and the contractor may be instructed to backfill the open sections of trench at the joints and connections, where applicable.

The contractor shall then proceed to build all the valve chambers, inspection chambers etc.

15.12 STERILISING OF WATER PIPES

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

At least 14 days prior to the commencement of sterilising the contractor shall submit the full details of the proposed method of sterilising the pipeline to the engineer for his approval.

The contractor shall provide all necessary materials, tools, equipment and labour necessary to sterilise the pipeline. After sterilising the pipeline the contractor shall, at no extra cost, empty the pipeline and dispose of the water in a manner approved by the engineer.

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

a) Chlorine of lime to SABS 295 yielding 33% free chlorine by mass.

b) Calcium hypochlorite to SABS 295 yielding 70% free chlorine by mass.

c) Chlorine gas applied by chlorinator.

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

After pressure tests have been made, the unit to be disinfected shall be thoroughly flushed with water until all entrained dirt and mud have been removed before introducing the chlorinating material which shall provide a dosage of not less than 50 parts per million and shall be introduced into the water lines in an approved manner.

The treated water shall be retained in the pipe long enough to destroy all non-spore-forming bacteria. Except where a shorter period is approved, the retention time shall be at least 24 hours and shall produce not less than 10 parts per million of chlorine throughout the line at the end of the retention period.

All valves on the lines being disinfected shall be opened and closed several times during the contract period. The line shall then be flushed with clean water until the residual chlorine is reduced to less than 1.0 parts per million. From several points the contractor shall take samples of water in properly sterilised containers for bacterial examination. The disinfection shall be repeated until tests indicate the absence of pollution for at least 2days. The unit will not be accepted until satisfactory bacteriological results have been obtained. The contractor shall arrange for a field laboratory, approved by the Consultant, to conduct all bacterial examinations required.

It is required to take a control sample of the incoming water at the same time as the other samples are taken.

16. FIRE SYSTEMS

16.1 GENERAL

Materials and equipment shall be of a type and size approved by the local Fire Department, the Owner's Insurance Underwriters and the engineer.

Systems as installed shall meet the requirements of the local Authorities having jurisdiction and the Owners Insurance Underwriters and receive approval of same before final payment.

16.2 PIPE AND FITTINGS

Pipework, above ground, shall be galvanised steel pipe to SABS 62 heavy. Pipework, below ground, shall be uPVC Class 16.
Fittings shall be screwed or flanged as specified and shall be suitable for a WWP with non-shock water of 25 bar.

16.3 VALVES

Valves shall be suitable for the pressure duty required, and shall be of a suitable pressure class, depending on the mounting location.

Valves shall be sealed or locked in the correct position by means of an approved lock and chain.

Hosereel valves shall be 20mm CP bronze shut off valves, globe type with threaded ends. Valves shall be "Hattersley" or equal suitable for a WWP of 16 bars with non shock water and shall be clearly marked with an arrow and the words "oop" - "uper" in red. Valves shall be suitable for the installation of an approved sealing device.

16.4 HOSE REELS

Hose reels shall be red enamelled type of all steel construction, and provided with wall mounting bases, spindles and glands and shall be securely fixed to the wall with suitable "rawl" bolts and plate washers.

Hose reels shall be fitted complete with supply pipe, nozzle cock and hose guide in conformity with SABS 543 and bear the SABS mark. Fire hose shall be reinforced rubber 20mm nominal bore, having 32mm outside diameter and shall be in 30m lengths, unless otherwise specified.

16.5 28.5 FIRE HYDRANT

Fire hydrant valves shall be 65mm angle type, with brass on gunmetal body and polished brass trim. The hydrant shall be provided with quick coupling female outlets with brass cap and brass chain.

Handwheel shall be cast iron, painted red and shall have the words "open" - "oop" together

with direction arrows embossed on the face. Hydrant shall be suitable for WWP of 18.5 bar with run slack water and shall be tested to 20 bar

Hydrants shall be in accordance with SABS 1128, Parts I and II and shall have the instantaneous pattern connection, unless otherwise specified.

16.6 FIRE EXTINGUISHERS

Portable fire extinguishers shall be of the size and type specified and installed in the positions as indicated on the drawings.

Fire extinguishers shall be provided with brackets and fixed to and including 230mm x 760mm x 22mm chamfered oiled hardwood backboard bolted with and including four 9mm bolts with plate washers cut and pinned to brick or concrete wall.

Fire extinguishers shall be in accordance with and shall bear the SABS mark and shall be approved by the Authorities having jurisdiction over the site.

Soda acid water extinguishers shall be in accordance with SABS 889 and shall be of the gas cartridge type.
Dry powder type extinguishers shall be in accordance with SABS 810 and shall be of the gas cartridge type.

16.7 TESTING

The entire fire reticulation system shall be pressure tested to a maximum pressure of 20 bar measured at the lowest point in the system and a minimum of 12 bar at the highest point. Where the head of water causes the maximum pressure to be exceeded, the system is to be tested in sections.

17. . GAS INSTALLATION

17.1 GENERAL

Run piping free of traps with drain pocket consisting of nipple and cap at low points.

Pipework to be installed in accordance with the requirements of the supply authorities and to the approval of the Engineer. Installation shall be carried out only by registered gas piping fitters. Copies of their certificate of competence shall be submitted to the Engineer before installation work commences.

17.2 PIPE AND FITTINGS

Pipe - Bare Steel. Fittings welded or flanged
Provide copper union between nipples on equipment side of individual gas cocks.

17.3 CONTROL VALVES

Provide stop cock at connection to each piece of gas burning equipment.

Valves and stop cocks, except service cock : threaded or flanged iron body lubricated plug valve, 10 bars WOG class.

Attach wrench to each valve

17.4 TEST

Test gas piping with air at 1 bar which pressure shall be maintained for at least 30 minutes without drop.

While the pipework is under pressure, each joint on the system is to be checked using a suds mixture in ensure all joints are perfectly sealed.

18. SANITARY FITTINGS

Install and connect up kitchen and toilet fittings as specified in the schedules, or provided under work of other divisions and/or owner, and provide required trim and "P" traps for same as specified.

Provide water supply fixtures with stop valves. Exposed pipe fittings, traps, escutcheons, valves, valve handles and accessories, both above and below fixtures, shall be CP brass (covering tubes not permitted).

Water supply and drainage nipples shall be brought to the wall and covered by CP escutcheons.

Supply fixtures shall be renewable seat composition washer, all metal indexed handles and integral on separate screwdriven or lockshield stops. No manufacturer's name allowed on exposed portion of fixtures

During course of construction, protect exposed fittings from damage and cover fixtures with wooden protection housings. Uncover and thoroughly clean fixtures and fittings when directed.

Fixture connections shall be at least as follows:

Fixture	Drain	Vent	CW	HW
Water Closets Flush Valve	100mm	50mm	32mm	-
Urinals	50mm	40mm	25mm	-
Showers	40mm	40mm	15mm	15mm
Wash Hand Basins	32mm	32mm	15mm	15mm
Bath	40mm	40mm	20mm	20mm
Sink	40mm	40mm	15mm	15mm

Sanitary fittings shall be installed as follows:

18.1 PRECAST CONCRETE WASH TROUGHS

Precast concrete wash troughs shall be bedded on top of pedestals which shall be bedded on floors in 1:3 cement mortar.

18.2 STAINLESS STEEL WASH TROUGHS AND WASH HAND BASINS

Stainless steel wash troughs and wash hand basins shall be fixed to walls on a pair of 20mm diameter galvanised mild steel pipe brackets with flanged ends cut and pinned 150mm deep into walls in 1:3 cement mortar.

18.3 ACRYLIC RESINOUS WASH HAND BASINS

Acrylic resinous wash hand basins shall be fixed to walls on a pair of standard painted cast iron brackets screwed to underside of basin and bolted to wall with 6mm diameter expanding bolts.

18.4 CERAMIC WASH HAND BASINS

Ceramic wash hand basins shall be fixed to walls on a pair of standard painted steel or cast-iron brackets bolted to wall with 6mm diameter expanding bolts.

18.5 ACRYLIC RESINOUS BATHS

Acrylic resinous baths shall be bedded in 1:3 cement mortar on three cross rows of bricks or bedded solid on a layer of dry river sand and fixed to wall with galvanised steel brackets under edges (in the middle of the sides against walls) bolted to wall with 6mm diameter expanding bolts and sealed along top against wall finishes with patent mildew resistant silicone rubber.

18.6 WASHDOWN CLOSET PANS AND CISTERNS

Washdown closet pans shall be bedded on floors in 1:3 cement mortar. Cisterns shall be fixed to walls with 6mm diameter expanding bolts

18.7 CERAMIC URINALS

Ceramic stall and slab urinals shall be bedded on floors and against wall in 1:3 cement mortar. Slabs, channels, treads etc. shall be jointed in 1:3 cement mortar and pointed in white cement.

Ceramic bowl urinals shall be fixed to walls on standard steel brackets bolted to wall with 6mm diameter expanding bolts. Cisterns shall be fixed to walls on standard brackets bolted to wall with 6mm diameter expanding bolts.

18.8 STAINLESS STEEL URINALS

Stainless steel urinals shall be bedded on floors in 1:3 cement mortar and with backs and sides against walls filled in with fine unreinforced concrete. Cisterns shall be fixed as cisterns for ceramic urinals.

19. WATER STORAGE GEYSERS

19.1 DOMESTIC GEYSERS

The geysers shall be installed as indicated and specified on the drawings and this specification.

All work is to be executed in a first class workmanlike manner and all equipment supplied shall be of new high quality material, design and manufacture, suitable for providing an efficient, reliable and trouble free service

It will be the contractor's responsibility to select such equipment and to position it into a building space as provided. Where no specified make or quality of material is directed, a standard article as approved by the engineer shall be supplied.

The contractor shall ensure, before ordering of equipment, that the plant room dimensions and access to the plant room are to his satisfaction. Special care shall be taken not to damage equipment during positioning and installation. All faulty and

damaged equipment shall be replaced by new before handover (or made good, only if approved by the engineer).

All materials to be used shall be compatible with the total installation.

The water temperature of the geysers shall not be higher than 80oC and shall be set at a temperature as indicated in the detail specification

The piping to be used shall be as specified in the detail and standard specification for domestic hot and cold-water installations.

The contractor shall ensure that the necessary equipment is installed to protect the geyser from over pressure and over temperature. The necessary test and approval certificates for the geysers shall be supplied to the engineer

These geysers shall comply with SABS 151. The units are to be manufactured out of a steel cylinder welded by means of the MIG CO2 process, the interior of the cylinder shall be porcelain coated by means of the vacuum process and the exterior shall be spray coated
and fired to 870oC. the unit is to be insulated with a high-density insulation material. The
insulation is to be covered with a 0.8mm fully bonderized steel with a baked enamel finish. The unit shall be equipped with wall brackets for mounting purposes

Each geyser shall be equipped with an immersion element as specified, incalloy elements are to be used for hard water.

The elements are to be controlled by means of a fail safe thermostat which shall be adjustable between 40oC and 75oC. The geyser is also to be equipped with the following:

- Temperature and pressure relief set at 600 kPa and 97°C
- 20mm dia in and outlet BSP thermal sockets
- Magnesium sacrificial anode

The unit shall be designed for a working pressure of 400 kPa. Each geyser is to be furnished with a 5-year warranty.

Geysers installed in ceiling voids and in areas where leaks can cause damage, shall be installed with a drip tray. The safety and expansion relief valves and drip tray shall be piped to the outside or nearest drain point.

19.2 UNDER BASIN AND OVER BASIN WATER STORAGE HEATERS

These water storage heaters shall comply with all the relevant IEC standards and Government Notice 466 (Electrical Safety Standard for Appliances). This specification covers geysers up to 30 litre in storage.

The unit is to be rated for a maximum operating pressure of 700 kPa.

The unit is to be manufactured out of a lap welded steel cylinder by means of the MIG CO2 process. The unit is to be internally coated with two coats of thermofused porcelain with a magnesium sacrificial anode. Insulation material to be high density polyurethane

50mm. The outer casing shall be manufactured out of injection moulded ABS plastic finished in appliance white.

The unit shall be equipped with the following

700 kPa safety valve

- Correctly sized expansion valve
- Direct immersion element
- Control thermostat adjustable between 40°C and 75°C with fusible l ink for over temperature cut
- 15mm dis BSP threaded female sockets for water in and outlets.

The units shall be furnished with a 5-year warranty.

19.3 INDUSTRIAL HOT WATER GENERATORS

Hot water generators shall be semi pressure vessels of the vertical or horizontal configuration as indicated. The size and capacity of the generator shall be as indicated on the drawings.

The cylinders shall be manufactured in accordance with S.A.B.S. or equal code. Mild steel aluminium flame sprayed and epoxy coated after the surface has been shotblasted.

The vessels shall be of welded construction with dished ends to B.S. 5500 and shall be provided with welded flanged connections as indicated for heater batteries and all piping connections.

Screwed sockets may be welded into the vessel for instrument connections. Where these are provided, the insulation shall be applied around the connections and finished neatly with Sheetmetal surround without sharp edges or protrusions.

The vessel shall be provided with a minimum 400 x 450mm oval manhole for inspection and cleaning.

The vessel shall be pressure tested to 1.1/2 times the working pressure but not less than 700 kPa.

The generators shall be provided with immersion heaters of the capacities indicated. Elements shall conform with S.A.B.S. or equal standard.

The tanks shall be insulated after installation with 50mm thick mineral wool with a density of 88kg/m3 or equivalent glass fibre insulation and covered with 0.8mm thick galvanised Sheetmetal cladding, pop rivetted in position. Cladding shall be neatly installed without sharp edges or protrusions. Escutcheons shall be provided around all tapings.

The generator shall be provided with tapping for bulb connections for thermometers, thermostats, pressure gauges and any other instrumentation necessary or indicated.

The generator shall be provided complete with a safety valve set to release at 150 kPa above design working water pressure and shall be sized sufficient for the rate of heat

rise provided by the element and the production of steam in the event of a failure. The discharge from the safety valve shall be taken without further connections to discharge in a place of safety but shall also be visible.

The generator shall be provided complete with thermostat to control the temperature of the water and to switch the element on in stepped sequence. The number of steps shall be as indicated. A safety thermostat shall be provided to trip all elements in the event of the water temperature rising too high. The safety thermostat shall be of the manual reset type and shall be set to operate at 70° C. All thermostats shall be set, sealed, and of a tamper-proof type.

Provide on top of each generator a dial type thermometer and pressure gauge.

Provide a control board to operate the boilers. The board shall be of the "Packaged" type incorporating prewired controls, circuit breakers, 3 phase magnetic contactors and all items necessary for the operation of the boiler. The element shall be wired in step configuration. Refer to the electrical section of this section for further details

The installation of the boilers, control panel and wiring shall form part of this subcontract. Power shall be provided at the control panel however, final connection to the panel shall form part of this installation.

Shop drawings of vessel and control panel shall be submitted to the Engineer for approval prior to manufacture.

20. CONTROL PANEL AND ELECTRICAL WIRING INSTALLATION

20.1 GENERAL

The Subcontractor shall supply and install a complete 3 phase - 4 wire 400 Volt wall mounted control panel assembly to SABS 1180 which shall be complete with main isolator, contractor, circuit breakers, busbars, step controllers, temperature controllers, ammeters, current transformers, fuses, indicating lights, interlocking remote control wiring and interconnecting wiring as necessary. Spare fuses and indication lamps shall be provided as necessary.

The installation shall be installed in accordance with the latest edition of SABS 0142-1987, Code of Practice for the Wiring of Premises, as amended, as well as Local Municipal By-Laws and Regulations and Regulations of the Local Supply Authority.

The Subcontractor shall commission and test the entire installation in accordance with the requirements of the Local Authority, Supply Authority and the Engineer at his own expense. All test equipment shall be provided by the Subcontractor at his expense. Testing shall be carried out in the presence of the Engineer who shall be notified timeously of the dates of such tests in writing to allow them to be witnessed.

"As built" drawings of the switchboard shall be installed inside the panel and THREE sets shall be submitted to the Engineer on completion of the installation. The following information shall be indicated: -

a) A complete wiring diagram of the equipment indicating terminal numbers, numbers and colours of conductors connected to terminal strips

and the numbers and colours of the conductors utilised for internal panel wiring.

b) All labelling information on a separate sheet.

c) The make, catalogue number and capacity of all equipment, including electrical equipment

20.2 SURFACE MOUNTED SWITCHBOARD

Surface mounted switchboards shall be equipped with a 1.6mm² thick galvanised steel reinforced tray with gusseted corners. Securing lugs shall be provided for fixing the tray to walls or any other structure. A solid brass or cadmium plates steel earth connection stud and nut shall be provided.

All joints shall be welded. The tray shall be square and neatly finished without protrusions. The front tray sides shall be rounded with an edge of at least 20mm to accommodate flush doors. Removable panels shall be secured by means of "Camloc" or "Dzus" fasteners.

The switchboard shall be of ample size to accommodate all the necessary switchgear, control equipment etc and shall be provided for heaters where specified to facilitate "load shedding"

Pilot lights shall be provided on the front panel to indicate power on, heater step on (one per step) and boiler high temperature trip

All busbars, cables, wiring etc. shall be colour coded in accordance with the SABS requirements.

External wiring for low voltage, control interlocking, alarm, measuring and D.C. circuits shall terminate on numbered terminal strips of the "KLIPPON" or "ENTRELEC" or equivalent manufacture. The correct terminal size, as recommended by the manufacturer for each conductor to be connected shall be used throughout. The terminal numbers shall appear on the wiring diagrams of the switchboard. Terminals for power wiring shall be separate from other terminals. Terminals for internal wiring shall not be interposed with terminals for external circuits.

Labelling shall be Black on White ivorine except warning labels which shall be Red on White ivorine.

All metal components of the framework, panels and chassis shall be finished with a high quality
baked enamel finish. Prior to painting, all metal parts shall be thoroughly cleaned of rust, millscale, grease and foreign matter. Immediately after cleaning all surfaces shall be covered by an electrolytically applied rust inhibiting, tough, unbroken metal phosphate fibre and then thoroughly dried.

Within forty-eight (48) hours after phosphating, a passivating layer consisting of a high-quality zinc chromate primer shall be applied, followed by two (2) coats of high-quality baked enamel to SABS 783 type 1. The minimum paint thickness after baking shall be 0,06mm and shall have a shock resistance of 25kg-cm on 0,9mm soft steel plate and scratch resistance of 2000 grams.

The electrical installation between the switchboard and the equipment shall comply with SABS 0142. Armoured cabling shall comply with SABS 150 and shall be neatly run on galvanised cable tray installed on walls and overhead providing a maximum headroom at all times.

Local isolation shall be provided at all items of equipment e.g. boilers, pumps etc. in accordance with the code of practice.

Earthing of non-conducting metal parts and equipment shall comply with the code of practice.

PART C6.4.4: BILLS OF QUANTITIES

1. GENERAL.

The tenderer must complete the Bills of Quantities and detail unit rates and total amount for each item. All rates and prices exclude VAT.

The "Total" shall constitute the tender for adjudication

NOTE

Tenderers are advised to check their item extensions and total additions as arithmetical errors occurring in the priced Bills of Quantities cannot be considered as having an effect on the tender amount.

No alteration, erasure or addition is to be made in the text of the Bills of Quantities. Should any alteration, erasure or addition be made it will not be recognized but the original wording of the Bills of Quantities will be adhered to.

The Employer will check the completed Bills of Quantities and reserves the right to adjust any individual price and to rectify and discrepancy whilst the total tender price as quoted remains unaltered.

The quantities given in the Bills for video cables, power cables, cable markers, and fibre cables cannot be regarded as exact and are subject to measurement on site after completion of the installation and adjustments will be made according to the unit rates given in the Bills.

The quantities given in the Bill of Quantities are estimates only, and subject to re-measuring during the execution of the work. The Contractor shall obtain the Engineer's detailed instructions for all work before ordering any materials or executing work or making arrangements for it.

The Works as finally completed in accordance with the Contract shall be measured and paid for as specified in the Bill of Quantities and in accordance with the General and Special Conditions of Contract, the Specifications and Project Specifications and the Drawings. Unless otherwise stated, items are measured net in accordance with the Drawings, and no allowance has been made for waste.

The validity of the contract will in no way be affected by differences between the quantities in the Bill of Quantities and the quantities finally certified for payment.

Item	Description	Unit	Qty	Rate	Total
1.0	**WATER RETICULATION SYSTEM INSTALLATION**				
1.1	The Contractor shall supply, install, and commission according to facility Building tender drawing. The rates shall include material, labor, all mounting and accessories, including connection to the point of supply. Guarantee and maintenance of efficient and safe working of the installation for 12 months after hand over of the completed building to the client.				
1.2	**The Bill below is excluding of all fittings**				
1.3	All piping to be water reticulation copper piping type with traced joints. Class 3 copper pipe to be used outside and Class 2 to be for internal use.				
1.4	**BOOSTER DOMESTIC WATER PUMPING SYSTEM**				
1.4.1	Pressure booster system comprising of 2 vertical multistage centrifugal pumps type CR 10-6 completely independent to fire pumping system (Including its own water makeup) Delivered on a common base plate, completely assembled and tested before it leaves the factory and ready for connection of water and electricity. All pumps are CR pumps connected to frequency drives, all Pumps are connected in parallel, and operated in cascade. The booster maintains a constant pressure through continuous adjustment of speed of the pumps and starting and stopping the pumps to meet the required flow. Resulting head of the pump: 40.14 m. Must have Dry-running protection and diaphragm tank, to be Easy to use HMI with 2 displays for set-point and process value: -2 digital outputs, -Auto / manual control of pumps, -Optional bus communication, -Optional Safe Tank filling sequence. Installation: Maximum operating pressure: 5 bar, Manifold inlet: 80mm, Manifold outlet: 80mm, Pressure rating: PN16, System design: E Electrical data: Power (P2) main pump 2.2 kW, Mains frequency: 50 Hz, Rated voltage: 3 x 3 x380-415V, N, PE, 50HZ V, Starting main: direct-on-line. Rated current of system: 4.45 A, Enclosure class (IEC 34-5): IP54	No	1		
Sub Total: Booster Domestic Water Pumping System carried to Summary Page (A)					

Item	Description	Unit	Qty	Rate	Total
1.5	**WATER RETICULATION PIPING WITH COMPLETE INSULATION**				
1.5.1	67 mm ϕ Copper piping	m	75		
1.5.2	54 mm ϕ Copper piping	m	75		
1.5.3	42 mm ϕ Copper piping	m	75		
1.5.4	35 mm ϕ Copper piping	m	85		
1.5.5	28 mm ϕ Copper piping	m	85		
1.5.6	22 mm ϕ Copper piping	m	80		
1.5.7	20 mm ϕ Copper piping	m	80		
1.5.8	15 mm ϕ Copper piping	m	120		
1.6	**EXTRA OVER COPPER PIPING FOR FITTINGS.**				
1.6.1	80 x 67 mm Reducer	No	8		
1.6.2	54 x 42 mm Reducer	No.	10		
1.6.3	42 x 22 mm Reducer	No	10		
1.6.4	35 x 28 mm Reducer	No.	20		
1.6.5	28 x 15 mm Reducer	No.	20		
1.6.6	22 x 15 mm Reducer	No.	30		
1.6.7	80 mm Bend	No.	4		
1.6.8	67 mm Bend	No.	4		
1.6.9	54 mm Bend	No.	20		
1.6.10	28 mm Bend	No.	100		
1.6.11	15 mm Bend	No.	100		
1.6.12	54 mm Tee	No.	40		
1.6.13	28 mm Tee	No.	140		
1.6.14	15 mm Tee	No.	180		
1.6.15	54 x 22 mm Reducing tee	No	15		
1.6.16	54 x 15 mm Reducing tee	No	60		
1.6.17	42 x 22 mm Reducing tee	No.	45		
1.6.18	35 x 15 mm Reducing tee	No.	25		
	Sub Total: Water Reticulation Piping carried to Summary Page (B)				

Item	Description	Unit	Qty	Rate	Total
1.6	**EXTRA OVER COPPER PIPING FOR FITTINGS CONTINUED...**				
1.6.19	28 x 15 mm Reducing tee	No.	60		
1.6.20	22 x 15 mm Reducing tee	No.	60		
1.6.21	18 x 15 mm Reducing tee	No.	30		
1.6.22	67 mm Straight coupler suitable for male or female connection	No.	25		
1.6.23	54 mm Straight coupler suitable for male or female connection	No.	20		
1.6.24	42 mm Straight coupler suitable for male or female connection	No.	44		
1.6.25	35 mm Straight coupler suitable for male or female connection	No.	28		
1.6.26	28 mm Straight coupler suitable for male or female connection	No.	28		
1.6.27	22 mm Straight coupler suitable for male or female connection	No.	25		
1.6.28	20 mm Straight coupler suitable for male or female connection	No.	25		
1.6.29	15 mm Straight coupler suitable for male or female connection	No.	35		
1.7	**VALVES ETC. TO COPPER PIPING**				
1.7.1	67 mm Brass valve (male or female connection)	No.	4		
1.7.2	54 mm Brass valve (male or female connection)	No.	4		
1.7.3	35 mm Brass valve (male or female connection)	No.	6		
1.7.4	22 mm Brass valve (male or female connection)	No	6		
1.7.5	15 mm Brass valve (male or female connection)	No.	45		
1.8	**PVC PIPES**				
1.8.1	50 mm	m	150		
1.8.2	100 mm	m	200		
1.8.3	Connecting component with all accessories	Sum	1		
1.8.4	Other accessories	Sum	1		
Sub Total: Water Reticulation Piping carried to Summary Page (C)					

Item	Description	Unit	Qty	Rate	Total
2.0	**GENERAL ITEMS**				
2.1	Training of personnel	Sum	3		
2.2	O & M manuals with as built drawings	No	4		
2.3	12 Months maintenance & guarantee	Sum	12		
2.4	Programming of the works	Sum	1		
2.5	Workshop drawings & Equipment Submissions	Sum	1		
2.6	Acceptance and sign off by Local Fire Department	Sum	1		
	Sub Total: General Items carried to Summary Page (D)				

SUMMARY: PART C6.4 – PLUMBING AND WET SERVICES	
BOQ SUBTOTAL DESCRIPTION	**AMOUNT**
Sub Total: Booster Domestic Water Pumping System (A)	
Sub Total: Water Reticulation Piping (B)	
Sub Total: Water Reticulation Piping (C)	
Sub Total: General Items (D)	
SUB TOTAL: PART C6.4 – PLUMBING AND WET SERVICES CARRIED TO THE MECHANICAL SECTION SUMMARY (EXCLUDING VAT)	

PART C6.4.5: SCHEDULE OF INFORMATION FOR MATERIAL SUPPLIES

None to record.

PART C6.4.6: DRAWINGS ISSUED FOR TENDER PURPOSES

Item	Drawing Number	Drawing. Title	Revision
1	ME159/WCS046363/6	GROUND FLOOR. DOMESTIC WATER RETICULATION	T
2	ME159/WCS046363/7	BASEMENT FLOOR. DOMESTIC WATER RETICULATION	T

BILL OF QUANTITIES, SPECIFICATION AND DRAWINGS
FOR
PROPOSED NEW MAGISTRATES COURT ON ERF 253, JAN KEMPDORP FOR THE DEPARTMENT OF PUBLIC WORKS & INFRASTRUCTURE FOR MECHANICAL ENGINEERING WORKS

WCS 046363

PART C6:
PART C6.5: NEW PASSENGER LIFT: SUPPLY, INSTALLATION, COMMISSIONING AND 12 MONTHS FREE MAINTENANCE OF NEW PASSENGER LIFT

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PART C6.5.1: GENERAL PARTICULARS APPLICABLE TO TIIIS CONTRACT

1 INTENT OF SPECIFICATION

The lift specification is intended to cover the complete installation of the lift plant. The minimum equipment requirements are outlined, but do not cover all the details of design and construction. Such details are recognised as being the exclusive responsibility of the lift contractor. It is hereby acknowledged that neither the Principal Agent nor the Consulting Engineer invented or developed any part of the lift system, but have only made selections of capacities, speed, control systems, materials and finishes, as well as specified performance and installation criteria as may be applicable.

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.

2 STANDARDS AND CODES

All work shall be in accordance with the requirements of the SABS1545-1, SABS1545-2: SABS1545-5: SABS1545-10: SABS1543. "Specifications for Lifts, Escalators and Passenger Conveyors" and shall comply with the Occupational Health and Safety Act 85 of 1993 and current regulations of all other codes applicable to this work.

Equipment and materials shall be new and manufactured in accordance with EN-81-28. EN81-1:98+A3:2009 standards and approved by the local authorities having the appropriate jurisdiction.

All equipment shall be provided by the same manufacturer.

3 COMPLIANCE WITH REGULATIONS

The installation shall be erected and tested in accordance with the following Acts and regulations:

a) The latest issue of SABS 10142: "Code of Practice for the Wiring of Premises",

b) The Occupational Health and Safety Act, 1993 (Act 85 of 1993) as amended,

c) 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,

d) The Fire Brigade services Act 1993 Act 99 of 1987 as amended,

e) The National Building Regulations and Building Standards Act 1977 (Act 103 of 1977) as amended,

f) The Post Office Act 1958 (Act 44 of 1958) as amended,

g) The Electricity Act 1984 (Act 41 of 1984) as amended and

h) The Regulations of the local Gas Board where applicable

4 SCOPE OF WORK

4.1 WORK INCLUDED

Design and provide all labour, materials, equipment and services and perform all operations required for lift work as indicated on drawings or specified herein.

Supply and installation of all fixing materials for installation of equipment in the lift shaft.

Supply and installation of the necessary wiring in conduit from the controlling circuit breaker to the power section of the lift controller.

Supply and install conduit and wiring for the car lighting and socket outlets and the termination and connection thereof in the distribution board.

The lift shaft shall be provided with permanently installed electric lighting, which shall be switched from both the pit and the motor room. The highest and lowest luminaires shall be mounted not more than 500mm from the top of the shaft and from the bottom of the pit respectively, with intermediate luminaires mounted at intervals not exceeding 7000mm. The minimum illumination at 1000mm above the car roof and the lift pit shall be 50lux.

The installation of all electrical equipment shall comply with the requirements of the SABS 10142 and a Certificate of Compliance shall be issued therefore by a Master Electrician

The works shall include the striping and removal of existing lift to make way for the new lift.

Note: The lift shat shall be as existing, the supplier shall take necessary measurements on site as part of the making sure that the offer presented suits the existing shaft.

The actual lifts are room less type and must be of less energy consumption type

4.2 WORK EXECUTED BY OTHER TRADES

4.2.1 Structural

Lift shafts, pits and motor rooms complete with all access doors and openings as per drawings.

Concrete slabs with up-stands constructed for the lift machine foundations at the top of each lift shaft.

Waterproofing of lift pit after setting of all pit supporting steels and rail inserts. Pit drains or auto draining pumps as required.

4.2.2 Electrical

Provision of a 3-phase, 4-wire, 50Hz 400/231V permanent power supply to a surface mounted distribution board in each machine room in the position shown on drawings. The distribution board will also be equipped with a separate circuit breaker for the shaft and car lighting as well as a separate circuit breaker with earth leakage protection for the socket outlet in the pit and on top of the lift car.

Machine room shall be equipped with sufficient lighting, ventilation and socket outlets as required by the relevant standards and regulations.

If applicable, the standby power supply will be sized to run a predetermined number of lifts simultaneously

The normal/standby power indicating circuitry shall include, a delayed normally closed potential free contact at 220 Volts/5 Ampere of the emergency power change over switch gear shall be wired to the lift machine room/s and shall be terminated in a suitable junction box. All wire ways or 25mm minimum conduit required to inter-link the lift motor room for the sequencing of lifts in multi-group installations shall be included under this section.

If required, a suitable pit sump pump will be designed, supplied and installed.

5 CO-ORDINATING

Due to the nature of the installation, a fixed sequence of operation is required to properly install the complete lift system. The work shall be closely scheduled in order not to delay the entire project.

The Lift Contractor shall familiarise himself with the requirements of the other trades and shall examine the plans and specifications covering each of these sections.

The lift space requirements shall be carefully checked with other trades to ensure that the equipment can be installed in the proper sequence in the space allotted

6 SUBMITTALS

6.1 LAYOUT AND SHOP DRAWINGS

Layout drawings are required for all lift work, including car enclosure and landing entrance co-ordinating drawings. Drawings shall show top clearance above cross-heads and counterweight frames, machine room layouts with power requirements and heat release data, location of all equipment on tops of cars, overhead beams and elevations, and reactions which will be transmitted to the building structure during normal operation of lifts.

Shop drawings are required for car enclosure, landing entrances and signal fixture work showing construction, finish and fastening details. Furthermore, show drawings shall clearly show the motor room construction detail, shaft construction detail including all the required internal supporting beams, pit dividing walls for multi-lift shafts and pit sump pump drains. Composite shop drawings shall be submitted for areas, which require close co-ordination with the work of the different trades.

All special equipment and fixture faceplates shall be submitted for approval. Drawings and samples or brochures shall be submitted for each type of fixture and shall be co-ordinated with the architectural drawings. Final design and material proposed for fixture faceplates and special equipment shall be approved by the Representative/Agent.

6.2 SAMPLES

All exposed materials and finishes shall be submitted to Representative/Agent for approval in sample form.
The Lift Contractor shall furnish such samples as may be called for and Representative/Agent may reject all materials or workmanship not corresponding with the samples. All approved samples shall be held in safe-keeping until such time as the work to which they apply has been completed

7 TESTS CERTIFICATES AND INSPECTIONS

The Lift Contractor shall carry out all the tests and checks required in terms of the document SABS 1545-10 Annex A and/or B and issue the necessary Certificate of Compliance prior to final completion

Upon completion of the installation of all equipment and once being in full operation the Lift Contractor shall completely test the lift equipment to demonstrate that the equipment is provided in compliance with the specification. The total costs for these tests shall be included in the tendered amount.

The Lift Contractor shall make arrangements for such tests and shall give at least 72 hours written notice to the Representative/Agent, before commencing the test.

In the event of the plant, equipment or installation not passing the test, the Representative/Agent shall be at liberty to deduct from the Contract amount all reasonable expenses incurred by the Employer and/or the Representative/Agent attending the test.

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

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

After completing the installation or system, all equipment shall be tested, adjusted and readjusted until they operate to the satisfaction and approval of the Representative/ Agent.

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

8 APPLICATION TO CLIENT OR END USER OF LABOUR

The Lift Contractor shall submit all the necessary drawings and information to the Regional Director of the Client or End User of Labour and shall submit the necessary application for the erection and use of the lifts.

9 OPERATING AND MAINTENANCE MANUALS

The Contractor shall be responsible for the compilation of a complete set of Operating and Maintenance manuals.

This shall be done in accordance with the Additional Specification – Operating and Maintenance manuals.

All information shall be recorded and reproduced in electronic format as well as supplying the Representative/Agent with three sets of hard copies.

Approval of the final Operating and Maintenance Manuals shall be a prerequisite for issuing of a Certificate of Practical Completion of the installation.

10 GUARANTEE

After first delivery of the installation, there will follow a 12-month free maintenance period. During this period the lift contractor shall maintain the lift installation as per the requirements of the Occupational Health and Safety Act. This maintenance shall include systematic examinations, adjustments and lubrication of all lift equipment. Electrical and mechanical parts shall be repaired or replaced whenever it is required to maintain optimum performance without additional cost to the Client or End User, unless the condition was caused by misuse or vandalism of the lift equipment or due to acts of God.

The work under this section shall be performed by competent, qualified personnel under the supervision and in the direct employment of the Lift Contractor and shall not be transferred to any non-affiliated agent. Contract maintenance and repair work shall be done during normal working hours and shall further provide emergency call-back service twenty-four (24) hours a day, seven (7) days a week.

During the guarantee period the Client or End User will invite tenders for the comprehensive maintenance of the lift installation, which will commence after the final delivery has taken place, i.e., after the twelfth month guarantee period is over and all defects are corrected.

11 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 Representative/Agent.

(b) All work shall be executed in a first-class manner by qualified tradesman.

(c) The Contractor shall be fully responsible for his work and shall replace any of the work which may be damaged, lost or stolen. The Contractor shall protect the building and its contents against damage by him, his employees or sub-contractors and shall make good any damage thereto.

(d) The Contractor shall indemnify the Employer of all liability for damages arising from injuries or disabilities to persons or damage to property occasioned by any act or omission of the Contractor or any of his sub-contractors, including any and all expenses, legal or otherwise, which may be incurred by the Employer or Representative/Agent in the defence of any claim, action or suit

(e) 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.

(f) 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.

(g) The Contractor shall inspect and verify that the existing power feeder system is compatible with the equipment offered and any changes or upgrading of the electrical supply shall be brought to the attention of the Representative/Agent.

(h) Material and equipment damaged in transit shall be replaced with undamaged material.

(i) 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.

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

(k) The Contractor shall make sure that all safety regulations and measures are applied and enforced during the installation and guarantee periods to ensure the safety of the public and the User Client.

(l) The Contractor is to include for all scaffolding required to complete the work required.

PART C6.5.2: EQUIPMENT REQUIREMENT

1 HOISTING MACHINE

1.1 TRACTION DRIVE

(a) The brake shall be spring applied and electrically released by direct current. There shall be two shoes actuated by compression springs. The brake shall have sufficient power to hold the car at any landing with the normal amount of counter balancing and with at least 150% of rated load. The brake shall operate in the event of a power failure or any other safety device designed to stop the lift.

(b) An effective sound reducing material shall be installed between the bed-plate of an overhead or basement driving machine and the beams, the structural concrete slab, shaft structure or the up-stands.

(c) The driving machine and motor shall have sufficient capacity to operate the lift continuously at 100% of rated speed in both directions without overheating or heating during levelling.

(d) The lift machinery shall operate silently and without vibration. The lifts shall constantly operate and shall be maintained at noise levels not exceeding 56 DB (A). The noise level shall be considered acceptable if it does not exceed 56 DB (A) measured on the landing and in the car enclosure.

(e) Provision shall be made for a safe method of moving the car by hand in the event of a power failure and all the necessary equipment required to carry out this task shall be mounted neatly in the motor room and shall remain on site at all times.

(f) The Contractor shall supply and install suitable structural steel beams with bearing plates for the mounting of the lift machine on the motor room floor, as well as supporting beams or deflector and secondary pulleys, as required. In the cases where machines are located below, the diverter sheaves shall be secured to the floor slabs and not to the overhead slabs, to prevent the transmission of vibration to the structure.

(g) Anti-vibration mountings shall be provided to minimise the transmission of vibrations to the structure and to ensure the silent and smooth operation of all the equipment. Tenderers shall describe the methods to be used to achieve the desired results.

1.2 HYDRAULIC DRIVE

(a) An effective sound reducing material / vibration isolation shall be installed between the tank and the motor room walls.

(b) Provision shall be made for a safe method of moving the lift by hand in the event of a power failure and all the necessary equipment required to carry out this task shall be mounted neatly in the motor room and shall remain on site at all times.

(c) The lift machinery shall operate silently and without vibration. The lifts shall constantly operate and shall be maintained at noise levels not exceeding 56 DB (A). The noise level shall be considered acceptable if the noise does not exceed 56 DB (A) measured on the landing and in the car enclosure.

(d) Oil coolers shall be provided if it is required to maintain an acceptable oil operating temperature.

(e) The driving machine and motor shall have sufficient capacity to operate the lift continuously at 100% of rated speed in both directions without overheating or hunting during levelling.

2 CONTROLLER

(a) Programmable solid-state operation and motion controller shall be provided to control the operation, the starting, the stopping and the speed of the lift motor and also to apply the brake automatically if any of the safety devices operate or the power fails.

(b) All solid-state controllers shall be enclosed in ventilated sheet metal cabinets with integral blowers. All power resistors and heat generating transformers shall be mounted in separate enclosures if necessary to maintain the specified control panel internal temperature. The control cabinets shall be totally enclosed, vermin and insect proof, drip proof and dust proof to at least class IP42 of IEC 144.

(c) Contacts breaking heavy currents shall be provided with magnetic blowouts and arc chutes. Contact surfaces shall be of silver-to-silver except those for heavy currents, where carbon-to-silver or carbon-to-copper contact surfaces may be used.

(d) All terminals of the machinery and control gear shall be marked with distinctive letters or numbers, and corresponding markings shall appear on the contract drawings.

(e) All controllers shall be generic manufactured, assembled and supplied.

(f) As a standard, PLC lift controllers shall not be accepted. However, if these controllers are considered a generic product by the Representative/Agent and are able to meet the requirements of the specification, PLC controllers may be offered as an alternative if the following requirements are met:

- Documentation stating that the control system has been subjected to extensive testing and is verified as safe, reliable and fully complies with SABS 1545 and all national, local regulations and by-laws.

- If requested by the Representative/Agent, the Contractor shall provide the Representative/Agent with a full set of backup software / software module and all associated maintenance related documentation including principal diagrams.

- Documentation from the PLC supplier is provided to verify the age of the model used, the date it is expected to be removed from the production line and the period the PLC supplier will guarantee parts and repairs.

- The Contractor shall verify that the PLC supplier is willing to maintain under a fully comprehensive agreement, the entire PLC unit(s) for at least 20 years.

3 CONTROL SYSTEM

(a) The control system shall be capable of constantly producing the performance criteria specified.

(b) The associated control equipment for each control system shall provide smooth acceleration and deceleration. In conjunction with the controller and machine, the system shall consistently provide the performance times specified.

(c) The drive control system shall be capable of decelerating the lift to stand still without a "levelling in" or "creeping in" phase. Only lifts with direct floor approach capabilities shall be accepted.

(d) The motor drive unit shall provide a smooth lift performance including acceleration, steady velocity and deceleration plus levelling to various floors within the time allowance and levelling tolerances specified. This performance shall be consistent under all conditions of loading and in either direction of travel.

(e) The motor drive unit shall be equipped with all necessary monitoring circuits to maintain a safe and reliable operation. These shall include but are not limited to the monitoring of the load, direction of rotation, speed, supply voltage, and operating currents.

(f) The hoist motor shall be provided with a thermostatically controlled blower if necessary, to dissipate the heat in order to maintain the equipment within the specified operating temperature range.

(g) The control system shall provide a smooth acceleration and deceleration with the levelling accuracy at all landings from no load to full rated load in the lift. This smooth operation shall be obtained for all lifts under stable conditions. A maximum of 0.8 seconds shall be allowed from door close to car start.

(h) The equipment shall be designed to operate at plus or minus 15% of normal feeder voltage and plus or minus 5% of feeder frequency without damage or interruption of lift service.

(i) The control system shall be designed to operate the hoist motor continuously at 100% of rated speed and at 100% of rated load in both directions without overheating or heating.

4 MACHINE ROOM INDICATORS / ROPE MARKERS, MONITORS AND TESTING TOOLS

(a) Monitor and keyboard or hand-held testing instruments for commissioning, re-commissioning and fault analysis of the lift control system shall be provided and shall remain on site at all times. Each group of lifts shall be supplied with its own monitor and keyboard or testing instrument.

(b) As each lift travels through the lift shaft, a main hoisting rope marker shall indicate its floor level position by means of a mechanical selector attached to the machine control indicator. This indicator shall operate independently to the lift control and shall not be dependent on the lift supply for its operation.

(c) The lift control system shall be capable of generating error/fault reports. Error logs for each lift showing at least forty (40) of the most recent faults shall be accessible. The error log shall clearly indicate the type of fault, lift number, date and time the fault occurred.

5 SAFETY GEAR AND GOVERNOR

(a) An over-speed governor, driven directly by an independent rope attached to the car, shall be provided in the motor room and shall be designed to operate the safety gear fitted to the car when the speed of the car, due to any cause, exceeds its normal maximum speed by more than a predetermined value. The tripping speed of the governor shall be selected with due regard to the rated speed. The tripping speed shall be approximately inversely proportional to the rated speed and shall for rated speeds ranging from 0,25m/s to 5.0m/s not exceed the rated speed by more than 40% and 20% respectively.

(b) The safety gear shall be arranged to stop the lift whenever excessive descending speed is attained. Means shall be provided to cut off power from the motor and apply the brake prior to application of the safety gear. The safety gear shall be released by moving the lift in the "UP" direction.

(c) The governor rope system, including the governor and tension sheave, shall be arranged so that the carrier shall not be released due to system dynamics when the lift is subjected to an emergency stop in the "UP" direction.

(d) Car and counterweight safety gear shall be provided with a switch to cut off the power from the motor and apply the brake, if the safety gear applies without tripping the governor.

(e) Rope guards and an electrical contact to monitor the rope stretch shall be provided on the governor tension sheaves.

6 ROPE GUARDS

Rope guards shall be used to cover machine sheaves, secondary or deflector sheaves and governor sheaves to cover moving sheaves and ropes. Guards are also required on rope

hole openings in the machine room and secondary level floors to prevent objects from falling into the lift shaft. Guards shall be provided in secondary level floors where ropes and tapes or selector drives pass through to prevent accidental contact.

7 MOTOR ROOM VENTILATION AND LIGHTING:

Not applicable as it is room less type of Lift recommended on this site.

(a) If any alterations have to be made the Lift Contractor must inform the Representative/Agent in writing, to ensure that it will be corrected.

8 MACHINE DATA SUBMITTALS

The Contractor shall supply all the relevant machine data to ensure the correct power feeder design, including, but not limited to the following:

-	Lift	Number
-	Capacity / load	kg
-	Speed	m/s
-	Supply Voltage	Volts
	Supply Frequency	Hertz
-	Number of wires	Number
-	Motor kW rating	kW
-	Roping	
-	Full load UP acceleration	Amps
-	Full load UP nominal speed	Amps
-	Machine heat release per car	BTU/h/car
-	Power Factor	%

9 LIFT SHAFT REQUIREMENTS

(a) In terms of SABS 1545 (Parts 1 and 2) provide the necessary rope or selector tape guards in pit areas and landing door unlocking devices on all landings

(b) Provide safe Working Platforms in pits with depths in excess of two (2) metres and if necessary, at the top of the shaft to create sheave-room platforms. The working platforms shall comply with SABS 1545 (Parts 1 and 2) safety requirements pertaining to the depth/height and free space of these areas.

(c) In terms of SABS 1545 (Parts 1 and 2), shaft lights are to be provided and installed by the Contractor.

10 CAR AND COUNTERWEIGHT GUIDE RAILS

(a) The guide rails for the car and counterweight shall consist of planed steel tees with milled, tongued and grooved joints. Metal splice plates shall be of a suitable length and fixing brackets for guide rails shall be provided at intervals not

exceeding 2,4m. Guide rail fixings shall be located in such positions that when the car is at any landing, the guide shoes on the car will be at a fixing bracket. The bottom end of each guide rail shall be provided with a sole-plate fixed to the pit floor

(b) All brackets shall be secured by means of approved expandable concrete anchor bolts of adequate size and length.

11 HOIST AND GOVERNOR ROPES

(a) The ends of the hoist ropes shall be properly secured to the car and counterweight cross-head or to the dead-end hitch plates on 2:1 roping, with adjustable rope shackles having approved sockets. Screw adjustment shall permit equalisation of the tension in all ropes

(b) The lift car hoisting rope attachment / hitch shall be suitably vibration isolated to prevent rope noise from being transferred to the car enclosure.

(c) Governor ropes shall be in accordance with SABS 1545 (Parts 1 and 2) and the steel rope shall be specially designed for lift service. The two ends shall be securely fastened together at the lift and shall be attached to the safety operating mechanism. The governor rope shall pass over the governor sheave and over an approved tensioner sheave in the pit. An electrical contact shall be fitted to the pit sheave and shall stop the lift if the governor rope becomes slack or breaks.

12 COUNTERWEIGHT

(a) Each lift shall be suitably counterbalanced for smooth and economical operation Cast iron or steel sub-weights shall be contained in a guided structural steel frame. The counterweight shall be equal to the weight of complete lift car plus at least 40% of the rated load. The weights in the counterweight frame shall be balanced with the weight equally distributed across the width of the frame to equalise guide pressures. The sub-weights shall be welded or fastened together as necessary to prevent rattling.

(b) Counterweight screen guards shall be provided at the bottom of the shaft to a height of 2150mm above the floor of the pit and approximately halfway up the shaft at the position where the car and counterweight pass each other.

13 CAR AND COUNTERWEIGHT GUIDE ROLLERS OR SHOES

The car and counterweight guide rollers/shoes shall constantly provide the ride quality as specified in Section 3 clause 11 of this specification.

13.1 GUIDE ROLLERS

(a) Each lift shall be provided with car and counterweight rollers guides. Each roller guide shall consist of at least three wheels with a durable resilient material, each rotating on ball bearings having sealed-in lubrication, assembled on a substantial metal base and so mounted as to provide continuous contact of all wheels with the corresponding rail surface under all conditions of loading and operation. The wheels shall run on three machined rail surfaces. The roller guides shall be properly secured at top and bottom on each side of the car frame and counterweight frame

(b) The roller guides shall run on dry guide rails. Sheet metal guards shall be provided to protect wheels located on the top of the car and the counterweight. The roller wheels for the car shall not exceed 500-rpm and the roller wheels for the counterweight shall not exceed 1000-rpm at rated speed.

13.2 GUIDE SHOES

If the speed and load nominated for a specific lift allows the use of guide shoes:

(a) The lift shall be provided with car and counterweight spring loaded guide shoes. The spring tension shall be adjusted so as to maintain the lift in the centre of the rails and provide continuous contact with the corresponding rail surface under all conditions of loading and operation. The guide shoes shall be lined with a durable resilient material, which shall ensure a quiet and smooth ride. When oil buffers are attached to the bottom of the counterweight, additional guide shoes shall be installed on each side of the buffer cylinder frame.

(b) The guide shoes shall run on lubricated rails. The guide rails shall be lubricated by a permanently mounted lubrication reservoir on top of the car and counterweight.

14 ELECTRICAL COMPENSATION

A sufficient extra hoisting kilowatt rating in the hoist motor, machine and motor generator capacity and control equipment may be provided so that effective electrical compensation for the weight of the hoist ropes and travelling cables shall be accomplished as the lift travels through the lift shaft.

15 COMPENSATION CABLES

If Section 2 clause 14 (Electrical Compensation), cannot be achieved the following shall apply:

(a) Compensating trailing cables or compensating chains encased in a synthetic sleeve (whisper flex) shall be provided

(b) Compensating cable restraining rings shall be provided in each pit and mounted on both the car and the counterweight buffer supports

(c) Compensation shall be fixed to the bottom of the counterweight and car in a position which shall allow the counterweight to remain balanced in the guides and exert equal pressure on each face of the guide at the four guide locating positions.

(d) The fixing of the compensation to the car shall be accomplished by a vibration isolating compensation hitch.

(e) Where compensating steel ropes are used for compensation, they shall be accompanied by a statically balanced compensation pit sheave and shall be mounted centrally between the guides.

16 BUFFERS

(a) Suitable oil, heavy spring or polyurethane buffers shall be provided for the car and counterweight and shall be so adjusted that in the case of over-travel, no parts of the car or counterweight will touch the shaft ceiling and that the retardation of the car does not exceed the limits as laid down in the SABS 1545

(b) Hydraulic buffers shall be so constructed and shall be installed to allow the fluid level to be checked easily. Easy access to the buffer for testing and maintenance purposes shall be possible without having to remove the counterweight pit screen.

(c) Energy dissipation type buffers shall have an electrical contact fitted to monitor the stroke (extended position).

17 PIT SWITCHES

Each lift pit shall be provided with watertight pit safety switches accessible from the entrance to the pits without the necessity of entering the pit and shall also be accessible from the pit while standing on the pit floor. The pit switch shall interrupt the power supply and apply the brake to hold each car so as to permit safe access to the pit. The pit switch shall be clearly distinguished from other switches that may be mounted in the pit area and the on/off position shall be clearly marked.

18 STOPPING DEVICES

(a) Normal terminal stopping devices shall be enclosed in dust-proof enclosures for each lift. These devices, once operated, shall bring the lift automatically to a smooth stop at the terminal landing.

(b) Final terminal stopping devices shall be positioned at the top and at the bottom of each lift shaft. A fixed cam securely attached to the lift shall operate these final limit switches. These limit switches shall be independent of any other stopping devices and shall positively open without the use of springs to cut off all power from the driving machine motor and brake. It shall prevent the operation of the lift in either direction. They shall be so located that they open at the time the lift or the counterweight engages the buffer.

19 TRAVELLING CABLES

(a) Travelling cables between the lift and the fixed lift shaft wiring shall be flexible and suitably suspended to relieve the strains in the individual conductors. All

cables shall contain an approximately equal number of conductors, or shall have equal flexibility.

(b) Travelling cables shall include two shielded pairs for each lift car to accommodate voice communication

(c) The travelling cables shall be positioned in such a manner to eliminate the possibility of interference with the shaft information, selector tape or governor rope and all the necessary travelling cable protection shall be fitted to the shaft wall and shaft trimmers to prevent damage to the outer cover during normal travel.

(d) The travelling cables shall be neatly and adequately strapped to the side of the car enclosure and all the necessary protection shall be provided where the cables cross over metal extrusions.

(e) Travelling cables for the counterweight shall comply with the requirements of this section.

(f) Flat and round trailing cables shall be fixed and shall hang in accordance with the trailing cable manufacturer's requirements.

20 ELECTRICAL WIRING AND CONTROL COMMUNICATION

(a) All low voltage and control communication cables shall be run in separate ducts, conduits and trailing cables.

(b) Car top terminal boxes of ample size and car top inspection control units shall be provided

21 AUTOMATIC SELF LEVELLING

All lifts shall be provided with both a self-levelling and a re-levelling feature that shall automatically bring the lift to the floor landings within a tolerance of 3.0 mm under no load to full rated load conditions without hunting. Self-levelling shall, within its zone, be entirely automatic and independent of the operating device and shall correct over-travel and rope stretch. The lift shall be maintained level with the landing, irrespective of load and while loading and unloading.

22 LIFT CAR CONSTRUCTION AND ENCLOSURE

(a) The lift car shall be an assembly consisting of the sling, the platform and the cabin.

(b) The sling shall be constructed of rolled steel angle or channel sections bolted or welded together to form a rigid framework, which shall be suitably braced and

reinforced to withstand the operation of the safety gear without permanent distortion.

(c) The car platform shall consist of a 3mm thick mild steel plate or 20mm thick hardwood floor laid on closely spaced steel channel sections welded to a steel frame which in turn shall be laid on rubber pads in a structural steel frame. Load weighing devices shall be incorporated where specified.

(d) The cabin shall be designed as a fully enclosed car with a flat roof and solid full height panels on the sides and the back.

(e) The cabin shall be securely fixed to its sling and platform in such a manner that the cabin is not subjected to strain in the event of an unequal distribution of load occurring over the floor area.

(f) The entire car assembly, including the car frame and the car platform shall be constructed to operate free from objectionable squeaks or metallic sounds, comprising of a rigidly tuned resonance car frame and acoustically treated superstructure.

(g) The following features shall also be embodied in the lift car:

- A continuous lighting system shall be provided along each side of the car. The lighting system shall consist of concealed, surface mounted, standard 2-lamp open fluorescent luminaires, providing an illumination level of not less than 200 lux at 1000mm above floor level. Fluorescent tubes shall be 1500mm, 58 Watt or 1200mm, 36-Watt, colour "Warm White". Tubes and control gear shall be of the switch start type and shall bear the SABS mark. The width of the lighting troughs shall be the same as the front return panels and shall be covered by easily removable low brightness diffusers, mounted in purpose made hinged frames

- One of the lamps in each trough shall be provided with an emergency battery/inverter unit by means of which the lamp will be operated for at least 60 min. in the event of a power failure. This lamp shall operate at full output under normal conditions.

- Luminous car position indicator and "Up/Down"" travel indicators installed above the entrance doors.

- Fixing clips for the attachment of canvas protective coverings which shall be supplied with the lift for the side and rear walls.

- Silent running squirrel cage, centrifugal flow exhaust blowers for passenger and goods/passenger lifts shall be mounted to draw air into car enclosure when doors are open and through door side clearances when doors are closed. The blower shall be mounted on the car top, draw air from the car through the perimeter of the suspended ceiling and exhaust the air into the lift shaft. **The fan shall without exception, be capable of delivering not less than 0.3 cubic meters of free air per minute per square meter of floor area.** The fan shall be switched via a toggle switch mounted in the car operating panel

23 LIFT CAR FINISHES

Lift car finish detail shall be as specified in section 4 of this document

23.1 PASSENGER & GOODS/PASSENGER LIFT

(a) The entire car internal finish including the area above the suspended ceiling shall be installed and finished off to the highest standard. All finished work shall be smooth and free from wraps, buckles, squeaks and rattles and all joints shall be light-proof.

(b) All wall panelling shall be jointed with a pliable material /silicone to prevent squeaks generated by car panel movement / deflection.

(c) A robust handrail, consisting of an "Intrad" poly-carbonate bumper rail, spaced 50mm off the panelling, must be provided across the rear and side walls of the lift car. The spacer blocks to which the hand and bumper rails are secured shall be fixed to the panels by means of 2 x M10 bolts with locknuts or other approved method.

(d) A silvered glass mirror shall be provided at the rear of the cabin in the side walls between the hand rail and the ceiling.

(e) Goods/Passenger lift car panels shall be manufactured from at least 1.5mm mild or stainless steel with at least two horizontal intermediate stiffening ribs and panels with a width greater than 400mm shall have vertical stiffening ribs at intervals not exceeding 200mm or equivalent construction.

23.2 FIXTURE FACEPLATES AND MOUNTING

(a) Unless otherwise specified, all landing fixture faceplates shall be surface mounted and shall be manufactured of at least 3.0 mm thickness stainless steel, with bevelled edges for all lifts if square rectangle stainless steel face plates are offered. However, Contractors may offer alternative landing fixture face plates if these faceplates are generic products and aesthetically acceptable to the Representative/Agent.

(b) The fixture faceplates in the lift car and at the landings shall be mounted with concealed security fastenings or fastenings requiring special tools to remove them, as approved by the Representative/Agent. Exposed fastenings shall match the material and finish of the faceplate

(c) The following fixture face plates shall be located and sized in accordance with dimensions approved by the Representative/Agent:

- Car operating panels.
- Car position indicators.
- Car direction indicators.
- Landing push button stations.
- Landing position indicators and signals.
- Blanking-off plates

(d) Without exception the Representative/Agent shall approve the final design of the fixture faceplates before placing the order or manufacturing of this equipment.

24 CAR AND LANDING DOOR OPERATOR

(a) Only door operators with the capabilities of coping with medium to heavy traffic shall be accepted and the type of door operator offered shall be clearly shown in the tender submitted. The door system shall be capable of controlling the position of the doors at any given moment and shall constantly produce a smooth, accurate and efficient operation.

(b) The doors on the lift car and at each landing opening shall be opened and closed quietly and smoothly by an electric operator.

(c) The motion of the door operator shall be accomplished with arms and appropriate linkages to the approximate centre of gravity of the driven door panel.

(d) Each landing door shall be equipped with Electro-mechanical interlocks so that the lift can operate only when the interlock circuit is established. Landing door locks shall meet the SABS 1545-1 safety requirements. All work and material related to this Sub-Section shall form part of the Contractor's scope of works.

(e) An independent auxiliary self-closing device shall close each landing door panel whenever the door is not in the closed position and the equipment relating to the car and landing door system does not restrain it.

(f) An electric contact for the lift car door shall be provided which shall prevent the lift moving away from a landing unless the door is in the closed position.

(g) An electrical contact shall be fitted to the non-driving car door if its linkage is dependent on a wire rope or chain.

(h) Emergency Triangle access key mechanisms shall be provided on each entrance.

25 LIFT DOOR HANGERS

Hangers shall be equipped with ball bearing adjustable rollers to take the up-thrust of the doors. The hangers and rollers shall be designed to accommodate the size and weight of the doors operated with a high-speed door operator.

26 CAR DOOR CONTROL

26.1 CAR DOOR MOTION CONTROLLERS

(a) Car door motion controllers dependent on resistors, rheostats or switches to control the opening and closing motion shall not be accepted. The car door motion controller shall be capable of controlling the position of the doors at any

given moment and shall constantly produce a smooth, accurate and efficient operation.

(b) **(For Group controls only)** Adjustable hardware or software timers shall be provided to hold the doors open for the dwell times specified below. The tabulated dwell times are initial adjustment standards. Further adjustment to suit specific traffic movement capabilities and the arrangement of car and landing stations shall also be possible. The first passenger dwell times are those measured from door fully open to door start-to-close. The second and succeeding dwell times are from restoration of the light beam to door start to close from its fully reopened position.

Passenger Conditions	Stops for Car Call	Stops for Landing Call
First Passenger	**2.0 sec.**	**3.0 sec.**
Succeeding Passengers	**1.0 sec.**	**1.0 sec.**

Stops at the high or low car call reversal floors shall be considered as landing call stops.

(c) If doors are held open for an adjustable period of time by a passenger standing in the entrance or by constant pressure of the door open button, a buzzer shall sound and the doors shall start to close at a reduced speed and force level. When the doors touch an obstruction, they shall re-open.

26.2 DOOR PROTECTION DEVICES

(a) A non-retractable electronic infra-red/ultrasonic protective leading edge shall be provided and shall extend at least 2100-mm above the platform and its active surface/area shall project beyond the front edges of each leading car door panel. Should this device come in close proximity or touch a person or object whilst the car doors are closing, the car and shaft doors shall return to their open position. Manual reversal of the doors while the lift is on automatic operation shall be accomplished by pressing a door open button in a car-operating panel. Should this device be activated while the car doors are closing, the car and shaft doors shall return to their open position.

(b) Without exception the Contractor shall demonstrate on the day of Completion that the door closing pressures comply in full with the SABS 1545 Part 1 and Part 2 under normal and forced closing conditions.

(c) The door protection device shall have the capabilities of detecting metal/plastic trolleys.

27 CAR PLATFORM

The car platform with enclosure of each lift shall be balanced by arranging balancing weights to equalise the guide pressure (front to back and side to side) so that the pressure on any guide shoe roller does not exceed 18kg without load in the car. (Statically balanced).

28 LANDING ENTRANCES

(a) Each lift shaft landing entrance assembly shall consist of unit frame, door panels, fascia, sill, hanger, closer and interlock. The installation shall comply with the applicable code requirements.

(b) As a standard all lift landing equipment including doors, signal faceplates shall have a two (2) hour fire rating. The Contractor shall provide the relevant SABS test certificates for Class "C" type landing door equipment.

29 DOOR PANELS

(a) The door panels for all openings shall be constructed of at least 1.5 mm thick mild or stainless steel. Continuous stiffener channels must be provided to the top, bottom and edges at the faceplates. The bottom of each door panel shall be provided with removable laminated phenolic guides, which run in the sill slots.

(b) Door panels shall be constructed to operate free from squeaks or metallic sounds and shall be adequately treated with a sound deadening material to produce a quiet door operation under all operating conditions.

(c) The leading edge of the car and landing doors shall have an interlocking profile with rubber stoppers (top and bottom) to prevent the door panels closing metal to metal. Add on rubber profiles shall not be accepted.

(d) All landing door site guards shall have a stainless-steel box type construction for added rigidity.

(e) <u>Goods/Passenger Lift and Access, Goods Only Lift Car Doors</u>

(i) Car and landing sills shall have additional angle iron supports (reinforced sills) to accommodate the applicable point loads.

(ii) Landing and car door panels shall have reinforced sliding shoe supporting sections

(iii) Only reinforced sliding door panels shall be accepted. Door panels shall be at least 1.5 mm thick Mild Steel or Stainless Steel with at least two horizontal intermediate stiffening ribs.

30 SILLS AND SUPPORT ANGLES

The landing sills for all openings shall be of narrow extruded aluminium. Grooves in all sills for the door guides shall be machine planed with minimum clearances for the guides. The sills shall be supported on steel angles provided by the lift Contractor and securely fastened to the building floor construction.

31 TOE GUARDS

Toe guards shall be of at least 1.5 mm thick steel and shall be installed on all landings. They shall extend the full width of the door opening and be gradually bevelled to the wall. The straight vertical portion of the guards shall at least be 400 mm long or as in the case of the lowest landing shall equal the distance travelled by the car sill from the bottom terminal landing to when the car is on the fully compressed buffer.

32 CAR POSITION INDICATORS

(a) Electronic LED digital readout position indicators shall be incorporated in each lift car operating panel at a height of not less than 2100 mm above the floor. As each lift travels through the lift shaft, its position shall be indicated continuously by the illumination of the numeral or letter corresponding to the landing that the lift is stopped at or is passing.

(b) The digital readout shall be at least 50 mm in height.

33 CAR OPERATING PANEL (COP)

(a) The operating device for each lift shall include a series of buttons, numbered to correspond to the active landings served and various additional buttons and key switches, including emergency alarm, intercom, door open and door close buttons, independent control, fire control and rear door control key switches.

(b) The car call buttons shall be numbered to correspond to the landings served or the numbers shall be engraved with recessed background adjacent to the car buttons.

(c) Car, landing and emergency buttons shall be of the Micro push operation type and shall be approved in terms of the Occupational Health and Safety Act. Each button shall be clearly marked with its corresponding floor position. The demarcation shall either comprise a raised or recessed numeric or alphabetic character. Car call buttons shall have Braille incorporated into the button unit.

(d) The car operating station shall be paraplegic friendly and shall be located so that all operating and emergency buttons are located between 1500 mm and 900 mm above the car platform. The emergency buttons and switches shall be mounted at the bottom and the call buttons in numerical order starting above the emergency button and numbering from left to right.

(e) Swing front return panels used in the passenger car enclosures shall be arranged so that the call buttons and the control and signal devices are substantially flush to the vertical surface and shall be mounted on the return panel. The wiring to the individual components shall permit the panel to swing open for maintenance purposes.

(f) A second rear door car-operating panel for lifts with two entrances shall operate independently to the front panel and shall comply in full with this section.

(g) As a standard the lift signage shall include No Smoking, Load, Passengers, Certificate Number and Lift Number / Designation, as required by the applicable standards and regulations. All signage shall be engraved into the Car Operating Panel.

(h) Without exception the Representative/Agent shall approve the final design of the car-operating panel before placing the order or manufacture of this equipment.

(i) The number of Car Operating Panels per lift shall be as nominated by the Representative/Agent.

(j) The button markings/engraving shall be such that it does not fade or wear with continuous operations. The markings, whether engraved or raised shall remain clearly visible and the coloured epoxy shall remain intact throughout the life of the button.

(k) All key switch cylinders in the fixture faceplates of landing stations, car stations and supervisory control stations shall be master keyed with removable core cylinders (KABA type or equivalent).

34 CALL ACKNOWLEDGING LIGHTS

All car and landing buttons shall be of the call acknowledging type. The registering of a call button shall illuminate the button to acknowledge that a call has been registered. Incandescent indicator lamps shall not be accepted.

35 LANDING CALL BUTTONS

35.1 PASSENGER AND GOODS/PASSENGER LIFTS

(a) A riser of landing micro push button stations shall be provided. Terminal floors shall contain a single button station and intermediate floors shall contain both up and down buttons. Pressure on the button in one fixture shall cause the electronic illumination of the corresponding button unit in the other fixture at the same landing. Incandescent button illumination shall not be accepted.

(b) Landing push buttons shall be of the Miern push operation type and shall be approved in terms of the Occupational Health and Safety Act.

(c) The location of the centreline of each landing micro push button fixture shall be located at 1050 mm above the floor.

(d) Each button shall be clearly marked with its corresponding direction of travel. The demarcation shall either comprise a raised or recessed approved symbol.

(e) The button markings/engraving shall be such that it does not fade or wear with continuous operations. The markings, whether engraved or raised shall remain

clearly visible and the coloured epoxy shall remain intact throughout the life of the button. Buttons shall have Braille incorporated into the button unit.

35.2 ACCESS GOODS ONLY LIFTS AND DUMBWAITERS

(a) Refer to Section 3, clause 1.2 of this document.

(b) All buttons shall be micro-push buttons.

36 WAITING PASSENGER LANTERNS AND GONGS

(a) Provide an up and down, LED digital readout electric indication waiting passenger lantern at each intermediate landing and an up or down single indication lantern at a terminal landing of all lifts. The lanterns shall be mounted above the head jamb or beside the side jamb of each typical entrance. Incandescent indicator lamps shall not be accepted

(b) Supply and fit adjustable electronic arrival gong to each entrance. The fixture face plate shall contain an approved pattern of slots to enable the transmitting of the sound from within the shaft to the lift foyer. In terms of the paraplegic/blind person's requirements the gongs shall have a different tone when announcing cars travelling in the up and down directions - two "gongs" for down and one "gong" for up.

(c) As soon as a lift has reached a predetermined distance from a landing and is going to stop at that landing, the corresponding waiting passenger lantern shall be illuminated and the gong shall sound whether or not a landing call has been registered. The waiting passenger lantern shall remain illuminated until the lift leaves the landing or if the car becomes filled, whichever occurs first.

(d) The type and design of the landing signals shall take into account long lift lobbies associated with groups of lifts installed adjacent to each other. After installation the landing direction and/or announcing arrows shall be clearly visible from any position within the lift lobby. It shall be the Contractor's responsibility to inform the Representative/Agent if the selection of landing signal design is not going to achieve the visual requirements detailed under this section.

(e) As an exception and if specifically requested by the Contractor and accepted in writing by the Representative/Agent, adjustable gongs may be fitted to the car. Gongs fitted to the car shall be positioned in the header section of the car and the sound shall be contained and directed towards the entrance so as not to be transmitted to the floors above and below the lift. The gongs shall further only sound when the lift is within 200 mm from the landing level.

(f) As an exception and if specifically requested by the Contractor and accepted in writing by the Representative/Agent, announcing arrows may be fitted to the side jambs or incorporated in the push button unit. However, this option shall be restricted to Simplex and Duplex units with a single riser of buttons.

37 LANDING POSITION INDICATORS

(a) Electronic LED digital readout position indicators shall be provided over the architrave of each lift in the main lift lobby. As the lift travels through the lift shaft, its position shall be indicated continuously by the illumination of the numeral or letter corresponding to the landing that the lift stopped at or is passing

(b) The final number of landing indicators required for each lift and their locations shall be as approved by the Representative/Agent.

(c) The digital readout shall be at least 50 mm in height.

(d) Landing position indicators shall not illuminate if the lift can no longer respond to calls as a result of a fault condition or when undergoing routine maintenance.

38 LANDING DOORS AND ARCHITRAVE FINISHES

(a) All stainless steel landing doors and architraves shall be cleaned prior to final acceptance and receive a coat of an approved stainless steel polish.

(b) When spray painting the landing doors and frames, the Contractor shall ensure that the landing door panels are satisfactorily prepared before the final coat of Duco is applied.

(c) Floor designation shall be permanently marked on the inside of the landing doors (shaft side).

39 LIFT INTERCOM SYSTEM

Only if Specified in Section 4 of this Specification

(a) Provide an intercommunication system complete with talk-back speakers with all required auxiliary equipment, wiring and a six (6) hour minimum back-up power supply

(b) Lift travelling cables shall contain two (2) shielded pairs of conductors for each car for the intercommunication system.

(c) Terminal strip boxes for all wiring shall be provided.

(d) All wires in the wiring system shall be shielded without exception.

(e) Wiring between all master stations in the building shall comply with manufacturer's recommended standards.

(f) Provide one sub-station in each lift car, one master station for each motor room and one master station for the security control room.

(g) The voice link shall constantly produce a sound/speech quality comparable to that of the normal Telkom telephone network. All provisions to adequately address interference in the lines shall be included. The intercom master stations shall include an indicator system/panel to indicate the lift car initiating the emergency call and an "All Call" feature to allow for communication to all lifts at the same time.

(h) The lift intercoms for all the lifts shall be wired back to a common security/control room centrally located.

(i) The Master Stations shall be capable of accommodating all the lifts covered under this Specification. The individual lift's designation and its call code shall be clearly and neatly displayed on the Master Station.

40 LOAD SWITCHES

All load switches and sensors which influence the control and the drive shall be adjusted in order to achieve an optimum operation, and their operating loads documented for future reference on the data sheet or certificate of compliance SABS1545 - Annex "A". These load contacts may include but are not limited to the over-load, minimum load and the landing call by-pass functions.

41 CAR TOP REQUIREMENTS

41.1 CAR TOP WORKING PLATFORM

Securely fitted working platforms of adequate strength shall be provided on the top of the car roof to create a level and safe working area. The platform shall be free of any electrical cabling and lift equipment. The car roof shall not be regarded as a working platform.

41.2 CAR TOP GUARD RAILS

In terms of SABS 1545 the car top shall be provided with a balustrade (guard-rail) where the free distance in the horizontal plane beyond and perpendicular to its outer edge exceeds 300 mm.

PART C6.5.3: OPERATIONAL REQUIREMENT

1 SIMPLEX SELECTIVE

1.1 PASSENGER & GOODS/PASSENGER LIFTS

(a) The operation of lifts shall be from the landing buttons and from the call buttons in the car-operating panel. Single call buttons shall be mounted at each terminal landing and "up" and "down" buttons at each intermediate landing.

(b) The operation shall be such that momentary pressure on one or more car or landing buttons, other than those for the landing at which the lift is standing, shall start the lift, provided the interlock circuits are established and cause the lift to stop at the first landing for which a car or landing call is registered corresponding to the direction calls registered and these stops shall be made in the order in which the landings are reached, irrespective of the sequence in which the calls are registered provided the call for a given landing is registered sufficiently in advance of the arrival of the lift at that landing to permit the stop to be made.

(c) If there are no car calls and the lift starts up in response to several down calls, the lift shall proceed to the highest down call and then reverse to collect the down calls. Up calls shall be collected similarly when the lift starts down in response to such calls. If the lift stops for a landing call the direction of travel shall be anticipated and maintained for a predetermined interval and independent of additional car and landing calls registered in the opposite direction of the anticipated travel.

(d) If down landing buttons are pressed while the lift is travelling up, the lift shall not stop at these landings, but these calls shall remain registered. After the highest car and landing calls have been answered the lift shall reverse automatically and respond to car and landing calls registered below the lift. When travelling down, the lift shall not respond to up landing calls, but these calls shall remain registered and be answered on the next up trip.

(e) After the lift has answered the last call and after a pre-set time period, normally 20-seconds, the lift shall be dispatched to a nominated Boarding Floor. Provision must be made to have this automatic return feature disabled if required.

1.2 ACCESS GOODS LIFTS

(a) Each landing shall be provided with the number of buttons corresponding to the number of landings served.

(b) The lift shall have a call and send operation. The lift shall respond to one call at a time and this call shall be the first call registered.

(c) As the lift arrives at a landing a gong or buzzer shall sound for an adjustable time. The adjustable time shall be pre-set to 30 seconds.

(d) Should the lift be standing at a landing with open doors and it is called from another floor, a gong or buzzer shall sound on the landing that the lift is standing

for an adjustable time before the doors close and the lift moves to answer the call. The adjustable time shall be pre-set to 30 seconds

2 OPERATION WITH INDEPENDENT SERVICE

(a) A two-position key operated switch, with removable cylinder as approved by the Representative/Agent and master keyed to the building system, shall be mounted in the main car operating station of each lift specified for Independent Service Operation. When this switch is in the on position, the removal of the key from the barrel shall be prevented and the lift shall be operated from the car buttons only and independent of all other automatic or special operation modes.

(b) The power operated car and lift shaft doors shall remain open when a lift is at a landing until a car call for another landing is registered and the door close button is pressed. If another car call has been registered, it shall be necessary, after each stop, to repress the door close button to affect the closing of the doors.

(c) It shall further be possible to activate and de-activate this service through the remote monitoring control station.

3 OPERATION WITH INSPECTION

A two-position switch shall be provided on top of the car enclosure to operate each lift manually during adjustment, inspection, maintenance and repair. The operating buttons shall be of the continuous pressure type and the speed of the car shall not exceed 0.63 m/s. It shall operate the car only when the car doors and all lift shaft doors are closed and all safety circuits made.

4 EMERGENCY OPERATION

A two-position switch shall be provided in the motor room to operate each lift manually during emergency conditions, adjustment, inspection, maintenance and repair. The operating buttons shall be of the continuous pressure type and the speed of the car shall not exceed 0.63 m/s. Emergency operation shall operate the car only when the car doors and all lift shaft doors are closed and when the inspection control on top of the car is switched to normal operation. However, it shall be permitted to override the final limits, safety contacts and governor contacts.

5 FIREMAN'S OPERATION

5.1 FIRE RECALL – LEVEL-1

(a) All lifts shall be equipped with Fire Control Level-1 and each group or single lift shall be equipped with a common Fire Control switch to recall the lifts (non-stop) to the nominated evacuation landing, where it shall remain parked with open doors. The switch shall be mounted in a box with a break-glass front marked "Lift Fire Control".

(b) When the switch is activated, cars travelling away from the designated landing, shall reverse at the next served floor without opening its doors, and return non-stop to the designated fireman's floor.

(c) An illuminated indicator fitted inside the car shall instruct the passengers to evacuate the lift at the designated evacuation floor.

(d) When on Standby Power the Fire Control operation shall operate as detailed under this section in conjunction with the Emergency Control sequenced evacuation shown under Section-3 Clause 7 (Operation with Standby Power) of this Specification.

5.2 FIRE RECALL – LEVEL-2

(a) A Fire Service Key Switch mounted in the car operating panel shall be provided in each lift operating as a Fireman's Lift. Lifts operating as fireman's lifts shall be as nominated by the Representative/Agent.

(b) A lift operating on Fire Service shall respond only to its own car call while ignoring all landing calls. When the lift arrives at a landing not being the main landing, its car and landing doors shall remain closed. If the door open button is pressed, the doors shall open and continue opening. If the door open button is released, the doors if not yet fully open, shall immediately reverse direction and close. Once the doors have been fully opened via the door open button, they shall remain open until a further car call has been registered and the door close button has been pressed.

(c) If more than one car call has been registered, all the remaining car calls shall be cancelled once the lift stops at the nearest car call in the direction of travel.

(d) If the lift remains stationary at a selected floor away from the main landing with the doors closed for an adjustable time initially set at 30 (thirty) seconds, the lift shall return to the fire recall floor automatically. When the lift returns to the main landing, the doors shall open automatically and remain open awaiting a further car call.

(e) All the car door horizontal and vertical light rays, ultrasonic and infrared detectives, shall be made inoperative during the firemen's service operation.

(f) It shall further be possible to initiate the fire control operation through the remote monitoring control station or fire detection system. The Fire and Security Sub-Contractor shall provide a potential free contact in each lift motor room to indicate a fire condition.

6 OPERATION WITH STANDBY POWER

6.1 EMERGENCY RECALL TO MAIN LANDING – LEVEL-1

(a) Provide a standby power operation which recognises the feeder arrangement and the standby power operation which automatically evacuates all lifts on each affected

feeder by operating 1 (one) lift at a time to the main dispatching landing without responding to car or landing calls. The system shall subsequently permit automatic and manual selection of any lift to be released for normal operation with standby power. If any lift fails to return to its main landing within 90 (ninety) seconds, it shall automatically be disconnected from the automatic return feature.

(b) The standby power supply shall be sized to run a predetermined number of lifts simultaneously. The Electrical Sub-Contractor shall provide the number of lifts to run and the maximum kVA available for emergency operation. Alternatively, if this information is available, it shall be as nominated by the Representative/Agent.

(c) In the event of a total failure of normal power, the feeder or feeders in each group shall be transferred to the standby power source. A potential free normally closed contact shall be provided in the lift motor rooms to indicate the transfer to the standby power source. The potential free contact supplied by the Electrical Sub-Contractor shall open (fail to safety) when on standby power and the lifts will commence their sequenced evacuation.

(d) The lifts shall be capable of operation on standby power at minimum of 100% of rated speed in both directions and at a maximum load of 100% of rated capacity for a period of 10 (ten) minutes without overheating.

(e) All connections to the lift controls for standby power operation shall be provided in the appropriate machine rooms and all the necessary interlocking interconnection wiring among machine rooms shall be provided under this section.

6.2 MANUAL RELEASE – LEVEL-2

(a) Once all the lifts have been evacuated in sequence to the selected main landing, a predetermined lift or lifts shall be released for normal operation automatically or manually via a remote monitoring station. All manual or automatic release shall be prevented until the automatic evacuation covered under Section-3 Clause 7.1 has taken place.

(b) The cars nominated / selected to run on emergency power shall not be fixed and it shall, furthermore, be possible to change the lift / lifts selected to run on emergency operation without making major changes to the lift wiring or control circuitry.

(c) In all instances the fireman's lift shall have priority when selecting a lift or lifts to run on emergency power.

7 DOOR OPERATION AND CONTROL

7.1 INDEPENDENT DOOR OPERATION AND CONTROL

For lifts with two car entrances, the car doors front and back shall operate independently from its own car and landing call buttons, and associated door control equipment and this shall include the operation with independent service.

7.2 CAR AND LANDING DOORS FOR ACCESS GOODS LIFTS ONLY

(a) The car and landing doors shall open and close quietly and smoothly. Doors shall be capable of being operated by hand.

(b) Each landing door shall be equipped with an electro-mechanical interlock so that the lift can only operate when the interlock circuit is established

(c) Each car door/gate shall be equipped with a mechanical lock so that the lift can only operate when the car door is locked.

(d) An electric contact for the car door shall be provided that shall prevent the lift from moving away from a landing unless the door is in the fully closed position.

8 OVERLOAD PROTECTION

Without exception, overload protection shall be provided (SABS1545-Part-1 1999 & EN81 Code 1997). When the load in the car enclosure exceeds the rated load, a buzzer shall sound, an overload indicator shall illuminate in the car operating panel and the lift doors shall remain open and the lift blocked from travelling. The overload device shall not be active during the travel.

9 DRIVE CONTROL

(a) A fully regulated distance dependant closed loop VVVF, DC Ward Leonard, DC Direct Drive or Hydraulic drive control system shall be provided and shall constantly maintain the floor levels and ride quality as specified. Lift acceleration, nominal speed and slowdown phases shall constantly be monitored and controlled against, and with reference to, distance, speed, current and voltage feedback loops. The lift drive shall be capable of bringing the lift to a standstill after a travel without a "creeping in" or "levelling in" phase i.e. a direct approach.

(c) Driving machine and motor shall be controlled to operate the lift continuously at 100% of rated speed in both directions without overheating or hunting during levelling.

10 RIDE QUALITY AND PERFORMANCE CRITERIA

10.1 RIDE QUALITY OBJECTIVE

The main objective is to be able to determine a ride standard and to maintain that standard by routine measurement and adjustment as necessary. The standards nominated are for lifts with rated speeds of 5 m/s or higher. Lower speed lifts should be able to perform better in terms of ride quality, and at worst the same parameters should be applied.

(a) Vibration

Vibration, also sometimes referred to as "quaking", is measured in three dimensions:

- Lateral quaking from front to back.
- Lateral quaking from side to side.
- Vertical vibration (up and down).

The vibration levels are measured as acceleration levels of the car floor using an accelerometer. Measurements are expressed in terms of mm/s², milli-g or LAL. - 9.81 mm/s² = 1 milli-g or LAL.

Recording accelerometer tests in the horizontal plane shall be conducted prior to practical completion on each lift travelling at rated speed the full length of the shaft between terminal landings in both up and down directions with a maximum load of 230 kg located in the centre of the platform. Recordings shall be taken on the platform in the plane of the car guide rails and perpendicular to the plane of the car guide rails.

One set of recordings for each lift shall become the property of the Employer as a permanent record. If these tests show that the equipment is in any way defective, at variance with the specified requirements, or objectionable in any operation, the Contractor shall make any change necessary to remedy these defects. All expenses for carrying out this remedial work and the costs of all subsequent tests including labour, material, test equipment, on site observations, etc, shall be for the Contractor's account.

Notice of all tests shall be given to the Representative/Agent in writing at least 96 hours prior to conducting the test.

(b) Noise Levels

Noise levels in the car are measured during operation of the lift. Maximum and mean dB (A) figures are measured.

10.2 PERFORMANCE CRITERIA

After practical completion the Contractor shall confirm that the lift equipment performs in accordance with the contract documents and shall provide documentation to substantiate accordingly.

The lifts shall be adjusted as required to, at least meet the following performance requirements within a 10% tolerance:

(a) Ride quality

Acceleration / Deceleration:	max	1.0 m/s²
Jerk Rate: max	2.0 m/s³	
Stack changes:	nil	
Shooting Off or Rollback:	nil	
Car Noise:	max	56 dB (A)
Car Noise:	mean	52 dB (A)

(i) Lateral Quaking ISO X & ISO Y (Velocity m/sec to Time / Drive Curve)

ISO Y = Side to side movement
ISO X = Front to back movement

Peak to peak:	max	18 milli-g
Peak to peak:	mean	5.0 milli-g
RMS:	mean	1.7 milli-g

(ii) Vertical Vibration ISO-Z (Velocity m/sec to Time / Drive Curve)

Peak to peak:	max	10 milli-g
Peak to peak:	mean	3.0 milli-g
RMS:	mean	1.2 milli-g

(iii) Vertical Vibration Start and Stop Kicks

Peak to peak:	max	18 milli-g

(b) Levelling Tolerance

Re-levelling:	max.	3 mm
Levelling Accuracy.		max. 3 mm

(c) Cycle Time

Times specified are for a typical floor-to-floor run of 3400 mm with a balanced load.

Door close to car start: max. 0.8 sec

Rated Speed	Car Start to Car Stop
>1.6 m/s	<5.0 sec.
1.0 m/s	5.6 sec.
0.63 m/s	10.5 sec.

(d) Door Dwell Times

Passenger Conditions	Stops for Car Call	Landing Call
First Passenger	2.0 sec.	3.0 sec.
Succeeding Passengers	1.0 sec.	1.0 sec.

(e) Door Open and Close Times

Door Opening	Type	Door Open	Door Closed
900 mm	C/O	max. 2.2 sec	max. 3.0 sec
1100 mm	C/O	max. 2.2 sec	max. 3.0 sec
1200 mm	C/O	max. 2.4 sec	max. 3.2 sec
1400 mm	C/O	max. 2.7 sec	max. 3.5 sec

(f) Door Pre-Opening

Max. 3/4 open when lift is within 5 mm of floor level

PART C6.5.4: DETAIL LIFT SPECIFICATION

1 GENERAL REQUIREMENT

Tenderers shall offer lifts designed to comply with the technical requirements and the as described in Sections 2 and 3 of this specification.

The equipment offered shall be suitable for continuous operations under the following conditions:

(a) Electricity Supply

3-phase, 4-wire, 50HZ, AC with nominal voltage of 400/231V varying between 95% and 105% of the nominal voltage

(b) Ambient Air Conditions

Max. Temperature : 40 °C
Min. Temperature : -5°C
Max. relative humidity : ……% Gauteng

(c) Altitude of site

1 250 m above sea level

All lifts shall comply with the latest edition of SABS1545-1 and SABS-1545-2 specifications.

The lift installation shall comply in all respects with the requirements of the Occupational Health and Safety Act, Act 85 of 1993 as amended.

2 DESCRIPTION OF LIFT SYSTEM

Description	**Lift Number**	**Stops**	**Floors**	**Speed**	**Load**	**2.1.1.1.1**
Passenger Lift	*L1*	*2*	*G & Basement*	*1.0 m/s*	*1800 kg*	*1*

3 TECHNICAL REQUIREMENTS FOR GROUP-1: PASSENGER LIFT INSTALLATION

3.1.1 General

Item	Description	Detail Requirements
(a)	Operation	*Simplex*
(b)	Number of Units	*1*
(c)	Type of Lift	*Passenger Lift*
(d)	Load	*1860 kg*
(e)	Speed	*1.0 m/s*
(f)	Lift Numbers	*1.1*
(g)	Total Travel	*2*
(h)	Number of Stops	*2*
(i)	No of Openings	*2 verticals in line*
(j)	Car Entrances	*One per Lift*
(k)	Floor Designation	*G & Basement*
(l)	Pit Depth	*1460*
(m)	Machine Room Dimension	*No Machine Room*
(n)	Pit Service Platform	.....
(o)	Extended Buffers	.....
(p)	Access below Pit	.....
(q)	Counterweight Safeties	.....

3.1.2 Machine

Item	Description	Detail Requirements
(a)	Drive	*VVVF or .....*
(b)	Machine	*Geared or .....*
(c)	Roping	*1:1 or 2:1*
(d)	Automatic Self-Levelling	*Yes, As Specified*
(e)	Compensation	*Yes, As Specified*

3.1.3 Control Operation

Item	Description	Detail Requirements
(a)	Operation	*Simplex*
(b)	Up/Down Peaks	*Yes, As Specified*
(c)	Fire Control	*Yes (as specified)*
(d)	Fireman's Floor	*Basement Level*
(e)	Emergency Power Control	*Yes (required)*
(f)	Evacuation Floor	*Ground and Basement Level*
(g)	Independent Control	*Yes, As Specified*
(h)	Load Measuring	*Over Load, Landing Call By-pass, Anti-Nuisance*

3.1.4 Landing Equipment

Item	Description	Detail Requirements
(a)	Landing Doors Opening	*1500 x 2100mm Clear Opening.*
(b)	Door Operation	*Two Speed, Centre Opening*
(c)	Door Control	*VVVF Motion Control*
(d)	Position Indicator	*Digital Indicators on All Landing Floors*
(e)	Waiting Lanterns	*Yes, As Specified*
(f)	Gongs	*Yes, As Specified*
(g)	Call Buttons	*Approved, Vandal Proof Mechanical Push Button*
(h)	Direction Arrows	*Yes, As Specified – Above all Landing Entrances*

3.1.5 Car Equipment

Item	Description	Detail Requirements
(a)	Number of COP's	*One*
(b)	Protection Drapes	*No*
(c)	Position Indicators	*Yes, As Specified on COP*
(d)	Direction Arrows	*Yes, As Specified on COP*
(e)	Intercom	*Yes, As Specified – Master Station - Security Control*
(f)	Call Buttons	*Approved, Vandal Proof Mechanical Push Button*
(g)	Door Detectors	*Yes, As Specified Ultrasonic Proximity Detectors*
(h)	Signage	*Yes, As Specified*
(i)	Emergency Light	*Yes, As Specified*
(j)	Braille Call Buttons	*Yes, As Specified*

3.1.6 Shaft Dimensions and Equipment

Item	Description	Detail Requirements
(a)	Shaft Dimensions	*1800 x 2000 (TBC)*
(b)	Head Room	*Distance floor to floor of 3810mm TBC*
(c)	Pit Sump	*Supplied by Others pit size 1500mm*
(d)	Shaft Lighting	*Yes As Specified*

3.1.7 Car Enclosure

Item	Description	Detail Requirements
(a)	Car Dimensions	*1800 mm (deep) x 1750 mm (wide), refer to structural drawing for conformity*
(b)	Car Clear Internal Height	*2250 mm*
(c)	Clear Door Opening	*1500 x 2100mm*

3.1.8 Interfacing with Remote Control Centre (Building Management System, and Switchboard)

Item	Description	Detail Requirements
(a)	Switchboard Interface	*Intercom communication system from lift car to switchboard (50m-100m)*
(b)	BMS Interface	*SCADA system for remote monitoring of all alarm and statistical lift information*

3.1.9 Finishes

Item	Description	Detail Requirements
(a)	Fixture Faceplates	*Minimum 3mm thick Stainless Steel (SST) with bevelled edges and a brushed finish*
(b)	Car COP Faceplates	*Full height next to car door SST with brushed Finish*
(c)	Car Side Walls	*SST – Brushed Finish*
(d)	Car Rear Wall	*SST – Brushed Finish*
(e)	Car Front	*SST – Brushed Finish*
(f)	Car Floor	*Nornament – Principal Agent to Specify Colour*
(g)	Car Ceiling	*High Quality Suspended Ceiling with recessed Fluorescent Luminaires & Battery back-up luminaire*
(h)	Hand Rails	*At a height of 900mm above car floor on sides and rear of car*
(i)	Car Doors	*SST – Brushed Finish*
(j)	Landing Doors	*SST Brushed Finish*
(k)	Landing Frames	*SST – Brushed Finish*
(l)	Landing Signals	*Fitted above landing entrances*

PART C6.5.5: SCHEDULE OF TECHNICAL INFORMATION

1 GENERAL

Tenderers are required to complete the following Schedule of Technical Information and shall in addition, under separate cover, give full particulars of the equipment and installations offered as well as detailed descriptions of the various methods of control and operation.

NB: **The acceptance of this tender shall not be construed as being approval of all or any of the equipment listed herewith.**

The contractor shall within 14 days of the signing the contract, provide a full list of materials and or equipment to be used complete with supporting data to compliment the schedules as per the tender document, upon which approval process would begin.

2 TECHNICAL INFORMATION SCHEDULE

Item	Description	Details
1.	Manufacturer's name	
2.	Country of origin	
3.	% South African manufacture	
4.	Performance	
a)	Car speed in m/s	
b)	Average round trip time	
c)	Maximum carrying capacity of each lift car	
d)	Average waiting time after registration of a landing call	
5.	Main Hoist Motor	
a)	Maker's name	
b)	Type	
c)	Rated output (kW)	
d)	Time rating (starts/hr)	
e)	Manufacturing standard and safety codes	
f)	Maximum speed (RPM)	
g)	Rated voltage (Volts)	
h)	Full load current (Amps)	
i)	Starting current (Amps)	

Item	Description	Details
j)	Type of bearings	
k)	Maximum line current with lift starting with full contract load (Amps)	
6	Type of Brake	
7.	Gearing (If Applicable)	
a)	Material of worm	
b)	Material of worm wheel	
c)	Type of thrust bearings	
d)	Ratio of gearing	
e)	Type of worm-shaft bearings	
f)	Worm above or below wheel	
8	Drive	
a)	Diameter of traction sheave (rope centres)	
b)	Type of grooving used on traction sheave	
c)	Type of bearing for sheave shaft	
d)	Diameter of smallest deflector pulley used	
e)	Type of grooves provided on deflector pulleys	
f)	Type of bearings for deflector pulleys	
g)	Means provided for absorption of vibration	
9.	Switch gear and Control System	
a)	Make of main circuit breaker	
b)	Rupturing capacity of main circuit breaker (kA)	
c)	Type of control system	
d)	Control voltage	
e)	Make of contactors	
f)	Make of control relays	
g)	Contact materials used for auxiliary and main contacts of controller switch gear	
h)	Type of selector	
10	Car and Doors	
a)	Mass of complete car with doors and operating gear (kg)	
b)	Net inside dimensions (width x depth x height) in mm	
c)	Thickness of material of car and landing doors	
d)	Finish of car and landing doors	
e)	Clear width and height of car and landing entrances	

Item	Description	Details
f)	Type of door drive mechanism of lift	
g)	Type of suspension used for car and landing doors	
h)	Type of proximity detectors	
(I)	For passengers approaching from landing	
(II)	For passengers leaving PB of car	
i)	Type of material used for inside finishes of car (i.e., panels, ceiling trim)	
j)	Thickness and type of floorboards and floor covering	
s)	How is car and platform isolated from supporting structure?	
l)	Are car panels treated externally for sound absorption?	
m)	Door speed:	
(I)	Normal (m/min)	
(II)	On force closing (m/min)	
11.	Ropes	
a)	Maker's name	
b)	Diameter of ropes (mm)	
c)	Number of main ropes	
d)	Breaking load of each rope (kN)	
e)	Maximum working load of each rope	
f)	Factor of safety	
g)	Tensile strength of steel used (MPa)	
h)	Number of strands in rope	
i)	Number of wires per strand	
j)	Construction and lay of rope	
k)	Type of rope fastening used	
l)	System of roping (i.e., 2:1 or 1:1, single or double wrap)	
12.	Counterweight	
a)	Total mass (kg)	
b)	Percentage of live load counter balanced (%)	
13.	Guide Rails	
a)	Type and section	
b)	Mass per metre-length (kg) for:	
(I)	Car	

Item	Description	Details
(II)	Counterweight	
14.	Roller Shoes	
a)	Type	
b)	Material of tyres for roller type guides	
15.	Buffers	
a)	Type	
b)	Length of stroke	
c)	Reactions on pit floor when buffers are hit at 115% of contract speed whilst car is carrying contract load	
(I)	Car buffers	
(II)	Counterweight buffers	
16.	Safety Gear	
a)	Type	
b)	Type of governor	
c)	Stopping distance at overspeed with:	
(I)	Car empty (mm)	
(II)	With contract load (mm)	
d)	Percentage over-contract speed when governor trips safety (%)	
e)	Percentage over-contract speed at which governor trips motor supply	
f)	Is safety still effective if governor rope breaks after application of safety device?	
17.	Steelwork at Top of Shaft	
a)	Number and type of sections used	
b)	Reactions on structure must be submitted with tender by indicating position, magnitude and direction of all reactions on a drawing	
18.	Levelling	
a)	Levelling speed (m/s)	
b)	Levelling tolerance guaranteed (Maximum) (mm)	
c)	Will car and landing doors be fully open when car reaches floor level?	
d)	What is distance of levelling zone above and below floor level?	
19.	Selector Type	
20.	Deviations from Specification as an Alternative Offer: Does the equipment offered comply strictly with the specification (Yes/No)	

3 DEVIATIONS FROM SPECIFICATION AS ALTERNATIVE OFFER

If answer to 20 above is NO tenderers shall give full details of all deviations between the alternative offered and specified equipment hereunder:

.....

.....

.....

.....

.....

.....

.....

TENDERER'S NAME AND ADDRESS

.....

Signature of Tenderer's
Authorised Signatory

.....

.....

TEL NO. ..... DATE: .....

NB: The acceptance of this tender shall not be construed as being approval of all or any of the equipment listed herewith.

The contractor shall within 14 days of the signing the contract, provide a full list of materials and or equipment to be used complete with supporting data to compliment the schedules as per the tender document, upon which approval process would begin.

PART C6.5.6: OPERATING AND MAINTENANCE MANUALS

CONTENTS

4 SCOPE

The Contractor shall be responsible for the compilation of complete sets of Operating and Maintenance Manuals. A separate Operating and Maintenance Manual shall be supplied for each installation.

5 PROCEDURE FOR SUBMISSION OF MANUALS

5.1 SUBMISSION OF DRAFT MANUALS

A draft copy of each Operating and Maintenance Manual shall be submitted to the Representative/Agent prior to safety inspection of the installation. Approval of the draft Operating and Maintenance Manuals shall be a prerequisite for commencement of the safety inspection in terms of the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993).

The manuals will be reviewed and checked by the Representative/Agent and returned to the Contractor with comments, where necessary. The Contractor shall make the necessary changes and amendments to the manuals to incorporate the Representative/Agent's comments.

5.2 DEVELOPMENT OF FINAL MANUALS

A final draft copy of each Operating and Maintenance Manual shall be submitted to the Representative/Agent at least one week prior to commencement of Day 1 tests on commissioning. This set of manuals will not be accepted without the Contractor's verification of the information contained in the manuals and the professional language editing thereof. The Representative/Agent shall return the manuals to the Contractor, who shall make the final corrections. The Representative/Agent will, however, not be responsible for the quality control on manuals. Approval of final Operating and Maintenance Manuals shall be a prerequisite for issuing of a Certificate of Practical Completion for repair of the installation.

After the Representative/Agent has approved the final Operating and Maintenance Manuals, the Contractor shall provide the Representative/Agent with seven (7) sets of

the manuals. Approval of the final Operating and Maintenance Manuals shall be a prerequisite for issuance of a Certificate of Completion.

6 FORMAT OF OPERATING AND MAINTENANCE MANUALS

(a) Manuals shall be bound in hardcover lever-arch files with plastic coatings. The files shall be clearly labelled on the front cover, as well as on the back band, with the following information:

(i) The title "Operating and Maintenance Manuals"
(ii) Name of the
(iii) Name of the contract and contract number
(iv) The Contractor's name, address and contact telephone number and fax (logo optional)
(v) Month and year in which the manuals are finally handed over to the Employer
(vi) Name of the User Client

(b) Pamphlets and bound leaflets/booklets from suppliers or manufacturers shall be placed in plastic pockets.

(c) Drawings and diagrams larger than A3 shall be folded and placed in plastic pockets to be easily removed or stored.

(d) The sections of the manuals specified below shall be clearly partitioned.

(e) Cross-referencing between drawings/diagrams and text shall be in a clear and consequent format.

(f) The Operating and Maintenance Manuals shall be supplied in English.

Table of Contents

The table of contents shall appear on the second page and shall consist of the headings of the various sections in the manual and the relevant page numbers.

The table of contents shall essentially contain at least the following:

1. Introduction
   - 1.1 Scope of the manual
   - 1.2 General arrangement of the manual
   - 1.3 Description of installation
   - 1.4 Specifications
2. List of drawings and diagrams
3. Parts and components
4. Operating procedures
5. Maintenance

5.3 Purpose of maintenance
5.4 Preventative maintenance
5.5 Trouble-shooting

6. Breakdown maintenance and repair

7. List of Appendices.

1. Introduction

The introduction shall contain at least the following:

1.1 Scope of the manual

A summary shall explain the scope of the contents.

1.2 General arrangement of the manual

A brief description shall explain the way in which the manual is arranged

1.3 Description of installation

This section shall give a functional description of the complete installation covered by the manual, including all systems and/or functional units deemed to form part thereof.

1.4 Specifications

A summary shall be given of the specifications applicable to the particular part of the Contract

2. Drawings and Diagrams

2.1 Mechanical flow diagrams (MFDs) and single line diagrams

Mechanical flow diagrams (for mechanical systems) or single line diagrams (for electrical systems) of the system and/or functional unit shall be included in the Operating and Maintenance Manuals for easy reference by the operators of the installation. Diagrams shall be drawn not only for parts of an installation that have been repaired, but also for the complete installation, including all the components.

3. Parts and Components

3.1 Equipment data sheets

A data sheet shall be drawn up for each piece of equipment and/or machine forming part of the installation and shall contain the following information:

(a) Equipment tag number

(b) Equipment description
(c) Model/make/manufacturer
(d) Supplier/Reconditioning details
(e) Ordering details
(f) Details of fixed components
(g) Details of lubrication
(h) Maintenance references (refer to supplier/reconditioning technical manual).

3.2 Technical equipment manuals

For each piece of equipment and/or machine forming part of the installation the following information shall be included in this section of the Operating and Maintenance Manuals:

(a) The supplier or reconditioning manual and/or standards of operating and maintenance instructions;

(b) illustrated parts breakdown and/or group assembly drawings as agreed with the Representative/Agent;

(c) parts lists and data sheets, including all characteristic curves for machines indicating operation point, efficiency, power consumption, etc;

(d) calibration charts, and

(e) test certificates for hydraulic pressure tests, flame-proof grading, materials, non-destructive examinations, coating and lining details, etc.

Each detailed description shall be accompanied by a set of engineering drawings. From the drawings the functionality of each part or component used, as well as the special characteristics associated with the part or component shall be very clear.

3.3 Parts and components list

A detailed description shall specify all the parts and components used for the duration of the Contract. This description shall include new parts and components, as well as existing parts and components that have either been reconditioned or used as specified in the Contract

The description shall state at least the part or component number, part or component name, the size of the part or component, an explanatory description, the quantity used, the material of which the part or component is made, the coating (if any), date of purchase, as well as any relevant remarks as to the application thereof.

Details of the manufacturer of the part or component shall also be listed. This shall at least state the name, address, telephone number, fax number and name of a contact person.

The supplier of the part or component shall also be stated and shall include at least the name, address, telephone number, fax number, name of a contact person and an alternative supplier (if available)

3.4 Drawings

Drawings shall contain a descriptive heading, an explanatory key and relevant comments. Drawings shall be done on a computer-aided design package approved by the Representative/Agent.

A compound drawing for all subassemblies shall clearly indicate how and where the various parts fit in the subassembly. The compound drawing shall be linked to the equipment data sheets and parts and components list and shall clearly specify the parts or components used, their model numbers, their sizes and the quantities used. The compound drawings shall also be accompanied by a short description explaining the workings of the subassembly, as well as the assembly of the parts or components to complete the subassembly.

4. Operating Procedures

The operating instructions shall be a step-by-step description of the manual start-up and shut-down procedure for every piece of equipment and/or process reconditioned, repaired or supplied with references to the MFDs. For automatic operation the operators shall be referred to the automatic control manual (if applicable).

The functioning of the installation shall be clearly described, using a flow diagram depicting the interrelationships among the various subassemblies. The subassemblies shall be described by descriptive drawings.

Each mechanical or process flow diagram shall contain at least a heading, relevant comments and a key.

Every subassembly shall also have its own flow diagram explaining the operation of the subassembly, as well as the application of each part and component. The application of the subassembly shall also be very clear. The flow diagram shall consist of at least a heading, relevant comments and an explanatory key

A detailed description shall be given of all operational systems forming part of the installation, explaining the operation and functioning of the system and the number of operations personnel required for performing the operation successfully.

The preparations, which are required before the system can be operational, shall be clearly stated and explained.

The operation tasks shall be clearly explained with reference to dangerous situations that might occur. Hazardous operations shall be explained in great detail and cover all the applicable safety precautions.

5. Maintenance

5.1 Purpose of maintenance

The maintenance process shall be explained and the main responsibilities described

5.2 Preventative maintenance

A preventative maintenance and lubrication schedule shall be included in this section. This schedule shall be in table format and shall include a summary of all the maintenance actions required for each different system and/or functional unit covered by this manual, in order to give a single summary of all routine preventative maintenance actions required for the complete installation.

The schedule shall indicate daily, weekly, fortnightly, monthly and yearly maintenance actions. A lubrication schedule summary shall also be included under this section.

The frequency of routine preventative maintenance actions shall be indicated very clearly

The Contractor shall provide the maintenance requirements as prescribed by the manufacturer. The type of maintenance shall be clearly indicated. The description of the maintenance to be performed shall include at least the part name, location of the part in either the assembly or subassembly, the model number, the quantity of the particular part or component to be maintained, the type of maintenance, and notes on the maintenance procedure.

A brief description shall accompany the maintenance schedule, indicating special tools to be used, maintenance and test equipment required for the test procedures. Any special tools necessary for maintenance shall be specified in terms of name, model, size, manufacturer, supplier (name, telephone number, fax number, contact person), coating (if any) and notes on the use of the equipment

Remarks on the system readiness checks of each subassembly shall be explained in detail. Routine inspection and maintenance processes shall be described. It shall be very clear what needs to be done, how to perform the necessary task and any dangers that are present.

5.3 Trouble-shooting

An explanation shall be given to assist the maintenance personnel in analysing and resolving malfunctions that might occur. Various scenarios with possible causes and rectification procedures shall be explained.

The scenarios shall be accompanied by drawings indicating the position of the part that is faulty. Each of these drawings shall have a heading, comments and an explanatory key.

6. Breakdown Maintenance and Repair

The Contractor shall describe the complete procedure to be followed in the event of a breakdown. It shall be very clear what the operating personnel should look for, how to eliminate any dangers due to the breakdown (e.g., electricity must be shut off in the event of problems with the wiring) and who should be contacted. The Contractor shall

supply the names and telephone numbers of at least two contact persons who may be contacted in the event of a breakdown.

Repair instructions shall provide the maintenance personnel with detailed instructions for the removal and/or replacement of any item requiring replacement due to malfunctioning. Contact numbers shall also be given to assist maintenance personnel, should a breakdown occur.

The Contractor shall specify the actions expected of maintenance personnel in the event of a breakdown.

The Contractor shall also specify the testing procedures to be followed before the system can be put into operation again. Every procedure shall be described clearly and all the potential dangers pointed out, as well as the precautions that have to be taken.

The testing procedures shall be accompanied by drawings illustrating the process to be performed. Every drawing shall have a heading, comments and an explanatory key.

7. List of Appendices

PART C6.5.7: 12 - MONTHS FREE SERVICE AND MAINTENANCE SCHEDULE

1 THE CONTRACTOR AGREES AND UNDERTAKES TO:

1.1 Provide fully comprehensive maintenance on the lift in accordance with the terms of this agreement.

1.2 Acknowledges that planned, preventative maintenance on the units shall be the major objective of this agreement.

1.3 Systematically and regularly examine and where necessary adjust the equipment in accordance with the Occupational Health and Safety Act of 1993 and the South African Bureau of Standards 1543, and 1545 regulations, latest editions.

1.4 Ensure that only a "Competent" person as defined in the Occupational Health and Safety Act directly employed and supervised by him shall carry out all the repair and maintenance work of a technical nature.

1.5 The response time to any call-out are kept to an absolute minimum. Life-threatening calls shall be given a priority

1.6 The maximum response time to any non-life-threatening calls will be a maximum of sixty (60) minutes during or after normal working hours. The response time means the period of time from when the Contractor was first notified of the problem until the time the technician arrives on site.

1.7 Provide a call-out service seven (7) days a week, twenty-four (24) hours per day without additional expense to the Client or End User.

1.8 Perform the maintenance and repair work, except in the case of call-outs, required in terms of this agreement during normal working hours, Monday to Friday, public holidays excluded.

1.9 Supply and use only new replacement parts that are correctly designed and manufactured in all respects

1.10 Supply, repair or replace all parts made necessary by normal wear and tear or failure without expense to the Client or End User.

1.11 Replace all ropes whenever necessary to ensure an adequate factor of safety.

1.12 Replace all motor room, shaft, pit and lift car enclosure lamps and fittings or fluorescent tubes, starters and ballasts where necessary.

1.13 Provide a maintenance register in the motor room of each elevator / escalator and accurately maintain records of all maintenance procedures, repairs, breakdowns, call-outs, safety operation checks and tests and all site visits.

1.14 No modification to the equipment may be carried out without the Client or End Users prior approval and written consent.

1.15 The Contractor must ensure the reliability of the equipment and the safety and comfort of the passengers using the equipment.

1.16 Inform the Client or End User's authorised agent at every visit before commencing any maintenance or repair work.

1.17 The downtime of the equipment shall be kept to a minimum.

2 MAINTENANCE SCHEDULE

2.1 MONTHLY:

Check, clean, adjust, repair, or replace:

1. Report to responsible person.
2. Place service cards on each floor.
3. Attend to customer complaints / problems.
4. Condition of no admittance sign, motor room door, barrel bolts, locks, motor room lights, ventilation, extraction fans, windows, wiring diagrams.
5. Car and hall push buttons, position indicators, fans, car lights, light diffusers, direction indicators / gongs, load plate, telephone plate on main floor.
6. Thoroughly test all the landing and car door mechanical and electrical locks, car door protection devices.
7. Floor levels, emergency alarm and light unit and car door open button.
8. Inspect elevator floor levels, pits and pit equipment
9. Oil levels in bearings, geared machines and hydraulic units.
10. Machine room floors.
11. Remove old oil, waste, spares etc from site.
12. Observation lifts only clean the tops of cars and the pit.

2.2 TWO MONTHLY INTERVALS:

Check, clean, adjust, repair, replace or lubricate:

1. Electrical contacts of the buffer(s), governor tension device and pit emergency stop switches.
2. Controller relays, contacts, leads, fuses, controller and motor terminal connections and selector brushes or switches.
3. Brake pivot pins, linings, brake gears and operation.
4. Motor and generator brushes, bearings, thrust, tooth lash, couplings, slip rings and commutators.
5. Check selector gears, brushes or switches, cables and wiring.
6. Check car door operator, skid and detector / safety shoe / light ray cables for damage.
7. Guide rails, car and counterweight shoes and lubricators.
8. Safety gear, final limits, main and diverter sheaves and governor.
9. Check motor room ventilation system. Clean ventilation grills / filters.

2.3 THREE MONTHLY INTERVALS:

Check, clean, adjust and lubricate:

1. Thoroughly clean the motor room, shaft, top of car, underneath and sides of car, safeties, guide shoes and the pit.
2. Deflector, compensating sheaves and governor tension sheave in pit.
3. Landing and car door hanger rollers, moving parts, up thrust rollers, air cords or chains and door shoes.
4. Landing door hinges, handles, closers and vision panels
5. Counterweight overruns.
6. Oil level in hydraulic buffers.

2.4 SIX MONTHLY INTERVALS:

Check, clean, adjust, repair, replace or lubricate:

1. Thoroughly clean and inspect the main hoisting ropes and rope springs.
2. Inspect the governor and compensating ropes and trailing cables.
7. Test the final limits, pit switch and emergency stopping devices.
8. Governor and lubricate all pins, check operation and test safeties.
3. Selector rope / tape.
4. Travelling cables for damage.
5. Equalise the tensions on main and compensating ropes.
6. Guide rails and fixing brackets. Tops of guides must have a minimum of 25 mm clearance from the top of shaft slab.

2.5 TWELVE MONTHLY INTERVALS:

Check, clean, adjust, repair, replace or lubricate:

1 Test the safety gear, governors and buffers.

2 Strip, clean and adjust the brake. Check condition of brake linings.

3 Car door operator, linkages and settings.

3 PAYMENT FOR SERVICE AND MAINTENANCE

The contractor / tenderer shall allow for the cost to provide free service and maintenance for 12 Months after the issuing of the First Delivery Certificate.

PART C6.5.8: BILLS OF QUANTITIES:

1. GENERAL

The tenderer must complete the Bills of Quantities and detail unit rates and total amount for each item. All rates and prices exclude VAT

The "Total" shall constitute the tender for adjudication.

NOTE

Tenderers are advised to check their item extensions and total additions as arithmetical errors occurring in the priced Bills of Quantities cannot be considered as having an effect on the tender amount.

No alteration, erasure or addition is to be made in the text of the Bills of Quantities. Should any alteration, erasure or addition be made it will not be recognized but the original wording of the Bills of Quantities will be adhered to.

The Employer will check the completed Bills of Quantities and reserves the right to adjust any individual price and to rectify and discrepancy whilst the total tender price as quoted remains unaltered.

The quantities given in the Bills for video cables, power cables, cable markers, and data cables cannot be regarded as exact and are subject to measurement on site after completion of the installation and adjustments will be made according to the unit rates given in the Bills.

The quantities given in the Bill of Quantities are estimates only, and subject to re-measuring during the execution of the work. The Contractor shall obtain the Engineer's detailed instructions for all work before ordering any materials or executing work or making arrangements for it.

The Works as finally completed in accordance with the Contract shall be measured and paid for as specified in the Bill of Quantities and in accordance with the General and Special Conditions of Contract, the Specifications and Project Specifications and the Drawings. Unless otherwise stated, items are measured net in accordance with the Drawings, and no allowance has been made for waste.

The validity of the contract will in no way be affected by differences between the quantities in the Bill of Quantities and the quantities finally certified for payment

Item	Description	Unit	Qty	Rate	Total
1	**GENERAL**				
1.1	Net price for compliance with the Department Standard and Quality Specifications	Sum	1		
2	**OCCUPATIONAL HEALTH AND SAFETY**				
2.1	Allow for compliance with the requirements as set out in Part 1	Sum	1		
	Sub Total: General and OHS carried to Summary Page (A)				

Item	Description	Unit	Qty	Rate	Total
3	**LIFT INSTALLATIONS:**				
3.1	Simplex Combined Goods and Passenger Lift to be installed in an existing shaft (excluding items that are measured below): 2500kg				
3.1.1	Material	No	1		
3.1.2	Labour	No	1		
3.2	Intercom system to Control Room / Switchboard, including relevant cabling (100m)				
3.2.1	Material	Sum	1		
3.2.2	Labour	Sum	1		
3.3	Lift Monitoring and Recording System: Including PC, cabling, latest software, etc. to be located at the Control Room (over 100m distance).				
3.3.1	Material	Sum	1		
3.3.2	Labour	Sum	1		
3.4	Allow for the amount for striping of the current existing lift and handing over the material removed to the client or taking them off site to make way for the installation of the new lift.	Sum	1		
	Sub Total: Lift Installations carried to Summary Page (B)				

Item	Description	Unit	Qty	Rate	Total
4	**TESTS, INSPECTION, COMMISSIONING AND EXTRAS:**				
4.1	Testing, Inspection and Commissioning: The contractor shall allow for all testing instruments, tools, water, power, fuel, etc. for commissioning.				
4.1.1	Including attendance for any inspections and tests that the Representative / Agent may call for and the issuing of the Certificate of compliance (COC) by Master Electrician.				
4.1.1.1	Material	No	1		
4.1.1.2	Labour	No	1		
4.2	Training, Maintenance Manual and Documentation, including as built drawings: (four), as detailed in the specification				
4.2.1	Material	Sum	1		
4.2.2	Labour	Sum	1		
4.3	Maintenance for one year; (1 Visit per Month, for a period of 12 Months); for 1 Lifts				
4.3.1	Material	Sum	1		
4.3.2	Labour	Sum	1		
4.4	Any additional items not included in the schedule of quantities that the Contractor wishes to specify and price separately				
4.4.1	Item Description:				
4.4.1.1	Material	Sum	1		
4.4.1.2	Labour	Sum	1		
4.5	**BUILDERS WORK**				
4.5.1	Provide all necessary scaffolding, hoisting, rigging & drilling, chasing and punching of holes in the walls, filling and making good, etc.				
4.5.1.1	Material	Sum	1		
4.5	**RIGGING**				
4.5.1	Transport and rigging operation	Sum	1		
Sub Total: Tests, Inspection, Commissioning & Extras carried to Summary Page (C)					

SUMMARY: PART C6.5 – NEW PASSENGER LIFT	
BOQ SUBTOTAL DESCRIPTION	**AMOUNT**
Sub Total: General and OHS (A)	
Sub Total: Lift Installations (B)	
Sub Total: Tests, Inspection, Commissioning & Extras (C)	
ALLOW THE AMOUNT OF R 100 000.00 (ONE HUNDRED THOUSAND RAND) FOR ADJUSTMENTS, TO BE USED AT THE DISCRETION OF THE PRINCIPAL AGENT AND DEDUCTED IN WHOLE OR IN PART IF NOT REQUIRED	R100 000.00
SUB TOTAL: PART C6.5 - NEW PASSENGER LIFT CARRIED TO THE MECHANICAL SECTION SUMMARY (EXCLUDING VAT)	

PART C'6.5.9: SCHEDULE OF INFORMATION FOR MATERIAL SUPPLIES

None to record

PART C6.5.10: DRAWINGS ISSUED FOR TENDER PURPOSES

Item	Drawing Number	Drawing Title	Revision
-	Not Applicable	-	-

BILL OF QUANTITIES, SPECIFICATION AND DRAWINGS
FOR
PROPOSED NEW MAGISTRATES COURT ON ERF 253, JAN KEMPDORP

FOR

THE DEPARTMENT OF PUBLIC WORKS & INFRASTRUCTURE FOR MECHANICAL ENGINEERING WORKS

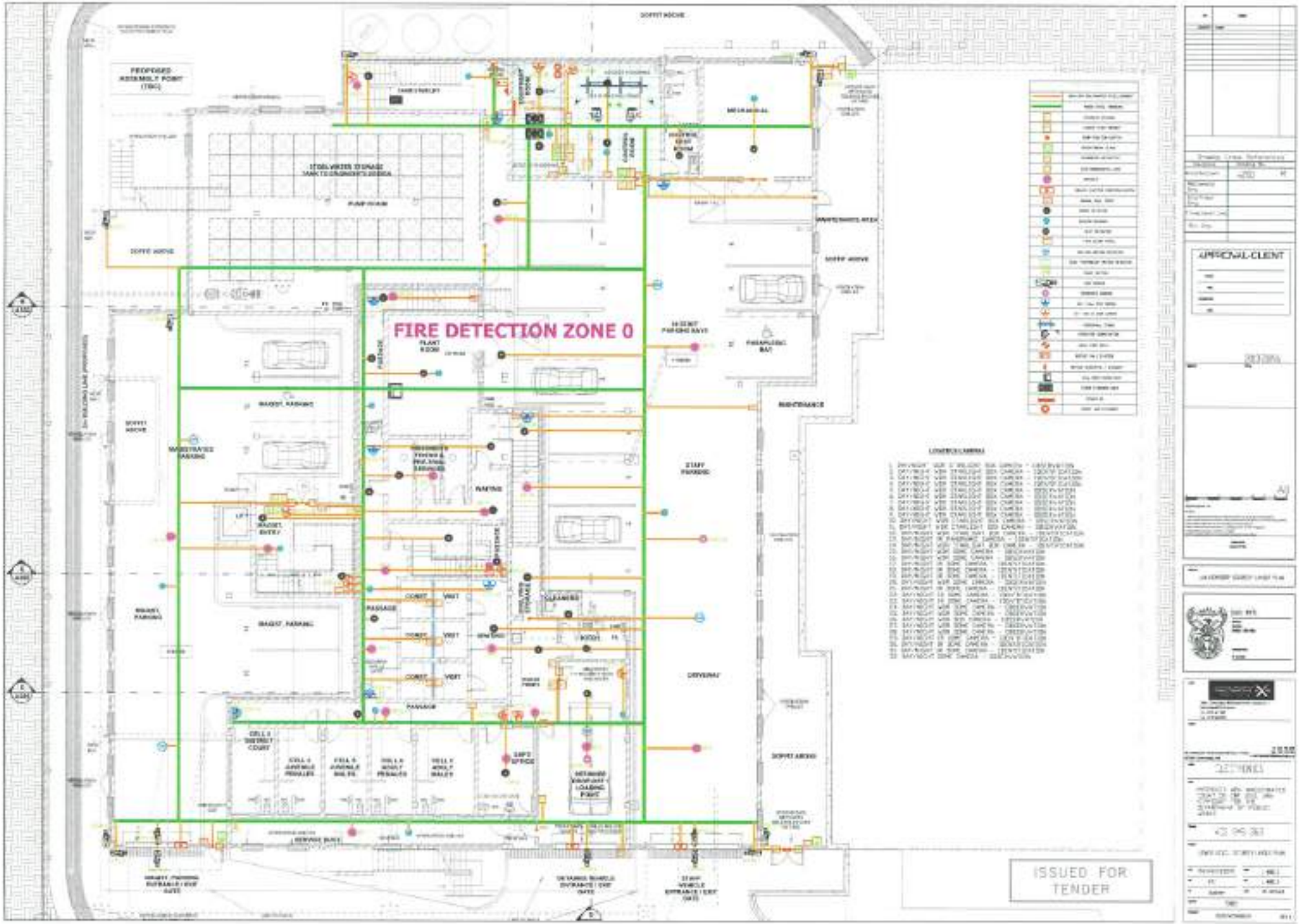
WCS 046363

PART C6:
PART C6.6: DRAWINGS SECTION

Prepared for:	Prepared by:
public works & infrastructure Department: Public Works and Infrastructure REPUBLIC OF SOUTH AFRICA	Bakone Consulting Engineers
DEPARTMENT OF PUBLIC WORKS & INFRASTRUCTURE PRIVATE BAG X 5002, KIMBERLEY, 8301 CONTACT PERSON: MR J. P. MARIUS EMAIL: Hannes.marais@dpw.gov.za TEL: (053) 838 5288 FAX: (086) 489 7460 / 053 833 1153	BAKONE CONSULTING ENGINEERS CC 581 MENDELSSOHN STREET, CONSTANTIA PARK, PRETORIA, 0181 CONTACT PERSON: MR M.E. MATLALA EMAIL: edward.matlala@bakonegroup.co.za TEL: (012) 998 1225 / (087) 379 5110 FAX: (086) 672 9965

JULY 2021

CONTENTS OF DRAWING SECTION: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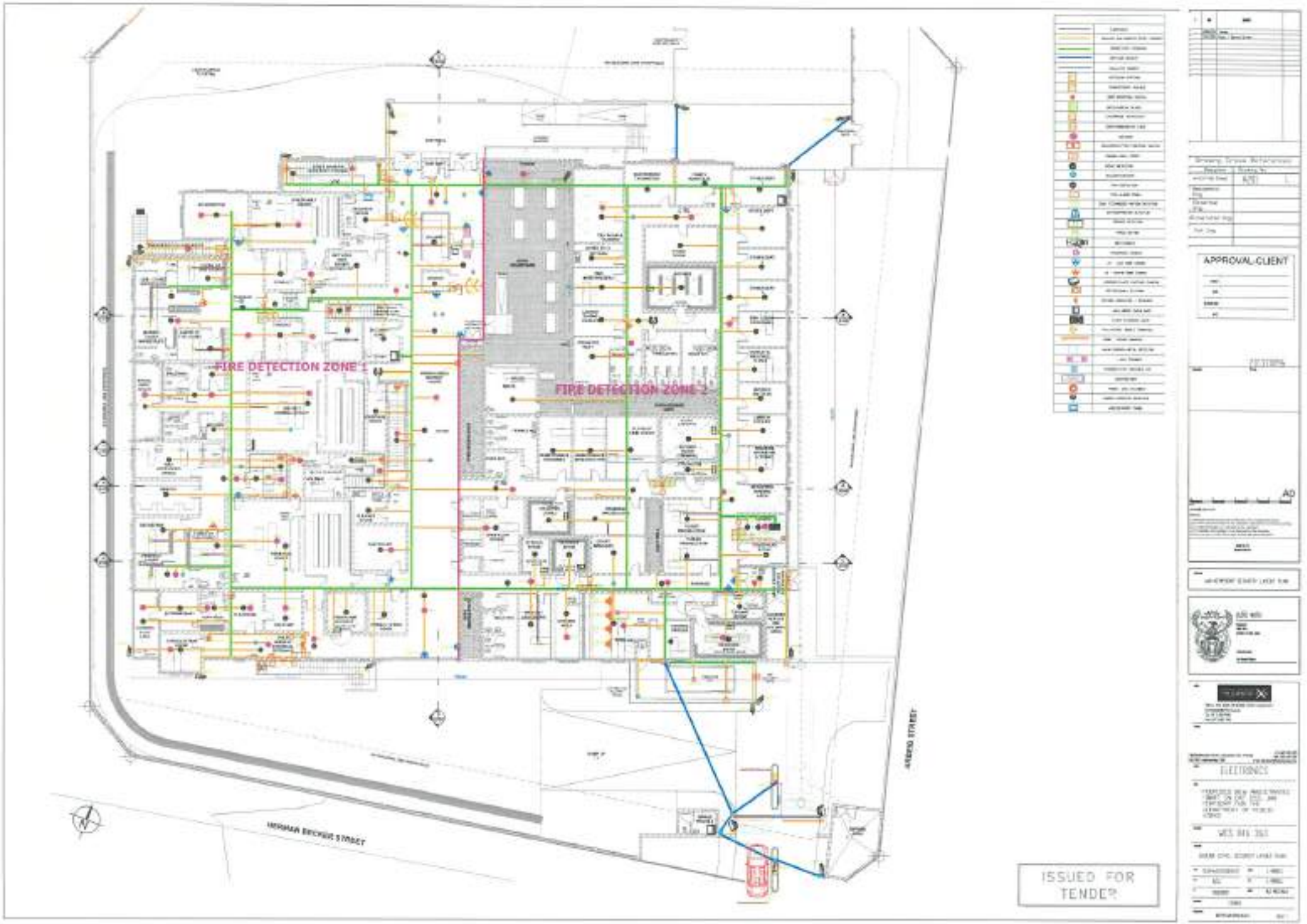
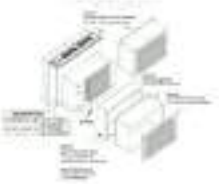
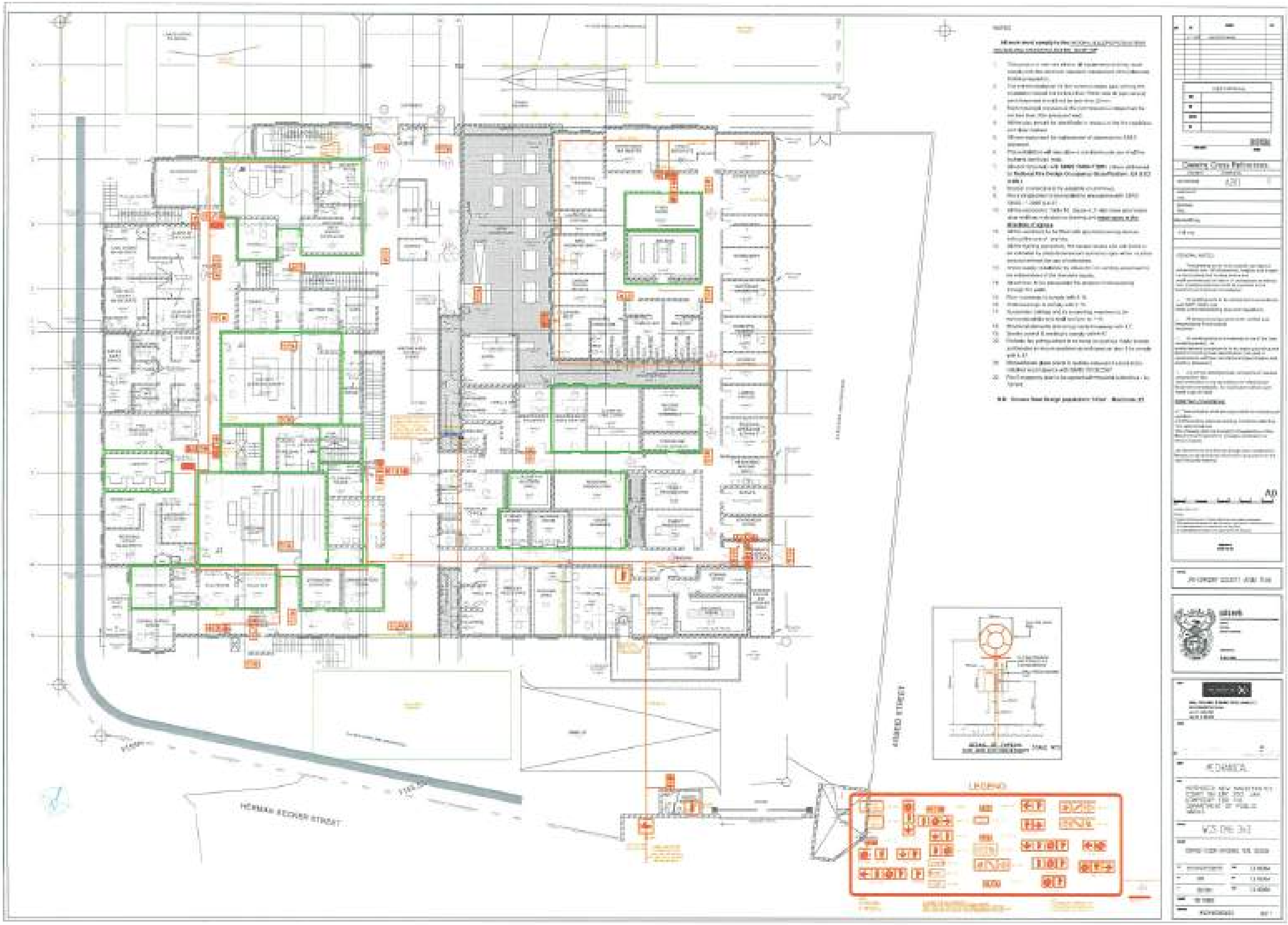
ISSUED FOR TENDER


FIRE DETECTION ZONE 1
FIRE DETECTION ZONE 2
IRRIMA BECKER STREET
AVENO STREET
ISSUED FOR TENDER
APPROVAL-CLIENT
ELECTRONICS


Typical Hideaway Mounting
350
1200
650



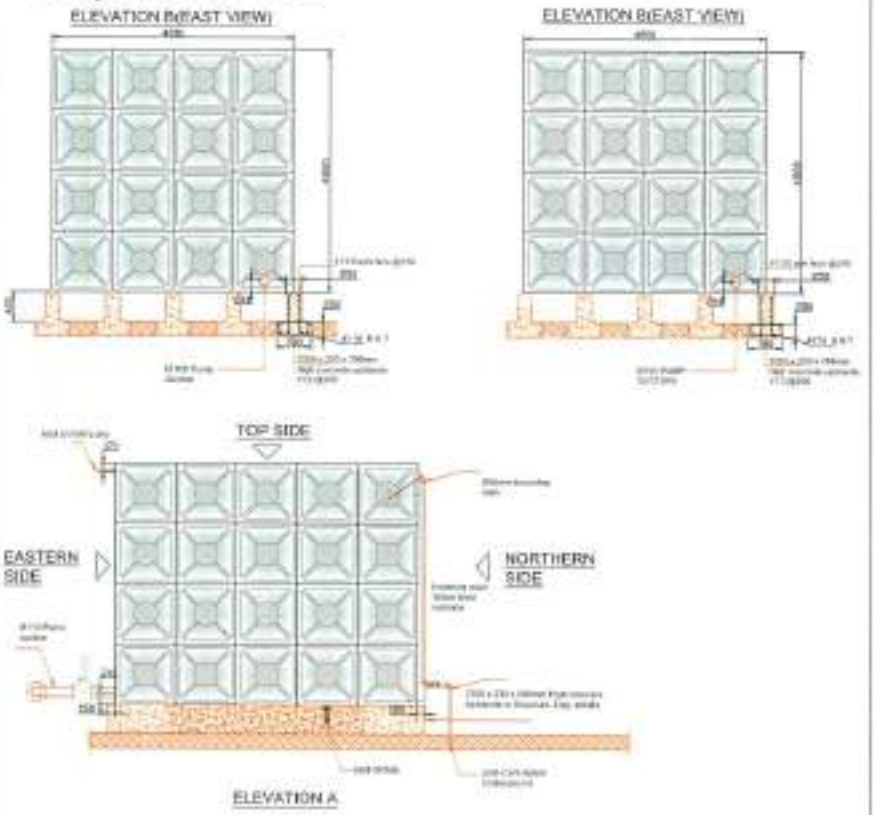


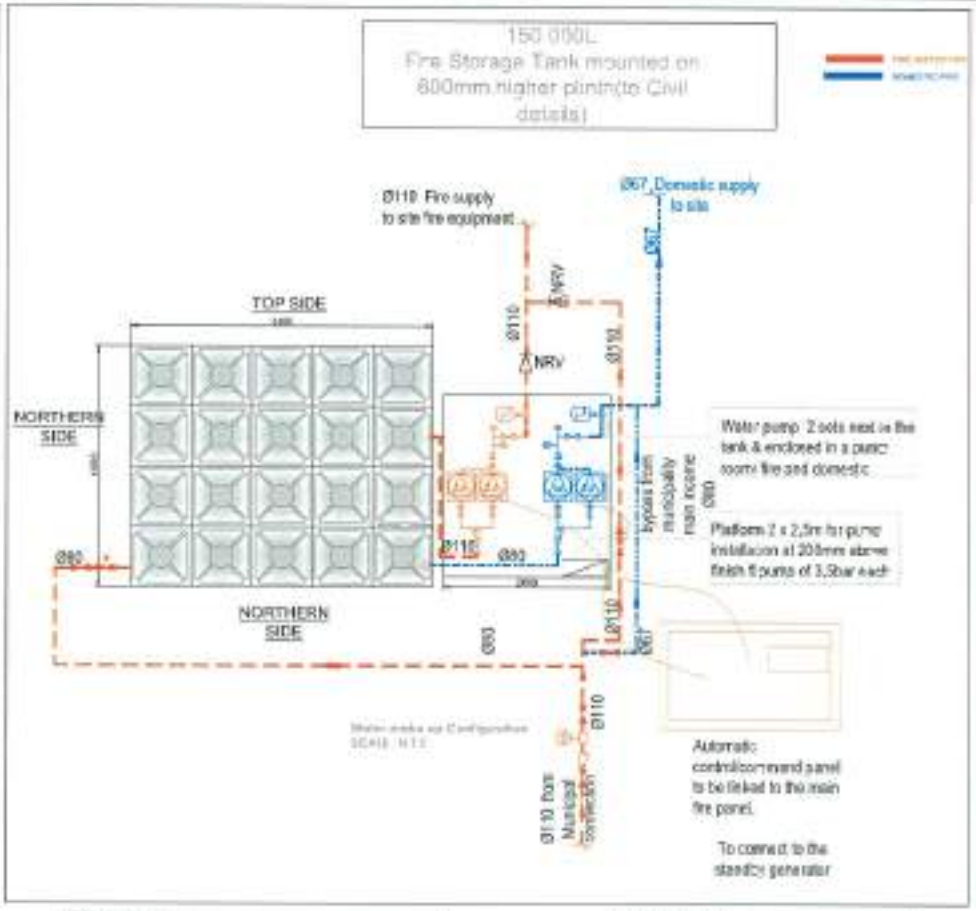
NOTES
LEGEND
HERMAN ECKER STREET
A0

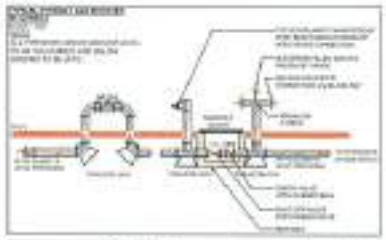

HERMAN BECKER STREET

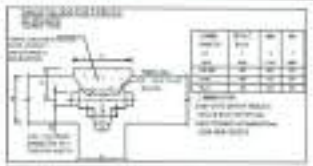

LEGEND:

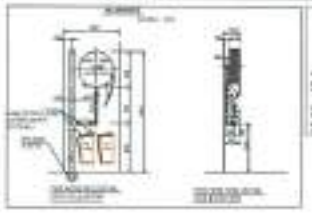
Fire protection Tank

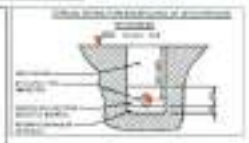




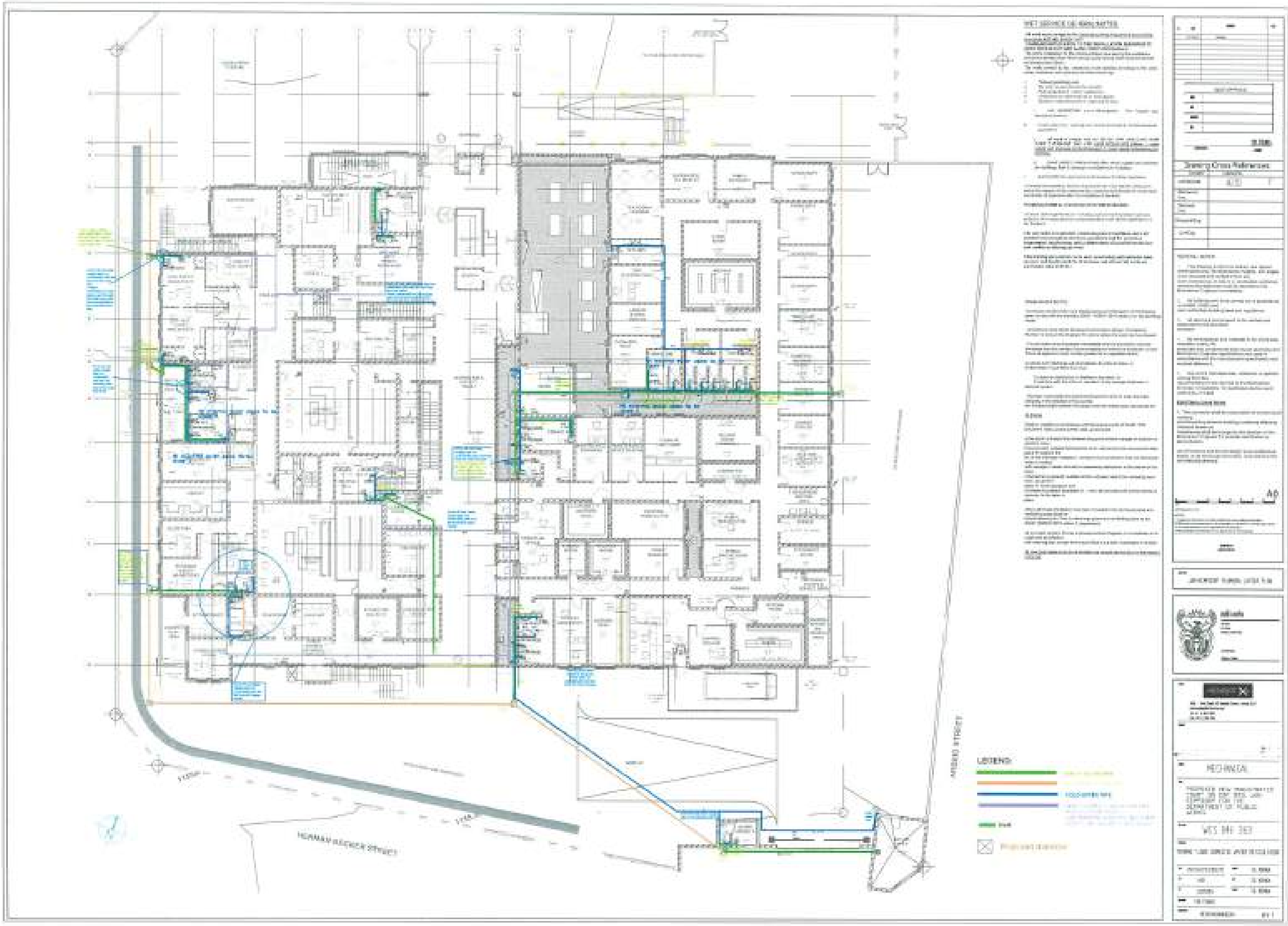








Typical Combined Fire Protection and Domestic water tank make up configuration layout, Scale 1:50


WET SERVICE (& RAIN WATER)
Drawing Cross References
LEGEND:
MECHANICAL


LEGEND:

ADDITIONAL SPECIFICATION

SL EMPLOYMENT AND TRAINING OF YOUTH WORKERS ON THE EXPANDED PUBLIC WORKS PROGRAMME (EPWP) INFRASTRUCTURE PROJECTS: NATIONAL YOUTH SERVICE (NYS)

CONTENTS

SL 01 SCOPE

This project is part of the Expanded Public Works Programme and the National Youth Service Programme and aims to train young people and provide them with practical work experience as part of this programme. Youth aged between 18 and 35 will be recruited and trained in skills relevant to the work to be done on this project. These youth will have to be employed by the contractor as part of this project so that they can gain their work experience on these projects. The training of the youth will be coordinated and implemented by a separate service provider. This service provider will provide the contractor with a list of all the youth and the training each of these youth have received. The Contractor will be required to employ all of these youth for a minimum period of 6 months. Furthermore the Contractor will be required to supervise these youth to ensure that the work they perform is of the required standard. If necessary the contractor's staff will be required to assist and mentor the youth to ensure that they are able to perform the type of work they need to do to the satisfactory standards required. The contractor will not be required to employ all youth in the programme at the same time if not feasible, but may rotate the youth on the project, as long as all youth are employed for the minimum duration stated earlier.

This specification contains the standard terms and conditions for workers employed in elementary occupations and trained on a Special Public Works Programme (SPWP) for the National Youth Services Programme. These terms and conditions do NOT apply to persons employed in the supervision and management of a SPWP

SL 02 TERMINOLOGY AND DEFINITIONS

SL 02.01 TERMINOLOGY

(a)	SPWP	The Code of Good Practice for Special Public Works Programmes, which has been gazetted by the Department of Labour, and which provides for special conditions of employment for these EPWP projects. In terms of the Code of Good Practice, the workers on these projects are entitled to formal training, which will be provided by training providers appointed (and funded) by the Department of Labour. For projects of up to six months in duration, this training will cover life-skills and information about other education, training and employment opportunities.
(b)	EPWP	Expanded Public Works Programme, a National Programme of the government of South Africa, approved by Cabinet
(c)	DOL	Department of Labour.

SL 02.02 DEFINITIONS

(a)	"employer"	means the contractor or any party employing the worker / beneficiary under the EPWP – NYS Programme.
(b)	"client"	means the Department of Public Works.
(c)	" worker / trainee"	means any person working or training in an elementary occupation on a SPWP.

SL 03 APPLICABLE LABOUR LAWS

In line with the Expanded Public Works Programme (EPWP) policies, the Ministerial Determination, Special Public Works Programmes, issued in terms of the Basic Conditions of Employment Act of 1997 by the Minister of labour in government Notice No. R63 of 25 January 2002, of which extracts have been reproduced below in clauses

SL 04, shall apply to works described in the scope of work and which are undertaken by unskilled or semi-skilled workers.

The Code of Good Practise for Employment and Conditions of Work for Special Public Works Programmes, issued in terms of the Basic Conditions of Employment Act of 1997 by the Minister of Labour in Government Notice No. R64 of 25 January 2002 shall apply to works described in the scope of work and which unskilled or semi-skilled workers undertake.

SL 04 EXTRACTS FROM MINISTERIAL DETERMINATION REGARDING SPWP

SL 04.01 DEFINITIONS

In this specification

(a) "department" means any department of the State, implementing agent or contractor;

(b) "employer" means any department that hires workers to work in elementary occupations on a SPWP;

(c) "worker" means any person working in an elementary occupation on a SPWP;

(d) "elementary occupation" means any occupation involving unskilled or semi-skilled work;

(e) "management" means any person employed by a department or implementing agency to administer or execute a SPWP;

(f) "task" means a fixed quantity of work;

(g) "task-based work" means work in which a worker is paid a fixed rate for performing a task,

(h) "task-rated worker" means a worker paid on the basis of the number of tasks completed;

(i) "time-rated worker" means a worker paid on the basis of the length of time worked

(j) "Service Provider" means the consultant appointed by Department to coordinate and arrange the employment and training of labour on EPWP infrastructure projects.

SL 04.02 TERMS OF WORK

(a) Workers on a SPWP are employed on a temporary basis

(b) A worker may NOT be employed for longer than 24 months in any five-year cycle on a SPWP.

(c) Employment on a SPWP does not qualify as employment and a worker so employed does not have to register as a contributor for the purposes of the Unemployment Insurance Act 30 of 1966.

SL 04.03 NORMAL HOURS OF WORK

(a) An employer may not set tasks or hours of work that require a worker to work–

(i) more than forty hours in any week

(ii) on more than five days in any week; and

(iii) for more than eight hours on any day.

(b) An employer and a worker may agree that the worker will work four days per week The worker may then work up to ten hours per day

(c) A task-rated worker may not work more than a total of 55 hours in any week to complete the tasks (based on a 40-hour week) allocated to him.

Every work is entitled to a daily rest period of at least eight consecutive hours. The daily rest period is measured from the time the worker ends work on one day until the time the worker starts work on the next day.

SL 04.04 MEAL BREAKS

(a) A worker may not work for more than five hours without taking a meal break of at least thirty minutes duration.

(b) An employer and worker may agree on longer meal breaks.

(c) A worker may not work during a meal break. However, an employer may require a worker to perform duties during a meal break if those duties cannot be left unattended and cannot be performed by another worker. An employer must take

reasonable steps to ensure that a worker is relieved of his or her duties during the meal break.

(d) A worker is not entitled to payment for the period of a meal break. However, a worker who is paid on the basis of time worked must be paid if the worker is required to work or to be available for work during the meal break.

SL 04.05 SPECIAL CONDITIONS FOR SECURITY GUARDS

(a) A security guard may work up to 55 hours per week and up to eleven hours per day.

(b) A security guard who works more than ten hours per day must have a meal break of at least one hour duration or two breaks of at least 30 minutes duration each.

SL 04.06 DAILY REST PERIOD

Every worker is entitled to a daily rest period of at least eight consecutive hours. The daily rest period is measured from the time the worker ends work on one day until the time the worker starts work on the next day.

SL 04.07 WEEKLY REST PERIOD

Every worker must have two days off every week. A worker may only work on their day off to perform work which must be done without delay and cannot be performed by workers during their ordinary hours of work ("emergency work").

SL 04.08 WORK ON SUNDAYS AND PUBLIC HOLIDAYS

(a) A worker may only work on a Sunday or public holiday to perform emergency or security work.

(b) Work on Sundays is paid at the ordinary rate of pay.

(c) A task-rated worker who works on a public holiday must be paid –

(i) the worker's daily task rate, if the worker works for less than four hours;

(ii) double the worker's daily task rate, if the worker works for more than four hours.

(d) A time-rated worker who works on a public holiday must be paid

(i) the worker's daily rate of pay, if the worker works for less than four hours on the public holiday;

(ii) double the worker's daily rate of pay, if the worker works for more than four hours on the public holiday

SL 04.09 SICK LEAVE

(a) Only workers who work four or more days per week have the right to claim sick-pay in terms of this clause.

(b) A worker who is unable to work on account of illness or injury is entitled to claim one day's paid sick leave for every full month that the worker has worked in terms of a contract.

(c) A worker may accumulate a maximum of twelve days' sick leave in a year.

(d) Accumulated sick-leave may not be transferred from one contract to another contract.

(e) An employer must pay a task-rated worker the worker's daily task rate for a day's sick leave.

(f) An employer must pay a time-rated worker the worker's daily rate of pay for a day's sick leave.

(g) An employer must pay a worker sick pay on the worker's usual payday.

(h) Before paying sick-pay, an employer may require a worker to produce a certificate stating that the worker was unable to work on account of sickness or injury if the worker is –

(i) absent from work for more than two consecutive days; or

(ii) absent from work on more than two occasions in any eight-week period.

(i) A medical certificate must be issued and signed by a medical practitioner, a qualified nurse or a clinic staff member authorised to issue medical certificates indicating the duration and reason for incapacity.

(j) A worker is not entitled to paid sick-leave for a work-related injury or occupational disease for which the worker can claim compensation under the Compensation for Occupational Injuries and Diseases Act.

SL 04.10 MATERNITY LEAVE

(a) A worker may take up to four consecutive months' unpaid maternity leave.

(b) A worker is not entitled to any payment or employment-related benefits during maternity leave.

(c) A worker must give her employer reasonable notice of when she will start maternity leave and when she will return to work.

(d) A worker is not required to take the full period of maternity leave. However, a worker may not work for four weeks before the expected date of birth of her child or for six weeks after the birth of her child, unless a medical practitioner, midwife or qualified nurse certifies that she is fit to do so.

(e) A worker may begin maternity leave –

(i) four weeks before the expected date of birth; or

(ii) on an earlier date –

(1) if a medical practitioner, midwife or certified nurse certifies that it is necessary for the health of the worker or that of her unborn child; or

(2) if agreed to between employer and worker, or

(iii) on a later date, if a medical practitioner, midwife or certified nurse has certified that the worker is able to continue to work without endangering her health.

(f) A worker who has a miscarriage during the third trimester of pregnancy or bears a stillborn child may take maternity leave for up to six weeks after the miscarriage or stillbirth.

(g) A worker who returns to work after maternity leave, has the right to start a new cycle of twenty-four months employment, unless the SPWP on which she was employed has ended.

SL 04.11 FAMILY RESPONSIBILITY LEAVE

(a) Workers, who work for at least four days per week, are entitled to three days paid family responsibility leave each year in the following circumstances -

(i) when the employee's child is born;

(ii) when the employee's child is sick;

(iii) in the event of the death of

(1) the employee's spouse or life partner

(2) the employee's parent, adoptive parent, grandparent, child, adopted child, grandchild or sibling

SL 04.12 STATEMENT OF CONDITIONS

(a) An employer must give a worker a statement containing the following details at the start of employment –

(i) the employer's name and address and the name of the SPWP;

(ii) the tasks or job that the worker is to perform;

(iii) the period for which the worker is hired or, if this is not certain, the expected duration of the contract;

(iv) the worker's rate of pay and how this is to be calculated.

(v) the training that the worker may be entitled to receive during the SPWP.

(b) An employer must ensure that these terms are explained in a suitable language to any employee who is unable to read the statement.

(c) An employer must supply each worker with a copy of the relevant conditions of employment contained in this specification.

(d) An employer must enter into a formal contract of employment with each employee. A copy of a pro-forma is attached at the end of this specification.

SL 04.13 KEEPING RECORDS

(a) Every employer must keep a written record of at least the following –

(i) the worker's name and position;

(ii) in the case of a task-rated worker, the number of tasks completed by the worker;

(iii) in the case of a time-rated worker, the time worked by the worker;

(iv) payments made to each worker.

(b) The employer must keep this record for a period of at least three years after the completion of the SPWP.

SL 04.14 PAYMENT

(a) A task-rated worker will only be paid for tasks that have been completed.

(b) An employer must pay a task-rated worker within five weeks of the work being completed and the work having been approved by the manager or the contractor having submitted an invoice to the employer. Payment must be made in cash, by cheque or by direct deposit into a bank account designated by the worker.

(c) A time-rated worker will be paid at the end of each month and payment must be made in cash, by cheque or by direct deposit into a bank account designated by the worker.

(d) Payment in cash or by cheque must take place –

(i) at the workplace or at a place agreed to by at least 75% of the workers; and

(ii) during the worker's working hours or within fifteen minutes of the start or finish of work;

(e) All payments must be enclosed in a sealed envelope which becomes the property of the worker.

(f) An employer must give a worker the following information in writing –

(i) the period for which payment is made;

(ii) the number of tasks completed or hours worked;

(iii) the worker's earnings;

(iv) any money deducted from the payment;

(v) the actual amount paid to the worker.

(g) If the worker is paid in cash or by cheque, this information must be recorded on the envelope and the worker must acknowledge receipt of payment by signing for it.

(h) If a worker's employment is terminated, the employer must pay all monies owing to that worker within one month of the termination of employment.

SL 04.15 DEDUCTIONS

(a) An employer may not deduct money from a worker's payment unless the deduction is required in terms of a law.

(b) An employer must deduct and pay to the SA Revenue Services any income tax that the worker is required to pay.

(c) An employer who deducts money from a worker's pay for payment to another person must pay the money to that person within the time period and other requirements specified in the agreement law, court order or arbitration award concerned

(d) An employer may not require or allow a worker to –

(i) repay any payment except an overpayment previously made by the employer by mistake;

(ii) state that the worker received a greater amount of money than the employer actually paid to the worker; or

(iii) pay the employer or any other person for having been employed.

SL 04.16 HEALTH AND SAFETY

(a) Employers must take all reasonable steps to ensure that the working environment is healthy and safe and that all legal requirements regarding health and safety are strictly adhered to.

(b) A worker must:

(i) work in a way that does not endanger his/her health and safety or that of any other person;

(ii) obey any health and safety instruction;

(iii) obey all health and safety rules of the SPWP;

(iv) use any personal protective equipment or clothing issued by the employer;

(v) report any accident, near-miss incident or dangerous behaviour by another person to their employer or manager.

SL 04.17 COMPENSATION FOR INJURIES AND DISEASES

(a) It is the responsibility of employers to arrange for all persons employed on a SPWP to be covered in terms of the Compensation for Occupational Injuries and Diseases Act, 130 of 1993.

(b) A worker must report any work-related injury or occupational disease to their employer or manager.

(c) The employer must report the accident or disease to the Compensation Commissioner.

(d) An employer must pay a worker who is unable to work because of an injury caused by an accident at work 75% of their earnings for up to three months. The employer will be refunded this amount by the Compensation Commissioner. This does NOT apply to injuries caused by accidents outside the workplace such as road accidents or accidents at home.

SL 04.18 TERMINATION

(a) The employer may terminate the employment of a worker provided he has a valid reason and after following existing termination procedures.

(b) A worker will not receive severance pay on termination.

(c) A worker is not required to give notice to terminate employment. However, a worker who wishes to resign should advise the employer in advance to allow the employer to find a replacement.

(d) A worker who is absent for more then three consecutive days without informing the employer of an intention to return to work will have terminated the contract. However, the worker may be re-engaged if a position becomes available for the balance of the 24-month period.

(e) A worker who does not attend required training events, without good reason, will have terminated the contract. However, the worker may be re-engaged if a position becomes available for the balance of the 24-month period.

SL 04.19 CERTIFICATE OF SERVICE

(a) On termination of employment, a worker is entitled to a certificate stating –

(i) the worker's full name;

(ii) the name and address of the employer;

(iii) the SPWP on which the worker worked,

(iv) the work performed by the worker;

(v) any training received by the worker as part of the SPWP;

(vi) the period for which the worker worked on the SPWP;

(vii) any other information agreed on by the employer and worker.

SL 05 EMPLOYER'S RESPONSIBILITIES

The employer shall adhere to the conditions of employment as stipulated in the *Code of Good Practice for Employment and Conditions of Work for Special Public Works Programmes*. Over and above the conditions stipulated above, he shall be responsible to:

(a) formulate and design a contract between himself/ herself and each of the recruited youth workers, ensuring that the contract does not contravene any of the Acts stipulated in South African Law, e.g. Basic Conditions of Employment Act, etc. (A copy of a pro-forma contract is attached at the end of this specification);

(b) ensure that the recruited youth workers are made available to receive basic life skills training which will be conducted and paid for by the appointed service provider;

(d) ensure that all youth workers receive instruction on safety on site prior to them commencing with work on site;

(e) ensure that all youth workers are covered under workmen's compensation for as long as they are contracted to the contractor. Payment to the Compensation Commissioner shall be the responsibility of the contractor;

(f) assist in the identification and assessment of potential youth workers to undergo advanced technical training in respective trades;

(g) test and implement strict quality control and to ensure that the health and safety regulations are adhered to;

(h) provide all youth workers with the necessary protective clothing as required by law for the specific trades that they are involved in;

(i) provide overall supervision and day-to-day management of youth workers and/or sub-contractors; and

(j) ensure that all youth workers are paid their wages on time through a pre-agreed payment method as stipulated in the contract with the youth worker.

SL 06 PLACEMENT OF RECRUITED YOUTH WORKERS

Employers will be contractually obliged to:

(a) employ youth workers from targeted social groups from the priority list provided by the Departmental National Youth Service (NYS) manager.

(b) facilitate on-the-job training and skills development programmes for the youth workers;

(c) achieve the following minimum employment targets:

(i) 100% people between the ages of 18 and 35

(ii) 60% women;

(iii) 2% people with disabilities.

(d) brief youth workers on the conditions of employment as specified in sub clause SL 04.09 above;

(e) enter into a contract with each youth worker, which contract will form part of the Employment Agreement;

(f) allow youth workers the opportunity to attend life skills training through DOL. This shall be arranged at the beginning of the contract;

(g) ensure that payments to youth workers are made as set out in sub clauses SL 04.14 and SL 04.15 above.

(h) set up of personal profile files as prescribed by the NYS Manager and as set out in sub clause SL 04.13 above.

(i) in addition to (h)
- a copy of the I.D;
- qualifications;
- career progress; e.g.
  - Status of technical improvement,
  - Willingness to work,
  - Leadership capabilities,
  - Discipline; and
  - Any other factors that can assist DPW-HR with the placement of the youth workers ant the end of the programme
- EPWP Employment Agreement, and
- list of small trade tools,

must be included in the youth worker's personal profile file.

SL 07 TRAINING OF YOUTH WORKERS

Three types of training are applicable, namely

- On the job training
- Technical Skills training

Training will be implemented by training institutions accredited CETA.

- Youth workers shall be employed on the projects for an average of 6 months.
- Youth workers shall be deployed on projects in the vicinity of their homes.

(a) On-the job training

The Employer shall provide youth workers with on-the-job training to enable them to fulfil their employment requirements. The employer shall also be expected to closely monitor the job performance of youth workers and shall identify potential youth workers for skills development programmes.

(b) Technical skills training

The Employer shall assist in identifying youth workers for further training. These youth workers will undergo further technical training to prepare them for opportunities as semi-skilled labourers.

Such training will comprise of an off-site theoretical component and practical training on-site. The contractor will be responsible for on-site practical work under his supervision. Youth workers who graduate from the first phase of the training programme will be identified and given opportunities to register for skills development programmes. These can ultimately result in an accredited qualification. The programme will consist of theoretical instruction away from the construction site as well as on-site practical work under the supervision of the employer. Candidates will be entitled to employment to complete all training modules.

SL 08 BENEFICIARY (YOUTH WORKERS) SELECTION CRITERIA

SL 08.01 PREAMBLE

The *Code of Good Practise for Employment and Conditions of Work for Special Public Works Programmes* encourages:

- optimal use of locally-based labour in a Special Public Works Programme (SPWP);

- a focus on targeted groups which consist of namely youth, consisting of women, female-headed households, disabled and households coping with HIV/AIDS; and
- the empowerment of individuals and communities engaged in a SPWP through the provision of training.

SL 08.02 <u>BENEFICIARY (YOUTH WORKERS) SELECTION CRITERIA</u>

(a) The youth workers of the programmes should preferably be non-working individuals from the most vulnerable sections of disadvantaged communities who do not receive any social security pension income. The local community must, through all structures available, be informed of and consulted about the establishment of any EPWP - NYS

(b) In order to spread the benefit as broadly as possible in the community, a maximum of one person per household should be employed, taking local circumstances into account.

(c) Skilled artisans from other areas may be employed if they have skills that are required for a project and there are not enough persons in the local communities who have those skills or who could undergo appropriate skills training. However, this should not result in more than 20% of persons working on a programme not being from local communities.

(d) Programmes should set participation targets for employment with respect to youth, single male- and female-headed households, women, people with disabilities, households coping with HIV/AIDS, people who have never worked, and those in long-term unemployment.

(e) The proposed targets as set out in sub clause SL 08 (c)

- 100% youth from 18 to 35 years of age;
- 60% women;
- 2% disabled.

SL 09 CONTRACTUAL OBLIGATIONS IN RELATION TO YOUTH LABOUR

The youth workers to be employed in the programme (EPWP-NYS) shall be directly contracted to the employer. Over and above the construction and project management

responsibilities, the employer will be expected to perform the tasks and responsibilities as set out in clause SL 05 above.

SL 10 PROVINCIAL RATES OF PAY

As per the Ministerial Determination from the Department if Labour and Employment, it is stipulated that youth workers on the EPWP-NYS receive a minimum of R2 618,00 per month whilst on training in ALL provinces.

SL 11 MEASUREMENTS AND PAYMENT

The number of youth workers specified for this contract that will receive orientation and technical training is 130

SL 11.01 **TECHNICAL TRAINING CONDUCTED OFF SITE**

SL 11.01.01 Skills development and technical training for youth workers for an average period of _50_ days per youth worker.....**R2 250 000.00**..... Unit: worker-days

SL 11.02 **EMPLOYMENT OF YOUTH WORKERS**

SL 11.02.01 Employment of youth workers.....**R3 927 000,00**.....Unit: Prov.Sum

The unit of measurement shall be the number of youth workers at the labour rate of R 2618-00 per month as the amount agreed by MINMEC multiplied by the period employed in months and the rate tendered shall include full compensation for all costs associated with the employment of youth workers and for complying with the conditions of contract. The cost for the training shall be excluded from this item. This item is based on 10-12 months appointment for youth workers.

SL 11.03 **PROVISION OF EPWP DESIGNED OVERALLS, HARD HATS TO YOUTH WORKERS AS WELL AS ONE PAIR OF SAFETY BOOTS.**

SL 11.03.01 Supply 1 x EPWP branded overalls and 1 x EPWP branded hard hat and 1 pair of safety boots to youth each youth worker

R150 000.....Unit: PC.Sum

Youth worker overalls should be orange (top and bottom) as per EPWP branding specification with the exception of Correctional Services contracts where the overalls should be blue (top and bottom). **A minimum of one set of overalls and 1 pair of safety boots per youth worker should be supplied.** Hard hats should be orange and branded as per the EPWP branding specification which shall be provided to the Contractor.

SL 11.03.02 Profit and attendance..... Unit: %

An amount has been provided in the Schedule of Quantities under sub item SL 11.03.01 for the supply of EPWP designed overalls and hard hat, as per the EPWP branding specification provided by the EPWP unit. The Service Provider will have sole authority to spend the amounts or part thereof. The tendered percentage under sub items SL 11.03.01 will be paid to the contractor on the value of each payment pertaining to the supply of overalls and hard hats to cover his expenses in this regard.

SL 11.04 **PROVISION OF SMALL TOOLBOX FOR YOUTH WORKERS**

SL 11.04.01 Provide all youth workers with prescribed tools for their respective trades. Specification for the mentioned tools to be provided by the NYS Manager to the Contractor. These toolboxes will become the property of the youth workers after the completion of the programme...
(allowed R 1500-00 / youth worker) .... **.R187 000.** . . . .Unit: PC.Sum

SL 11.04.02 Profit and attendance..... ..... Unit: %

SL 11.05.01 **Provision for medical fitness test for the learners before coming to site (allowed R650 / youth worker) .....R81 250.....**

SL 11.05.02 **Provision for the appointment and payment by the Contractor to a technically inclined Supervisor who is not in the current employ of the Contractor. The Supervisor will watch over the learners to ensure quality assurance, adequate exposure, logbook management and overall skills transfer for learners on site. The Supervisor will handle all admin related functions for the General Labour & NYS Learners on site such as attendance and payment registers, and leave management etc. The Interview of the candidates to be done together and in consultation with the Departmental EPWP NYS Manager.**

(allow R8 500 per month x 1 Supervisor x 16 months) .....R136 000.....

SL 11:05:02 Allow for the graduations of the learners from the Learnership Programme where each of the 130 youth worker is allowed to bring 2 family members, NDPWI and Project team staff, allow to include the cost of the venue, PA system and lunch.

(allow R33 800 For The Event @ R210 per person.....)

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

OCCUPATIONAL HEALTH AND SAFETY

FOR

CONSTRUCTION PROJECT:

CONSTRUCTION OF NEW MAGISTRATE OFFICE AT

JAN KEMPDOP DOJ

MANAGED ON BEHALF OF

THE DEPARTMENT OF PUBLIC WORKS

PRINCIPAL CONTRACTOR RECEIPT

Received by:

Name:

Signature: *Date:*

Capacity:

OHS MANAGEMENT: WENDY MBOLEKWA

CONTENTS

1. PREAMBLE

In terms of Construction Regulation 4(1)(a) of the Occupational Health and Safety Act, 1993 (Act 85 of 1993), and 5(1) construction regulation of 2014, the Department of Public Works, as the Client and/or its Agent on its behalf, shall be responsible to prepare Health & Safety Specifications for any intended construction project and provide any Principal Contractor who is making a bid or appointed to perform construction work for the Client and/or its Agent on its behalf with the same.

The Client's further duties are as described in The Act and the Regulations made there-under. The Principal Contractor shall be responsible for the Health & Safety Policy for the site in terms of Section 7 of the Act and in line with Construction Regulation 5 as well as the Health and Safety Plan for the project.

2. SCOPE OF HEALTH AND SAFETY SPECIFICATION DOCUMENT

These Specifications should be read in conjunction with the Act, the Construction Regulations and all other Regulations and Safety Standards which were or will be promulgated under the Act or incorporated into the Act and be in force or come into force during the effective duration of the project.
The stipulations in this specification, as well as those contained in all other documentation pertaining to the project, including contract documentation and technical specifications shall not be interpreted, in any way whatsoever, to countermand or nullify any stipulation of the Act, Regulations and Safety Standards which are promulgated under, or incorporated into the Act.

2.1 APPLICATIONS AND INTERPRETATION

This document is to be read and understood in conjunction with the following, inter- alia:

- *Occupational Health and Safety Act 85 of 1993 (OHS Act).*
- *All regulations published in terms of the OHS Act.*
- *Construction Regulations, 2014*
- *SABS codes referred to by the OHS Act.*
- *Contract Documents*
- *Basic Conditions of Employment Act (Act 75 of 1997)*
- *National Environmental Management Act 107 of 1998 and all Regulations*
- *Compensation for Occupational Injuries and Diseases (COID) Act No. 130 of 1993*

ABBREVIATIONS

- OHS : Occupational Health and Safety
- CEO : Chief Executive Officer
- CR : Construction Regulations
- HCS : Hazardous Chemical Substances
- MSDS : Material Safety Data Sheet
- AIA : Approved Inspection Authority
- HBA : Hazardous Biological Agents

- OEL : Occupational Exposure Limit
- CSIR : Council for Scientific and Industrial Research
- H&SS : Health and Safety Specification
- HS&EP : Health, Safety and Environmental Plan
- HS&EF : Health, Safety and Environmental File
- CHSO : Construction Health and Safety Officer

3. PURPOSE

The Department is obligated to implement measures to ensure the health and safety of all people and properties affected under its custodianship or contractual commitments, and is further obligated to monitor that these measures are structured and applied according to the requirements of these Health and Safety Specifications.

The purpose of this specification document is to provide the relevant Principal Contractor (and his /her sub-contractor) with any information other than the standard conditions pertaining to construction sites which might affect the health and safety of persons at work and the health and safety of persons in connection with the use of plant and machinery; and to protect persons other than persons at work against hazards to health and safety arising out of or in connection with the activities of persons at work during the carrying out of construction work for the Department of Public Works and Infrastructure. The Principal Contractor (and his /her sub-contractor) is to be briefed on the significant health and safety aspects of the project and to be provided with information and requirements.

4. DEFINITIONS

The following definitions from the Occupational Health and Safety Act are listed as follows:

"Chief Executive Officer"
In relation to a body corporate or an enterprise conducted by the State, means the person who is responsible for the overall management and control of the business of such body corporate or enterprise

"Danger"
Means anything that may cause injury or damage to persons or property.

"Employee"
Means, subject to the provisions of Subsection (2), any person who is employed by or works for any employer and who receives or is entitled to receive any remuneration or who works under the direction or supervision of an employer or any other person.

"Employer"
Means, subject to the provisions of Subsection (2), any person who employs or provides work for any person or remunerates that person or expressly or tacitly undertakes to remunerate him, but excludes a labour broker as defined in Section 1(1) of the Labour Relations Act, 1953 (Act No. 28 of 1956).

"Healthy"
Means free from illness or injury attributable to occupational causes.

Machinery
Means any article or combination of articles assembled, arranged or connected and which is used or intended to be used for converting any form of energy to performing work, or which is used or intended to be used, whether incidental thereto or not for developing, receiving, storing, containing, confining, transforming, transmitting, transferring or controlling any form of energy.

Plant
Includes fixtures, fittings, implements, equipment, tools and appliances, and anything which is used for any purpose in connection with such plant

Medical Surveillance
Means a planned programme of periodic examination (which may include clinical examinations, biological monitoring or medical tests) of employees by an occupational health practitioner or, in prescribed cases, by an occupational medicine practitioner. Plant includes fixtures, fittings, implements, equipment, tools and appliances, and anything which is used for any purpose in connection with such plant. Properly Used Means used with reasonable care, and with due regard to any information, instruction or advice supplied by the designer, manufacturer, importer, seller or supplier.

User
In relation to plant or machinery, means the person who uses plant or machinery for his own benefit or who has the right of control over the use of plant or machinery, but does not include a lessor of, or any person employed in connection with, the plant or machinery.

Reasonably Practicable
Means practicable having regards to: a) the severity and scope of the hazard or risk concerned, b) The state of knowledge reasonably available concerning that hazard or risk and of any means to remove or mitigate that hazard or risk. c) the availability and suitability of means to remove of mitigate that hazard or risk; and d) The cost of removing or mitigating that hazard or risk in relation to the benefits deriving there from.

"Risk"
Means the probability that injury or damage will occur

"Safe"
Means free from any hazard.

"Standard"
Means any provision occurring: a) in a specification, compulsory specification, code of practice or standard method as defined in Section 1 of the Standards Act, 1993 (Act No. 29 of 1993); OR b) in any specification, code or any other directive having standardization as its aim and issued by an institution or organization inside or outside the Republic which, whether generally or with respect to any particular article or matter and whether internationally or in any particular country or territory, seeks to promote standardisation.

The following definitions from the Construction Regulations are listed as follows:

"Agent" – means any person who acts as a representative for a Client;

"Client" – means any person for whom construction work is performed;

"**Construction Work**" is defined as any work in connection with --

(a) the erection, maintenance, alteration, renovation, repair, demolition or dismantling of or addition to a building or any similar structure;
(b) the installation, erection, dismantling or maintenance of a fixed plant where such work includes the risk of a person falling;
(c) the construction, maintenance, demolition or dismantling of any bridge, dam, canal, road, railway, runway, sewer or water reticulation system or any similar civil engineering structure; or
(d) the moving of earth, clearing of land, the making of an excavation, piling, or any similar type of work;

"**Health and Safety File**" – means a file, or other record in permanent form, containing the information required a contemplated in the regulations;

"**Health and Safety Plan**" – means a site, activity or project specific documented plan in accordance with the client's health and safety specification.

"**Health and Safety Specification**" – means a site, activity or project specific document prepared by the client pertaining to all health and safety requirements related to construction work;

"**Electrical Installation**" means any electrical installation as defined in regulation 1 of the Electrical Installation Regulations, published under Government Notice R 2270 of 11 October 1985;

"**Method Statement**" – means a document detailing the key activities to be performed in order to reduce as reasonably as practicable the hazards identified in any risk assessment;

"**Principal Contractor**" – means an employer, as defined in section 1 of the Act who performs construction work and is appointed by the Client to be in overall control and management of a part of or the whole of a construction site;

"**Risk Assessment**" – means a program to determine any risk associated with any hazard at a construction site, in order to identify the steps needed to be taken to remove, reduce or control such hazard.

"**Competent person**" – means any person having the knowledge, training, experience and qualifications specific to the work or task being performed: Provided that where appropriate qualifications and training are registered in terms of the provisions of the South African Qualifications Authority Act, 1995 (Act No. 58 of 1995), these qualifications and training shall be deemed to be the required qualifications and training.

5. OCCUPATIONAL HEALTH & SAFETY MANAGEMENT

5.1. *Overall Supervision and Responsibility for OH&S*

The Client and/or its Agent shall ensure that the Principal Contractor implements and maintains the agreed and approved H&S Plan. Failure on the part of the Client or Agent to comply with this requirement will not relieve the Principal Contractor from any one or more of his/her duties under the Act and Regulations.

5.2. *Further (Specific) Supervision Responsibilities for OH&S*

Several appointments or designations of responsible and /or competent people in specific areas of construction work are required by the Act and Regulations. The following competent

appointments, where applicable, in terms of the Construction Regulations and other Regulations shall be made to ensure compliance to the Act, Regulations and SANS Standards.

LEGAL DOCUMENTATION/APPOINTMENTS

The following documents must be provided in the Health and Safety Plan (H&SP):

- Health and Safety Policy signed by CEO or statement of commitment to SHE
- Letter of good standing with the Compensation Commissioner, Federated Employers or similar insurer.
- HSE Organogram (or table), outlining the HSE Team, as well as the appointment(s) they have under the Act and Regulations (reference to specific section/regulation applicable to appointment)
- The competency of each member of the HSE Team must be provided and should include knowledge, training, experience & qualifications specific to the appointment.

Signed copies of the following legal appointments must be provided in the Health, Safety and Environmental Plan:

APPOINTMENT	OHS-ACT / REGULATION REFERENCE
Section 16.2 appointment	Section 16.2
HSE Representative (if necessary)	Section 17(1)
Incident Investigator	GAR 9(2)
First Aiders	GSR 3(4)
Fire Fighters	ER 9 & CR 29
Risk Assessor	HCS Reg (Incl. Asbestos & Lead); CR 9

The following information must be provided in the H&SP:

- Indicate the estimated number of employees to be working on site.
- Indicate the expected number of sub-contractors to be appointed by the Principal Contractor.

The following competent persons, where applicable, shall be appointed in writing by the Principal Contractor, prior to any work being carried out, and shall adhere to the requirements of the specific sub-regulations.

The competency of each of these appointed competent persons must be provided and should include knowledge, training, experience & qualifications specific to the appointment.

APPOINTMENT	OHS-ACT / REGULATION REFERENCE
Construction Manager	CR 8 (1)
Assistant Construction Manager	CR 8 (2)
Construction H&S Officer where applicable	CR 8 (5)
Construction Supervisor	CR 8 (7)
Construction Assistant Supervisor	CR 8(8)
Risk assessor	CR 9(1)
Fall Protection Competent Person	CR 10 (1)
Temporary works competent person	CR12 (2)
Excavation Work Supervisor	CR 13 (1)(a)
Demolition Work	CR 14 (1)
Competent Person (Use of Explosives for Demolition Work)	CR14(11
Scaffolding Erector/ Team Leader/ Inspector	CR 16 (1)
Suspended platform Competent Person	CR 17(1)
Rope Access Work Competent Person	CR 18 (1) (a)
Material Hoist Competent Person	CR 19(8)(a)
Bulk Mixing Plant Competent Person	CR 20 (1)
Explosive Powered Tools Competent Person	CR 21(2)(b)
Construction Vehicle and Mobile Plant Competent Person	CR23 (1)(d)
Electrical Machinery Competent Person	CR 24 (c)
Stacking and Storage Supervisor	CR 28 (a)
Fire Equipment Inspector	CR 29(h)

Indicate in the H&SP, which of these listed appointments are applicable to the construction work in question (project specific).

No work involving any of the listed appointments may be performed without the knowledge and approval of an appointed competent person

5.3 Communication & Liaison

5.2.1 The Principal Contractor will communicate all health and safety concerns with the DPW Health and Safety Officer.

6. RESPONSIBILITIES

6.1 Client/Agent

6.1.2 The Client/Agent shall discuss and negotiate with the Principal Contractor the contents of the health and safety plan and when compliant, approve the plan.

6.2 Principal Contractor

6.2.1 The Principal Contractor shall accept the appointment under the terms and Conditions of Contract. The Principal Contractor shall sign and agree to those terms and conditions and shall, before commencing work, notify the Department of Labour of the intended construction. Annexure 2 of this construction regulation contains a "Notification of Construction Work" form. The Principal Contractor shall submit the notification in writing prior to commencement of work and inform the Client or his Agent accordingly.

6.2.2 The Principal Contractor shall ensure that he is fully conversant with the requirements of this Specification and all relevant health and safety legislation.

6.2.3 The Principal Contractor will in no manner or means be absolved from the responsibility to comply with all applicable sections of the Act, the Construction Regulations or any Regulations proclaimed under the Act or which may perceivable as applicable to this contract.

6.2.4 The Principal Contractor shall provide and demonstrate to the Client a suitable and sufficiently documented health and safety plan based on this Specification, the Act and the Construction Regulations, which shall be applied from the date of commencement of and for the duration of execution of the works. This plan shall, as appendices, include the health and safety plans of all Sub-contractors for which he has to take responsibility in terms of this contract.

6.2.5 The Principal Contractor shall provice proof of his registration and good standing with the Compensation Fund or with a licensed compensation insurer prior to commencement with the works

6.2.6 The Potential Principal Contractor shall, in submitting his tender, demonstrate that he has made provision for the cost of compliance with the specified health and safety requirements, the Act and Construction Regulations. (Note: This shall have to be contained in the conditions of tender upon which a tenderer's offer is based.)

6.2.7 The Principal Contractor shall consistently demonstrate his competence and the adequacy of his resources to perform the duties imposed on the Principal Contractor in terms of this Specification, the Act and the Construction Regulations

6.2.8 The Principal Contractor shall ensure that a copy of his health and safety plan is available on site and is presented upon request to the Client, an Inspector, Employee or Sub-contractor.

6.2.9 The Principal Contractor shall ensure that a health and safety file, which shall include all documentation required in terms of the provisions of this Specification, the Act and the Construction Regulations, is opened and kept on site and made available to the Client or Inspector upon request. Upon completion of the works, the Principal Contractor shall hand over a consolidated health and safety file to the Client.

6.2.10 The Principal Contractor shall, throughout execution of the contract, ensure that all conditions imposed on his Sub-contractors in terms of the Act and the Construction Regulations are complied with as if they were the Principal Contractor.

6.2.11 The Principal Contractor shall from time to time evaluate the relevance of the Health and Safety Plan and revise the same as required, following which revised plan shall be submitted to the Client and/or his/her Agent for approval.

6.2.12 A letter of good standing in terms of COIDA (Compensation Commissioner) must be submitted to DPW.

7. SCOPE OF WORK

Construction of the new magistrate office. These specifications are applicable to the specific scope of work pertaining to the above-mentioned project as detailed in the tender documents.

8. HEALTH AND SAFETY FILE

a) The Principal Contractor must, in terms of Construction Regulation 7(7), keep a Health & Safety File on site at all times that must include all documentation required in terms of the Act and Regulations and must also include a list of all Contractors on site that are accountable to the Principal Contractor and the agreements between the parties and details of work being done. A more detailed list of documents and other legal requirements that must be kept in the Health and

b) The Health and Safety File will remain the property of the Client and/or its Agent on its behalf throughout the period of the project and shall be consolidated and handed over to the Client and/or its Agent on its behalf at the time of completion of the project

9. RISK ASSESSMENTS

In terms of Construction Regulations 5 the Client will prepare a baseline risk assessment for the construction work project. The Principal Contractor shall, before commencement of any construction work and during the construction work, have risk assessments performed by a competent person appointed in writing, which risk assessments form part of the health and safety plan to be applied on site, and must include –

(a) the identification of the risks and hazards to which persons may be exposed to;
(b) the analysis and evaluation of the risks and hazards identified;
(c) a documented plan of safe work procedures to mitigate, reduce or control the risks and hazards that have been identified,
(b) a monitoring plan; and
(c) a review plan.

The following hazards are identified:

- Drilling (Breaking of walls)

- Formwork and support work

- Scaffolding

- Construction vehicles and mobile equipment

- Electrical installations and electrical machinery

- Housekeeping

- Stacking and storage practices

- Fire risks and fire precautions

- Use of jackhammers

- Hot work (steel cutting and welding)

- Portable electrical tools

- Intoxicated persons on site

- Use of ladders

- Impact of construction work upon occupants of buildings not evacuated for the duration of the work

- Working at height (fall protection)

- Noise

- Potential presence of asbestos that forms part of the structure (cement fibre)

- Dust

Site Specific risk assessment of the above must be submitted to DPW before commencement of work.

10. HEALTH AND SAFETY POLICY

Each contractor to submit a suitable documented Health and Safety Policy as required by Section 7 of the OHS Act.

11. IDENTIFICATION OF HAZARDS AND DEVELOPMENT OF RISK ASSESSMENTS, STANDARD WORKING PROCEDURES (SWP) AND METHOD STATEMENTS

The Principal Contractor is required to develop Risk Assessments, Standard Working Procedures (SWP) and Method Statements for each activity executed in the contract or project

The identification of hazards is over and above the hazards identification programme and those hazards identified during the drafting of the Health and Safety Plan.

12. ARRANGEMENTS FOR MONITORING AND REVIEW

12.1 Monthly Audit by Client and/or its Agent on its behalf

The Client and/or its Agent on its behalf will be conducting Periodic Audits at times agreed with the Principal Contractor Audit to comply with Construction Regulation 4(1)(d) to ensure that the principal Contractor has implemented, is adhering to and is maintaining the agreed and approved OHS&S Plan.

12.3 Reports

a) The Principal Contractor shall report all incidents where an employee is injured on duty to the extent that he/she:

i. dies
ii. becomes unconscious
iii. loses a limb or part of a limb
iv. is injured or becomes ill to such a degree that he/she is likely either to die or to suffer a permanent physical defect or likely to be unable for a period of at least 14 days either to work or continue with the activity for which he/she was usually employed

OR where:

i. a major incident occurred
ii. the health or safety of any person was endangered
iii. where a dangerous substance was spilled
iv. the uncontrolled release of any substance under pressure took place
v. machinery or any part of machinery fractured or failed resulting in flying, falling or uncontrolled moving objects
vi. machinery ran out of control, to the Provincial Director of the Department of Labour within seven days and at the same time to the Client and/or its Agent on its behalf.

b) The Principal Contractor is required to provide the Client and/or its Agent on its behalf with copies of all statutory reports required in terms of the Act and the Regulations.

c) The Principal Contractor is required to provide the Client and/or its Agent on its behalf with a monthly "SHE Risk Management Report".

d) The Principal Contractor is required to provide a.s.a.p. the Client and/or its Agent on its behalf with copies of all internal and external accident/incident investigation reports.

12.4 Review

The Principal Contractor is to review the Hazard Identification, Risk Assessments and Standard Work Processes at each Production Planning and Progress Report meeting as the construction work develops and progresses and each time changes are made to the designs, plans and construction methods and processes.

The Principal Contractor must provide the Client and/or its Agent on its behalf, other Contractors and all other concerned parties with copies of any changes, alterations or amendments as contemplated in the above paragraph.

12.5 Site Rules and other Restrictions

a) *Site OH&S Rules*

The Principal Contractor must develop a set of site-specific OH&S rules that will be applied to regulate the Health and Safety Plan and associated aspects of the construction. When required for a site by law, visitors and non-employees upon entering the site shall be issued with the proper Personal Protective Equipment (PPE) as and when necessary.

b) *Security Arrangements*

The Principal Contractor must establish site access rules and implement and maintain these throughout the construction period.

12.6 Training

a) *General Induction Training*

All employees of the Principal and other Contractors must be in possession of proof of General Induction training

b) *Other Training*

All operators, drivers and users of construction vehicles, mobile plant and other equipment must be in possession of valid proof of training.

12.7 Accident and Incident Investigation

The Principal Contractor is responsible to oversee the investigation of all accidents/incidents where employees and non-employees were injured to the extent that he/she/they had to receive first aid or be referred for medical treatment by a doctor, hospital or clinic. (General Administrative Regulation 9)

The Principal Contractor is responsible for the investigation of all non-injury incidents as described in Section 24 (1) (b) & (c) of the Act and keeping a record of the results of such investigations including the steps taken to prevent similar incidents in future.

Notwithstanding the requirements of Section 24 of the Act, ALL incidents shall be investigated and reported on in writing, irrespective of whether such incident gave rise to injury or damage.

13 OUTLINED DATA, REFERENCES AND INFORMATION ON CERTAIN AND/OR SPECIFIC OBLIGATORY REQUIREMENTS TO ENSURE COMPLIANCE

OHS Act Section/ Regulation	Subject	Requirements
Construction. Regulation	**Notice of carrying out Construction work**	• Department of Labour notified • Copy of Notice available on Site
General Admin. Regulation 4	**Copy of OH&S Act (Act 85 of 1993)**	• Updated copy of Act & Regulations on site • Readily available for perusal by employees.
COID Act Section 80	**Registration with Compens. Insurer**	• Written proof of registration/Letter of good standing available on Site
Construction. Regulation 4 & 5(1)	**H&S Specification & Programme**	• H&S Spec received from Client and/or its Agent on its behalf • OH&S programme developed & Updated regularly
Section 8(2)(d) Construction. Regulation	**Hazard Identification & Risk Assessment**	• Hazard Identification carried out/Recorded • Risk Assessment and – Plan drawn up/Updated • RA Plan available on Site • Employees/Sub-Contractors informed/trained
Section 16(2)	**Assigned duties (Managers)**	• Responsibility of complying with the OH&S Act assigned to other person/s by CEO.
Section 37(1) & (2)	**Agreement with Mandatories/ (Sub-)Contractors**	• Written agreement with (Sub-)Contractors • List of Subcontractors displayed. • Proof of Registration with Compensation Insurer/Letter of Good Standing
Section 24 & General Admin. Regulation 8 COID Act Sect.38, 39 & 41	**Reporting of Incidents (Dept. of Labour)**	• Incident Reporting Procedure displayed. • All incidents in terms of Sect. 24 reported to the Provincial Director. Department of Labour, within 3 days. (Annexure 1 ;WCL 1 or 2) and to the Client and/or its Agent on its behalf • Cases of Occupational Disease Reported • Copies of Reports available on Site • Record of First Aid injuries kept

General Admin. Regulation 9	**Investigation and Recording of Incidents**	• All injuries which resulted in the person receiving medical treatment other than first aid, recorded and investigated by Investigator designated in writing. • Copies of Reports (Annexure 1) available on Site • Tabled at H&S Committee meeting • Action taken by Site Management.
Construction. Regulation Driven Machinery Regulations 18 & 19	**Cranes & Lifting Machines Equipment**	• Competent person appointed in writing to inspect Cranes. Lifting Machines & Equipment • Written Proof of Competence of above appointee available on Site. • Cranes & Lifting tackle identified/numbered • Register kept for Lifting Tackle • Log Book kept for each individual Crane • Inspection: - All cranes - **daily by operator** - Tower Crane/s - **after erection/6monthly** - Other cranes - **annually by comp. person** • - Lifting tackle(slings/ropes/chain slings etc.) - daily or before every new application
General Safety Regulation 3	**First Aid**	• Every workplace provided with sufficient number of First Aid boxes. (Required where 5 persons or more are employed) • First Aid freely available • Equipment as per the list in the OH&S Act. • One qualified First Aider appointed for every 50 employees. (Required where more than 10 persons are employed) • List of First Aid Officials and Certificates • Name of person/s in charge of First Aid box/es displayed. • Location of First Aid box/es clearly indicated. • Signs instructing employees to report all • Injuries/illness including first aid injuries
General Safety Regulation 2	**Personal Safety Equipment (PSE)**	• PSE Risk Assessment carried out • Items of PSE prescribed/use enforced

		• Records of Issue kept • Undertaking by Employee to use/wear PSE • PSE remain property of Employer, not to be removed from premises GSR 2(4)
General Safety Regulation 13A	**Inspection of Ladders**	• Competent person appointed in writing to Inspect Ladders • Ladders inspected at arrival on site and weekly there after. Inspections register kept • Application of the types of ladders (wooden, aluminium etc.' regulated by training and inspections and noted in register
Asbestos Regulations 5	**Information and training**	• Ensure that employees are adequately informed and trained on both practical aspects and theoretical knowledge
Asbestos Regulations 17	**Personal Protective equipment (PPE)**	• Ensuring suitable PPE, storing of PPE, disposal of such PPE and that persons exposure is adequately controlled.
Asbestos Regulations 20	**Disposal of asbestos**	• Safe disposal and handling of asbestos or asbestos containing material.

14. LOCKOUT PROCEDURE

Contractors undertaking maintenance and repair work must submit a suitably documented lockout/tag-out procedure to be approved before work commences.

15. HOUSEKEEPING

Good housekeeping will be maintained at all times as per Construction Regulation No. 25. Poor housekeeping contributes to three major problems, namely, costly or increased accidents, fire or fire hazards and reduction in production. Good housekeeping will enhance production time.

In promotion of environmental control all waste, rubble, scrap etc, will be disposed of at a registered dump site and records will be maintained. Where it is found to be impractical to use a registered dump site or it is not available, the Principal Contractor will ensure that the matter is brought to record with the client or his representative, after which suitable, acceptable alternatives will be sought and applied.

Dross and refuse from metals, and waste matters or by-products whose nature is such that they are poisonous or capable of fermentation, putrefaction or constituting a nuisance shall be treated or disposed of by methods approved of by an inspector.

NOTE: No employer (Principal Contractor) shall require or permit any person to work at night or after hours unless there is adequate, suitable artificial lighting including support services in respect of Health and Safety.

16. ELECTRICAL EMERGENCY RESPONSE PROCEDURE

Contractors undertaking electrical maintenance and repair work must submit a suitably documented Electrical Emergency Response Procedure to be approved before work commences.

17. Compliance to COVID Directives

The contractor should comply with Directives of Dept. of Health and Dept Of Labour and Employment.

10.1 Induction wrt COVID-19 is mandatory.
10.2 Specific COVID 19 PPE is mandatory

CONTRACT PARTICIPATION GOALS AND CIDB BUILD PROGRAMME IMPLEMENTATION GUIDE

1 SEPTEMBER 2023

NDPWI CONTRACT PARTICIPATION GOALS AND CIDB BUILD PROGRAMME IMPLEMENTATION GUIDE

1. PURPOSE

The purpose of this Contract Participation Goal (CPG) guideline is to provide guidance on the implementation of the CPGs which forms part of the Economic Reconstruction and Recovery Plan which also includes the cidb BUILD Programme that entails Enterprise Development and Skills Development through infrastructure and construction projects.

2. INTRODUCTION

The applicable cidb Standards establishes uniformity and standardisation of implementing CPGs and the cidb BUILD programme on construction and engineering works.

A separate CPG section for the Bill of Quantities was created to include all CPGs and the cidb BUILD programme for the following reasons (Document available @ www.publicworks.goc.za/consultantsdocs.html under Forms and Documents / Consultant's Guidelines / **Item 3 Quantity Surveyors**/):

- The implementation of CPGs should not give any bidder a competitive advantage. Borderline value thresholds can be manipulated by tenderers electing to tender just below the CPG value threshold requirement thereby creating a competitive advantage in not pricing for CPG;
- Bidders can determine the project estimate cost of the project through reverse calculations;
- Provisional amounts to be provided for in the Bills of Quantities, which is adjusted once enterprises and individual beneficiaries have been identified and associated cost have been determined;
- Different methods of calculating CPG values in terms of the definition used for "Contract Amount" in the respective cidb Standards; and
- Ease of extracting CPG reports and associated costs as well as contributions in the form of one overall report and/or individual CPGs.

Targeted enterprises or beneficiaries of any CPG may not participate or form part of more than one CPG.

All CPGs are Conditions of Contract, i.e. the tender does not need to submit any proof of CPG participation at the time of tender.

Sanctions (penalties) are applicable to all CPGs where the contractor fails to achieve the minimum specified requirements, unless the contractor can prove to the Employer's satisfaction that the non-achievement was beyond his/her control. The minimum percentage sanctions currently indicated in the tender documents are recommended by the cidb and can be adjusted to be project specific. All sanctions to be fair and reasonable and exclude VAT. Note that minimum percentage sanctions applicable to the cidb BUILD Programme elements is 30%.

The minimum required specifications and pricing instructions have been included in the Scope of Works (PG01.1 for GCC Contracts or PG01.2 for JBCC Contracts) and the Pricing Assumption documents (PG02.1 for GCC Contracts or PG02.2 for JBCC Contracts) respectively.

Normative reference documents:

- SANS 10845-5:2015 ISO 10845-5:2011, Construction procurement – Part 5: Participation of targeted enterprises in contracts, South African Bureau of Standards.
- SANS 10845-8:2015 ISO 10845-8:2011, Construction procurement – Part 8: Participation of targeted labour in contracts, South African Bureau of Standards.se

Even though minimum project requirements are prescribed by the cidb, CPGs may be implemented on any project where feasible, irrespective of the cidb prescribed project value, categories and construction period.

In calculating the respective CPGs, allowances and VAT are excluded from the Tender Amount at the time of award.

Allowances include the following:

- Provisional amounts (Contractor and Consultants)
- CPG allowances (Contractor and Consultants)
- Nominated and/or selected subcontractors (Contractor)
- Other expenses included in consultant pricing activity schedule (Consultants)
- Contract price adjustment (Not provided for within the B of C by NDPWI)
- Contingency amounts (Not provided for within the B of Q by NDPWI)

Note: CPG values in the CPG Bill of Quantities Section will be recalculated based on the awarded "Tender Amount" excluding provisional amounts, allowances and VAT, i.e. the Contract Amount as defined by the cidb Standards. No penalties will be applied should the CPG value based on the original "Contract Amount", has been achieved. The CPG values do not increase in the event of any expansion to the construction cost after award by way of variation orders, remeasurements or escalation applicable to the project

The main contractor shall submit monthly reports in terms of CPGs achievement and accumulative targets achieved inclusive audited supporting documentation to the Employer's Representative. The final CPG reconciliation will form part of the final account, clearly indicating the CPG targets, CPGs achieved and penalties applied if applicable

3. FEASIBILITY STUDY

The project must be introduced to the local community well in advance before going out on tender (at least 12 months) if possible upon which a feasibility study must be conducted to determine both the viability and extent of implementing the respective CPGs. A Social Facilitator to be appointed to assist in this regard either as a disbursement to the Principal Agent or a direct appointment.

Liaise with:

Community leaders	Department of labour
Business forums	Emerging contractor development forums
Any other Civic organisations / forums	

Refer to the cidb Standard for Targeting Enterprises and Labour through Construction Works Contracts as published in the Government Gazette Notice No. 41237 of 10 November 2017 for:

- Appendix A: Guidelines for Undertaking a Feasibility Study for Specifying CPGs

3.1 Establish a Community Project Support Committee

The objectives of this Memorandum of Understanding (MOU) Agreement are to establish and enter into an agreement with the Community Project Support Committee, representing the affected communities on the following aspects:

- Targeting strategies and contract participation goals to be implemented on the project;
- Establish minimum requirements of beneficiaries for subcontracting, NYS and skills development.
- Establish respective roles and responsibilities of:
  - NDPWI
  - Community Project Support Committee
  - Community Liaison Officer (CLO)
  - Consultants
    Contractor
- Deliverables and Timeframes
- Mediation for the resolution of community matters affecting the performance of the construction works contract;
- Enter into a written agreement

Refer to the cidb Standard for Targeting Enterprises and Labour through Construction Works Contracts as published in the Government Gazette Notice No. 41237 of 10 November 2017 for:

- Appendix B: Guidelines for Community Engagement.

4. CONTRACT PARTICIPATION GOALS

4.1 Targeted Local Material Manufacturers CPG

A targeted local manufacturer is a targeted enterprise that operates or maintains a factory or establishment that produces on its premises materials or goods required by the principal contractor for the performance of the contract.

This CPG is a **Condition of Contract** therefore it is not a requirement to submit substantiating documentation with the tender other than pricing the item in the CPG section of the Bills of Quantities.

The main contractor shall submit monthly reports in terms of CPG monthly achievement and accumulative targets achieved including audited supporting documentation to the Employer's Representative.

4.1.1. Applicable standards and implementation documents

- The cidb Standard for Targeting Enterprises and Labour through Construction Works Contracts as published in the Government Gazette Notice No. 41237 of 10 November 2017, and
- cidb Best Practice Project Assessment Scheme Notice No. 43726 of 18 September 2020

4.2.2 Minimum Requirements

- Grade 7GB / 7EC and higher (project value above R20 000 000),
- Minimum construction period 6 months,
- Selected materials subject to Local Content requirements as published by TDI&C from time to time:
- Material to meet SABS / SANS requirements;
- Material to meet minimum specified requirements; and
- Must be economically viable in terms of price and be aware of price fixing and / or cover quoting.

4.2.3 Penalties

The percentage penalty applicable to be **indicated** in the Scope of Works (PG01.1 for GCC Contracts or PG01.2 for JBCC Contracts) and is applied to the prorate targeted value of material not achieved with (Excluding VAT). **The percentage penalty is project specific to a maximum of 30% and should be fair and reasonable.**

4.2.4 CPG Calculation

- Feasibility study to indicate achievable CPG and specified in the Scope of Works (PG01.1 for GCC Contracts or PG01.2 for JBCC Contracts).
- CPG is Expressed as a percentage of the 'Contract Amount' = Tender amount at the time of award excluding allowances and VAT.
- Feasibility study established compliant material manufacturers.

The PQS determines value of material obtainable from compliant local material manufacturers expressed as a percentage of Contract Amount (Pre-tender estimate excluding allowances and VAT / Tender amount excluding allowances and VAT). The actual CPG to be achieved will be based on the Tender amount of the awarded bid, excluding allowances and VAT.

CPG calculation example:
"Tender Amount" = R150 Mil all inclusive of allowances and VAT
"Contract Amount" = R130 Mil (Tender Amount at the time of award excluding allowances and VAT)
CPG to be achieved = 5% as specified in the Scope of Works (PG01.1 for GCC Contracts or PG01.2 for JBCC Contracts)
CPG target value = R130 Mil x 5% = R 6,5 Mil (Value of material to be purchased from local manufacturers, excluding VAT)

Calculation of penalty:
Percentage penalty applicable = 10% as specified in the Scope of Works (PG01.1 for GCC Contracts or PG01.2 for JBCC Contracts)
CPG target value = R6,5 Mil excluding VAT
CPG Achieved = R5,5 Mil (R1 Mil shortfall) excluding VAT

Penalty = R1 Mil x 10% = R100 000 excluding VAT

4.2. Targeted Local Building Material Suppliers CPG

A targeted local supplier is a targeted enterprise which:

- owns, operates or maintains a store, warehouse or other establishment in which goods are bought, kept in stock and regularly sold to wholesalers, retailers or the public in the usual course of business; and
- engages as its principal business and in its own name, in the purchase and sale of goods.

This CPG is a **Condition of Contract** therefore it is not a requirement to submit substantiating documentation with the tender other than pricing the item in the CPG section of the Bills of Quantities.

The main contractor shall submit monthly reports in terms of CPG monthly achievement and accumulative targets achieved including audited supporting documentation to the Employer's Representative.

4.2.1. Applicable standards and implementation documents

- The cidb Standard for Targeting Enterprises and Labour through Construction Works Contracts as published in the Government Gazette Notice No. 41237 of 10 November 2017; and
- cidb Best Practice Project Assessment Scheme Notice No. 43726 of 18 September 2020

4.2.2 Minimum Requirements

- Grade 7GB / 7EC and higher (above R20 000 000);
- Minimum construction period 6 months;
- Selected materials subject to Local Content requirements as published by TDI&C from time to time;
- Material to meet SABS / SANS requirements;
- Material to meet minimum specified requirements; and
- Must be economically viable in terms of price and be aware of price fixing and / or cover quoting.

4.2.3 Penalties

The percentage penalty applicable to be **indicated** in the Scope of Works (PG01.1 or PG01.2) and is applied to the prorata targeted value of material not achieved with (Excluding VAT). **The percentage penalty is project specific to a maximum of 30% and should be fair and reasonable.**

4.2.4. CPG Calculation

- Feasibility study to indicate achievable CPG and specified in Scope of Works (PG01.1 for GCC Contracts or PG01.2 for JBCC Contracts);
- CPG is Expressed as a percentage of the "Contract Amount" = Tender amount at the time of award <u>excluding allowances and VAT.</u>
- Feasibility study established compliant material suppliers.

The PQS determines value of material obtainable from compliant local material suppliers, expressed as a percentage of Contract Amount (Pre-tender estimate excluding allowances and VAT or the Tender amount excluding allowances and VAT). The actual CPG to be achieved will be recalculated based on the Tender amount of the awarded bid, excluding allowances and VAT.

<u>CPG calculation example.</u>

"Tender Amount" = R150 Mil all inclusive of allowances and VAT

"Contract Amount" = R130 Mil (Tender Amount at the time of award excluding allowances and VAT)

CPG to be achieved = 5% as specified in the Scope of Works (PG01.1 for GCC Contracts or PG01.2 for JBCC Contracts)

CPG target value = R130 Mil x 5% = R 6.5 Mil (Value of material to be purchased from local suppliers, excluding VAT).

<u>Calculation of penalty:</u>

Percentage penalty applicable = 20% as specified in the Scope of Works (PG01.1 for GCC Contracts or PG01.2 for JBCC Contracts)

CPG large value – R6.5 Mil excluding VAT
CPG Achieved – R5,5 Mil (R1 Mil shortfall) excluding VAT
Penalty = R1 Mil x 20% = R200 000 excluding VAT.

4.3. Targeted Local Labour Skills Development CPG

Targeted labour are individuals who:

a) are employed by the principal contractor, sub-contractor or targeted enterprises in the performance of the contract;
b) are defined as the target group in the Scope of Works (PG01.1 for GCC Contracts or PG01.2 for JBCC Contracts); and
c) permanently reside in the target area or who are recognized as being residents of the target area on the basis of identification and association with and recognition by the residents of the target area

Targeting of local labour by skills categories is only permissible within categories of semi-skilled and unskilled labour.

Contract participation goals for semi-skilled and unskilled labour shall be limited to on-the-job training to targeted labour to enable such labour to master the basic work techniques required to undertake the work in accordance with the requirements of the contract and in a manner that does not compromise worker health and safety. Training can either be provided by an appointed suitably qualified training service provider or a foreman or artisan employed by the main contractor.

This CPG is a **Condition of Contract** therefore it is not a requirement to submit substantiating documentation with the tender other than pricing the item in the CPG section of the Bills of Quantities.

The contractor to submit monthly reports on training provided to include beneficiary particulars, type of training provided and the number of man hours converted to working days.

4.3.1. Applicable standards and implementation documents

- The cidb Standard for Targeting Enterprises and Labour through Construction Works Contracts as published in the Government Gazette Notice No. 41237 of 10 November 2017, and
- cidb Best Practice Project Assessment Scheme Notice No. 43726 of 18 September 2020

4.3.2. Minimum Requirements

- Grade 7GB / 7EC and higher (above R20 000 000)
- Minimum construction period 12 months
- Only semi-skilled and unskilled labour.
- Subject to the nature of the work.

4.3.3 Penalties

Failure to achieve the minimum Targeted Local Labour Skills Development CPC will result in a payment reduction of an amount specified in the Scope of Works (PG01.1 or PG01.2) per working day where training was not provided.

4.3.4 CPG Calculation

- Feasibility study to indicate achievable CPG and specified in the Scope of Works (PG01.1 for GCC Contracts or PG01.2 for JBCC Contracts).
- Expressed as a percentage of the "Contract amount" = Tender amount at the time of award excluding allowances and VAT.

The cidb standard provides 2 calculation methods.

Method 1

Converting the total monetary value of wages and allowances paid to targeted labour, exclusive of any value added tax or sales tax required by law, to a percentage of the applicable contract amount and multiplying such values by the appropriate

weightings for the different target groups, if any, as identified in the feasibility study and targeting strategy; or

Method 2
Converting the amount (number) equal to the person days worked for which the principal contractor, sub-contractors or targeted enterprises contract to engage targeted labour expressed as a percentage of the total person days worked associated with the targeting strategy that is identified in the feasibility study and defined in the Scope of Works (PG01.1 for GCC Contracts or PG01.2 for JBCC Contracts).

Method 2 should be used for ease of calculation and standardisation. The POPI Act also makes it very difficult to obtain all the personal information, especially from subcontractors and SMME subcontractors.

The number of working days allocated to local labour skills development will be derived from the feasibility study based on the nature of the work, the contract period and local labour available.

The PQS to determine the number of CPG % expressed as a percentage of the total number working days required to complete the Works.

The labour intensity outputs per person per day for the respective trades as per the EPWP LABOUR INTENSITY OUTPUTS PER PERSON PER DAY FOR BUILDING WORKS could be used as a guide in determining the number of working days applicable to the beneficiaries.

A suitably qualified and experienced training service provider to be appointed by the main contractor.

CPG calculation example:
"Tender Amount" = R150 Mil all inclusive of allowances and VAT
"Contract amount" = R130 Mil (Tender Amount at the time of award excluding allowances and VAT)
Number of working days required to complete the Works based on the construction period = 600 days
CPG percentage participation to be achieved = 30% as specified in the Scope of Works (PG01.1 for GCC Contracts or PG01.2 for JBCC Contracts)
Required number of working days training to be provided = 180 days (600 x 30%)

Calculation of penalty:
Payment reduction = R 5 000 per day for not providing training as specified in the Scope of Works (PG01.1 for GCC Contracts or PG01.2 for JBCC Contracts)
CPG = 600 x 30% = 180 working days training to be provided
CPG Achieved = 160 days (20 days shortfall where no training was provided)
Penalty = 20 days x R5 000 payment reduction per day= R100 000 excluding VAT

4.4 Cidb BUILD Programme: Enterprise Development (Principal contractor including subcontractors)

The aim is to promote enterprise development by providing for a **minimum** contract participation goal (CPG) of **five percent (5%)** of the **contract amount** as defined in the Standard (Tender amount, excluding allowances and VAT) on selected contracts to be undertaken by joint-venture partners or to be subcontracted to developing contractors that are also to be beneficiaries of enterprise development support from the main contractor. A **minimum 5% CPG is applicable to projects with a tender amount above R20 000 000**. The contract participation goal for projects above R30 Million (Tender Value) to be 30% depending on the nature of the works, the extent of specialised work and available suitably qualified and experienced compliant prospective sub-contractors. The participation goals may therefore vary between 5% and 30% on projects above R30 Million. Note that the 30% threshold is subject to a specific directive yet to be issued in this regard at the time of compilation of this implementation guide, although it is advisable to apply to avoid disruptions on site). **The training to be provided to the SMME business owners which is limited to one beneficiary per business.**

This CPG is a **Condition of Contract** therefore it is not a requirement to submit substantiating documentation with the tender other than pricing the item in the CPG section of the Bills of Quantities.

It is ***applicable to contracts in Grades 7 to 9 General Building and Civil Engineering contracts and can be adopted to other CIDB Classes of Works*** at the discretion of the end users/Construction Management Branch.

A targeted enterprise is an enterprise which:

a) Is a contractor registered with the cidb acting in the capacity of a subcontractor or JV partner; and
b) The contractor does not have an equity holding exceeding 20% in the enterprise, either directly or through a flow through calculation in accordance with the Construction Sector Code of Good Practice published in General Notice 862 of 2009 in Government Gazette No 32305 of 2009 in terms of BBBEE Act of 2003) (Act 53 of 2003); and
c) Employs at least three permanent employees other than the owner; and
d) Be registered in terms of the Company's Act of 2008 (Act No. 71 of 2008) or Close Corporation Act of 1984 (Act No. 69 of 1984), and
e) is 50% or more black owned or 30% or more black women owned, and
f) Has entered into a written relationship agreement of co-operation and assistance with the developed enterprise (main contractor) for the duration of the contract.

Where 30% black woman owned is an enterprise in which black people who are women:

a) Hold more than 30% of the voting rights that are not subject to any limitation, and
b) Hold more than 30% of the economic interest

The criteria for The Standard for Indirect Targeting and the Skills Standard is as follows:

There must be a needs analysis for indirect targeting and development or skill standard and should be development in at least any two developmental areas namely;

a) Management and labour skills transfer,
b) Establishment of Administrative systems
c) Establishment of Cost Control systems
d) Establishment of construction management systems and plans (health and safety, quality and environmental)
e) Planning, tendering and programming skills transfer
f) Business skills transfer with emphasis on entrepreneurial and negotiation skills
g) Technical skills transfer with emphasis on innovation
h) Legal compliance
i) Establishing financial loan capacity / Credit rating/history
j) Contractual knowledge

The above needs analysis shall be mutually agreed upon between the contractor and the targeted enterprise. However, it is advisable to provide the same training to all the SMMEs

The main contractor shall submit monthly reports in terms of CPG monthly achievement and accumulative targets achieved including audited supporting documentation to the Employer's Representative.

Training requirements

The main contractor must develop a training plan to address the developmental needs of the Targeted Enterprise. As a guide the development plan should refer to applicable unit standards that reside in NQF level 3 National Certificate: Supervision of Construction Process qualification or equivalent. Contractual knowledge development and planning, tendering and programming skills transfer must be pitched at NQF 3 level and aligned to the outcomes of the applicable unit standard.

The contractor shall appoint an enterprise development coordinator to:

a) develop a project specific enterprise development plan; and
b) submit to the employer's representative a monthly enterprise development report

To assist the contractor to comply with contractor development, the contractor is guided by the cidb **Competence Standard for Contractors, Government Gazette No. 41237, 10 November 2017**, which outlines the minimum recognised qualifications to which development of Targeted Enterprises must be undertaken by the main contractor. Note that development will not necessarily translate into an accredited outcome.

4.4.1 Applicable standards and implementation documents

- Minimum Targeted Enterprise Development Contract Participation Goal in accordance with the cidb Standard for Indirect Targeting for Enterprise Development through Construction Works Contracts, No 36190 Government Gazette, 25 February 2013; and
- cidb Best Practice Project Assessment Scheme Notice No 43726 of 18 September 2020

read in conjunction with:

- The cidb Standard for Targeting Enterprises and Labour through Construction Works Contracts as published in the Government Gazette Notice No. 41237 of 10 November 2017, and
- SANS 10845-5:2015 ISO 10845-5:2011, Construction procurement – Part 5: Participation of targeted enterprises in contracts, South African Bureau of Standards.

4.4.2 Minimum requirements

- Grade 7GB / 7 EP or higher
- In the case of a JV at least one of the JV partners must be 7GB / 7CE or higher.
- Minimum construction period 6 months
- **Minimum 5%** of contract amount to be subcontracted to beneficiaries to receive training and a maximum 30% on projects above R30 million,
- Minimum 25 % of project to be subcontracted to CE, ED, GD and/or ME.
- Only Qualifying Small Enterprises (QSE) and Exempt Micro Enterprises (EME)

4.4.3 Penalties

Minimum thirty percent (30%) penalty of the value not achieved in terms of % to be subcontracted and the training value, excluding VAT

4.4.4 CPG Calculation

- Feasibility study to indicate achievable percentage CPG and specified in the Scope of Works (PG01.1 for GCC Contracts or PG01.2 for JBCC Contracts)
- CPG is expressed as a percentage of the "Contract amount" – Tender amount at the time of award excluding allowances and VAT.

EXAMPLE 1: 5% CPG PARTICIPATION

Part 1: Calculation of minimum 5% CPG example:
"Tender Amount" = R150 Mil all inclusive of allowances and VAT
"Contract Amount" = R130 Mil (Tender Amount at the time of award excluding allowances and VAT)
CPG percentage participation to be achieved = 5% as specified in the Scope of Works (PG01.1 for GCC Contracts or PG01.2 for JBCC Contracts)
CPG value = R6,5 Mil (Value of work to be subcontracted to emerging enterprises)

Calculation of penalty:
Percentage penalty applicable = 30% as specified in the Scope of Works (PG01.1 for GCC Contracts or PG01.2 for JBCC Contracts)
CPG Minimum 5% = R6,5 Mil
Achieved = R5,5 Mil (Only subcontracted work to the value of R5,5 Mil, i.e. R1 Mil shortfall)
Penalty = R1 Mil x 30% = R300 000 Excl. VAT

Part 2: Calculations in terms of training to be provided:
The number of enterprises to be developed is subject to the contract amount and the apportionment of the work as per Example 1 below
Number of enterprises to be trained = 5 x 1 GB subcontractors
Total cost for training = R 1 650 000

Calculation of penalty
Total number of enterprises to be trained = 6
Total number trained = 4 (2 Shortfall)
Training cost per beneficiary = R1 660 000 / 6 = R 276 666,67 per beneficiary
Penalty = R 276 666,67 x 2 x 30% = R166 000 Excl. VAT

TABLE 1: EXAMPLE 1 - MINIMUM 5% CPG PARTICIPATION (MINI BILL OF QUANTITIES)

B of Q Item	Description	Unit	Rate	Quantity	Amount (R)
5	Enterprise Development				
5.1	Enterprise Development of Targeted Enterprise or JV partners				
5.1.1	Appointment of training co-ordinator *	Per Quarter	45,000	8	360,000
5.1.2	Appointment of Mentor /Training Service provider *	Per Quarter	101,250	8	810,000
5.1.3	Needs Analysis and Enterprise Development Plan per Targeted Enterprise **	No	5,000	6	30,000
5.1.4	Monitoring and Interim reporting per targeted enterprise *	Per Quarter	20,000	8	160,000
5.1.5	Project Completion report per Targeted Enterprise*	No	5,000	6	30,000
	Provisional Sum to be carried over to CPG bill of quantities				1,390,000

"Contract amount" Tender amount excl. allowances and VAT.	130,000,000	150 MIL - allowances and VAT = R130 MIL
CPG Monetary value (30%) to be subcontracted to beneficiary SMMEs	39,000,000	130 000 000 x 30% = 39 000 000
No of enterprises based on the CPG value and agreed by project Support committee	6	Grade 1 / 2 GB/CE,ETC.
Contract period (months)	24	
Number of Quarters	8	24 / 3 = 8

* Rates prescribed by the cidb. PQS to determine rate depending on the location of the project

** Rates to be determined by PQS and adjusted to accepted quotation amounts

The number of periods is project specific.

The training coordinator & the mentor/training service provider can be the same service provider which could reduce costs.

- The mini bill will be used to reflect actual cost once the bid has been awarded, the actual cost of the respective items are known and the provisional amount adjusted accordingly. Rather overestimate than underestimate in order not to negatively impact on the 20% expansion limitation on the project value.
- The Community Project Support Committee needs to be sensitised with regards to the number of enterprise development beneficiaries and may insist that all SMMEs are to be trained which will have a major financial impact on the training allowance as reflected in Example 2 below.
- Training is a once off event for each SMME beneficiary. However, the example allowed for training throughout the contract period as and when SMMEs are appointed and additional mentoring. The training period should be project specific. The number of quarters training to be provided will depend on the nature of the work, the trades to be subcontracted, and the anticipated date of appointments in relation to the construction programme. One can if possible arrange one training session for all beneficiaries in some instances.
- The mini bill will be used to reflect actual cost once the bid has been awarded, the actual cost of the respective items are known and the provisional amount adjusted accordingly. Rather overestimate than underestimate in order not to negatively impact on the 20% expansion limitation on the project cost.

- The Community Project Support Committee needs to be sensitised with regards to the number of enterprise development beneficiaries and agree on the number of beneficiaries of the CPG preferably prior to going out on tender.

- Training to be provided as close as possible to the project site to minimize cost.

- The intention is not to provide training for the full duration of the project. The assessment of the SMMEs will determine the type of training to be provided and at what stage/s of the projects whilst noting that this is managerial/business training for the owners of the companies only. It is also dependent on the nature of the works, SMME trades to be appointed and when the SMMEs are appointed. The ideal would be to limit the training sessions to a maximum of three sessions.

- Beneficiaries will not be replaced should a beneficiary exit the programme prematurely for whatever reason and the main contractor will not be penalised for not achieving the CPG if it is due to a beneficiary exiting the programme prematurely.

<u>EXAMPLE 2: 30% CPG PARTICIPATION (MINI BILL OF QUANTITIES)</u>

<u>Part 1: Calculation of minimum 30% CPG example:</u>
"Tender Amount" = R150 Mil all inclusive of allowances and VAT
"Contract Amount" = R130 Mil (Tender Amount at the time of award excluding allowances and VAT)
CPG percentage participation to be achieved = 30% as specified in the Scope of Works (PG01.1 for GCC Contracts or PG01.2 for JBCC Contracts)
CPG value = R39,000,000 (Value of work to be subcontracted to emerging enterprises to undergo training)

<u>Calculation of penalty:</u>
Percentage penalty applicable = 30% as specified in the Scope of Works (PG01.1 for GCC Contracts or PG01.2 for JBCC Contracts)
CPG Minimum 30% = R39,000,000 Mil
Achieved = R30 Mil (Only subcontracted work to the value of R30 Mil. i.e. R9 Mil shortfall)
Penalty = R9 Mil x 30% = R 2 700 000 Excl. VAT

<u>Part 2: Calculations in terms of training allowance for training to be done:</u>
The number of enterprises to be developed is subject to the contract amount and the apportionment of the work as per Example 1 below.
Number of enterprises to be trained = 15 (1GB) + 3 (1CE) + 5 (2GB) + 3 (2CE) = 26 SMME subcontractors
Total cost for training = R 4 020 000

<u>Calculation of penalty</u>
Total number of enterprises to be trained = 26
Total number trained = 24 (2 Shortfall)
Training cost per beneficiary = R4 020 000 / 26 = R154 615 per beneficiary
<u>Penalty</u> = R154 615 x 2 x 30% = R 92 769,23 Excl. VAT

TABLE 2: EXAMPLE 2 - 30% CPG PARTICIPATION

Example of calculating cost of SMME training (Worst case scenario)

B of Q Item	Description	Unit	Rate	Quantity	Amount (R)
5	Enterprise Development				
5.1	Enterprise Development of Targeted Enterprise or JV partners				
5.1.1	Appointment of training co-ordinator *	Per Quarter	45,000	8	360,000
5.1.2	Appointment of Mentor /Training Service provider *	Per Quarter	390,000	8	3,120,000
5.1.3	Needs Analysis and Enterprise Development Plan per Targeted Enterprise **	No.	5,000	26	130,000
5.1.4	Monitoring and Interim reporting per targeted enterprise *	Per Quarter	20,000	8	160,000
5.1.5	Project Completion report per Targeted Enterprise*	No.	5,000	26	130,000
	Provisional Sum to be carried over to CPG bill of quantities				3,900,000

"Contract amount" Tender amount excl. allowances and VAT	130,000,000	150 Mil - allowances and VAT = R130 Mil
CPG Monetary value (30%) to be subcontracted to beneficiary SMMEs	39,000,000	130 000 000 x 30% = 39 000 000
No of enterprises based on the CPG value and agreed by project Support committee	26	Grade 1 / 2 GB/CE,CE
Contract period (months)	24	
Number of Quarters	8	24 / 3 = 8

* Rates prescribed by the cidb. PQS to determine rate depending on the location of the project

** Rates to be determined by PQS and adjusted to accepted quotation amounts

All rates are provisional and will be adjusted upon receipt of quotations from service providers and acceptance

4.5 Cidb BUILD Programme: Skills Development (Principal contractor including subcontractors and consultants)

The aim is to provide opportunities to learners requiring structured workplace learning facilitated by the principal contractor including subcontractors and consultant service providers

This CPG is a **Condition of Contract** therefore it is not a requirement to submit substantiating documentation with the tender other than pricing the item in the CPG section of the Bills of Quantities.

The contract Skills Development Goal (CSDG) shall be expressed as follows:

- In the case of engineering and construction works contracts, design and build contracts and services contracts the contract skills development participation goals, expressed in Rand, shall be no less than the "contract amount" multiplied by a percentage (%) factor given in Table 5 for the applicable class of construction works used in the application of the Construction Industry Development Regulations issued in terms of the Construction Industry Development Board Act of 2000.

- In the case of professional services contracts the contract skills development goals, expressed in hours, shall be not less than the professional fees in millions of Rand multiplied by 150.

Upon registration of the project with the cidb, NDPWI will be invoiced to pay the cidb 0,2% to a maximum of R2 Mil under second contract (0002) on the WCS as a once off Payment. Project Managers must ensure that provision is for the payment of the BUILD programme costs when requesting funding prior to the invitation of tenders

and ideally register a Cost Item 0002 on the WCS for that purpose as soon as they become aware that the cidb BUILD Programme will be applicable to the project. The PQS is to include the cost in his estimate based on the pre-tender estimate including allowances and VAT. The actual amount payable to the cidb = the awarded tender amount x 0,2% to a maximum of R2 Million.

The main contractor shall submit monthly reports in terms of CPG monthly achievements and accumulative targets achieved including audited supporting documentation to the Employer's Representative

Contract skills development credits will not be awarded for learners enrolled as beneficiaries of other funded or subsidised programmes.

In the case of services contracts:

a) The contract skills development goals shall be granted by multiplying the number of people employed by the contractors and placed for continuous training opportunities in a three-month period by the notional values contained in Table 4, or as revised in a Gazette notice.
b) The contractor may source beneficiaries of the contract skills development goal from the cidb Skills Development Agency (SDA)
c) All beneficiaries of the Standard must be registered with the cidb Skills Development Agency (SDA)
   Where an unemployed learner is employed directly by the service provider / contractor, the service provider / contractor shall pay the stipend directly to the learner
d) Where an unemployed learner is sourced through an SDA, training provider or skills development facilitator the consultant / contractor must pay the stipend to the SDA, training provider or skills development facilitator who in turn will pay the learner
e) The notional cost of providing training opportunities will be increase by CPI on an annual basis. The new revised costs will be published on the cidb website on the 1st of April in each year

Credits towards the contract skills development goal for professional services contracts shall be granted by summating the hours of structured workplace learning opportunities provided to P1 and P2 learners as well as professional candidates in accordance with this standard

No more than 45 hours may be claimed per week for any individual.

Contract skills development goal credits shall be reduced to the extent that they fail to comply with the requirements of this standard.

Role and function of skills development agency

The Skills Development Agency (SDA) will provide career management and compliance reporting functions for all learners for CSDG compliance in terms of this Standard. Where the service providers / contractors provide direct employment to unemployed learners, or enrols own employees for CSDG compliance, the service provider shall register them with the cidb SDA. The SDA can also act as an employment intermediary for unemployed learners. NOTE: The role and function of a cidb SDA is outlined in Annexure B of the standard for skills development

Providing workplace learning opportunities through direct employment from colleges and indirect employment through Skills Development Agency (SDA). The aim of the SDA will be to facilitate structured, workplace training for beneficiaries of the CIDB Standard for Developing Skills through Infrastructure Contractors (Skills Standard) and their roles will be to ensure the smooth processing of training learners or beneficiaries in partnership with the contractor.

Appointing a coach/mentor for learners whose responsibilities are:

a) Submitting compliance baseline training plans 30 days after contract award(60 to 90 days is more realistic);
b) Submitting quarterly compliance reports; and
c) **<u>Submitting final contract compliance report prior to achieving Practical Completion and not 30 days after practical completion as per the cidb Standard, Certificate of Practical Completion will not be issued unless the report has been issued to the project manager.</u>**

Career management and compliance reporting

The contractor shall enter into a contract agreement with the cidb SDA training provider or skills development facilitator to manage their learners according to the provisions given below:

a) preparing training plans for registered learners, including details of the scope of experiential work to be covered and expected outcomes;
b) registering learners with the appropriate Sector Educational and Training Authority established in terms of the Skills Development Act of 2008 (Act 37 of 2008);
c) conducting entry and exit level medicals for learners at the conclusion of each placement opportunity;
d) providing personal protective equipment;
e) liaising with the supervisor to monitor onsite training progress of learners;
f) liaising with the supervisor to arrange for summative assessments at appropriate stages of the training; and
g) liaising with the supervisor to prepare reports for the employer's representative and cidb at practical completion of the contract.

The relevant training service provider or skills development facilitator shall invoice the main contractor for the provision of these services.

The cidb SDA shall open a trust fund to ring-fence monies essential for all learner requirements where necessary provided for in this standard such as personal protective equipment, medical assessments, insurance, course fees, monitoring as well as top up training and assessment.

Employment Intermediary
The cidb SDA can act as an employment intermediary for unemployed learners and provide contractors with learners qualifying for participation in the CSDG, as well as managing their employment functions such as payment of stipends, workman's compensation, provision of personal protective equipment, trade specific tools, etc.

In such cases, the consultant / contractor shall contract directly with an SDA, training provider or skills development facilitator of their choice for the recruitment, placement and management of learners. The contractor shall pay the SDA, training provider or skills development facilitator in accordance with the notional costs provided for in this standard, or as amended by a Gazette.

Provision of different types of workplace opportunities linked to work associated with a contract which culminate in or lead to registration in a professional category by one of the professional bodies listed in the standard **(Table 3 below).**

Table 3. Categories of registration
Source: cidb Standard for Developing Skills through Infrastructure Contracts as published in the Government Gazette Notice No. 45491 of 28 April 2023 (Table 1, Page 5)

Profession	Category of registration	Act
Architectural	Architect, Senior Architectural Technologist, Architectural Technologist or Architectural Draughtsperson	Architectural Profession Act of 2000 (Act No.44 of 2000
Construction Project Management or Construction Management	Construction Project Manager or Construction Manager	Project and Construction Management Professions Act of 2000 (Act No. 48 of 2000
Engineering	Engineer, Engineering Technologist, Engineering Technician or Certificated Engineer	Engineering Profession Act of 2000 (Act No. 46 of 2000)
Health and Safety Practitioners	Construction Health and Safety Agent, Construction Health and Safety Manager, Construction Health and Safety Officer	Occupational Health and Safety Act of 1993 (Act No. 85 of 1993); Construction Regulations, 2014
Landscape Architectural	Landscape Architect, Landscape Technologist, Landscape Technician or Landscape Assistant	Landscape Architectural Profession Act of 2000 (Act No. 45 of 2000)
Planning	Planner or Technical planner	Planning Profession Act, 2002, (Act No. 36 of 2002)
Quantity surveying	Quantity surveyor	Quantity Surveying Profession Act of 2000 (Act No. 49 of 2000)
Scientists	Natural scientists	Natural Scientific Professions Act (Act No. 27 of 2003)

Profession	Category of registration	Act
Surveying	Land surveyor, Engineering surveyor or Technician engineering surveyor	Professional and Technical Surveyors' Act (Act No. 40 of 1984)
Valuers	Valuer or Associate Valuer	Property Valuers Profession Act (Act No. 47 of 2000)

Training Methods:

The contractor / service provider shall achieve the measurable contract skills development goal by providing opportunities to learners requiring structured workplace learning using one or a combination of any of the following in relation to work directly related to the contract or order:

Method 1: structured workplace learning opportunities for learners towards the attainment of a part or a full occupational qualification;

Method 2: structured workplace learning opportunities for apprentices or other artisan learners towards the attainment of a trade qualification leading to a listed trade (GG No. 35625, 31 August 2012) subject to at least 60% of the artisan learners being holders of public TVET college qualifications (N/A for consultants);

Method 3: work integrated learning opportunities for University of Technology or Comprehensive University students completing their national diplomas; or

Method 4: structured workplace learning opportunities for candidates towards registration in a professional category by a statutory council listed in Table 3 above.

Employed learners may not account for more than 33 percent of the contract skills development goal. Not more than one method may be applied to any individual concurrently in the calculation of the contract skills development goal. The principle is that an individual can only be counted once towards the CSDG.

The contractor shall apportion the learners in the different construction activities based on the scope of work. The cost of accommodating learners will be determined by using **Table 3** and this cost will be used to determine the value in Rand for skills development and will be added to the provision for training as provided for in the CPG Bill of Quantity section.

Table 3: The notional cost pf providing training opportunities per quarter

Source: cidb Standard for Developing Skills through Infrastructure Contracts as published in the Government Gazette Notice No. 48491 Government Gazette, 27 April 2023 (Table 3, Page 9)

Type of Training Opportunity	Provision for stipends (Unemployed learners only)	Provisions for mentorship	Provisions for additional costs*	Total costs	
				Unemployed learners	Employed learners
Method 1					
Occupational qualification	R7 000	R0	R9 000	R16 000	R9 000
Method 2					
TVET College graduates	R14 000	R0	R9 000	R23 000	N/A
Apprenticeship	R14 000	R0	R12 000	R26 000	R12 000
Method 3					
P1 and P2 learners	R24 000	R20 000	R4 500	R48 500	N/A
Method 4					
Candidates with a 3 year diploma	R37 000	R20 000	R4 500	R61 500	R20 000
Candidates with 4 year qualification	R47 000	R20 000	R4 500	R71 500	R20 000

Note: the required CPG will be recalculated based on the awarded tender amount and "Contract amount" once the beneficiaries have been appointed and actual costs are known. The notional cost of providing training opportunities will increase by CPI on an annual basis based on April CPI. Should the rates increase after bid award or during construction then the rates will be adjusted as a remeasurable item.

4.5.1 Applicable standards and implementation documents

- Minimum Targeted Contract Skills Development Goal in accordance with the cidb Standard for Developing Skills through Infrastructure Contracts as published in the Government Gazette Notice No. 43495 of 3 July 2020
- cidb Best Practice Project Assessment Scheme Notice No. 43726 of 18 September 2020

4.5.2 Minimum requirements

Contractor:

- All classes of work from Grade 7 and above
- Minimum Construction Period 12 Months

Consultant

- Minimum total tender value = R5 Mil
- Minimum service contract period = 12 Months

4.5.3 Penalties

Contractor:

- Minimum thirty percent (30%) penalty of the value of the CPG portion not achieved, excluding VAT; AND
- **The issuing of completion certificates only after the completion certificate of achieving the skills development goal, counter-signed by the relevant individuals has been submitted**

Consultants:

- Minimum thirty percent (30%) penalty of the value of the CPG portion not achieved in terms of hours training to be provided and the associated notional cost , excluding VAT

4.5.4 CPG Calculation

Table 4: Contracting skills development goals for different classes of engineering and construction works contracts

Source: cidb Standard for Developing Skills through Infrastructure Contracts as published in the Government Gazette Notice No. 46431 Government Gazette, 23 April 2023 (Table 2, Page 7)

Class of construction works as identified in terms of Regulation 25 (3) of the Construction Industry Regulations 2004		Construction skills development goal (CSDG) (%)
Designation	Description	
CE	Civil Engineering	0.25
CE and GB	Civil engineering and General Building	0.375
EE	Electrical Engineering works (buildings)	0.25
EP	Electrical Engineering works (infrastructure)	0.25
GB	General Building	0.5
ME	Mechanical Engineering works	0.25
SB	Specialist	0.25

Note: the required CPG will be recalculated based on the awarded tender amount and "Contract amount" once the beneficiaries have been appointed and actual costs are known. The notional cost of providing training opportunities is subjected to annual increases as per the CPI issued on the 1st of April annually by Stats SA. The rates will be adjusted as an adjustment in the provisional amounts should the rates increase after bid award or during the construction period. The ideal is to maximize the number of beneficiaries and not target beneficiary with the highest associated costs which will reduce the number of beneficiaries. The beneficiaries to be targeted can be established during the feasibility study which can be specifically specified.

Contractor CPG calculation:
'Contract amount' = Tender amount at the time of award excluding allowances and expenses, and VAT
'Contract amount' x factor from Table 5 above.
The PQS to make allowance for CPI increases for the full duration of the training within the provisional amount allowed for in the Bill of Quantities whilst noting that the cidb uses the April CPI for annual increases.

CPG calculation example:
"Tender Amount" = R150 Mil for GB, all inclusive of allowances and VAT
'Contract Amount' = R130 Mil (Tender Amount at the time of award excluding allowances and VAT)
Factor for "GB" = 0,5% (as per Table 5 above)
CPG in R value = R130 Mil x 0.5% = R650 000 i.e. total notional cost of training to amount to R650 000

Calculation of penalty (excluding escalation):
Percentage penalty applicable = 30% as specified in the Scope of Works (PG01.1 for GCC Contracts or PG01.2 for JBCC Contracts)
CPG value = R650 000
Achieved = R550 000 = R100 000 Shortfall
Penalty = R100 000 x 30% = R30 000 Excl. VAT

CPG calculation if **escalation is applicable:**
CPG in R value = R130 Mil x 0,5% = R650 000
+ 6.5% annual increase (if applicable) = **R42 250**
Total CPG value to be achieved = R692 250

Calculation of penalty (including escalation):
Percentage penalty applicable = 30% as specified in the Scope of Works (PG01.1 for GCC Contracts or PG01.2 for JBCC Contracts)
CPG value = R650 000
+ 6,5% escalation = **R42 250**
Total CPG value = R692 250
Achieved = R500 000 = R192 250 Shortfall
Penalty = R192 250 x 30% = R57 675 Excl. VAT

Calculations based on "Contract Amount" after bid award and appointment of beneficiaries
Actual CPG training requirement value after award upon selecting method/s of training and appointment of beneficiaries = R676 000 (or R719 940 if is escalation is applicable) **(Table 5 below)**. The provisional amount allowed for must therefore be adjusted accordingly. The new monetary value of training required will then form the basis for determining penalties applicable. No penalties will be applied should the CPG value, based on the original "Contract Amount" be achieved. Note that it could emanate from the feasibility study that there are local candidate beneficiaries to which certain methods apply which could be specified specifically in the Scope of Works (PG-01.1 / PG01.2) to avoid increase in cost.

Table 6: Notional cost recalculation upon bid award and appointment of beneficiaries.
Adapted from the cidb Standard for Developing Skills through Infrastructure Contracts as published in the Government Gazette Notice No. No 48491 Government Gazette, 23 April 2023 (Table, Page 9))

Skills Types	Number of learners	Notional Cost / Learner / Quarter	Notional cost / learner / year	Total Notional Cost over 12 months Contract
Method 7: Workplace learning opportunities with unemployed TVET graduates	2	R23 000	R92 000	R184 000
Method 8: Candidacy for an unemployed learner with a 3-year qualification	2	R61 500	R246 000	R492 000
Total CPG value if escalation is not applicable / Sub-Total if escalation is applicable				R676 000
Add 6,5% escalation as per April CPI (if applicable)*				R43 940
Total CPG Value if escalation is applicable				R719 940

*Penalties percentage to be inserted by the Project Manager

<u>Consultant CPG calculation:</u>

- CPG value based on the "Contract Amount" = Number of Hours training to be provided x the Notional Cost per hour of beneficiaries appointed.
- Number of hours training to be provided = "Contract Amount" x 150.
- "Contract amount" = Tender amount excluding allowances, expenses and VAT [Basic fee tendered item (1) from the activity schedule) excluding VAT]

<u>Calculating consultant CPG example:</u>

Step 1: Calculate number of Hours <u>training to be provided:</u>

"Tender Amount" = R5.1 Mil

"Contract amount" = R4.5 Mil (Basic fee tendered item (1) from the activity schedule) excluding VAT)

Number of hours skills development training required = R4.5 x 150 = 675 hours (hours to be rounded off)

<u>Step 2: Calculate the Notional Cost per hour</u>

(a) Notional Cost per quarter as per Table 4 of Clause C 3.16 (Scope of Services) and optional methods

(b) Number of Hours per quarter = 3 months x 20 days x 8 hours per day = 480 Hours

(c) Notional Cost per Hour = (a) / (b)

<u>Step 3: Calculate Total Notional Cost</u>

(a) Total hours training to be provided x notional cost per hour

Example: Calculating the Total Notional Cost

(a) Fees (1) from Activity Schedule = R4.5 Mil

(b) Number of hours skills development required = R4.5 Mil x 150 = 675 hours

(c) Total number of hours per quarter = 40 hours per week x 4 weeks x 3 months = 480 hours

(d) Notional cost per hour "Method 4" = R71 500 per quarter / 480 hours = R148.95 per hour

(e) Total Notional cost = R148.95 (Rate per hour) x 675 (total number of hours) = R100 541.25

(f) PM to insert the calculated amount into the activity schedule as a provisional amount which will be adjusted upon the selection and appointment of the beneficiaries

<u>Calculation of penalty:</u>
Total notional cost = R 100 541.25
Achieved = R60 000 Shortfall of R40 541,25
<u>Penalty</u> = R40 541.25 x 30% = R12 162.38 Excl. VAT

Note: Annual escalation is applicable and allowance must be made in the provisional amount, as indicated in the above example for the contractor

The project manager must indicate in the consultant tender document whether the CPG is applicable or not, and provide a provisional amount in the activity schedule. In the event of being indicated as applicable and the awarded consultant tender amount is less than R5 Million, the CPG will still be applicable

If the estimate consultant fees is in the region of R5 Million make the CPG applicable and provide an allowance.

This CPG is strongly advocated by the cidb and one may apply same to projects where the cost is less or expected to increase above the minimum thresholds.

4.6 National Youth Service Programme (NYS) CPG

- The programme shall be implemented in terms of the implementation of the National Youth Service Programme under the Expanded Public Works Programme (EPWP) and shall be priced in the CPG section of the Bills of Quantities. The CPG determined in conjunction with NDPW NYS component which would quantify the NYS bill of quantities

- This CPG is a **Condition of Contract** therefore it is not a requirement to submit substantiating documentation with the tender other than pricing the NYS component within the CPG section in the Bill of Quantities.

- Monthly proforma reports are to be submitted to the Employer's Representative.

4.6.1 Applicable standards and implementation documents
- National Youth Service Programme

4.6.2 Minimum Requirements
- Minimum contract value R2 Mil
- Minimum construction period 12 months

4.6.3 Penalties
Payment reduction as stipulated in the CPG bill of quantities per person not trained (Excluding VAT).

Calculation of penalty example:
Payment reduction per person not trained as stipulated in the NYS Bill of Quantities = R 2 500 per person
Total number of NYS Beneficiaries as stipulated in the NYS Bill of Quantities = 25
Total Number of NYS beneficiaries trained = 20 (shortfall of 5 beneficiaries)
Penalty = 5 x R2 500 = R12 500 Excl VAT

4.7 Labour Intensive Works CPG

The consultant team is expected to use their initiative to identify activities that can be done labour-intensively to comply with the set minimum labour intensity target based on the Generic labour intensive works specifications.

This CPG is a **Condition of Contract** therefore it is not a requirement to submit substantiating documentation with the tender other than making allowance in his pricing of items indicated "LI" in the Bills of Quantities.

The main contractor shall submit monthly reports in terms of CPG monthly achievement and accumulative targets achieved including audited supporting documentation to the Employer's Representative

4.7.1 Applicable standards and implementation documents
- Expanded Public Works Programme (EPWP) and generic labour intensive works specifications.

4.7.2 Minimum Requirements
- All civil works projects.
- As general construction projects are labour intensive by nature specific general building items need not to be indicated as "LI" in the Bills of Quantities. It is however a requirement to implement and indicate "LI" items as defined in the Scope of Works (PG01.1 and PG01.2) where feasible on projects below R30 Mil
- Compulsory for projects above R30 Mil where feasible.
- Minimum construction period 6 months

4.7.3 Penalties
Minimum thirty percent (30%) penalty of the value of the works not done by means of labour-intensive methods, excluding VAT.

4.7.4 CPG Calculation
- Feasibility study to indicate achievable CPG and specified in the Scope of Works (PG01.1 for GDC

Contracts or PG01.2 for JBCC Contracts)

- CPG determined by PQS in conjunction with consultant team and NDPWI representative
- Example:

CPG Calculation
"Tender Amount" = R150 Mil all inclusive of allowances and VAT
"Contract Amount" = R130 Mil (Tender Amount at the time of award excluding allowances and VAT)
CPG value = R10 Mil (Total value of labour-intensive works specified in the Bills of Quantities)

Calculation of penalty
CPG value = R10 Mil
Percentage penalty applicable = 30% as specified in the Scope of Works (PG01.1 for GCC Contracts or PG01.2 for JBCC Contracts)
CPG Achieved = 9 Mil (R1 Mil shortfall)
Penalty = R1 Mil x 30% = R300 000 Excl. VAT

5. INFORM THE CIDB

Failing to inform the cidb is a criminal offence.

Cidb to be informed of:

- Bid award to be registered with the cidb within 21 days from date of award - SCM responsibility;
- List of skills development beneficiaries within 30 days from bid award – PM Responsibility (cidb informed to change to 90 days. Lists to be submitted soonest);
- Practical Completion within one calender month from issuing certificate – PM Responsibility; and
- The compliance of such project with the Standard for Developing Skills through Infrastructure Contracts and the contract skills development achieved– PM Responsibility.

6. CIDB CONTACT PERSON CIDB BUILD PROGRAMME

Cidb contact person cidb BUILD Programme for assistance with implementation:
Mr Ishmail Cassiem, Mobile Nr 078 801 8476, Email: IshmailC@cidb.org.za

Fully understanding the contract participation goals demands self-study of the relevant cidb Standards as well as the Standards and SANS documents referred to within the respective cidb Standards and Practice Notes

ERF 253 JAN KEMPDORP - MAGISTRATE'S PROPOSED NEW OFFICES

GEOTECHNICAL INVESTIGATION

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Report SL 3395/10003
FEBRUARY 2010

GEOTECHNICAL INVESTIGATION FOR THE PROPOSED MAGISTRATE'S (NEW) OFFICES IN JAN KEMPDORP

1. INTRODUCTION AND TERMS OF REFERENCE

At the request of Mr. J H Steyn representing Messrs ***Stabilis Development (Pty) Ltd*** acting on behalf of the ***Department of Public Works,*** Kimatlab cc was commissioned to perform a geotechnical investigation for the proposed (new) Magistrate's offices in Jan Kempdorp. The instruction to proceed with the geotechnical investigation was received from Mr. Steyn on 5 February 2010. The site to be investigated comprises Erf 253 situated in Jan Kempdorp and based on discussions with Mr. Steyn it is understood that the proposed structure/s will comprise of a double storey building/s.

This investigation is required to provide Stabilis Development (Pty) Ltd with the necessary geotechnical information to enable/facilitate the finalization of the structural design, drawings and documentation for the project. An (erf) layout drawing showing the location of Erf 253 was supplied to us.

The scope of the work and terms of reference for the geotechnical investigation were stated in the briefing session and are summarized as follows:

- Establish the nature, distribution and relevant engineering properties of the upper soil and rock strata underlying the site.
- Comment on the utilization of the on-site materials and to present comments on suitable excavation procedures for the installation of services.
- Present general foundation recommendations for the proposed structure/s and comment on any geotechnical aspect/s that may affect the proposed development.

2. SITE LOCATION AND DESCRIPTION

The site, as previously mentioned, is represented by Erf 253 which is situated in Jan Kempdorp and the area investigated comprises approximately 6 500m². The site is roughly rectangular in shape, undeveloped and it is uncertain where the western boundary (Kort Street – non-existent) and the eastern boundary (Arbeid Street - also not existing) are located. For the purpose of this investigation, the three eucalyptus trees toward the west and the overhead telephone line and street lighting toward the east of the site were assumed to form the western and eastern boundaries respectively. The site is bound by Piet Retief Street to the north and by Hermanus Bekker Street to the south.

Tall veld grass is present over the entire site and besides the eucalyptus trees mentioned, syringa and a few scattered thorn trees as well as an uprooted/dumped sizable tree trunk are present as well. A small stack of concrete kerbs as well as concrete hollow blocks and a concrete mixer were observed on site, while a number of boulders are scattered over the site. Boulders are observed daylighting in the northwestern area of the site.

3. NATURE OF THE INVESTIGATION

3.1 Fieldwork

The site was visited on 10 February to set-out the test pit positions and to arrange for the excavation of the test pits (by hand), as a TLB could not be obtained at short notice, while an excavator was available in Hartswater but a lowbed trailer to transport it was unavailable. Due to the relatively short time allowed for the submission of this report it was considered best to excavate the test pits by hand in order to avoid unnecessary delays.

The fieldwork was undertaken on 15 February 2010 and comprised of 'freshening' the walls of the 2 test pits excavated, in situ profiling of the test pits, the taking of a number of disturbed and undisturbed soil samples for laboratory testing and backfilling the test pits thereafter. Three Dynamic Cone Penetrometer tests were performed as well. Refusal on dolomitic Ventersdorp lava boulders was recorded in both of the test pits, while no watertable/seepage was observed.

The taking of the samples and DCP testing was performed by Simlab (Pty) Ltd under our supervision, who also undertook the laboratory testing. As a matter of interest, a field mouse nest/tunnel was bisected at Test Pit 1 and three of the mice stubbornly refused to vacate the test pit, with the result that the profiling and sampling had to be executed in their presence!

Copies of the recorded test pit profiles are presented in Appendix B. A copy of the layout drawing and a rough sketch showing the approximate test pit positions are enclosed in Appendix A.

3.2 Laboratory Testing

Due to the nature of the materials encountered the following tests were performed on the samples taken from the test holes during execution of the fieldwork.

- Particle Size Distribution and Atterberg Limits Analyses (Foundation Indicator tests) to determine the basic engineering properties of the materials encountered and to effect classification thereof.

- Moisture Content determinations in order to ascertain the prevailing moisture conditions.

- Relative Density and Bulk Density determinations to enable refinement of heave predictions and for calculation of the materials properties.

- California Bearing Ratio determination of the silty sand in order to refine the processing of the DCP soundings and to effect classification in terms of COLTO/TRH 14.

In addition to these tests, the Dynamic Cone Penetrometer tests were processed in order to calculate the soil bearing values by means of the Dynamic Cone Penetrometer/California Bearing Ratio/Bearing Value inter-relationships.

Copies of the reproduced laboratory test results, the bearing values as well as a summary of the materials properties/characteristics are presented in Appendix C, while some photographs of interest regarding the site are enclosed in Appendix D.

4. SITE GEOLOGY / SOIL PROFILE

The site is overlain by a thin horizon (105 – 160mm) of ***silty quartzitic topsoil*** below which ***transported silty sand*** to a depth of 510 – 800mm is present at TP 1 and to a depth of 930mm at TP 2. Below the transported silty sand a thin layer of slightly clayey, ***quartzitic gravel*** is present to 930mm (TP 1) and 950mm below surface level (TP 2). At Test Pit 2 a thin layer (160mm in thickness) of ***dolomitic cobbles/small boulders*** is present at 930 – 1110mm. The site is underlain by ***dolomitic Ventersdorp lava*** from 930mm below surface level at Test Pit 1 and from 1110mm BSL at Test Pit 2. The boulders were loosened by means of 'gwalas' and removed to a depth of 1650mm BSL at Test Pit 1 at which depth the size of the boulders and difficulty of removing them from the hole prevented any further excavation. This same difficulty was encountered at a depth of 1530mm BSL at Test Pit 2.

The soil profile over the site appears to be relatively homogeneous regarding the geology and the thickness of the horizons encountered, thus a typical soil profile could be taken as silty quartzitic sand overlying the upper 510 – 800mm underwhich quartzitic gravel and/or dolomitic cobbles/corestones to depths of 930 – 1110mm BSL are present, which in turn is underlain by dolomitic Ventersdorp lava boulders in a matrix of the horizons preceding it to depths of 1530 – 1650mm below surface level.

5. EXCAVATION PROCEDURES

Excavation procedures for cut terrace excavations and for the installation of services have been evaluated according to the South African Bureau of Standards standardised excavation classification for earthworks (SABS 1200 D, DA and DB). According to this classification, the area investigated classifies as ***Soft excavation*** upto approximately 950mm BSL, from which depth ***Boulder – Class A excavation*** would be applicable. The classifications were not proven due to the absence of appropriate machinery, but given the nature of the materials encountered, the classifications given here would in all probability be confirmed.

6. GEOTECHNICAL EVALUATION

The laboratory tests confirm the relative homogeneity of the overlying strata. It is also found that the overlying strata exhibits low potential expansiveness properties. The Bearing Values obtained from the Dynamic Cone Penetrometer/California Bearing Ratio/Bearing Capacity inter-relationships for the overlying approximately 1 metre vary substantially (40 – 250kPa) and the variation is mainly ascribed to the presence of cobbles, corestones and/or small boulders. The overlying approximately 1 metre thickness is thus inadequate as a founding strata/stratum for the structure/s envisaged.

It is quite obvious from the California Bearing Ratio data that the silty quartzitic sand exhibits a potential to collapse under load. The (sand) horizon is as previously mentioned fairly thin (510 – 800mm) and the expected collapse potential (estimated to be in the region of 2.5 – 3%) could thus be easily minimized/neutralized in the design of the foundations and surface beds. It would also be prudent to consider the fact that the underlying boulders are 'bedded' in a gravelly matrix which could result in slight consolidation/ compression under load. According to the SAICE Code of Practice (1995) the designation for the area investigated would be ***Site Class C2/S1***.

7. FOUNDATION RECOMMENDATIONS

Based on the fieldwork, observations on site, laboratory test results and the geotechnical evaluation thereof, the following foundation recommendations and solutions are given.

Careful consideration of the options available to counter the anticipated movements and inadequate bearing capacity indicates that a reinforced concrete footing and column approach where the footings are founded on or within the boulder formation typically at 1 – 1.5m Below Surface Level would be an appropriate approach. This approach will address the inadequate bearing capacity of the overlying strata where a minimum bearing capacity of 300kPa could be utilized by founding on/within the boulders, while the variable depth of the boulders below ground level could be easily accommodated by lengthening/shortening the (individual) columns. It is proposed that the foundations be designed to withstand total (consolidation) movements of upto

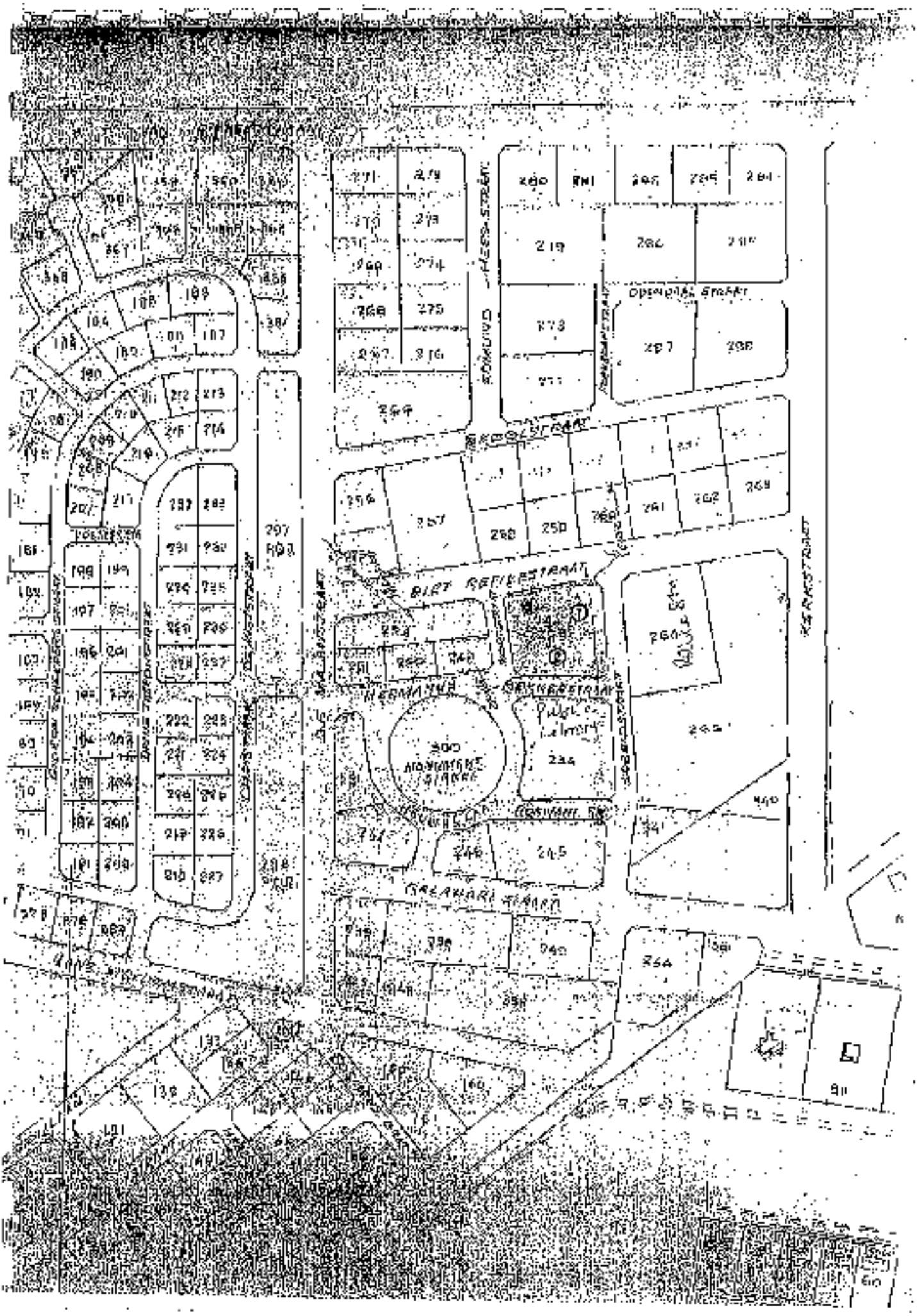
20mm and to accommodate differential movements equivalent to 75% of the total movements.

It is further proposed that 2 layers of 125mm compacted thickness each and comprising of (imported) material of at least G6 classification and which is compacted to a minimum of 93% Modified AASHTO density be utilized below the floors/surface beds. It is also proposed that suitably detailed articulation joints that would accommodate movements of upto 10mm be employed. Cognizance of the proximity of the boulders in relation to the ground level with regard to the installation of underground services should be taken.

S. BARDAY
KIMATLAB cc

APPENDIX A

SITE LOCATION & TEST POSITIONS



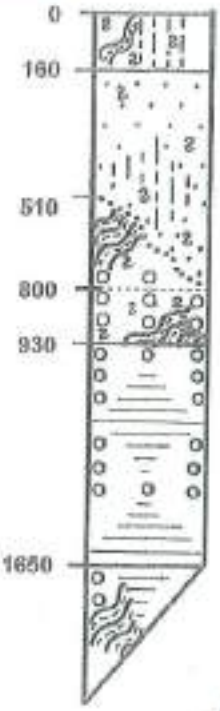
APPENDIX B

SOIL PROFILES

CLIENT KLIËNT	Stabilis Development (Pty) Ltd	DATE DATUM	15 February 2010
PROJECT PROJEK	Proposed New Magistrate's Offices – Jan Kempdorp	JOB No. WERK No.	SL 3395
SITE TERREIN	Erf 253 – Jan Kempdorp	TEST HOLE/PIT No. TOETSGAT No.	1

soil profile – grondprofiel

DEPTH (mm)



Dry to very slightly moist, light brown to beige, silty, quartzitic topsoil with many dark olive to fawn, dolomitic and beige, quartzite particles – *Medium dense, gravelly topsoil.* Many grass roots and hair roots are present.

Slightly moist, medium dense, *silty sand* with scattered quartzite fragments and occasional shards of zinc. Fine roots and abundant hair roots are present.

Slightly moist, reddish brown, *slightly clayey, quartzitic gravel* interspersed with light olive, angular, dolomitic stone and weathered dolomitic corestones and cobbles – Medium dense, with many hair roots.

Dolomitic Ventersdorp lava boulders of approximately 300 – 600mm diameter (inter-bedded) in a matrix of the previous horizon. The boulders represent approximately 80% of this horizon.

(Not To Scale)
Hand Excavated

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KIMBERLEY
CELL. 082 464 6315 FAX. 053 - 861 1029

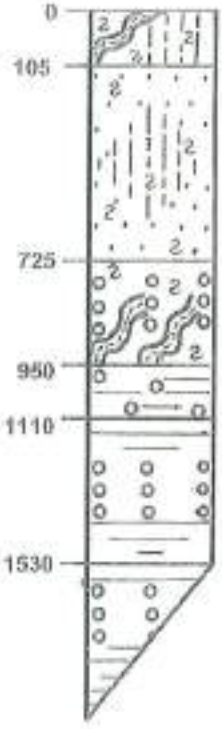
KIMATLAB cc

LOGGED BY / OPGESTEL DEUR
SB

CLIENT KLIËNT	Stabilis Development (Pty) Ltd	DATE DATUM	15 February 2010
PROJECT PROJEK	Proposed New Magistrate's Offices - Jan Kempdorp	JOB No. WERK No.	SL 3395
SITE TERREIN	Erf 253 – Jan Kempdorp	TEST HOLE/PIT No. TOETSGAT No.	2

soil profile -- grondprofiel

DEPTH (mm)



Dry to very slightly moist, light brown to beige, silty, quartzitic topsoil with scattered dark olive, dolomitic particles and sub rounded, quartzite pebbles – *Medium dense topsoil.* Many grass roots and hair roots are present.

Slightly moist, medium dense, *silty sand* with scattered quartzite fragments. Many hair roots and scattered fine roots are present.

Slightly moist, reddish brown, *slightly clayey, medium-fine, quartzitic gravel* sparsely interspersed with light olive, dolomitic gravel/particles. Abundant hair roots are present – Medium dense in profile.
Dolomitic *cobbles/boulders* of approximately 150mm diameter in a *matrix* of slightly moist, *olive to khaki, clayey, decomposed dolomitic gravel* interspersed with quartzitic particles. The cobbles/boulders represent ±50% of the horizon.

Dolomitic Ventersdorp lava *boulders* of approximately 250 – 400mm, diameter inter-bedded in a *matrix* of the previous horizon. The boulders represent approximately 60% of this horizon.
REFUSAL

[Not To Scale]
Hand Excavated

(Photo rotated 90° to the LHS)

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APPENDIX C

LABORATORY TEST RESULTS

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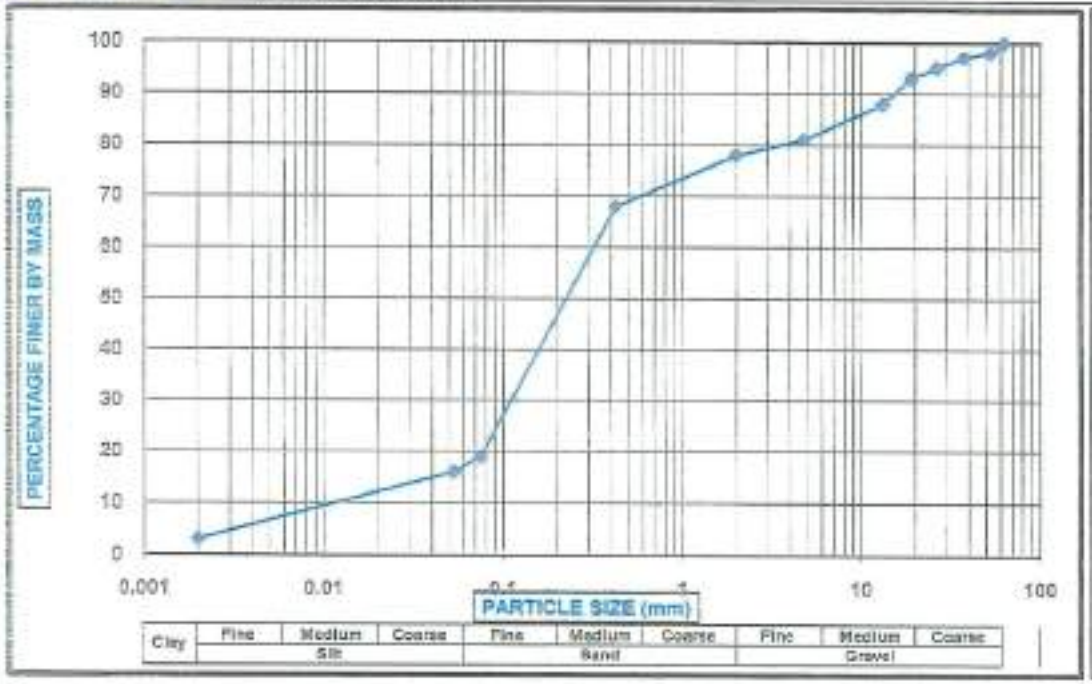
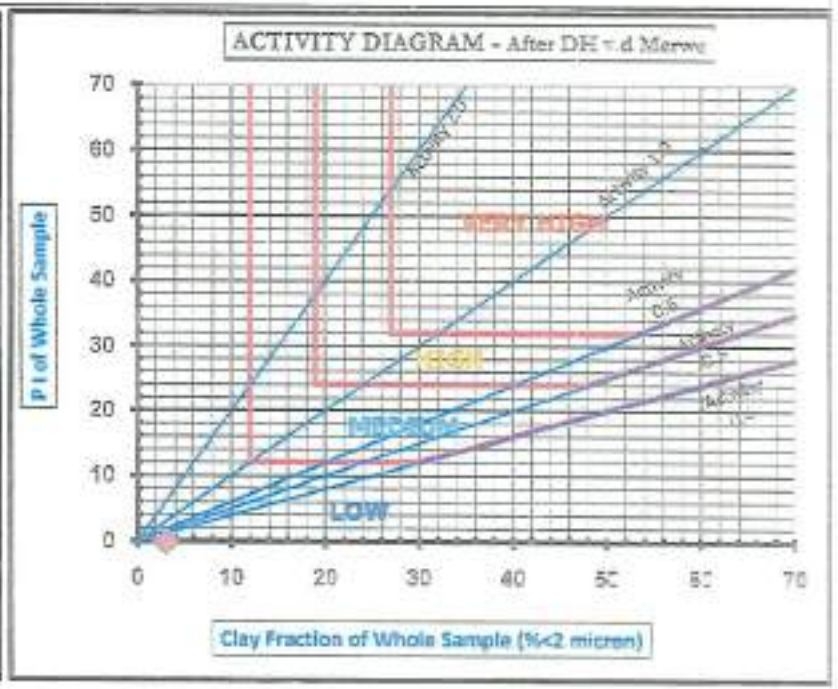
Kimberley 8300
Fax (053) 861 1028
Cell: 082 464 6315

FOUNDATION INDICATOR TEST

CLIENT	: Stabilis Development (Pty) Ltd	TEST HOLE No.	: 1	OUR REF	: SL 3395
PROJECT	: Jan Kempdorp - New Magistrates Offices	DEPTH	: 0 - 160mm	YOUR REF	: Mr. J.H. Steyn
SAMPLE No	: 10/0188			DATE	: 15 February 2010
DESCRIPTION	: See test hole profile				





ATTERBERG LIMITS	Soil Fines	Whole Sample
Liquid Limit		
Plastic Limit		
Plasticity Index	N.P.	0
Linear Shrinkage	0.0	

CLAY FRACTION (%)	
Soil Fines	
4	
Whole Sample	
3	

DISTURBED/UNDISTURBED SAMPLE DATA	
Insitu Moisture Content (%)	2.59
Relative Density	2.541
Bulk Density(Dry) (kg/m^3)	1662
Bulk Density(Wet)(kg/m^3)	1705

Remarks :

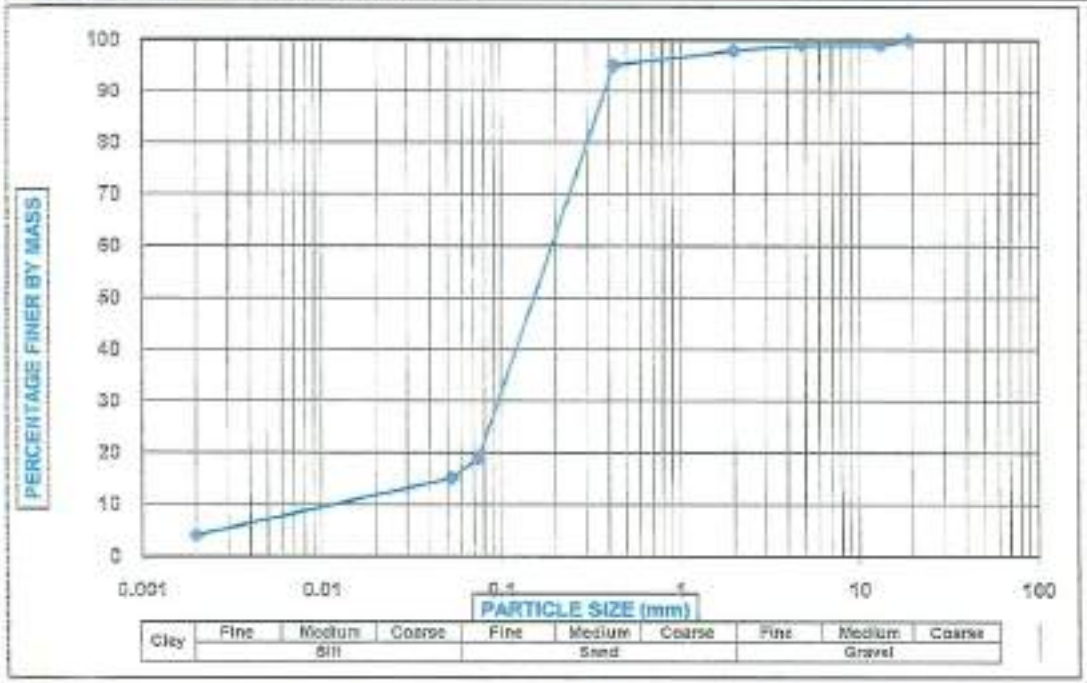
Disturbed & Undisturbed Sample

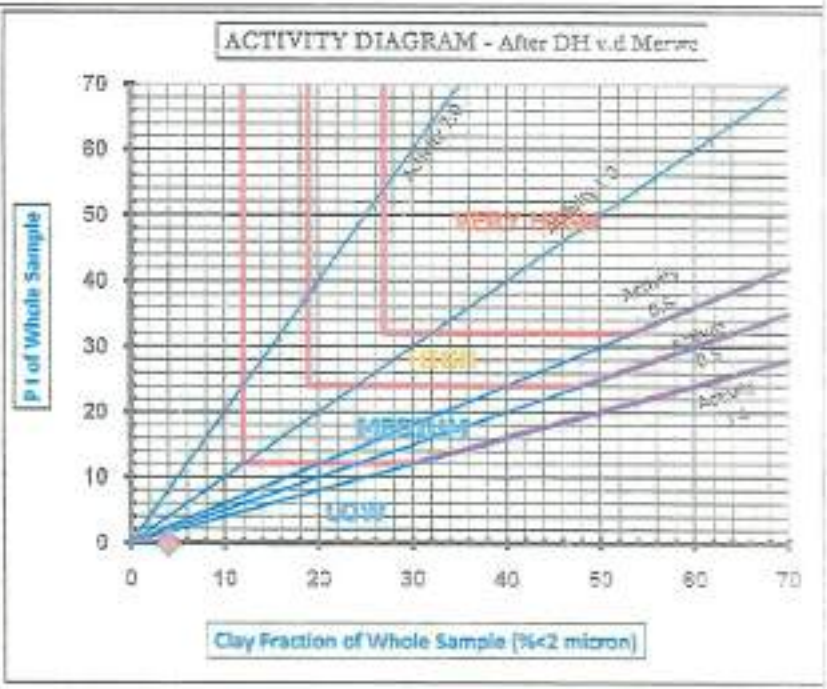
KIMATLAB cc

P.O.Box 1264
Kimberley 8300
Fax (053) 861 1020
Cell.: 082 464 6335

FOUNDATION INDICATOR TEST

CLIENT	: Stabilis Development (Pty) Ltd	TEST HOLE No.	: 1	OUR REF	: SL 3395
PROJECT	: Jan Kempdorp - New Magistrates Offices	DEPTH	: 160-510/800mm	YOUR REF	: Mr. J.H. Steyn
SAMPLE No.	: 10/0189			DATE	: 15 February 2010
DESCRIPTION	: See test hole profile				





ATTERBERG LIMITS	Soil Fines	Whole Sample
Liquid Limit		
Plastic Limit		
Plasticity Index	N.P.	0
Linear Shrinkage	0.0	

CLAY FRACTION (%)	
Soil Fines	
4	
Whole Sample	
4	

DISTURBED/UNDISTURBED SAMPLE DATA	
Insitu Moisture Content (%)	3.25
Relative Density	2.630
Bulk Density(Dry) (kg/m^3)	1576
Bulk Density(Wet)(kg/m^3)	1627

Remarks :
Disturbed & Undisturbed Sample

KIMATLAB cc

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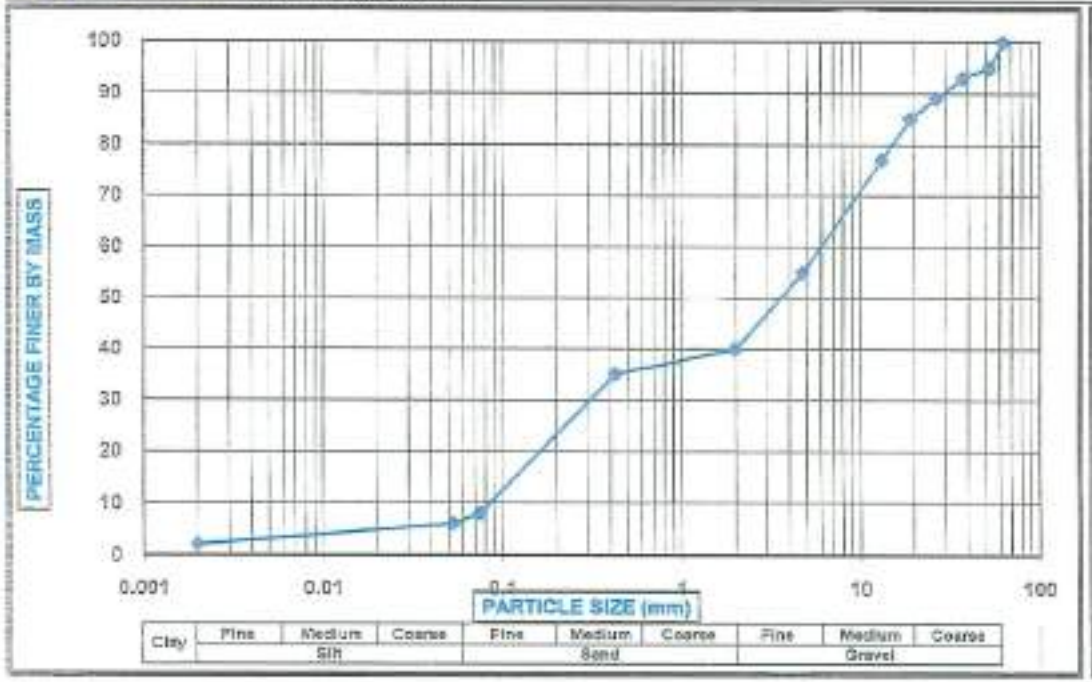
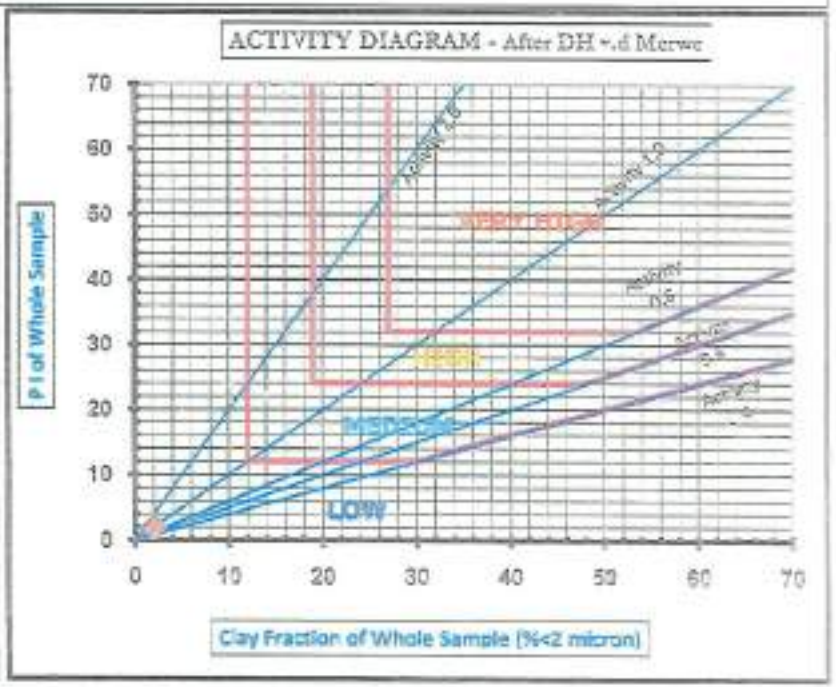
Kimberley 8300
Fax (053) 861 1029
Cell: 082 464 6315

FOUNDATION INDICATOR TEST

CLIENT	: Stabilis Development (Pty) Ltd	TEST HOLE No.	: 1	OUR REF.	: SL 3395
PROJECT	: Jan Kempdorp - New Magistrates Offices	DEPTH	: 510/800-930mm	YOUR REF.	: Mr. J.H. Steyn
SAMPLE No.	: 10/0190			DATE	: 15 February 2010
DESCRIPTION	: See test hole profile				





ATTERBERG LIMITS	Soil Fines	Whole Sample
Liquid Limit		
Plastic Limit		
Plasticity Index	S.P.	2
Linear Shrinkage	0.7	

CLAY FRACTION (%)	
Soil Fines	
6	
Whole Sample	
2	

DISTURBED/UNDISTURBED SAMPLE DATA	
Insitu Moisture Content (%)	3.43
Relative Density	2.655
Bulk Density(Dry) (kg/m^3)	1733
Bulk Density(Wet)(kg/m^3)	1792

Remarks :
Disturbed & Undisturbed Sample

KIMATLAB cc

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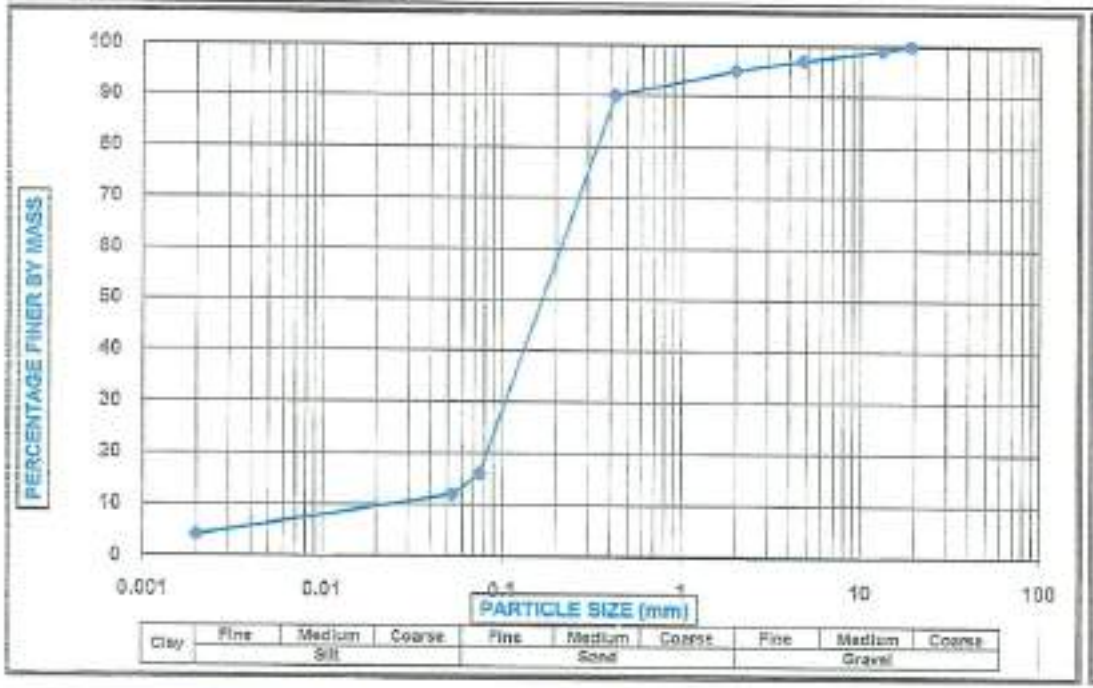
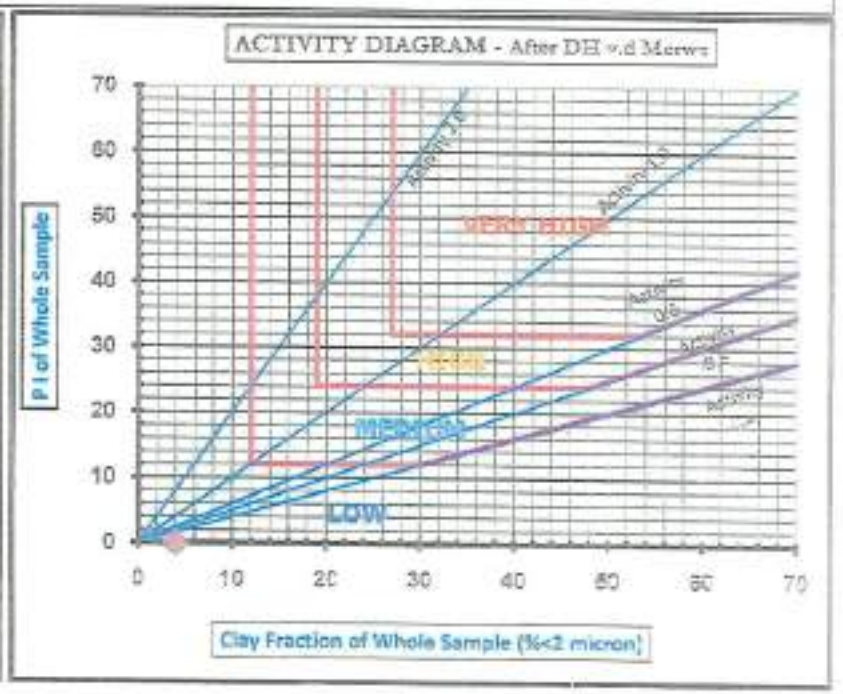
Kimberley 8300
Fax (053) 861 1020
Cell: 082 464 6315

FOUNDATION INDICATOR TEST

CLIENT	: Stabilis Development (Pty) Ltd	TEST HOLE No.	: 2	OUR REF.	: SL 3395
PROJECT	: Jan Kempdorp - New Magistrates Offices	DEPTH	: 0 - 105mm	YOUR REF.	: Mr. J.H. Steyn
SAMPLE No.	: 10/0191			DATE	: 15 February 2010
DESCRIPTION	: See test hole profile				





ATTERBERG LIMITS	Soil Fines	Whole Sample
Liquid Limit		
Plastic Limit		
Plasticity Index	N.P.	0
Linear Shrinkage	0.0	

CLAY FRACTION (%)	
Soil Fines	
4	
Whole Sample	
4	

DISTURBED/UNDISTURBED SAMPLE DATA	
Insitu Moisture Content (%)	2.63
Relative Density	2.556
Bulk Density(Dry) (kg/m^3)	1746
Bulk Density(Wet)(kg/m^3)	1792

Remarks :
Disturbed & Undisturbed Sample

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Kimberley 8300
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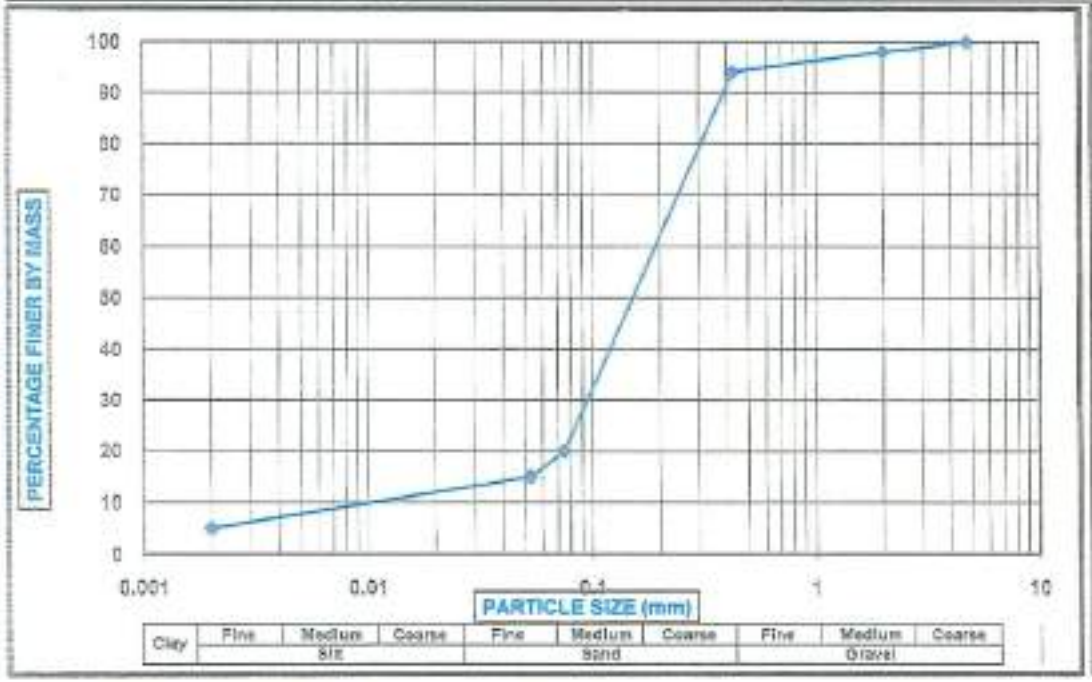
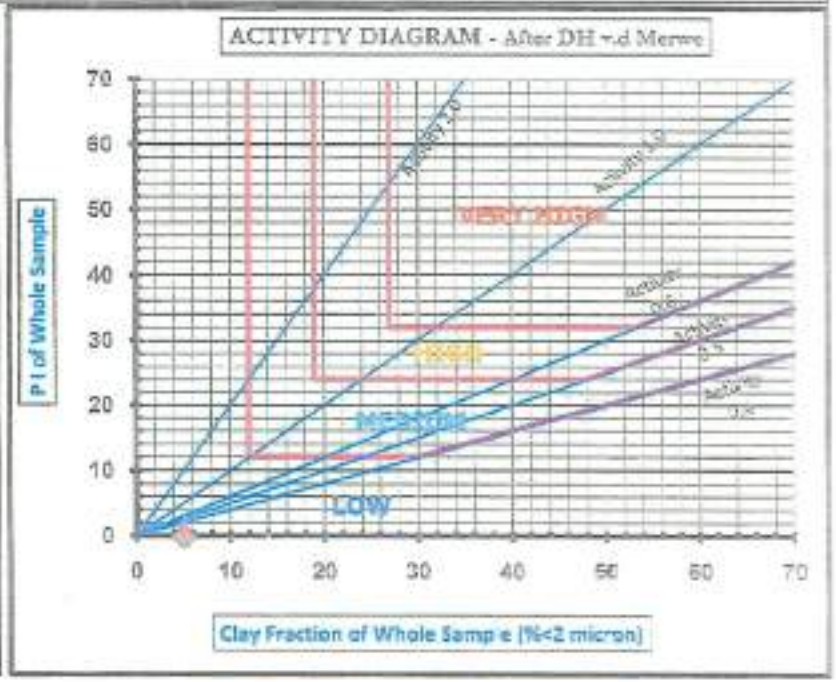
Cell: 082 464 8315

FOUNDATION INDICATOR TEST

CLIENT	: Stabilis Development (Pty) Ltd	TEST HOLE No.	: 2	OUR REF	: SL 3395
PROJECT	: Jan Kempdorp - New Magistrates Offices	DEPTH	: 105 - 725mm	YOUR REF	: Mr. J.H. Steyn
SAMPLE No.	: 10/0192			DATE	: 15 February 2010
DESCRIPTION	: See test hole profile				





ATTERBERG LIMITS	Soil Fines	Whole Sample
Liquid Limit		
Plastic Limit		
Plasticity Index	N.P.	0
Linear Shrinkage	0.0	

CLAY FRACTION (%)	
Soil Fines	
5	
Whole Sample	
5	

DISTURBED/UNDISTURBED SAMPLE DATA	
Insitu Moisture Content (%)	3.61
Relative Density	2.648
Bulk Density(Dry) (kg/m^3)	1685
Bulk Density(Wet)(kg/m^3)	1746

Remarks :
Disturbed & Undisturbed Sample

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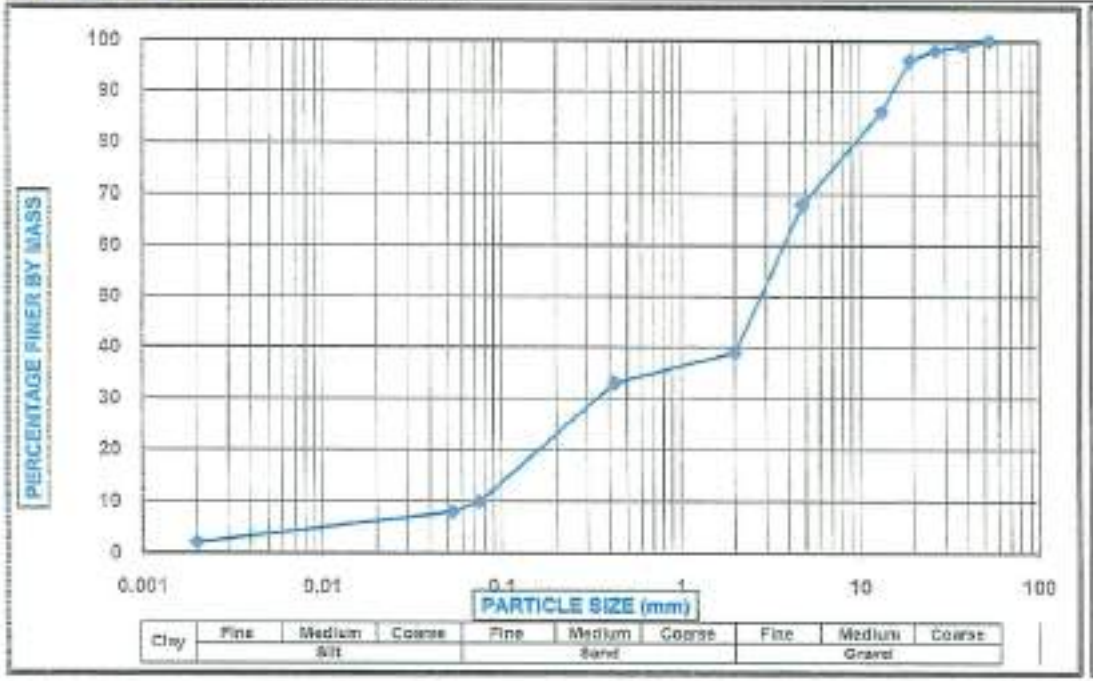
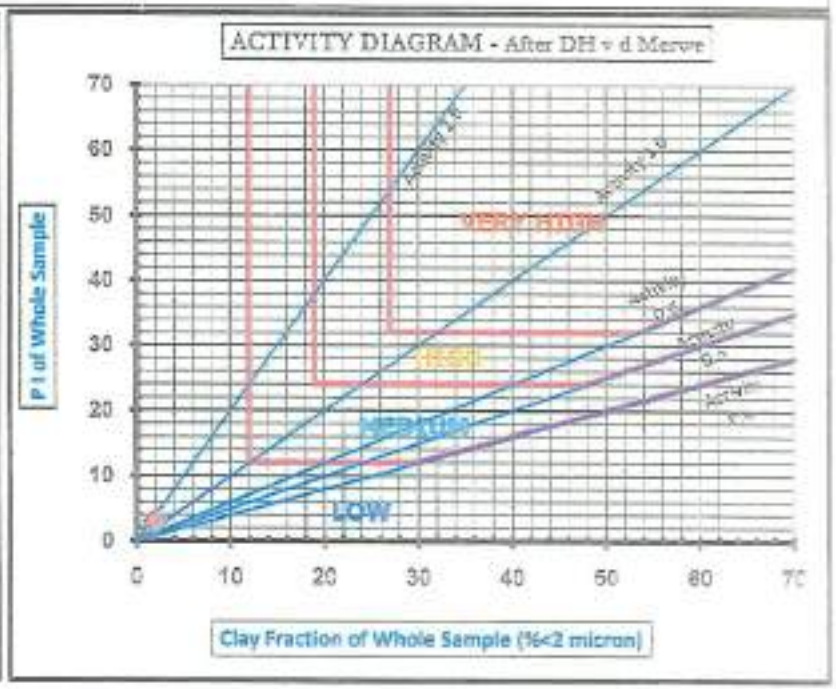
Kimberley 8300
Fax (053) 861 1029
Cell: 082 464 6315

FOUNDATION INDICATOR TEST

CLIENT	: Stabilis Development (Pty) Ltd	TEST HOLE No.	: 2	OUR REF.	: SL 3395
PROJECT	: Jan Kempdorp - New Magistrates Offices	DEPTH	: 725 - 950mm	YOUR REF.	: Mr. J.H. Steyn
SAMPLE No.	: 10/0193			DATE	: 15 February 2010
DESCRIPTION	: See test hole profile				





ATTERBERG LIMITS	Soil Fines	Whole Sample
Liquid Limit	22	7
Plastic Limit	14	
Plasticity Index	8	3
Linear Shrinkage	3.1	

CLAY FRACTION (%)	
Soil Fines	
6	
Whole Sample	
2	

DISTURBED/UNDISTURBED SAMPLE DATA	
Insitu Moisture Content (%)	4.35
Relative Density	2.683
Bulk Density(Dry) (kg/m^3)	1733
Bulk Density(Wet)(kg/m^3)	1808

Remarks :
Disturbed & Undisturbed Samp e

CALIFORNIA BEARING RATIO TEST REPORT
KALIFORNIESE DRAKRAG VERHOUDING TOETSVERSLAG

KIMATLAB cc
Testing and Research Laboratory
Civil, Structural and Building Materials
Toets en Navorsings Laboratorium
Siviele, Strukturele en Boumateriaal

STABILIS DEVELOPMENT (PTY) LTD
PO BOX 551
KIMBERLEY
8300

Your Ref. / U Verw.	MR J.H. STEYN	Our Ref. / Ons Verw.	SL 3085
Site / Terrein	ERF 253 JAN KEMPDORP - MAGISTRATE'S OFFICES		
Test Method / Toetsmetode	TMH 1 : A7 & A8	Press / Pers	

Roper Street/straat 3 Kimberley 8301 / P.O. Box/Posbus 1234 Kimberley 8300
Telephone/Telefoon: (053) 8322473 / Fax/Faks (053) 8322472

Date Received / Datum Ontvang	2010 02 15
Report Date / Verslag Datum	2010 02 20

Sample No. / Monster No.	Sample Description / Details / Monster Beskrywing / Besonderhede	Effort / Krag	Bearing Ratio @ / Drakrag Verh. @ 2.54 mm	5.08 mm	7.62 mm	Swell (%) / Uitswelling (%)	Mod. AASHTO Data / Gemod. AASHTO Data: Max. Dry Dens (kg/m³) / Maks. Droë Digt.	O.M.C (%) / O.V.I	Compaction Data / Verdigtingsdata: Dry Density (kg/m³) / Droë Digtheid	Compaction (%) / Verdigting	M.C. (%) / V.I.
10/0132	TEST PIT 3 155 - 725 mm	MOD	66		-	0.1	1987	7.2	1951	96.2	7.16
		NRB	51	--	--	-			1953	98.5	
		STD	41	--	--	--			1912	97.3	
		MOD									
		NRB									
		STD									
		MOD									
		NRB									
		STD									
		MOD									
		NRB									
		STD									

C.B.R. Data / K.D.V. Data

Comp (%) / Verd.	C.B.R. (%) / K.D.V.
100	36
98	43
95	25
93	18
90	8
100	
98	
95	
93	
90	
100	
98	
95	
93	
90	
100	
98	
95	
93	
90	

[illegible]

[illegible]

For/Vir KIMATLAB cc

DYNAMIC CONE PENETROMETER TEST

KIMATLAB cc
Civil, Structural & Building Solutions
CK 2001/102203
P.O.Box 1284 Kimberley 8300
Cellular: 082 464 6515 Fax: (053) 861 1021

Stabilis Development (Pty) Ltd
P.O. Box 861
KIMBERLEY
8300

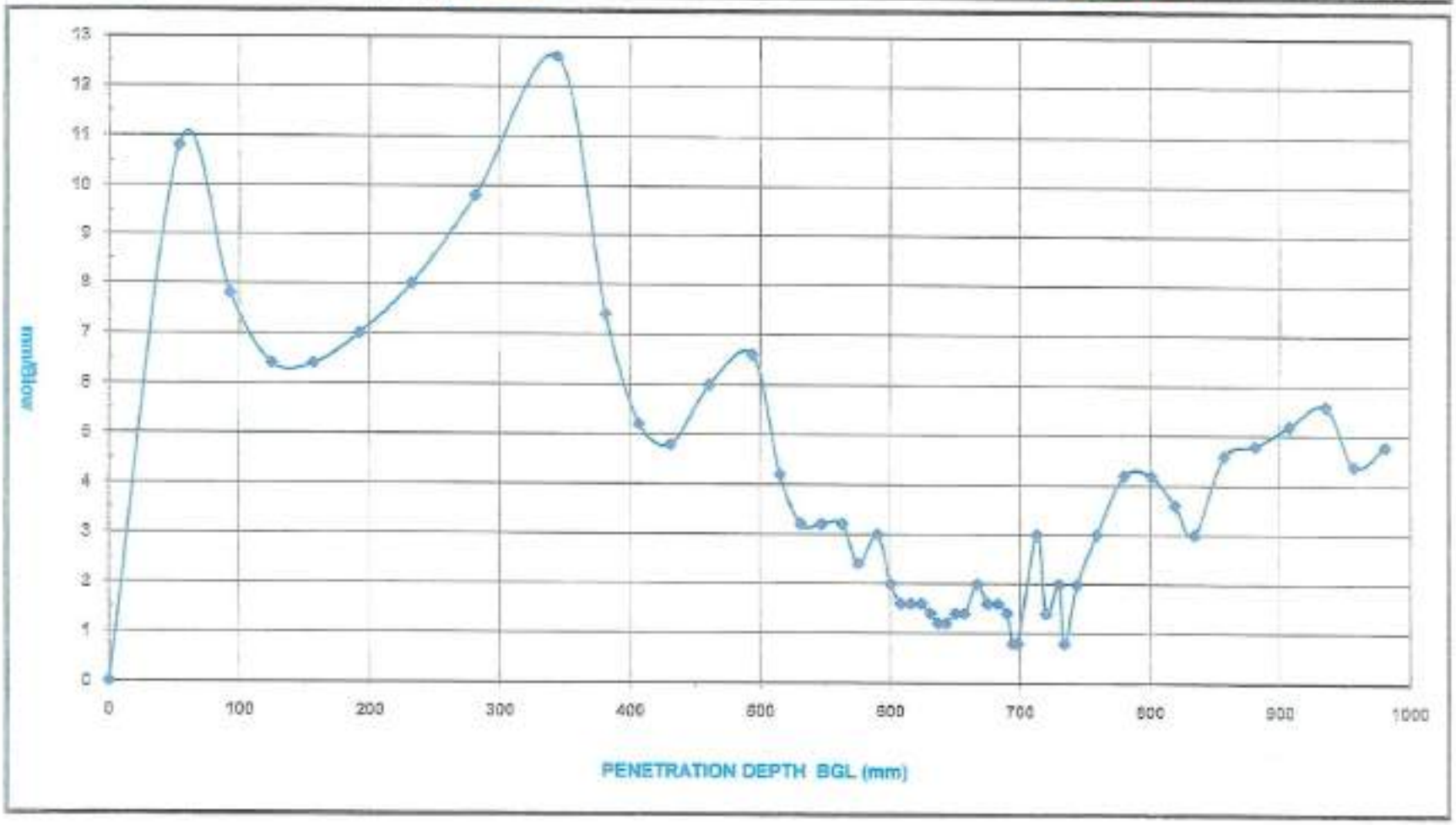
Your Ref.: Mr J.H. Steyn **Our Ref:** SL 3395

Site : Jan Kempdorp (New) Magistrates Offices : Erf 253

Position : Test Pit 1

Date Tested : 15 February 2010

Report Date : 19 February 2010



Blows	BLOWS	Depth	mm/Blow
0		0	
5		54	10.8
5		93	7.8
5		125	6.4
5		157	6.4
5		192	7
5		232	8
5		281	9.8
5		344	12.6
5		381	7.4
5		427	9.2
5		451	4.8
5		461	2
5		494	6.6
5		515	4.2
5		531	3.2
5		547	3.2
5		563	3.2
5		575	2.4
5		590	3
5		600	2
5		608	1.6
5		616	1.6
5		624	1.6
5		631	1.4
5		637	1.2
5		643	1.2
5		650	1.4
5		657	1.4
5		667	2
5		675	1.6
5		683	1.6
5		690	1.4
5		694	0.8

DYNAMIC CONE PENETROMETER TEST

KIMATLAB cc
Civil, Structural & Building Technicians
CK 98/10182/23
P.O.Box 1264 Kimberley 8300
Cellular 082 464 6315 Fax (053) 861 1039

Stabilis Development (Pty) Ltd
P.O. Box 861
KIMBERLEY
8300

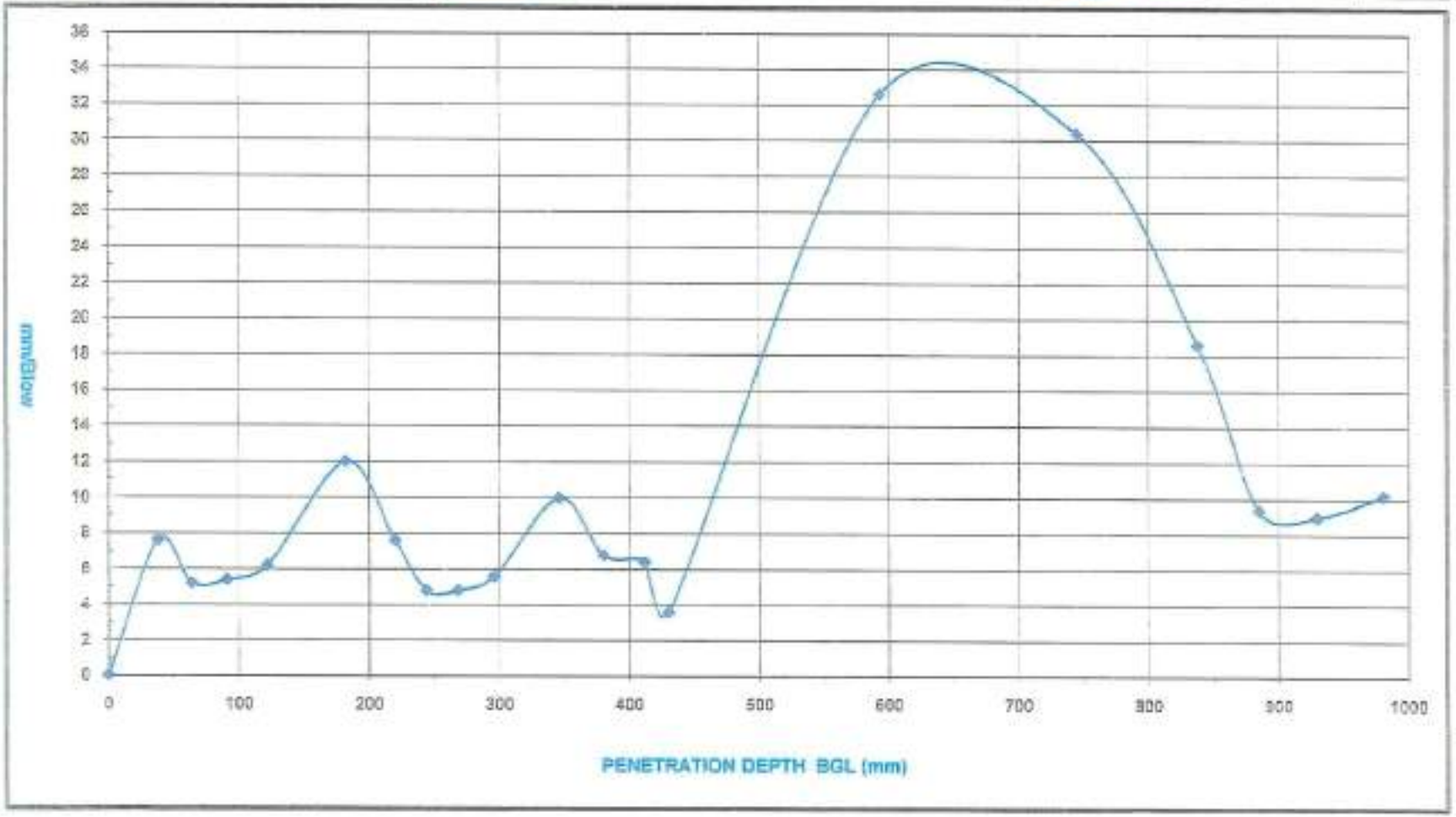
Your Ref.: Mr J.H. Steyn **Our Ref:** SL 3395

Site : Jan Kempdorp (New) Magistrates Offices : Erf 253

Position : Test Pit 2

Date Tested : 15 February 2010

Report Date : 19 February 2010



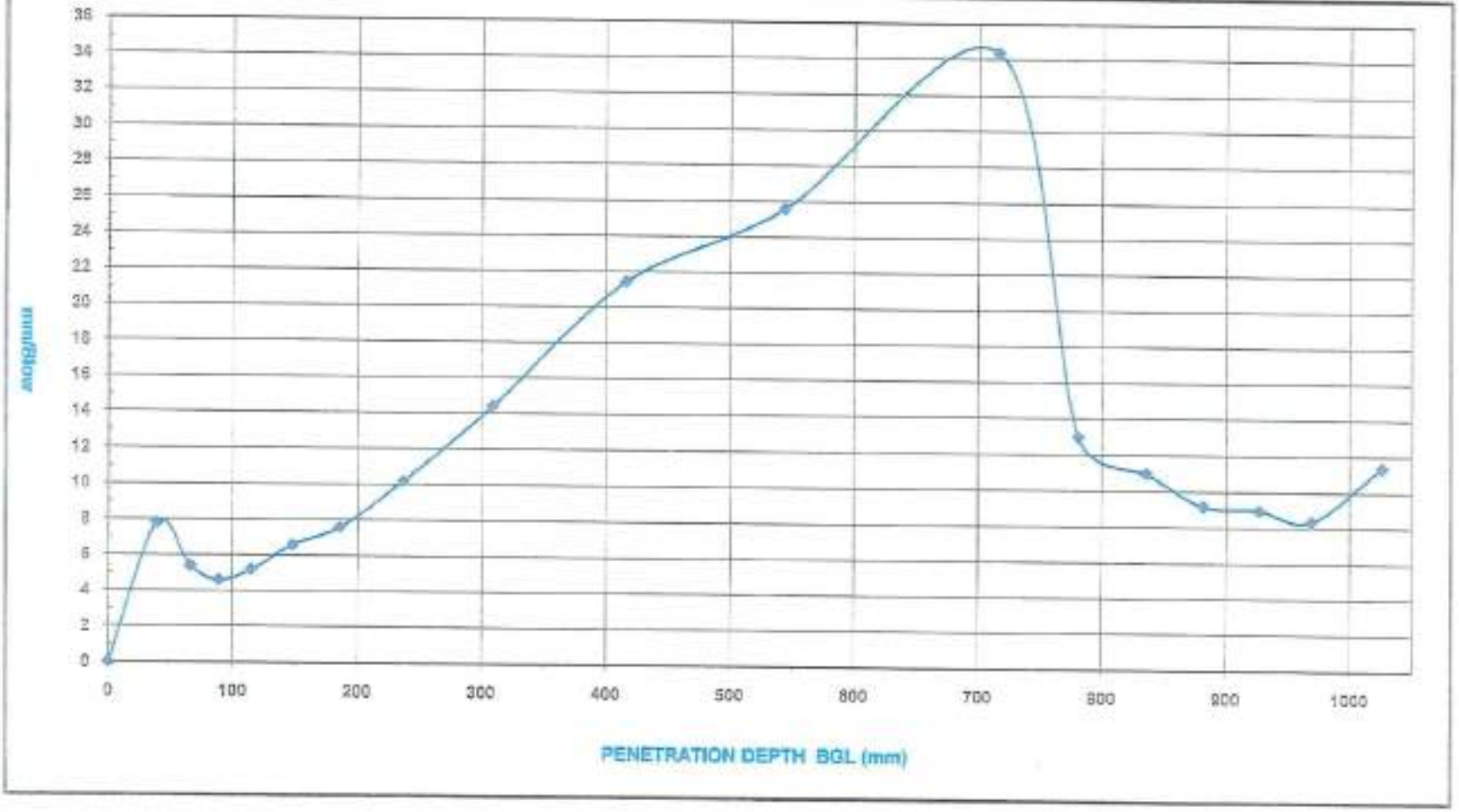
No. Blows	Depth	mm/Blow
0	0	
6	38	7.6
6	64	5.2
6	91	5.4
6	122	6.2
6	182	12
6	220	7.6
6	244	4.8
6	268	4.8
6	298	5.6
6	348	10
6	390	8.4
6	412	8.4
6	430	3.6
6	593	32.6
6	746	30.4
6	838	18.4
6	885	9.4
6	930	9
6	981	10.2

DYNAMIC CONE PENETROMETER TEST

KIMATLAB cc
Civil, Structural & Building Solutions
CK 99/15792/23
P.O.Box 1264 Kimberley 8300
Cellular 082 464 6215 Fax (053) 861 1009

Stabilis Development (Pty) Ltd
P.O. Box 861
KIMBERLEY
8300

Your Ref.: Mr J.H. Steyn **Our Ref:** SL 3395
Site : Jan Kempdorp (New) Magistrates Offices : Erf 253
Position : Test Position 3
Date Tested : 15 February 2010
Report Date : 19 February 2010



No. Blows	Depth	mm/Blow
0	0	
5	39	7.8
5	66	5.4
5	89	4.6
5	115	5.2
5	148	6.6
5	186	7.6
5	257	12.2
5	329	14.4
5	436	21.4
5	644	25.6
5	816	34.4
5	781	13
5	836	11
5	882	9.2
5	927	9
5	959	6.4
5	1026	11.4

JAN KEMPDORD ERF 253 - NEW MAGISTRATES OFFICES : GEOTECHNICAL INVESTIGATION

SUMMARY OF MATERIALS PROPERTIES / CHARACTERISTICS

TEST PIT No.	1			2		
DEPTH BGL (m)	0 – 0.16	0.16 – 0.51/0.8	0.51/0.8 –0.93	0 – 0.105	0.105 – 0.725	0.725 – 0.95
HORIZON THICKNESS (m)	0.16	0.50	0.27	0.15	0.62	0.23
MOISTURE CONTENT (%)	2.59	3.25	3.43	2.63	3.61	4.35
VOLUMETRIC M.CONTENT (%)	4.3	5.1	5.9	4.6	6.1	7.5
DEGREE OF SATURATION (%)	12.4	12.8	17.1	14.5	16.7	21.3
BULK DENSITY (kg/m³)	1705	1627	1792	1792	1746	1808
DRY BULK DENSITY (kg/m³)	1662	1576	1733	1746	1685	1733
RELATIVE DENSITY	2.541	2630	2.655	2.556	2.648	2.663
EQUIVALENT LIQUID LIMIT (%)	*16	*16	*16	*16	*16	7
EQUIVALENT P.I.	0	0	2	0	0	3
CLAY FRACTION (%)	3	4	2	4	5	2
VOID RATIO	0.529	0.669	0.532	0.464	0.571	0.649
POROSITY	0.346	0.401	0.347	0.317	0.364	0.364
OVERBURDEN PRESSURE(kPa) (At Centre Of Layer – Excluding Foundation/Structure)	1.3	5.3	7.7	0.9	6.2	8.2
POTENTIAL EXPANSIVENESS (VAN DER MERWE) LAYER (mm)	0	0	0	0	0	1
CUMULATIVE (mm)	0	0	0	0	0	2

*Assumed

KIMATLAB cc

STABILIS DEVELOPMENT (PTY) LTD

ERF 253 JAN KEMPDORP : MAGISTRATES NEW OFFICES

TABLE OF BEARING VALUES

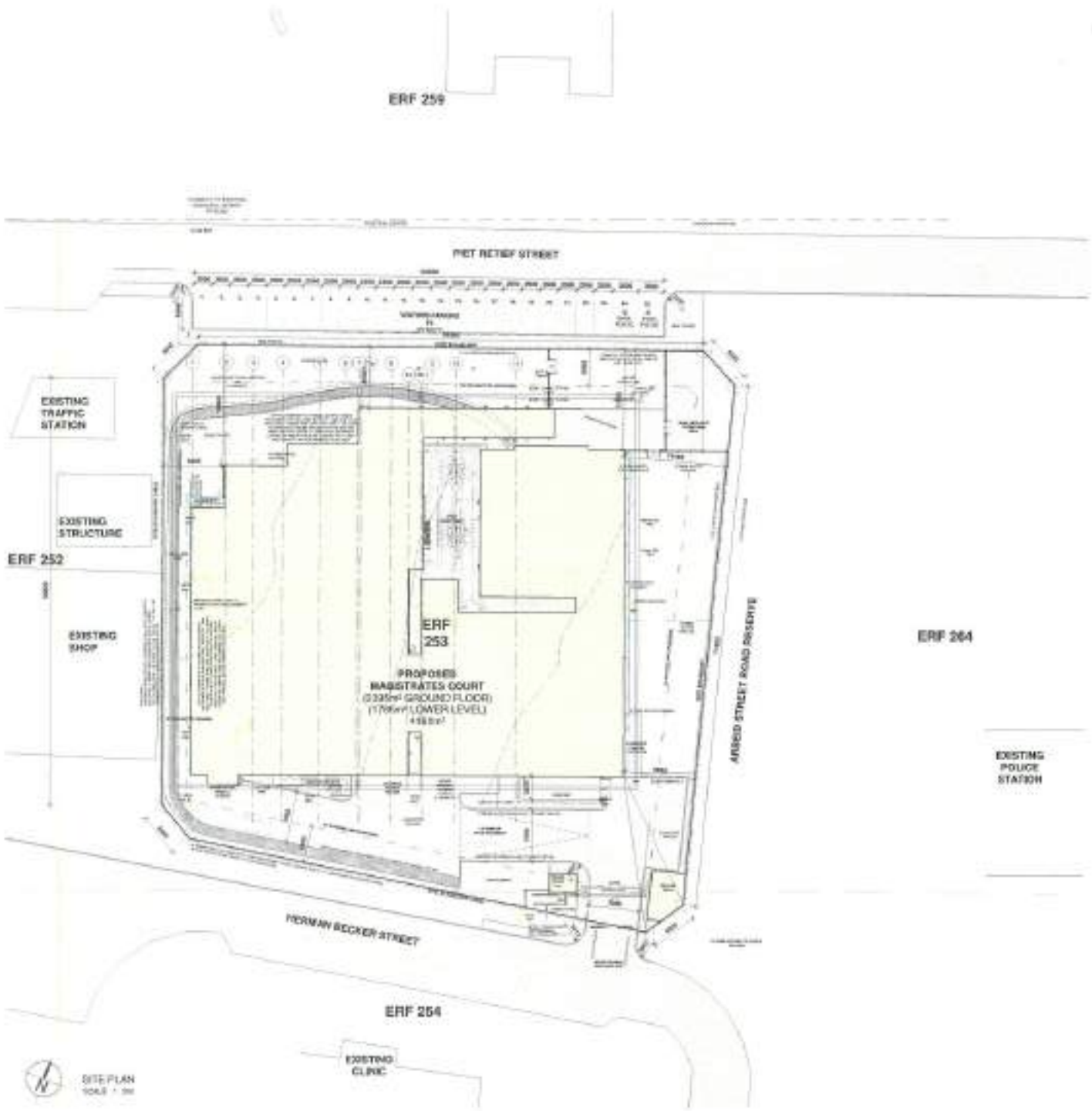
TP Nº	DEPTH BSL (mm) (kPa)	BEARING CAPACITY	TP Nº	DEPTH BSL (mm) (kPa)	BEARING CAPACITY	TP Nº	DEPTH BSL (mm)	BEARING CAPACITY (kPa)
1	0 – 380	95	2	0 – 475	95	3	0 – 200	115
1	380 – 525	145	2	475 – 850	40	3	200 – 420	70
1	525 – 760	250	2	850 – 980	95	3	420 – 750	40
1	760 – 1000	175				3	750 – 1030	95

KIMATLAB CC

APPENDIX D

GENERAL PHOTOGRAPHS

General view of the site. Top photo taken from the southwestern side, photo in the centre taken from the northwest of the site. Bottom photo shows one of the mics in Test Pit 1.



LOCALITY PLAN

SCHEDULE OF RIGHTS

PROPERTY DESCRIPTION

OTHER INFORMATION

ZONING SPECIFIC CONTROL MEASURES

PARKING

THE CREATIVE

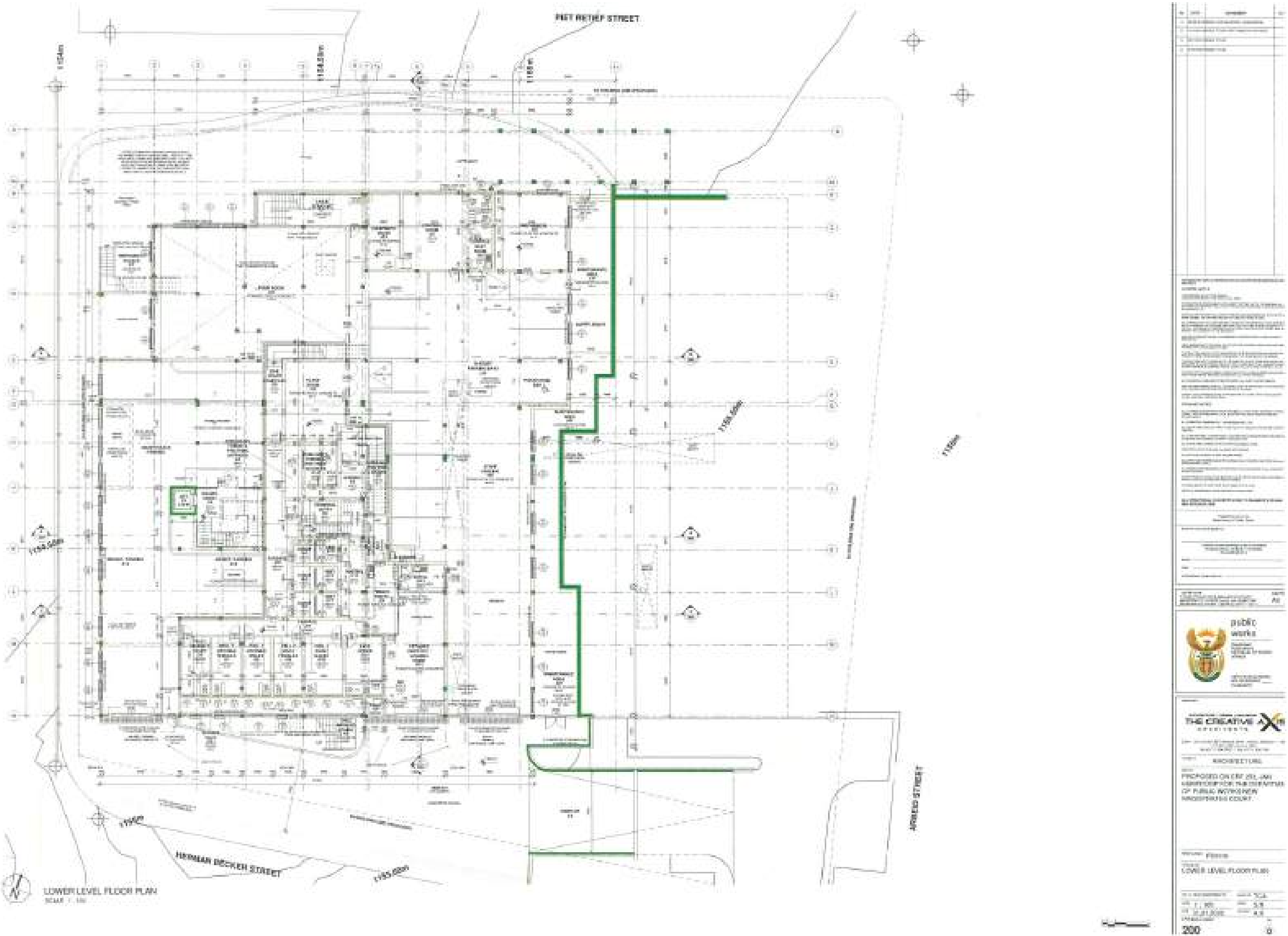
ARCHITECTURE

ARCHITECTURE

PROPOSED ON ERF 253, ANN HEMPENSTALL FOR THE DEPARTMENT OF PUBLIC WORKS NEW MAGISTRATES COURT

SITE PLAN, LOCALITY PLAN

101


PIET RETIEF STREET
HERMAN BECKER STREET
JOUBERT STREET
LOWER LEVEL FLOOR PLAN
public works
THE CREATIVE
ARCHITECTURE
PROPOSED ON ERF 251, AM
PUBLIC WORKS NEW
MAGISTRATES COURT
LOWER LEVEL FLOOR PLAN
200

GROUND FLOOR PLAN
SCALE: 1: 100

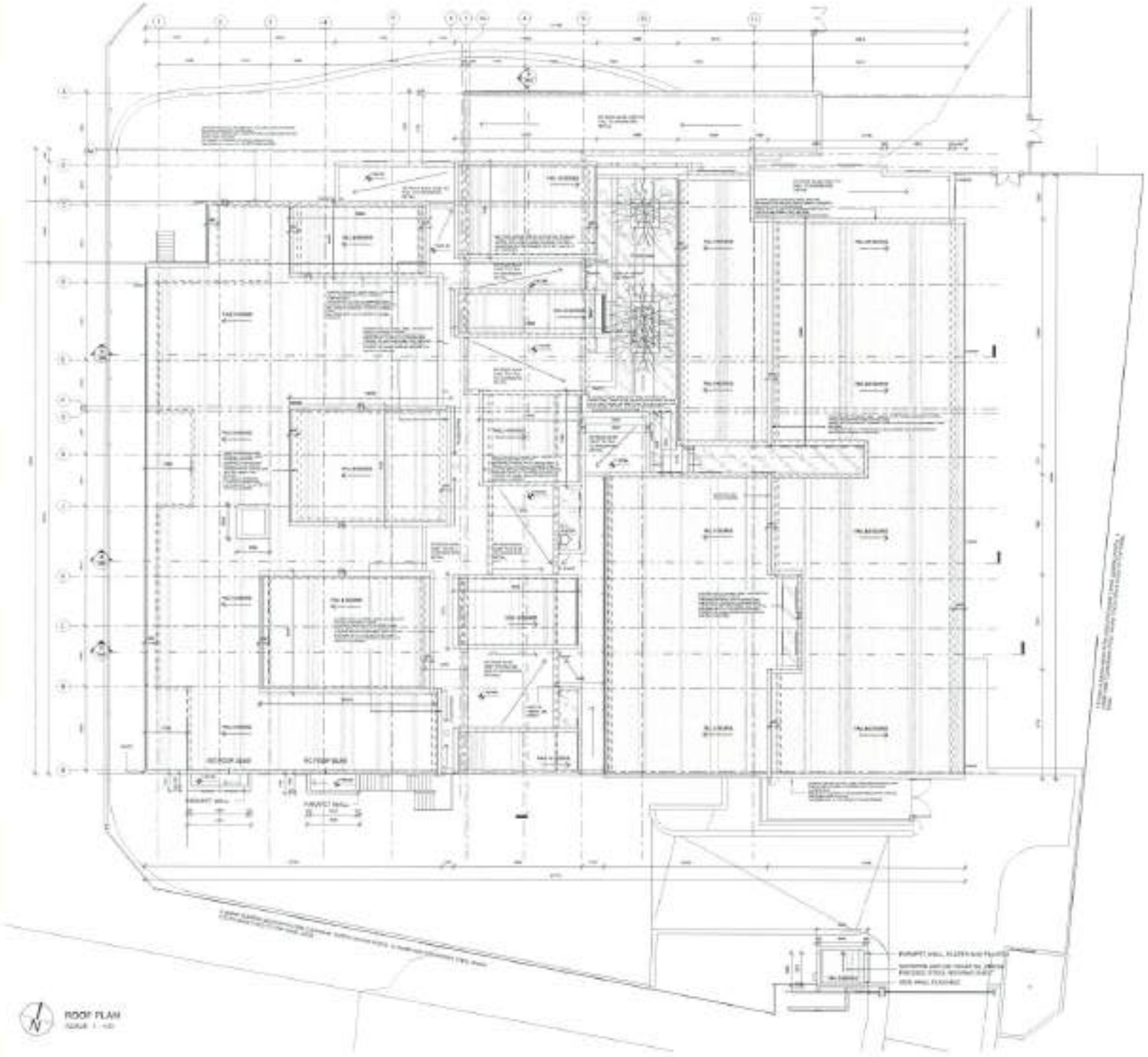
public works

THE CREATIVE A

ARCHITECTURE

GROUND FLOOR PLAN

201



ROOF PLAN

public works

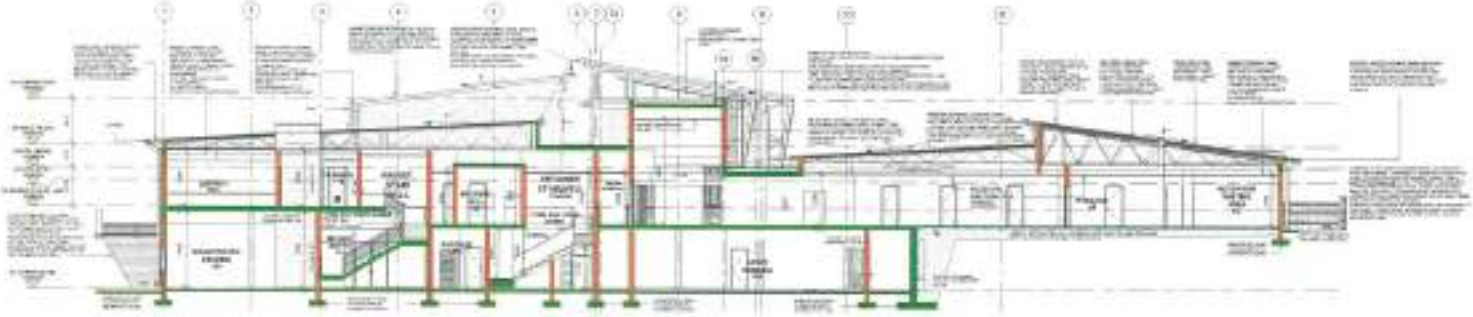
THE CREATIVE EXCHANGE

ARCHITECTURE

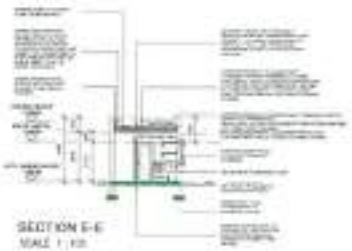
PROPOSED ON OF 001 JAN
WARRANT FOR THE DEPARTM
OF PUBLIC WORKS NEW
MAGISTRATES COURT

ROOF PLAN

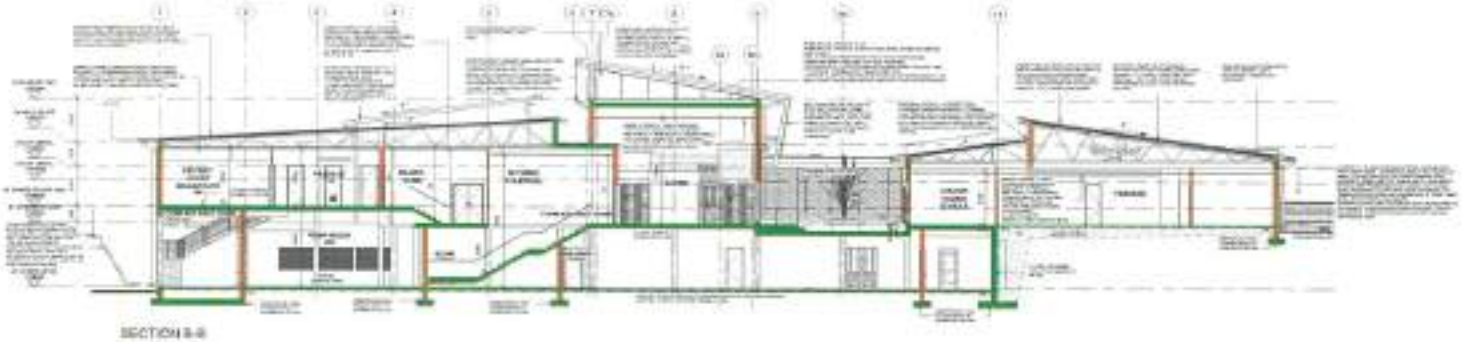
202



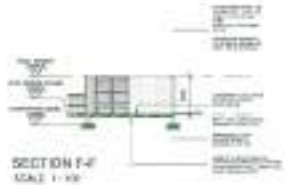
SECTION A-A
SCALE 1 : XX



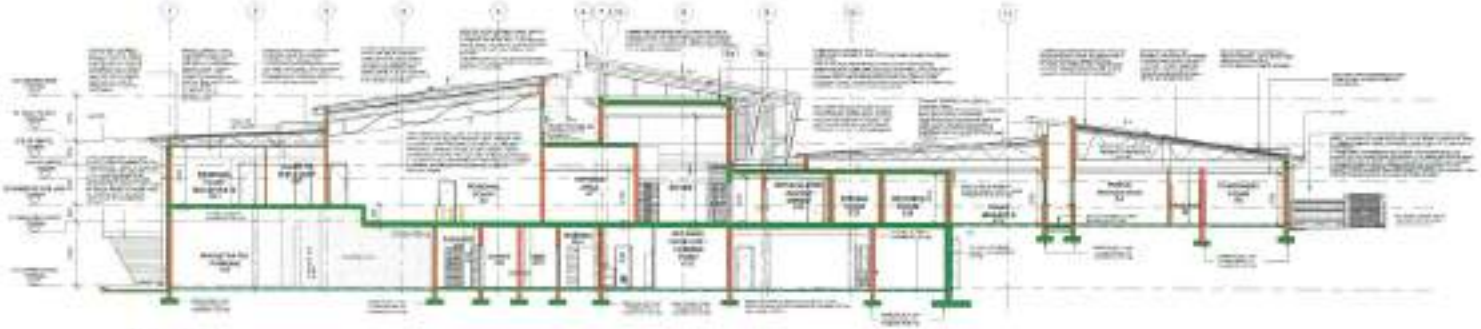
SECTION E-E
SCALE 1 : XX



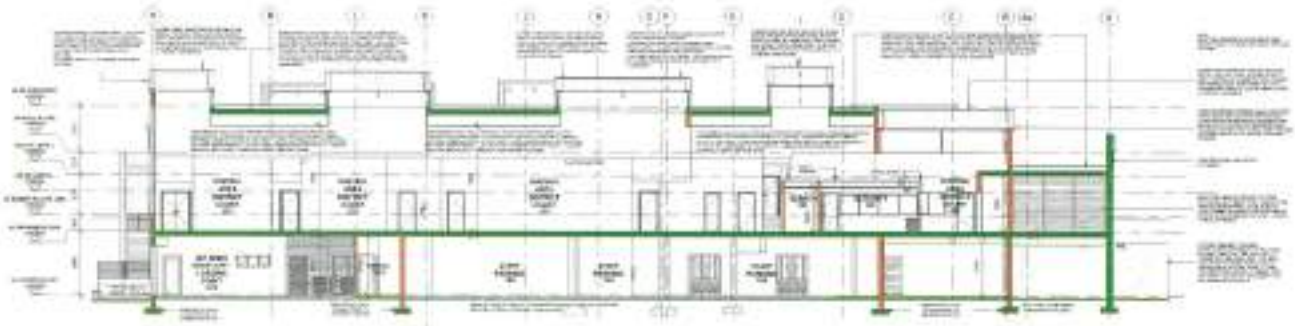
SECTION B-B
SCALE 1 : XX



SECTION F-F
SCALE 1 : XX



SECTION C-C
SCALE 1 : XX



SECTION D-D
SCALE 1 : XX

No.	DATE	COMMENT
1		
2		
3		
4		
5		

public works

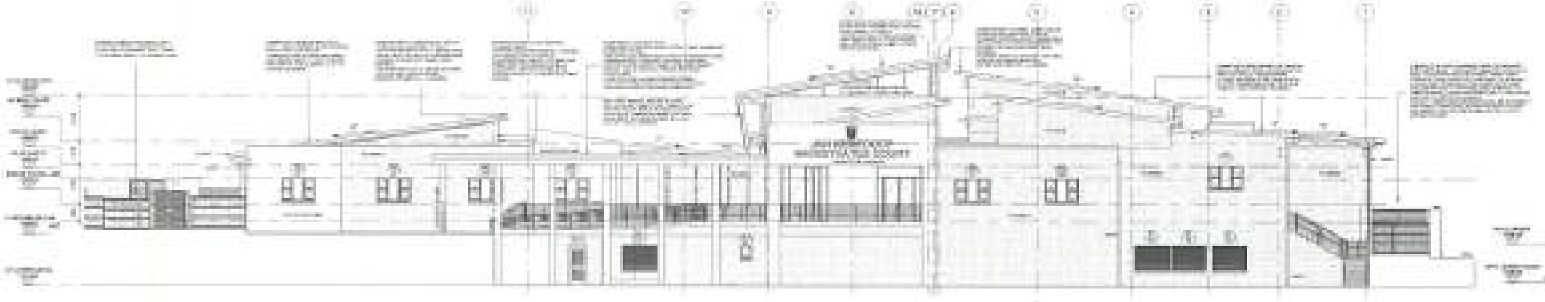
THE CREATIVE

ARCHITECTURE

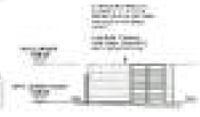
PROPOSED ON ERF 201, LIME KEMPDORP FOR THE DEPARTMENT OF PUBLIC WORKS NEW MAGISTRATES COURT

SECTIONS

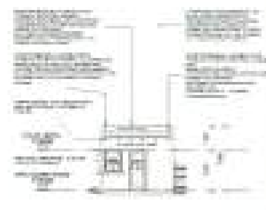
A0



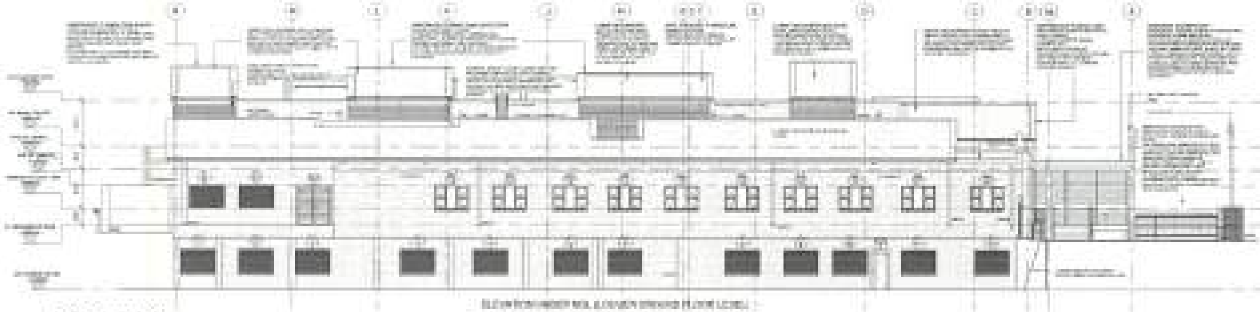
NORTH ELEVATION
SCALE 1 : 100



WASTE YARD: NORTH ELEVATION
SCALE 1 : 100

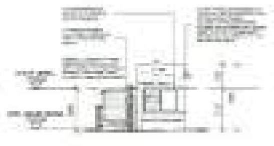


GUARD HOUSE NORTH ELEVATION
SCALE 1 : 50

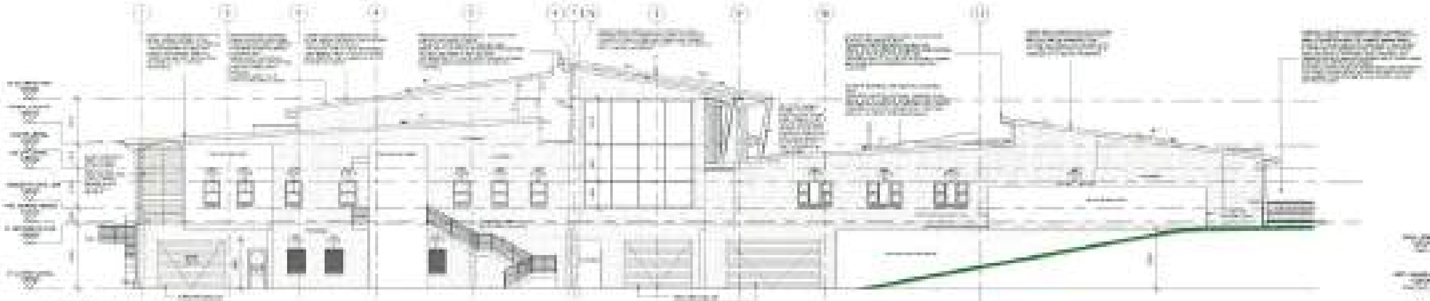


EAST ELEVATION
SCALE 1 : 100

WASTE YARD: EAST ELEVATION
SCALE 1 : 100

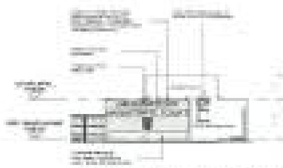


GUARD HOUSE: EAST ELEVATION
SCALE 1 : 50

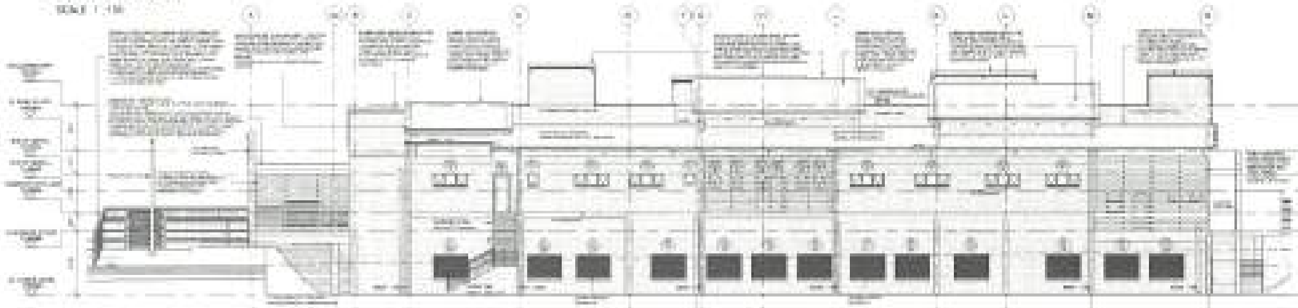


SOUTH ELEVATION
SCALE 1 : 100

WASTE YARD: SOUTH ELEVATION
SCALE 1 : 100



GUARD HOUSE: SOUTH ELEVATION
SCALE 1 : 50



WEST ELEVATION
SCALE 1 : 100

WASTE YARD: WEST ELEVATION
SCALE 1 : 100

GUARD HOUSE: WEST ELEVATION
SCALE 1 : 50

public works

THE CREATIVE AXIS
ARCHITECTS

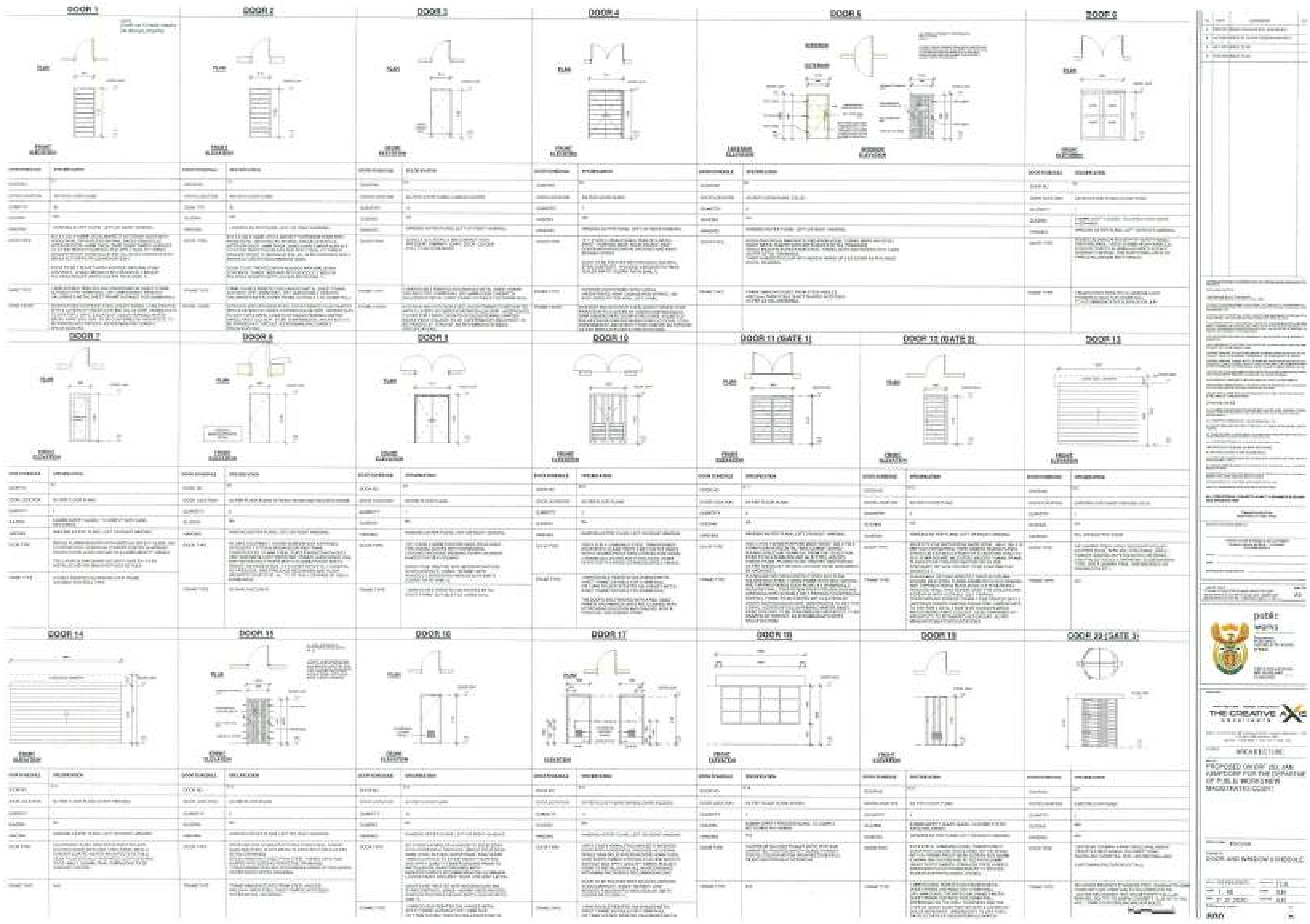
ARCHITECTURE

PROPOSED ONSITE BUILDING FOR THE DEPARTMENT OF PUBLIC WORKS NEW MAGISTRATE'S COURT

ELEVATIONS

400

0


DOOR 1
DOOR 2
DOOR 3
DOOR 4
DOOR 5
DOOR 6
DOOR 7
DOOR 8
DOOR 9
DOOR 10
DOOR 11 (GATE 1)
DOOR 12 (GATE 2)
DOOR 13
DOOR 14
DOOR 15
DOOR 16
DOOR 17
DOOR 18
DOOR 19
DOOR 20 (GATE 3)
public works
THE CREATIVE AXE
DOOR AND WINDOW SCHEDULE

DOOR AND WINDOW SCHEDULE

public works

THE CREATIVE AXIS ARCHITECTS

ARCHITECTURAL

PROPOSED ON ERF 263, JAN KEMPDORP FOR THE DEPARTMENT OF PUBLIC WORKS NEW MAGISTRATES COURT

DOOR AND WINDOW SCHEDULE

1:50

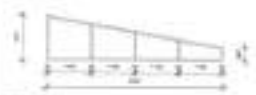
801

D

WINDOW 7

WINDOW SCHEDULE	SPECIFICATION
WINDOW NO.	W7
WINDOW LOCATION	GROUND FLOOR
QUANTITY	1
GLAZING TYPE	6MM CLEAR FLOAT GLASS
WINDOW TYPE	FIXED LIGHT
INTERNAL FINISH	PAINTED FINISH
EXTERNAL FINISH	PAINTED FINISH
HARDWARE TYPE	
FRAME FINISH	

WINDOW 8

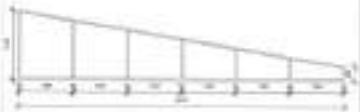


WINDOW SCHEDULE	SPECIFICATION
WINDOW NO.	W8
WINDOW LOCATION	GROUND FLOOR
QUANTITY	1
GLAZING TYPE	6MM CLEAR FLOAT GLASS
WINDOW TYPE	FIXED LIGHT
INTERNAL FINISH	PAINTED FINISH
EXTERNAL FINISH	PAINTED FINISH
HARDWARE TYPE	
FRAME FINISH	

WINDOW 9

WINDOW SCHEDULE	SPECIFICATION
WINDOW NO.	W9
WINDOW LOCATION	GROUND FLOOR
QUANTITY	1
GLAZING TYPE	6MM CLEAR FLOAT GLASS
WINDOW TYPE	FIXED LIGHT
INTERNAL FINISH	PAINTED FINISH
EXTERNAL FINISH	PAINTED FINISH
HARDWARE TYPE	
FRAME FINISH	

WINDOW 10

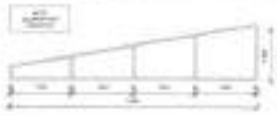


WINDOW SCHEDULE	SPECIFICATION
WINDOW NO.	W10
WINDOW LOCATION	GROUND FLOOR
QUANTITY	1
GLAZING TYPE	6MM CLEAR FLOAT GLASS
WINDOW TYPE	FIXED LIGHT
INTERNAL FINISH	PAINTED FINISH
EXTERNAL FINISH	PAINTED FINISH
HARDWARE TYPE	
FRAME FINISH	

WINDOW 11

WINDOW SCHEDULE	SPECIFICATION
WINDOW NO.	W11
WINDOW LOCATION	GROUND FLOOR
QUANTITY	1
GLAZING TYPE	6MM CLEAR FLOAT GLASS
WINDOW TYPE	FIXED LIGHT
INTERNAL FINISH	PAINTED FINISH
EXTERNAL FINISH	PAINTED FINISH
HARDWARE TYPE	
FRAME FINISH	

WINDOW 12



WINDOW SCHEDULE	SPECIFICATION
WINDOW NO.	W12
WINDOW LOCATION	GROUND FLOOR
QUANTITY	1
GLAZING TYPE	6MM CLEAR FLOAT GLASS
WINDOW TYPE	FIXED LIGHT
INTERNAL FINISH	PAINTED FINISH
EXTERNAL FINISH	PAINTED FINISH
HARDWARE TYPE	
FRAME FINISH	

WINDOW 13

WINDOW SCHEDULE	SPECIFICATION
WINDOW NO.	W13
WINDOW LOCATION	GROUND FLOOR
QUANTITY	1
GLAZING TYPE	6MM CLEAR FLOAT GLASS
WINDOW TYPE	FIXED LIGHT
INTERNAL FINISH	PAINTED FINISH
EXTERNAL FINISH	PAINTED FINISH
HARDWARE TYPE	
FRAME FINISH	

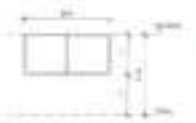
WINDOW 14

WINDOW SCHEDULE	SPECIFICATION
WINDOW NO.	W14
WINDOW LOCATION	GROUND FLOOR
QUANTITY	1
GLAZING TYPE	6MM CLEAR FLOAT GLASS
WINDOW TYPE	FIXED LIGHT
INTERNAL FINISH	PAINTED FINISH
EXTERNAL FINISH	PAINTED FINISH
HARDWARE TYPE	
FRAME FINISH	

WINDOW 15

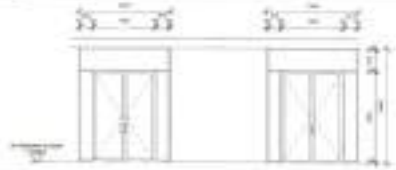
WINDOW SCHEDULE	SPECIFICATION
WINDOW NO.	W15
WINDOW LOCATION	GF
QUANTITY	1
GLAZING TYPE	6MM CLEAR FLOAT GLASS
WINDOW TYPE	FIXED LIGHT
INTERNAL FINISH	PAINTED FINISH
EXTERNAL FINISH	PAINTED FINISH
HARDWARE TYPE	
FRAME FINISH	

WINDOW 16



WINDOW SCHEDULE	SPECIFICATION
WINDOW NO.	W16
WINDOW LOCATION	GF
QUANTITY	1
GLAZING TYPE	6MM CLEAR FLOAT GLASS
WINDOW TYPE	FIXED LIGHT
INTERNAL FINISH	PAINTED FINISH
EXTERNAL FINISH	PAINTED FINISH
HARDWARE TYPE	
FRAME FINISH	

SHOPFRONT S1



WINDOW SCHEDULE	SPECIFICATION
WINDOW NO.	S1
WINDOW LOCATION	
QUANTITY	1
GLAZING TYPE	6MM CLEAR FLOAT GLASS, LAMINATED TYPE 'B' GLASS, ALL WITH A UNIFORM TINT, CLEAR, FLOAT GLASS TO CURTAIN WALL
WINDOW TYPE	2 SLIDING DOORS WITH FIXED LIGHTS ABOVE AND BELOW FRAMES TO BE POWDER COATED ALUMINIUM FIXED LIGHTS
FRAME FINISH	

SHOPFRONT S2

WINDOW SCHEDULE	SPECIFICATION
WINDOW NO.	S2
WINDOW LOCATION	
QUANTITY	1
GLAZING TYPE	6MM CLEAR FLOAT GLASS, LAMINATED TYPE 'B' GLASS, ALL WITH A UNIFORM TINT, CLEAR, FLOAT GLASS TO CURTAIN WALL
WINDOW TYPE	FIXED LIGHT
FRAME FINISH	

WINDOW 17

WINDOW SCHEDULE	SPECIFICATION
WINDOW NO.	W17
WINDOW LOCATION	GF
QUANTITY	1
GLAZING TYPE	6MM CLEAR FLOAT GLASS, LAMINATED TYPE 'B' GLASS, ALL WITH A UNIFORM TINT, CLEAR, FLOAT GLASS TO CURTAIN WALL
WINDOW TYPE	FIXED LIGHT
FRAME FINISH	

VENT 1

VENT SCHEDULE	SPECIFICATION
VENT NO.	V1
VENT LOCATION	
QUANTITY	8
GLAZING TYPE	6mm
VENT TYPE	
VENT FINISH	

VENT 2

VENT SCHEDULE	SPECIFICATION
VENT NO.	V2
VENT LOCATION	
QUANTITY	1
GLAZING TYPE	6mm
VENT TYPE	
VENT FINISH	

public works

THE CREATIVE AXE ARCHITECTS

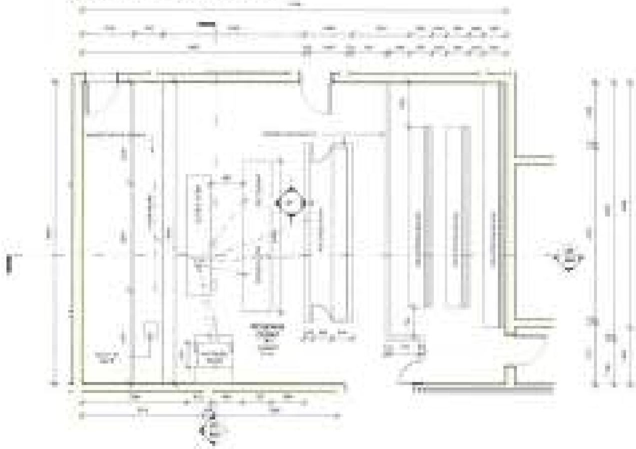
ARCHITECTURE

PROPOSED ON/OFF ATL JAN HEMSTORP FOR THE DEPARTMENT OF PUBLIC WORKS NEW KIRKENTWANG COURT

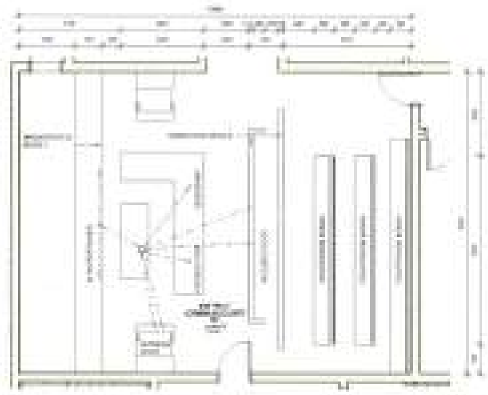
DOOR AND WINDOW SCHEDULE

802

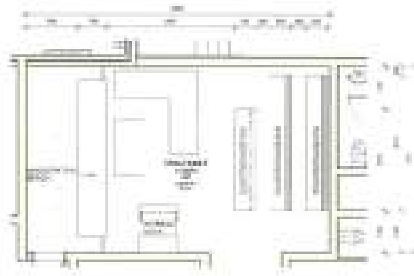
TYPICAL COURT DETAILS
ROOM: A1, B2 AND C2



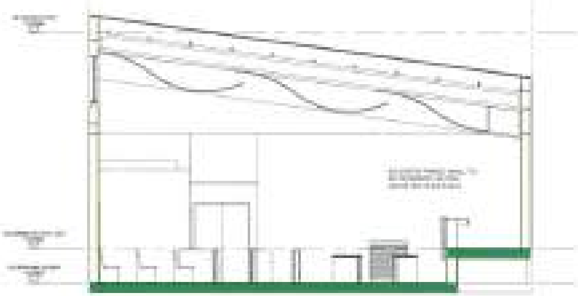
A1 REGIONAL COURT: GROUND FLOOR PLAN
SCALE 1 : 50



B2 DISTRICT CRIMINAL COURT: GROUND FLOOR PLAN
SCALE 1 : 50



C2 CIVIL/FAMILY COURT: GROUND FLOOR PLAN
SCALE 1 : 50



A1 REGIONAL COURT: SECTION AA
SCALE 1 : 50

A1 REGIONAL COURT: SECTION BB
SCALE 1 : 50

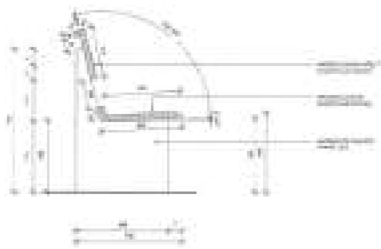
COURT BENCH DETAIL
SCALE 1 : 20

PLAN: BENCH TYPE 1
SCALE 1:20

FRONT ELEVATION: BENCH TYPE 1
SCALE 1:20

PLAN: BENCH TYPE 1
SCALE 1:20

FRONT ELEVATION: BENCH TYPE 1
SCALE 1:20



BENCH SECTION DETAIL
SCALE 1 : 10

public works

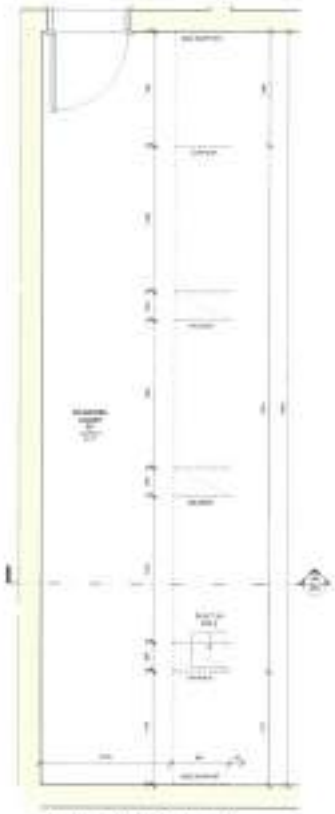
THE CREATIVE AXIS
ARCHITECTURAL

REGIONAL COURT DETAILS

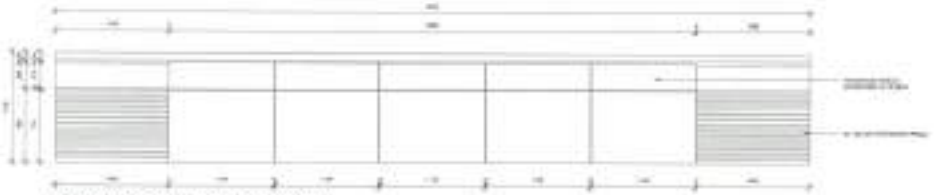
T.S.A.
A.W.
A.B.

A

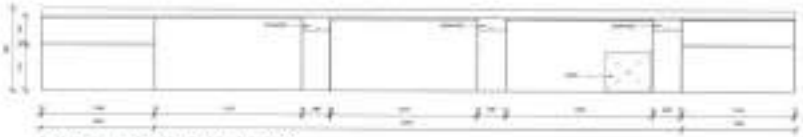
TYPICAL COURT DETAILS
ROOM: A1, B2 AND C2



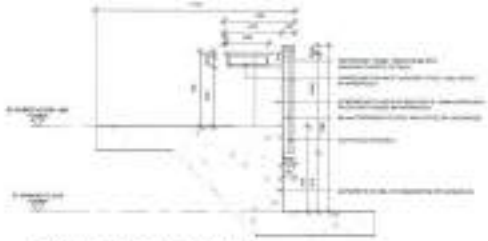
MAGISTRATE BENCH PLAN
SCALE 1 : 20



MAGISTRATE BENCH FRONT ELEVATION
SCALE 1 : 20

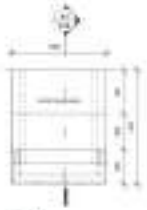


MAGISTRATE BENCH BACK ELEVATION
SCALE 1 : 20

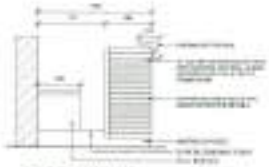


MAGISTRATE BENCH SECTION 1
SCALE 1 : 20

WITNESS DOCK DETAILS
SCALE 1 : 20

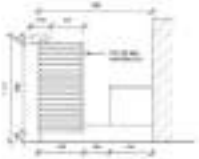


PLAN
SCALE 1:20



SIDE ELEVATION
SCALE 1:20

FRONT ELEVATION
SCALE 1:20



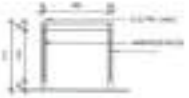
SIDE ELEVATION
SCALE 1:20

LECTERN TABLE DETAILS
SCALE 1 : 20

PLAN: LECTERN TABLE

FRONT ELEVATION: LECTERN TABLE

SIDE ELEVATION



SECTION LECTERN TABLE
SCALE 1 : 20

WITNESS DOCK SECTION
SCALE 1:20

public works

THE CREATIVE AXIS
ARCHITECTS

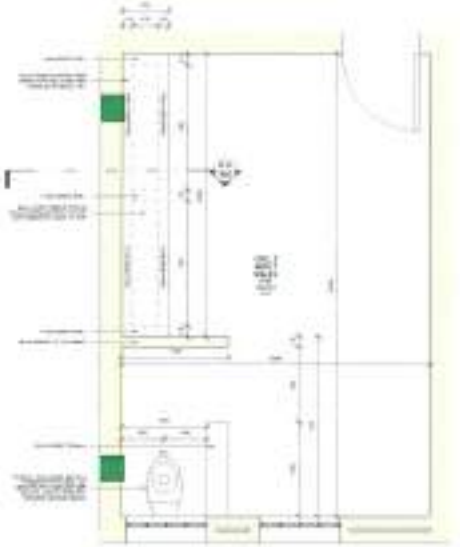
ARCHITECTURE

PROPOSED NON-MAGISTRATES COURT ON ERF 243, 289 KEMPDORP FOR THE DEPARTMENT OF PUBLIC WORKS

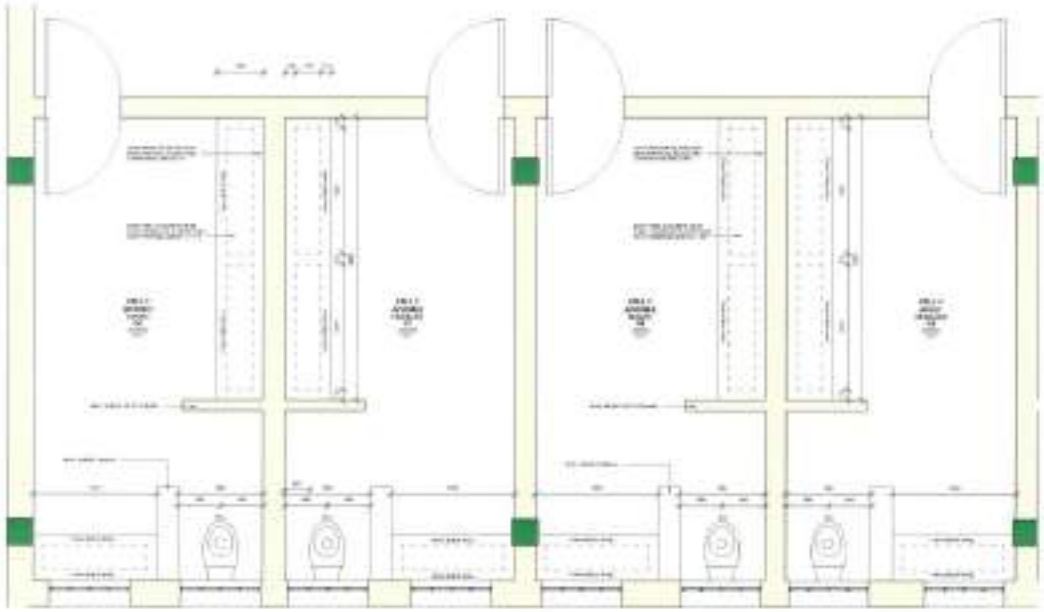
REGIONAL COURT DETAILS 2

TYPICAL HOLDING CELL
ROOM: G6 - G10, A9

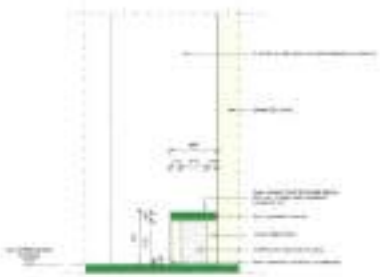
NOTE: ALL DIMENSIONS TO BE CONFIRMED ON SITE.



TYPICAL HOLDING CELL : LOWER GROUND PLAN
SCALE 1 : 20



HOLDING CELLS G6 - G10 : DISTRICT COURT : LOWER LEVEL PLAN
SCALE 1 : 20



TYPICAL HOLDING CELL : SECTION G10
SCALE 1 : 10

A9 HOLDING CELL : GROUND FLOOR PLAN
SCALE 1 : 20

public works

THE CREATIVE AXIS ARCHITECTS

ARCHITECTURAL

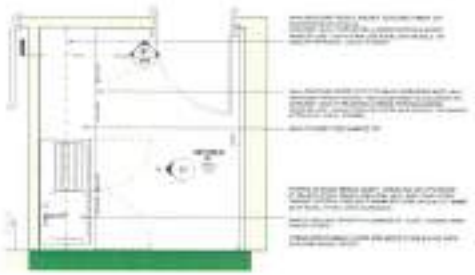
PROPOSED NEW MAGISTRATES COURT
ON ERF 203, JAN KEMPDORP FOR THE DEPARTMENT OF PUBLIC WORKS.

ADMIN DETAILS

603 A

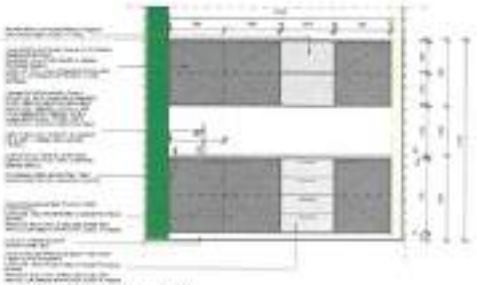
KITCHEN
ROOM: B7

NOTE: ALL DIMENSIONS TO BE CONFIRMED ON SITE



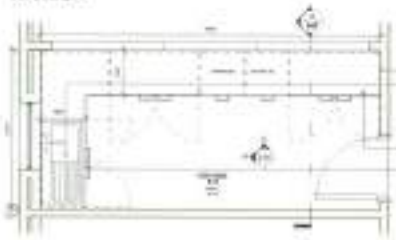
B7 KITCHEN : GROUND FLOOR PLAN
SCALE 1 : 20

B7 KITCHEN : SECTION B7
SCALE 1 : 20

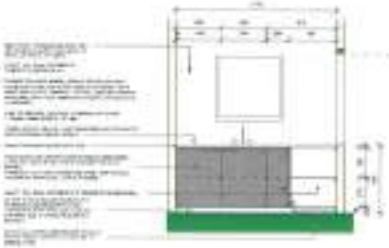


B7 KITCHEN : ELEVATION A
SCALE 1 : 20

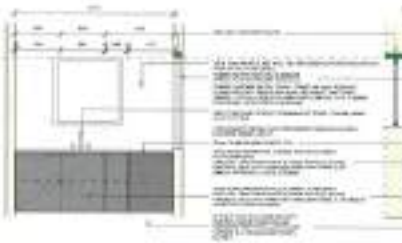
KITCHEN
ROOM: E14



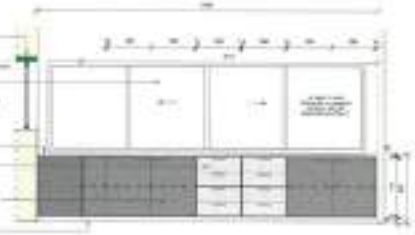
E14 KITCHEN : GROUND FLOOR PLAN
SCALE 1 : 20



E14 KITCHEN : SECTION E14
SCALE 1 : 20



E14 KITCHEN : ELEVATION A
SCALE 1 : 20



E14 KITCHEN: ELEVATION B
SCALE 1 : 20

public works

THE CREATIVE AXIS

PROPOSED NEW MAGISTRATES COURT ON ERF 1501, JAN KEMPDORP FOR THE DEPARTMENT OF PUBLIC WORKS

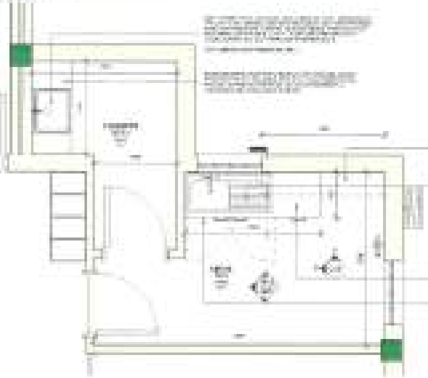
JOINERY DETAILS

604

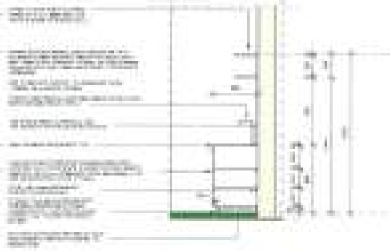
A

NOTE: ALL DIMENSIONS TO BE CONFIRMED ON SITE.

KITCHEN LOWER GROUND
ROOM: G13

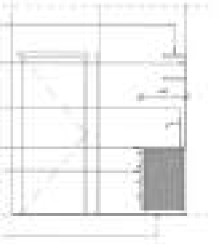


G13 KITCHEN : LOWER GROUND FLOOR PLAN
SCALE 1 : 20



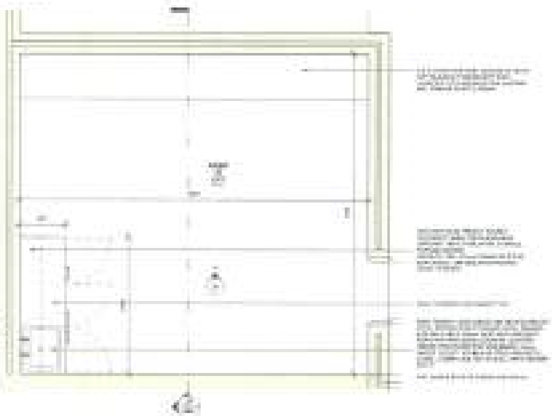
G13 KITCHEN : SECTION G13
SCALE 1 : 20

G13 KITCHEN : ELEVATION A
SCALE 1 : 20

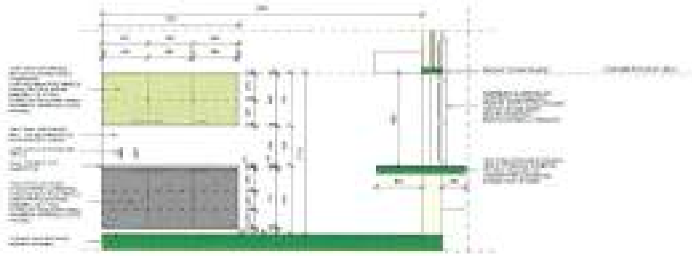


G13 KITCHEN : ELEVATION B
SCALE 1 : 20

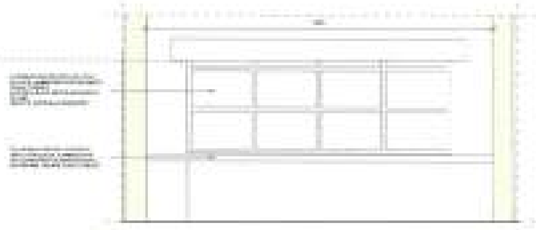
KIOSK
ROOM: J2



J2 KIOSK : GROUND FLOOR PLAN
SCALE 1 : 20

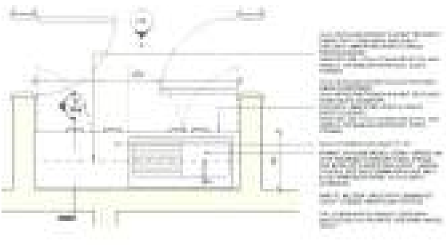


J2 KIOSK : SECTION J2
SCALE 1 : 20

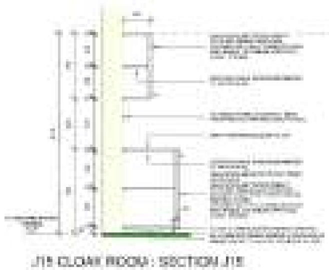


J2 KIOSK : ELEVATION A
SCALE 1 : 20

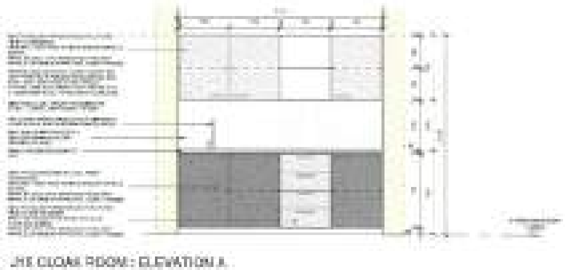
CLOAK ROOM
ROOM: J15



J15 CLOAK ROOM : GROUND FLOOR PLAN
SCALE 1 : 20



J15 CLOAK ROOM : SECTION J15
SCALE 1 : 20



J15 CLOAK ROOM : ELEVATION A
SCALE 1 : 20

public works

THE CREATIVE AXE
ARCHITECTS

ARCHITECTURE

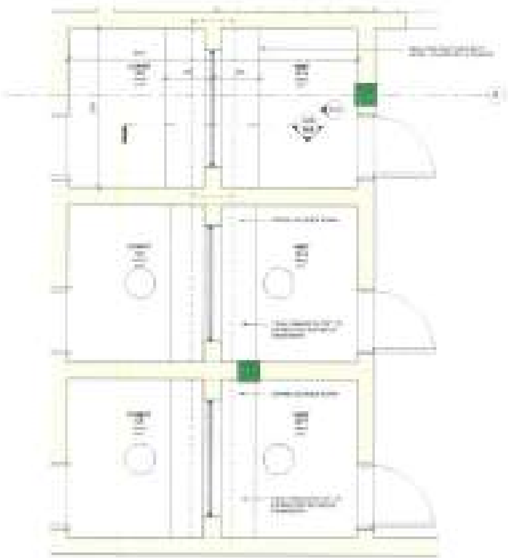
JOINERY DETAILS

As indicated

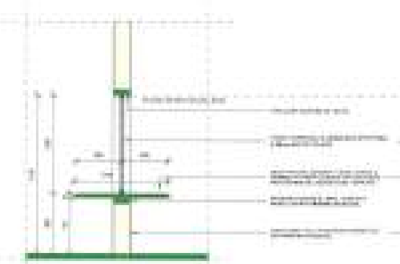
605

NOTE:
ALL DIMENSIONS TO BE CONFIRMED ON SITE.

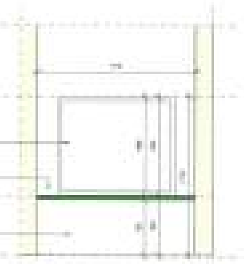
TYPICAL CONSULTATION CUBICLE
ROOM: G3 - 5 & G15 - 17



TYPICAL CONSULTATION CUBICLE : GROUND FLOOR PLAN
SCALE 1 : 25

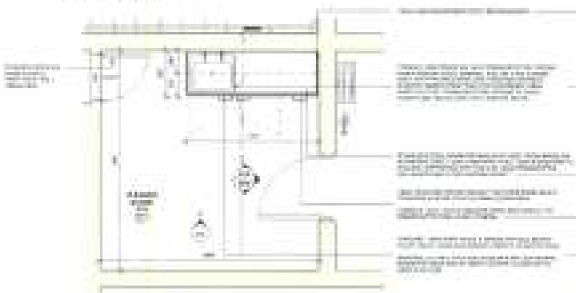


TYPICAL CONSULTATION CUBICLE : SECTION : G15
SCALE 1 : 25

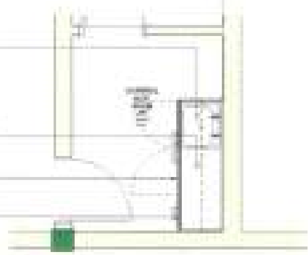


TYPICAL CONSULTATION CUBICLE : ELEVATION A
SCALE 1 : 25

CLEANING EQUIPMENT AND SUPPLIES STORE
ROOM: J16

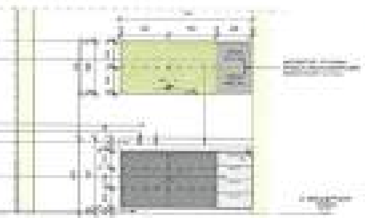


J16 CLEANER STORE : GROUND FLOOR PLAN
SCALE 1 : 25



J22 CONTROL REST ROOM : LOWER LEVEL PLAN
SCALE 1 : 25

TYPICAL CLEANER STORE : SECTION J16
SCALE 1 : 25



TYPICAL CLEANER STORE : ELEVATION J16
SCALE 1 : 25

public works

THE CREATIVE AXIS ARCHITECTS

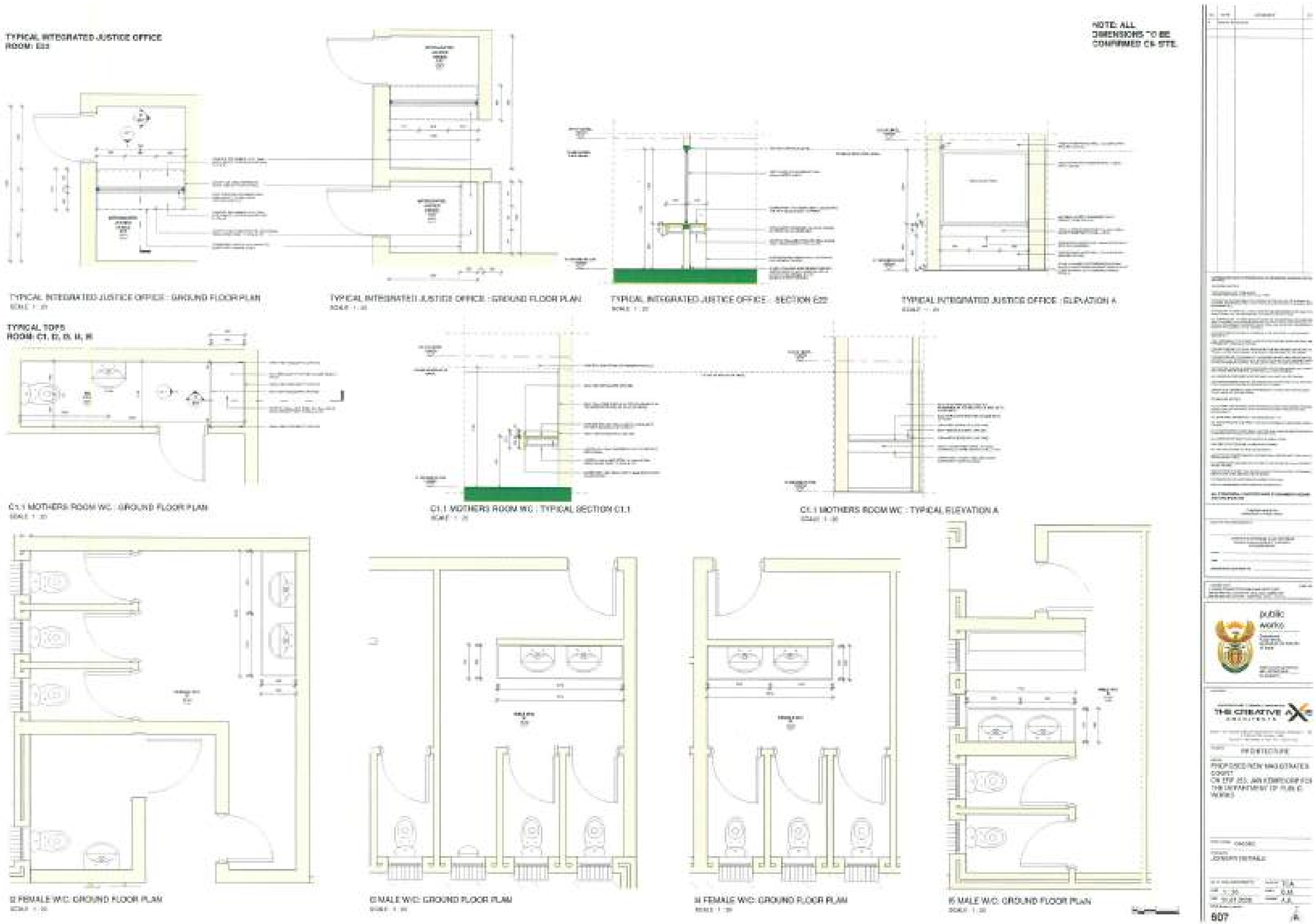
ARCHITECTURE

PROPOSED NEW MAGISTRATES COURT ON ERF 233, JAN KEMPDORP FOR THE DEPARTMENT OF PUBLIC WORKS

JOINERY DETAILS

1 : 25

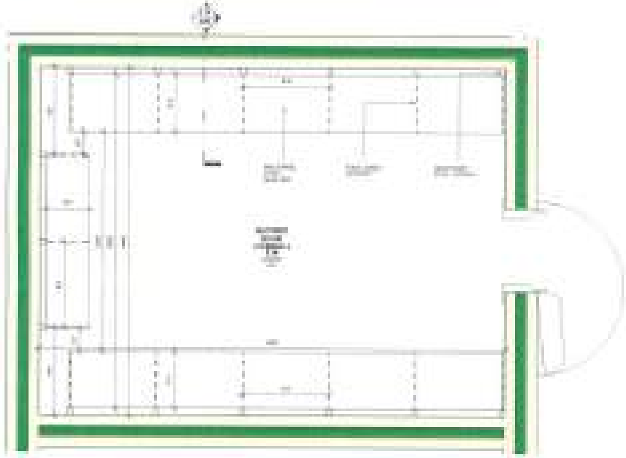
606



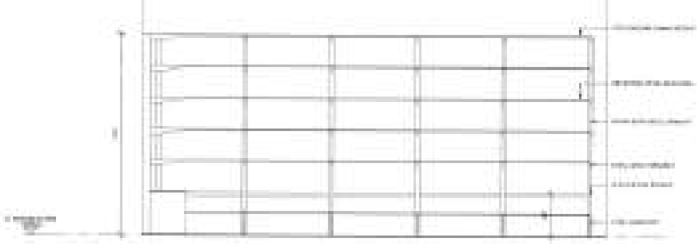
NOTE: ALL DIMENSIONS TO BE CONFIRMED ON SITE.
TYPICAL INTEGRATED JUSTICE OFFICE
ROOM: E22
TYPICAL INTEGRATED JUSTICE OFFICE : GROUND FLOOR PLAN
SCALE 1 : 20
TYPICAL INTEGRATED JUSTICE OFFICE : GROUND FLOOR PLAN
SCALE 1 : 20
TYPICAL INTEGRATED JUSTICE OFFICE : SECTION E22
SCALE 1 : 20
TYPICAL INTEGRATED JUSTICE OFFICE : ELEVATION A
SCALE 1 : 20
TYPICAL TOPS
ROOM: C1, D, G, H, K
C1.1 MOTHERS ROOM WC : GROUND FLOOR PLAN
SCALE 1 : 20
C1.1 MOTHERS ROOM WC : TYPICAL SECTION C1.1
SCALE 1 : 20
C1.1 MOTHERS ROOM WC : TYPICAL ELEVATION A
SCALE 1 : 20
D FEMALE W.C: GROUND FLOOR PLAN
SCALE 1 : 20
G MALE W.C: GROUND FLOOR PLAN
SCALE 1 : 20
H FEMALE W.C: GROUND FLOOR PLAN
SCALE 1 : 20
K MALE W.C: GROUND FLOOR PLAN
SCALE 1 : 20
public works
THE CREATIVE AXIS ARCHITECTS
ARCHITECTURE
PROPOSED NEW MAGISTRATES COURT ON ERF 253, JAN KEMPDORP FOR THE DEPARTMENT OF PUBLIC WORKS
JOINERY DETAILS
1 : 20
31.01.2020
507
A

TYPICAL STEEL SHELVING SYSTEM
ROOM: E19, C5, E3, E4, D3, E17, E18

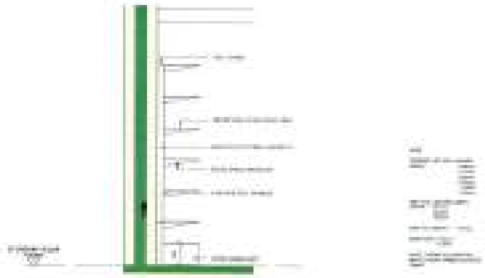
NOTE: ALL DIMENSIONS TO BE CONFIRMED ON SITE



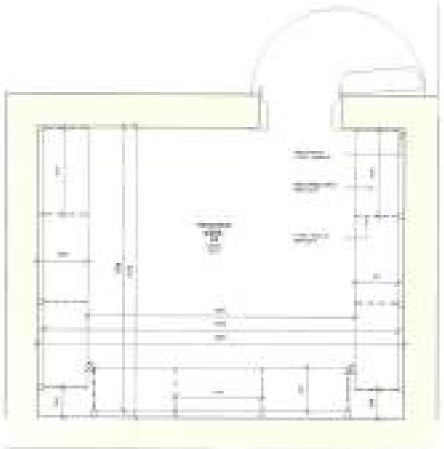
E19 RECORDS ROOM : GROUND FLOOR PLAN
SCALE 1 : 20



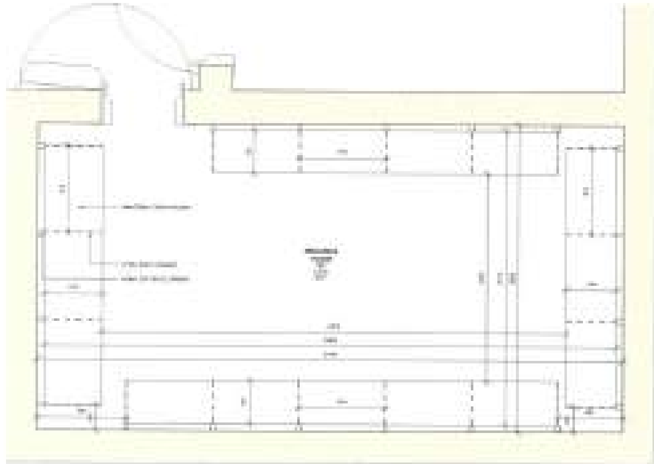
TYPICAL SHELVING : ELEVATION (E19)
SCALE 1 : 10



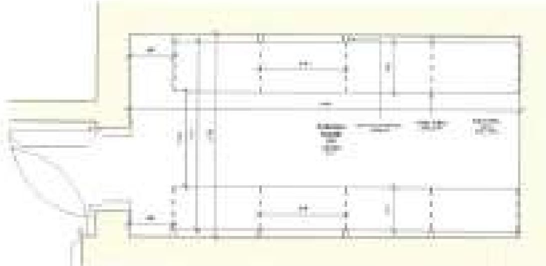
TYPICAL SHELVING DETAIL
SCALE 1 : 10



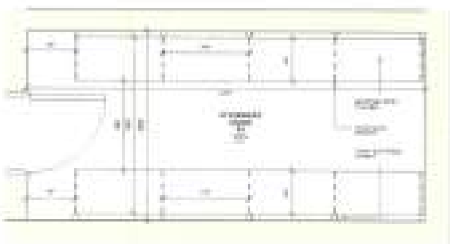
C5 RECORDS ROOM (CIVIL) - GROUND FLOOR PLAN
SCALE 1 : 20



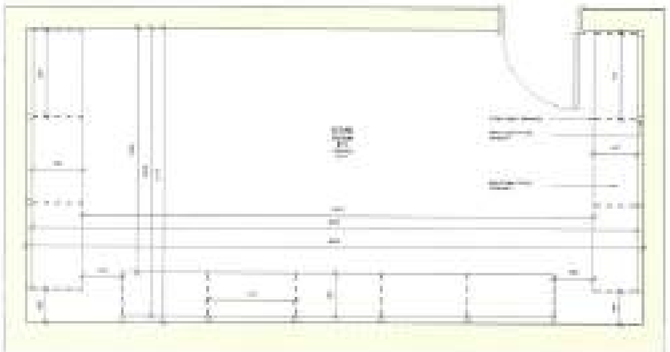
E3 RECORDS ROOM - GROUND FLOOR PLAN
SCALE 1 : 20



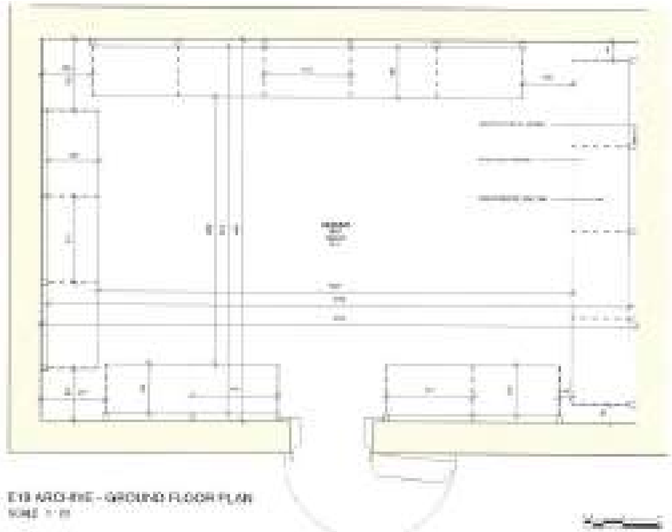
E4 STRONG ROOM - GROUND FLOOR PLAN
SCALE 1 : 20



D3 STATIONERY STORE - GROUND FLOOR PLAN
SCALE 1 : 20



E17 STORE ROOM - GROUND FLOOR PLAN
SCALE 1 : 20



E18 ARCHIVE - GROUND FLOOR PLAN
SCALE 1 : 20

public works

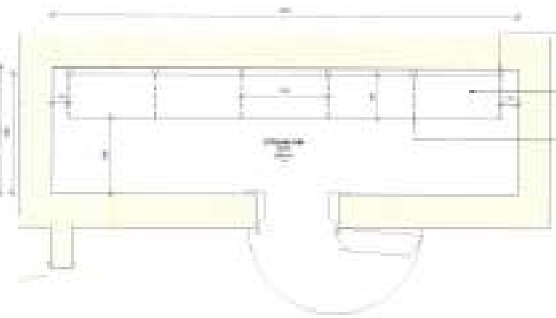
THE CREATIVE AX ARCHITECTS

ARCHITECTURE

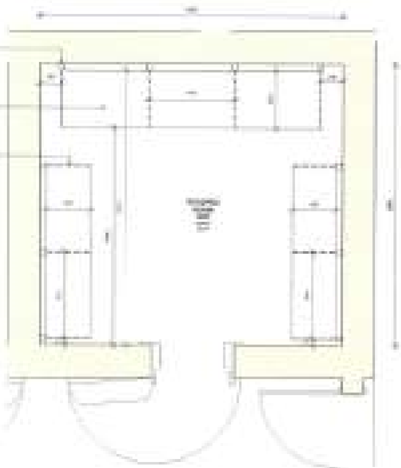
PROPOSED NEW MAGISTRATE COURT ON ERF 337 JAN KEMPDORP FOR THE DEPARTMENT OF PUBLIC WORKS

JOINERY DETAILS

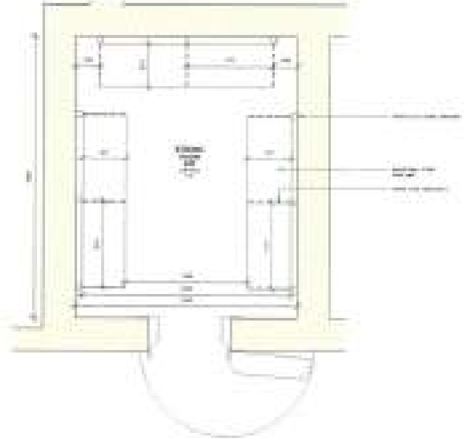
1 : 20



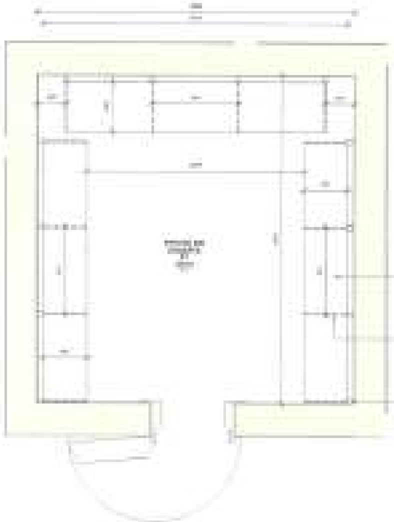
E30 STRONG ROOM : GROUND FLOOR PLAN
SCALE 1 : 20



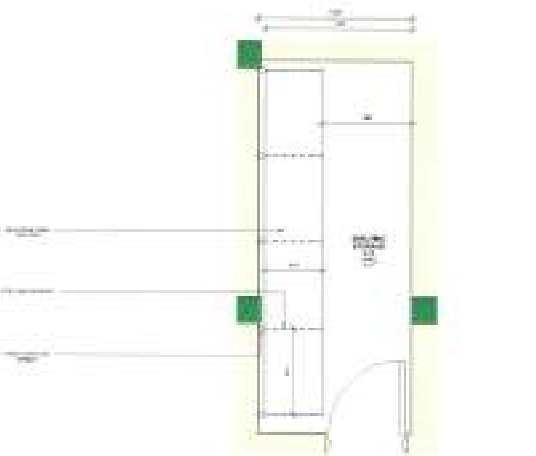
E24 RECORDS ROOM : GROUND FLOOR PLAN
SCALE 1 : 20



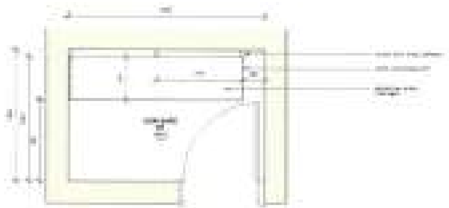
E35 STRONG ROOM : GROUND FLOOR PLAN
SCALE 1 : 20



F3 STRONG ROOM DOCKETS : GROUND FLOOR PLAN
SCALE 1 : 20



G14 SHELVING STORAGE : GROUND FLOOR PLAN
SCALE 1 : 20



H1 GUN SAFE : GROUND FLOOR PLAN
SCALE 1 : 20

public works
Department: Public Works Republic of South Africa

THE CREATIVE AX ARCHITECTS

ARCHITECTURE

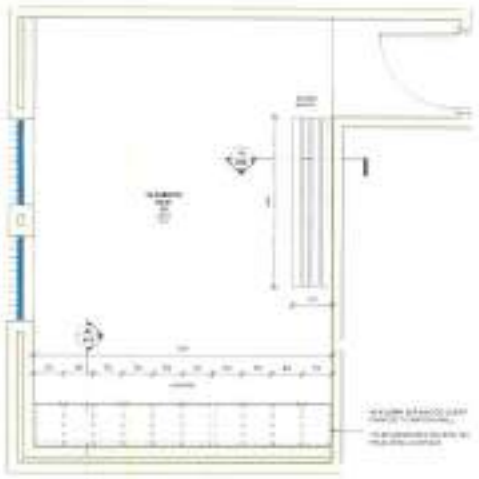
PROPOSED NEW MAGISTRATES COURT ON ERF ... JAN KEMPDORP FOR THE DEPARTMENT OF PUBLIC WORKS

JOINERY DETAILS

1 : 20
TGA

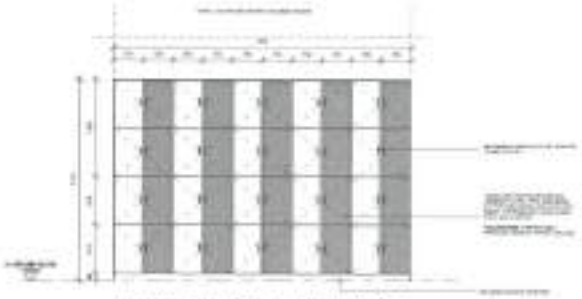
509

SLATED TIMBER BENCH AND LOCKERS
ROOM: J5 & J11

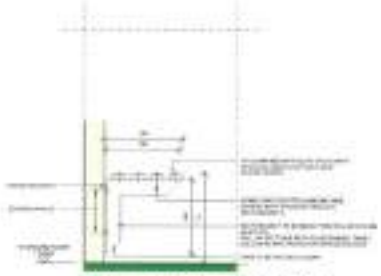


J5 CLEANERS REST ROOM: GROUND FLOOR PLAN
SCALE 1 : 01

TYPICAL SLATTED BENCH: PLAN
SCALE 1 : 01



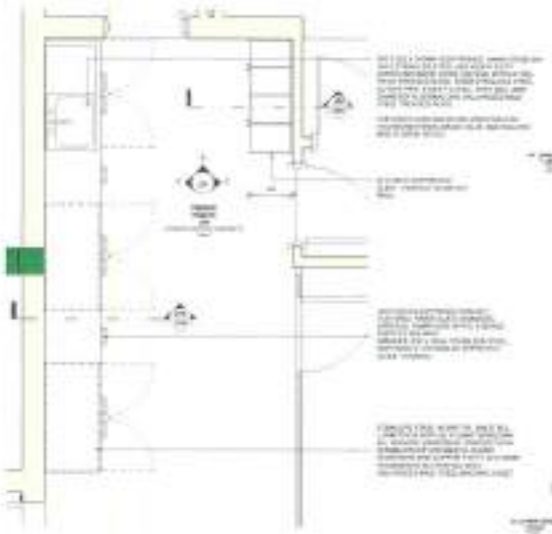
J5 CLEANERS REST LOCKERS: ELEVATION A
SCALE 1 : 01



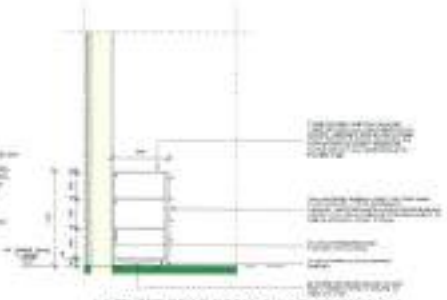
TYPICAL SLATTED BENCH: SECTION
SCALE 1 : 01

J5 CLEANERS REST LOCKERS: SECTION
SCALE 1 : 01

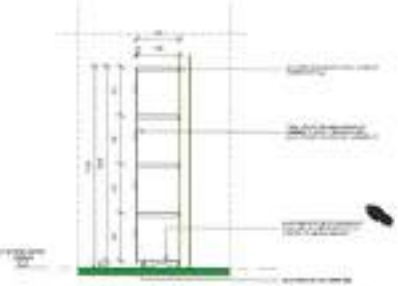
FINGER PRINTS ROOM
ROOM: J29



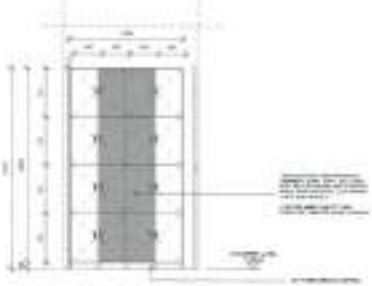
J29 LOWER LEVEL FINGER PRINTS ROOM PLAN
SCALE 1 : 01



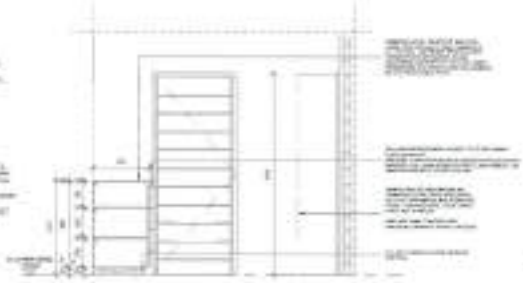
J29 FINGER PRINT ROOM: CUPBOARD SECTION
SCALE 1 : 01



J29 FINGER PRINT ROOM: LOCKER SECTION
SCALE 1 : 01



J29 PRINT ROOM LOCKERS: ELEVATION C
SCALE 1 : 01



J29 PRINT ROOM: ELEVATION B
SCALE 1 : 01

J29 PRINT ROOM: ELEVATION A
SCALE 1 : 01

public works

THE CREATIVE AXIS ARCHITECTS

ARCHITECTURE

PROPOSED NEW MAGISTRATES COURT ON ERF 210, JAN KEMPDORP FOR THE DEPARTMENT OF PUBLIC WORKS

JOINERY DETAILS

NOTE:

ALL DIMENSIONS TO BE CONFIRMED ON SITE.

DISTRICT COURT MAGISTRATE
ROOM: B4

B4.1 W.C GROUND FLOOR : PLAN
SCALE 1 : 20

B4.1 W/C : SECTION B4.1
SCALE 1 : 20

B4.1 W/C : ELEVATION A
SCALE 1 : 20

REGIONAL COURT MAGISTRATE
ROOM: A11

A11 REGIONAL COURT : GROUND FLOOR PLAN
SCALE 1 : 20

A11 REGIONAL COURT : SECTION A11
SCALE 1 : 20

A11 REGIONAL COURT : ELEVATION A
SCALE 1 : 20

CIVIL COURT MAGISTRATE
ROOM: C5

C5.1 W/C : GROUND FLOOR PLAN
SCALE 1 : 20

C5.1 W/C : SECTION : C5.1
SCALE 1 : 20

C5.1 WC : ELEVATION A
SCALE 1 : 20

public works

THE CREATIVE AXIS ARCHITECTS

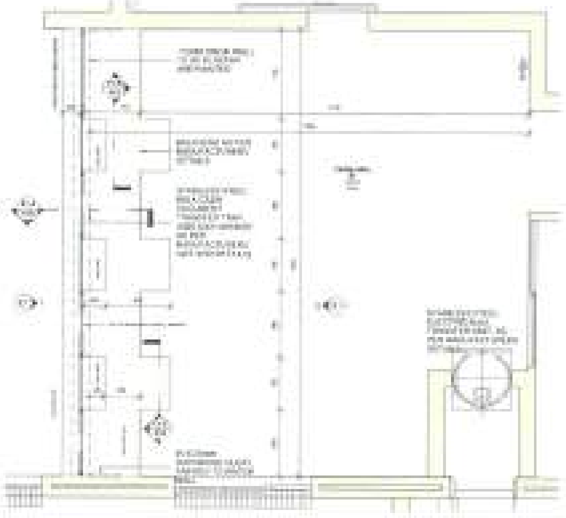
ARCHITECTURE

PROPOSED NEW MAGISTRATES COURT ON ERF 272, JMS TEMPO CRP FOR THE DEPARTMENT OF PUBLIC WORKS

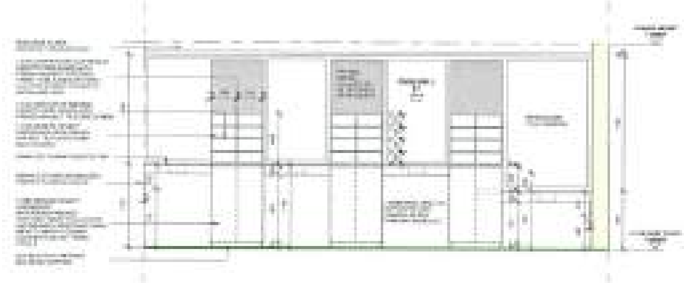
DRAWING DETAILS

CASH HALL
ROOM: E1

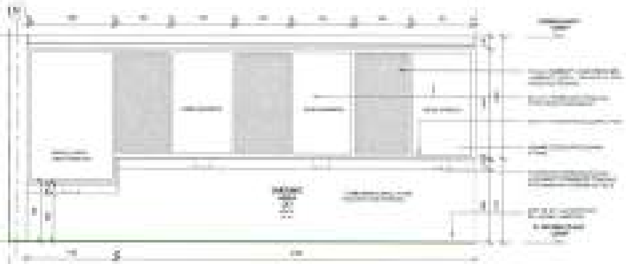
NOTE: ALL PANELS TO BE EDGED OFF WITH HIGH IMPACT 3MM PVC EDGING, COLOUR TO MATCH SHELVING. CARCASS OF JOINERY: 16MM MEDIUM DENSITY FIBREBOARD, COLOUR TO MATCH SHELVING IF OPEN. CARCASS IN CUPBOARDS TO BE 12MM CHARCOAL COMPACT HIGH PRESSURE LAMINATE.



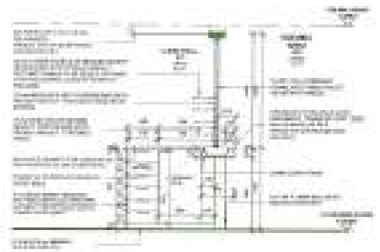
E1 CASH HALL GROUND FLOOR PLAN
SCALE 1 : 25



QUEUING AREA: BACK ELEVATION E1.1
SCALE 1 : 25

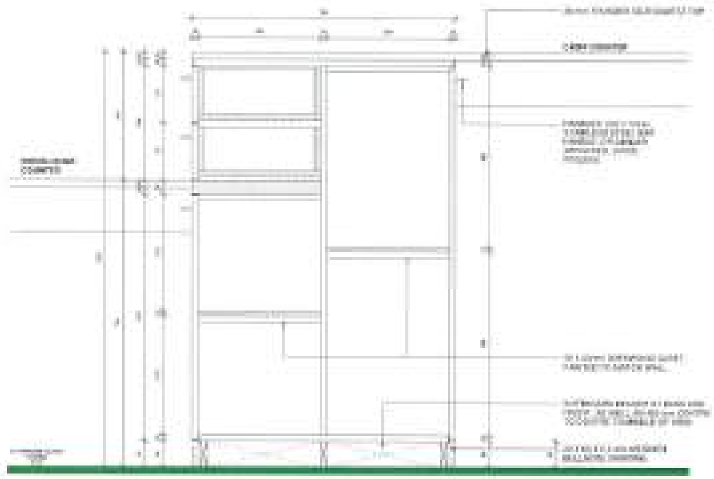


CASH HALL COUNTER: ELEVATION E1.2
SCALE 1 : 25

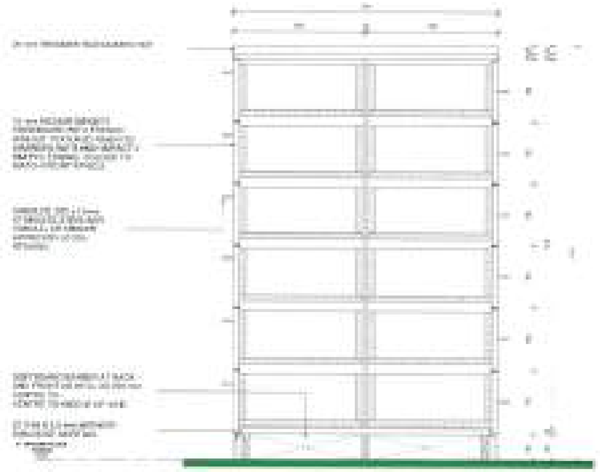


E1 CASH HALL: SECTION E1.A
SCALE 1 : 25

SHELVE DETAIL
SCALE 1 : 5



CUPBOARD DETAIL SECTION E1.B
SCALE 1 : 5



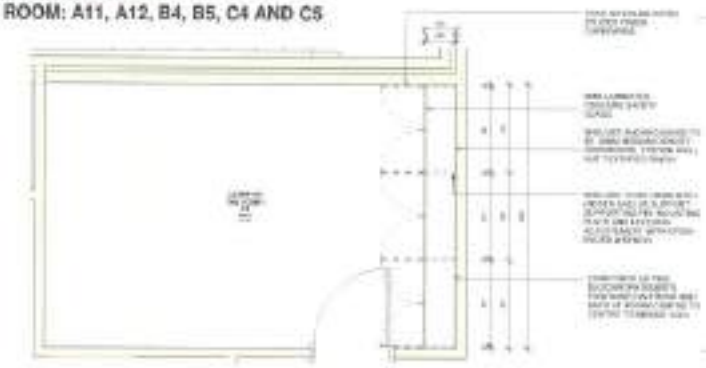
CUPBOARD DETAIL SECTION E1.B1
SCALE 1 : 5

public works

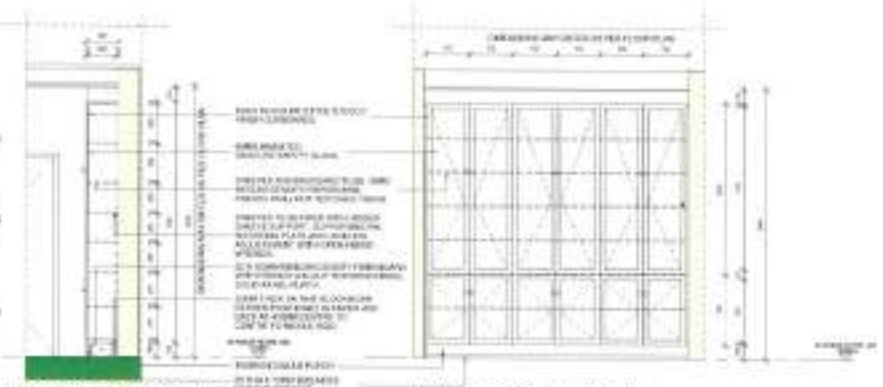
THE CREATIVE AXIS

JOINERY DETAILS

CLERK OF COURT
ROOM: A11, A12, B4, B5, C4 AND C5

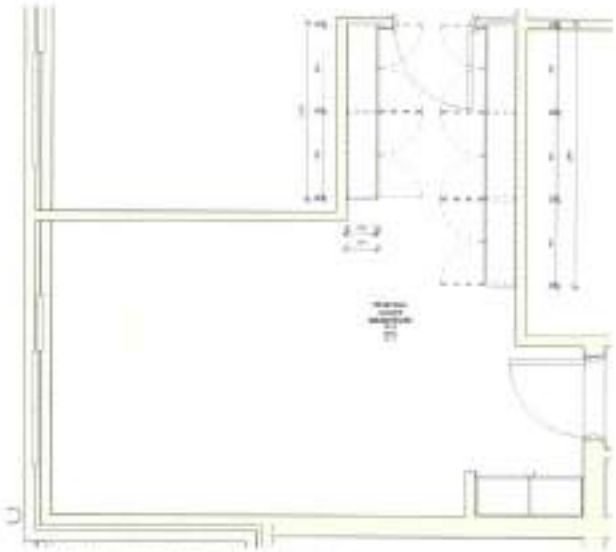


C4 CLERK OF THE COURT: GROUND FLOOR PLAN
SCALE 1 : 50

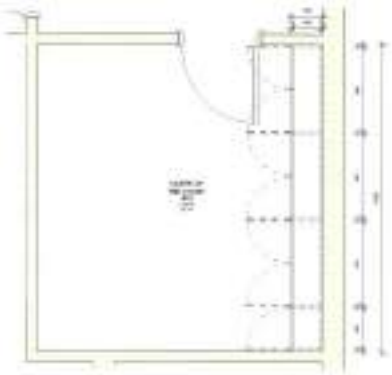


TYPICAL SHELVING: SECTION B6
SCALE 1 : 25

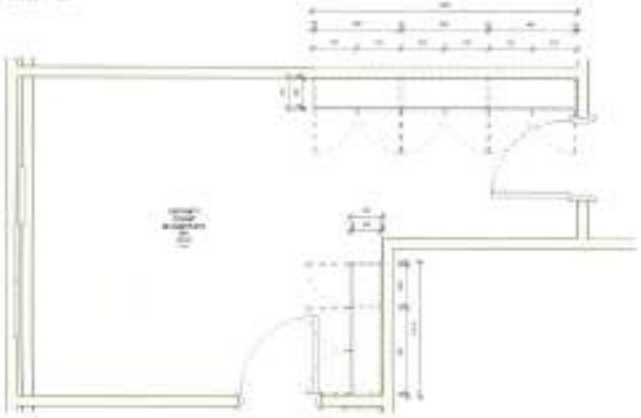
B5 CLERK OF COURT: ELEVATION A
SCALE 1 : 25



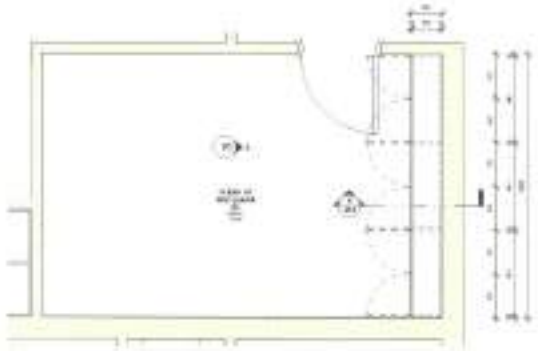
A11 REGIONAL MAGISTRATE COURT: GROUND FLOOR PLAN
SCALE 1 : 50



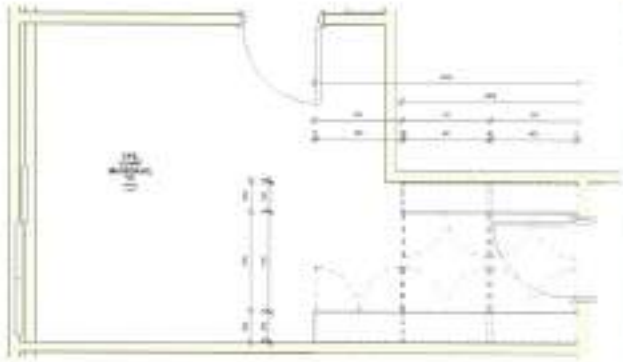
A12 CLERK OF THE COURT: GROUND FLOOR PLAN
SCALE 1 : 50



B4 DISTRICT MAGISTRATE COURT: GROUND FLOOR PLAN
SCALE 1 : 50



B5 CLERK OF COURT: GROUND FLOOR PLAN
SCALE 1 : 50



C5 CIVIL COURT MAGISTRATE: GROUND FLOOR PLAN
SCALE 1 : 50

public works

THE CREATIVE AXIS ARCHITECTS

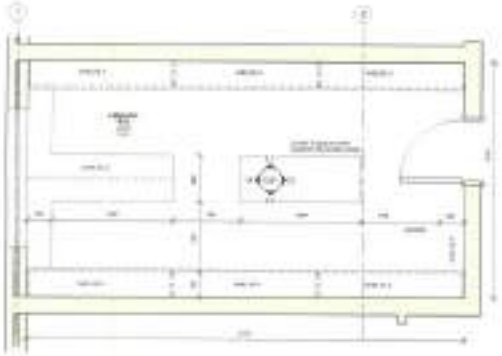
ARCHITECTURE

PROPOSED CIVILS' COLLIN KEMPDORP FOR THE DEPARTMENT OF PUBLIC WORKS NEW MAGISTRATES COURT

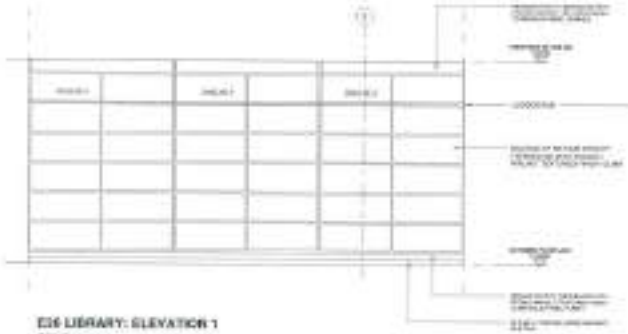
TYPICAL SHELVING OFFICE

LIBRARY
ROOM: E26

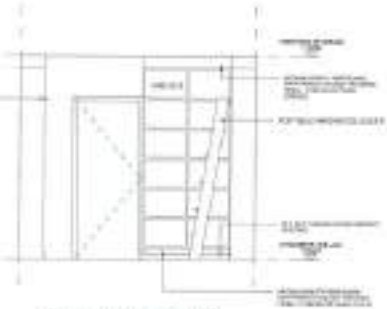
NOTE: ALL PANELS TO BE EDGED OFF WITH IMPACT 3 MM PVC EDGES. COLOUR TO MATCH SHELVING
MEASUREMENTS TO BE CONFIRMED AND TAKEN ON SITE. JOINERY TO BE ALTERED.



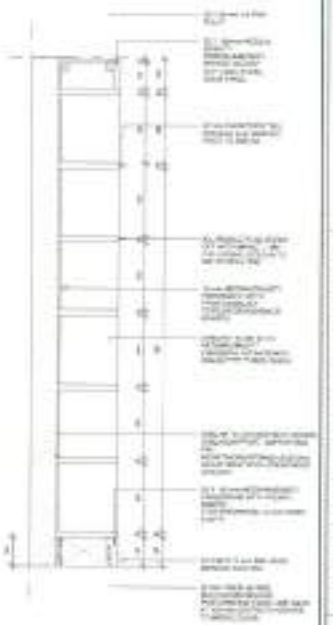
E26 LIBRARY LAYOUT: PLAN
SCALE 1 : 25



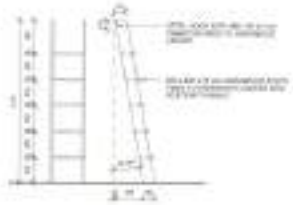
E26 LIBRARY: ELEVATION 1
SCALE 1 : 25



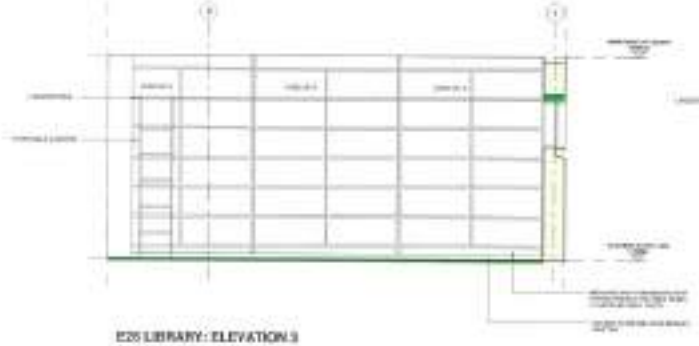
E26 LIBRARY: ELEVATION 2
SCALE 1 : 25



E26 TYPICAL LIBRARY: SHELVING SECTION
SCALE 1 : 10



E26 LIBRARY: LADDER
SCALE 1 : 25



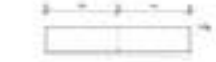
E26 LIBRARY: ELEVATION 3
SCALE 1 : 25

E26 LIBRARY: ELEVATION 4
SCALE 1 : 25

LIBRARY SHELVES
SCALE 1 : 25

TYPE A SHELVE X2
FRONT ELEVATION

SIDE ELEVATION

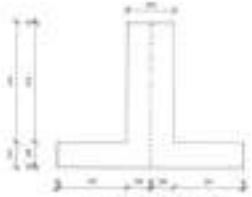


PLAN TYPE A

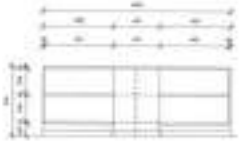
TYPE B SHELVE X1
FRONT ELEVATION

SIDE ELEVATION

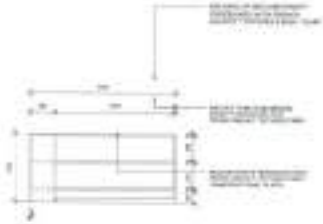
PLAN TYPE B



TYPE C SHELVE X1
PLAN TYPE C



FRONT ELEVATION



SIDE ELEVATION

LEGEND

MEDIUM DENSITY FIBRE BOARD
FRENCH WALNUT TEXTURED FINISH

PUBLIC WORKS

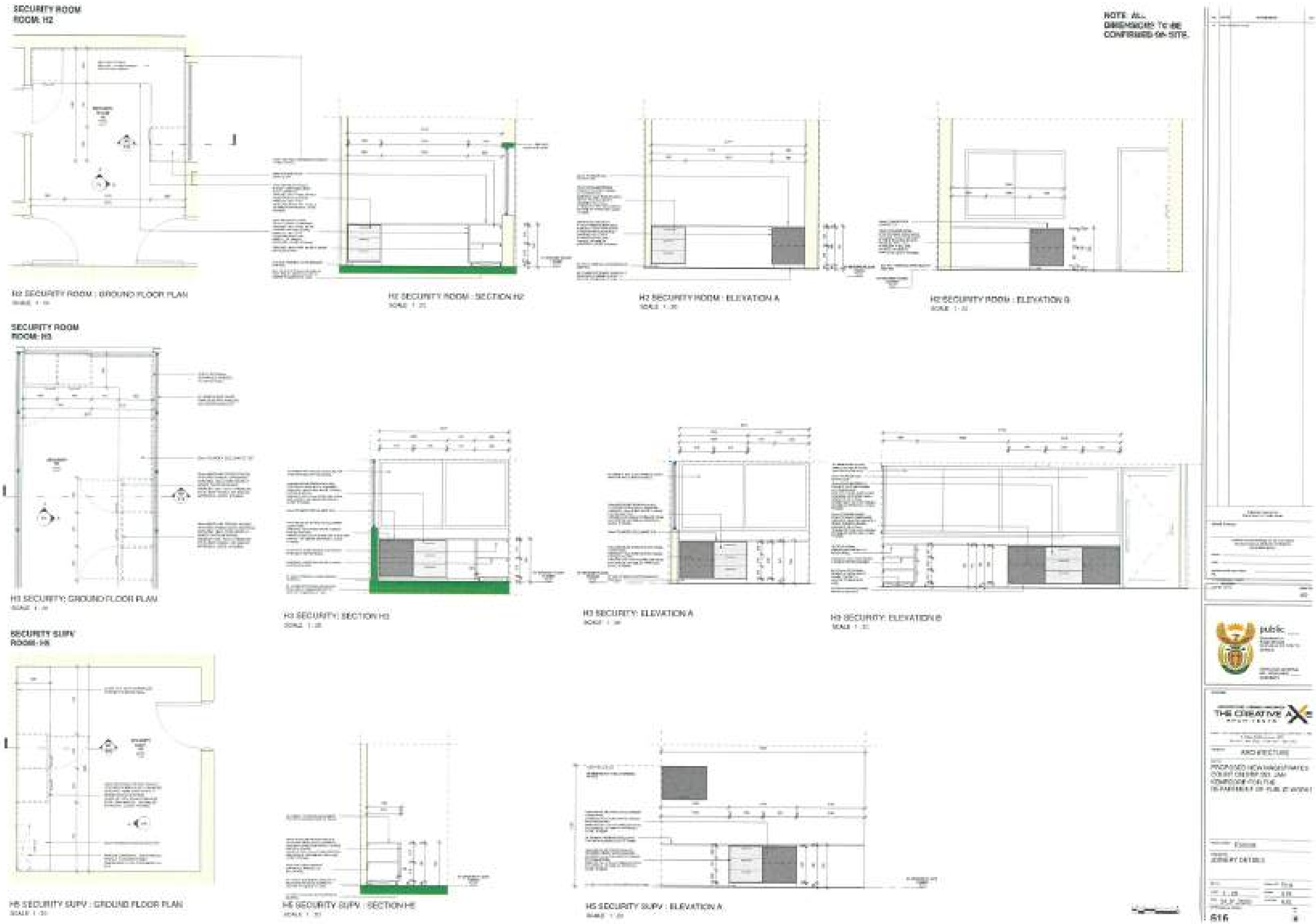
THE CREATIVE X

ARCHITECTURE

PROPOSED NEW MAGISTRATES COURT ON ERF 202, JAS KEMPDORP FOR THE DEPARTMENT OF PUBLIC WORKS

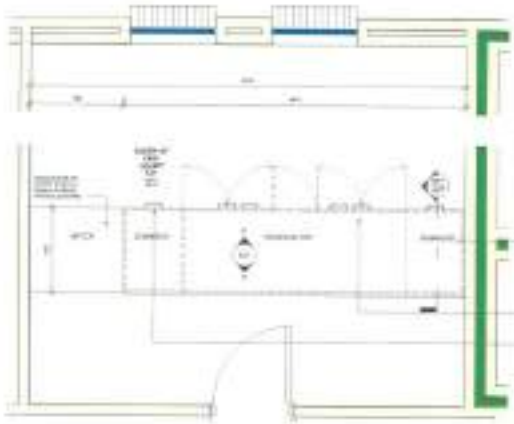
E26 LIBRARY JOINERY DETAILS

615

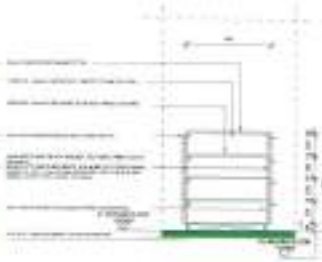

NOTE: ALL DIMENSIONS TO BE CONFIRMED ON SITE.
SECURITY ROOM
ROOM: H2
H2 SECURITY ROOM : GROUND FLOOR PLAN
H2 SECURITY ROOM : SECTION H2
H2 SECURITY ROOM : ELEVATION A
H2 SECURITY ROOM : ELEVATION B
SECURITY ROOM
ROOM: H3
H3 SECURITY: GROUND FLOOR PLAN
H3 SECURITY: SECTION H3
H3 SECURITY: ELEVATION A
H3 SECURITY: ELEVATION B
SECURITY SUPV
ROOM: H5
H5 SECURITY SUPV : GROUND FLOOR PLAN
H5 SECURITY SUPV : SECTION H5
H5 SECURITY SUPV : ELEVATION A
THE CREATIVE AXE
ARCHITECTURE
JOINERY DETAILS
616

NOTE : ALL DIMENSIONS TO BE CONFIRMED ON SITE

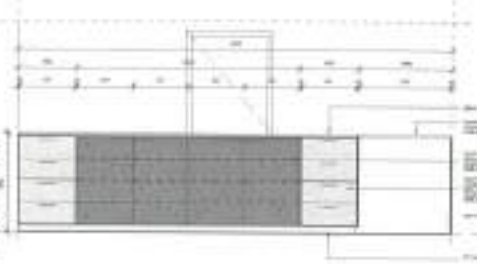
CLERK OF CIVIL COURT
ROOM: E21



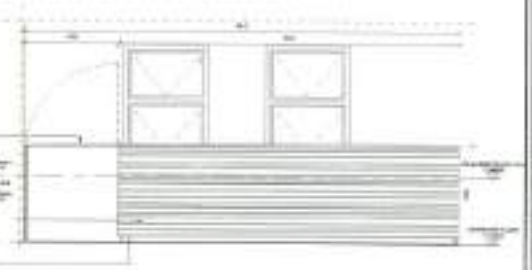
E21 CLERK OF CIVIL COURT : GROUND FLOOR PLAN
SCALE 1 : 50



E21 CLERK OF CIVIL COURT : SECTION E21
SCALE 1 : 50



E21 CLERK OF CIVIL COURT : ELEVATION A
SCALE 1 : 50

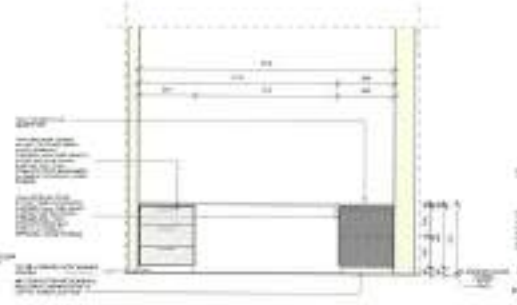


E2' CLERK OF CIVIL COURT : ELEVATION B
SCALE 1 : 50

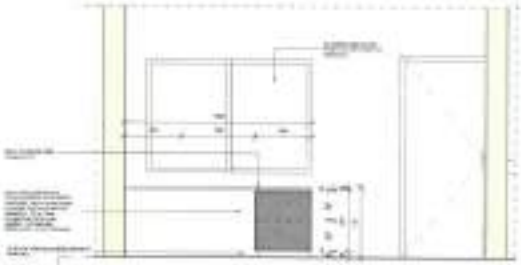
SECURITY ROOM
ROOM: H2

H2 SECURITY ROOM : GROUND FLOOR PLAN
SCALE 1 : 25

H2 SECURITY ROOM : SECTION H2
SCALE 1 : 25



H2 SECURITY ROOM : ELEVATION A
SCALE 1 : 25



H2 SECURITY ROOM : ELEVATION B
SCALE 1 : 25

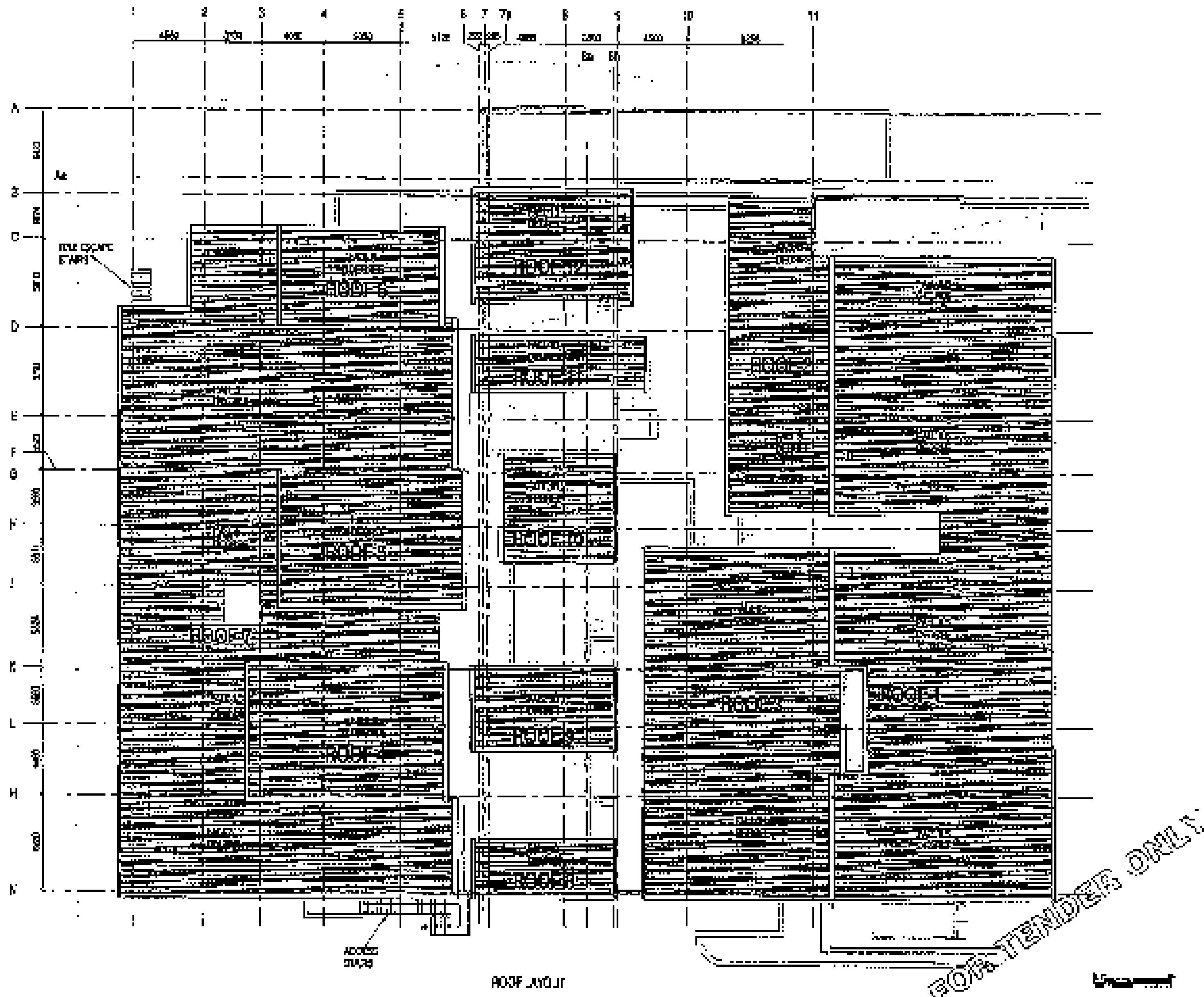
public works

"THE CREATIVE AXIS"

ARCHITECTURE

PROPOSED NEW MAGISTRATES COURT COMPLEX, MAHIKENG FOR THE DEPARTMENT OF PUBLIC WORKS.

JOINERY DETAILS



ROOF LAYOUT

public works

STABILIS

STRUCTURAL

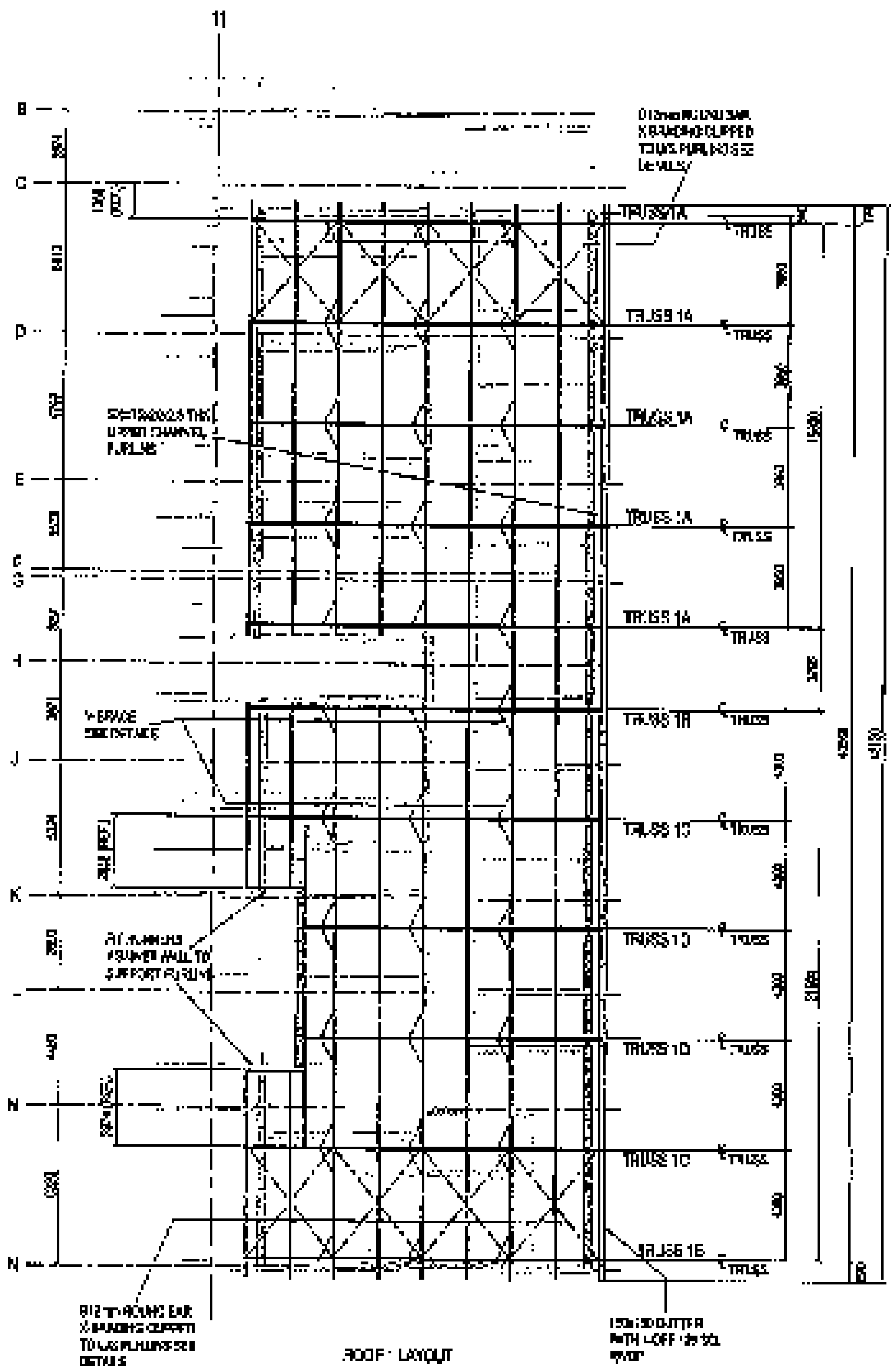
JAN KEMPDORP MAGISTRATES OFFICE

CONSTRUCTION OF NEW BUILDINGS

04339

ROOF 1 TO ROOF 12 LAYOUT

S200/1



ROOF - LAYOUT

KEY PLAN

FOR TENDER ONLY

Public Works

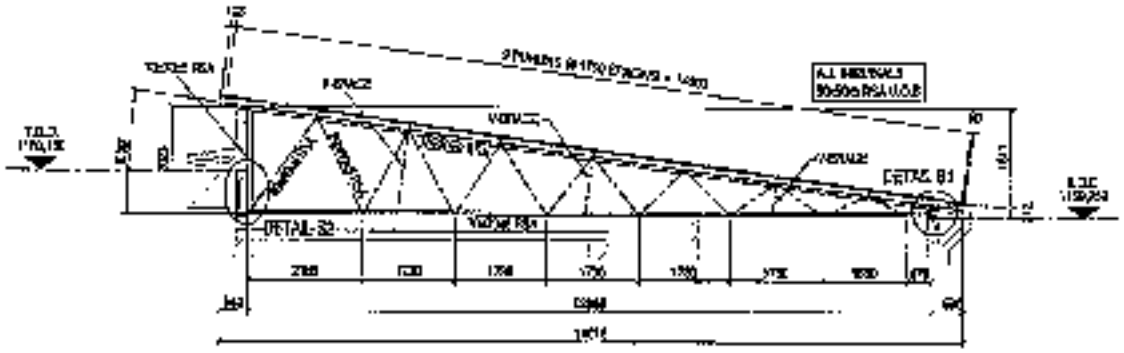
STABILIS

STRUCTURAL

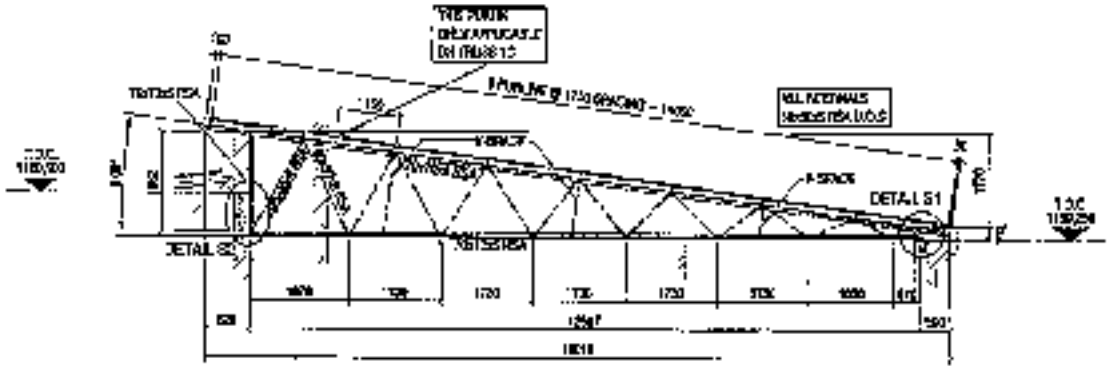
JAN KEMPDORP
MAGISTRATES OFFICE
CONSTRUCTION OF NEW BUILDING

ROOF - LAYOUT

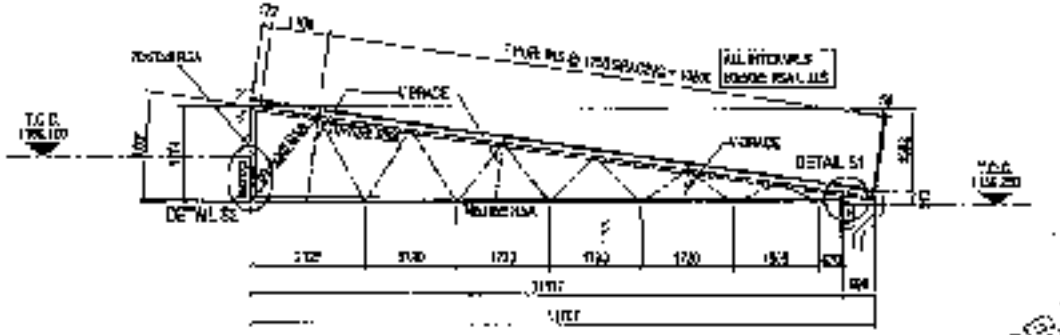
S200/2



TRUSS 1A DETAILS
S-OFF REQD AS DRAWN MKD TRUSS 1A



TRUSS 1B & TRUSS 1C DETAILS
S-OFF REQD AS DRAWN MKD TRUSS 1B
S-OFF REQD AS DRAWN MKD TRUSS 1C



TRUSS 1D
S-OFF REQD AS DRAWN MKD TRUSS 1D

FOR TENDER ONLY

SK1028 A1

public works

STARTER

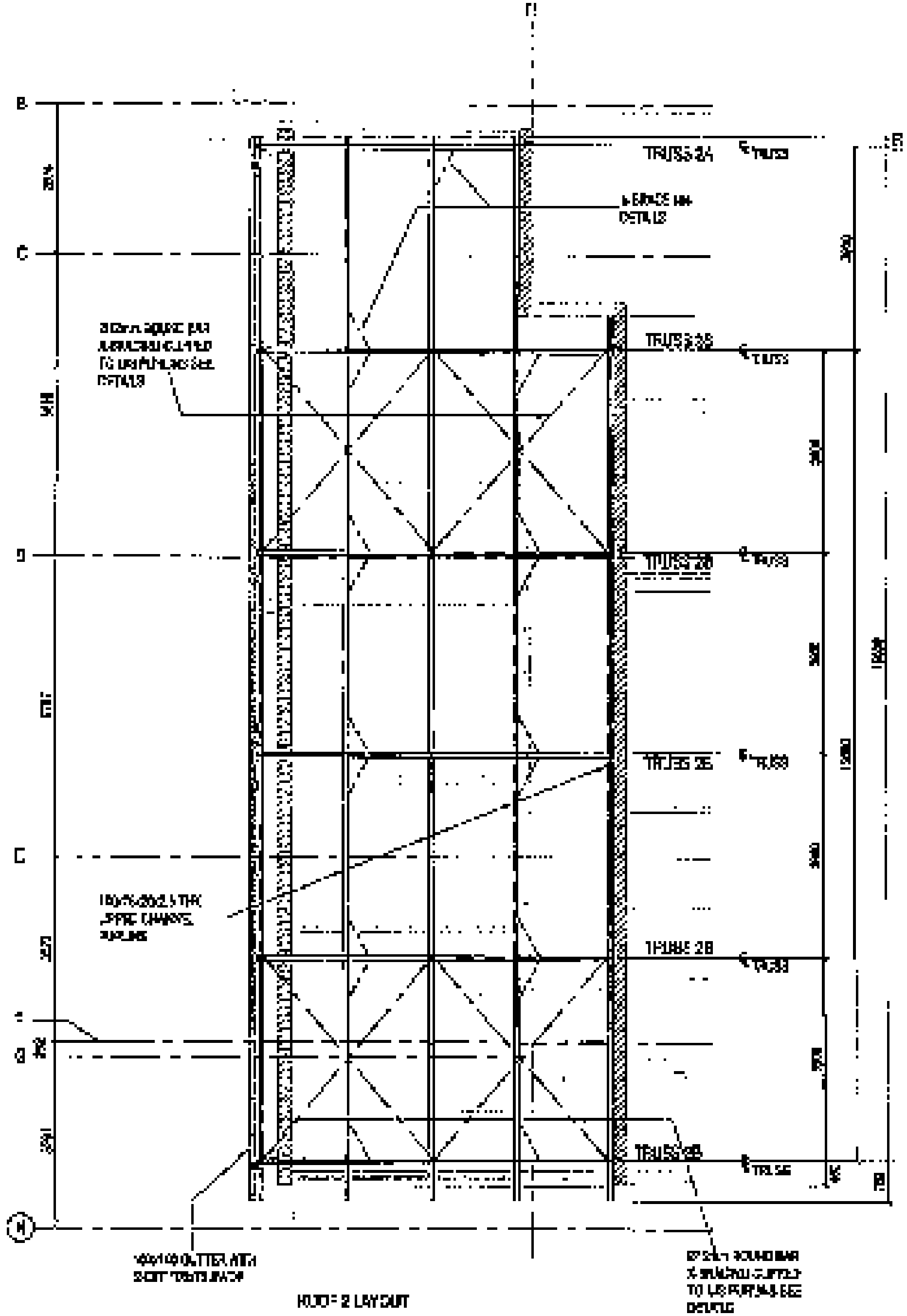
STRUCTURAL

LA KEMPSGRP

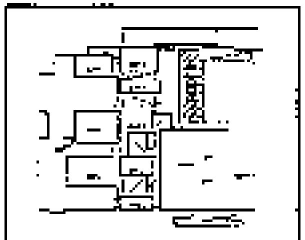
MAGISTRATES OFFICE

CONSTRUCTION OF

S200/3 -



ROOF 2 LAYOUT



KEY PLAN

NOTES:

FOR TENDER ONLY

public works

STABILIS

STRUCTURAL

CA: KEMPDORP
MAGISTRATE'S OFFICE
CONSTRUCTION OF
NEW BUILDING

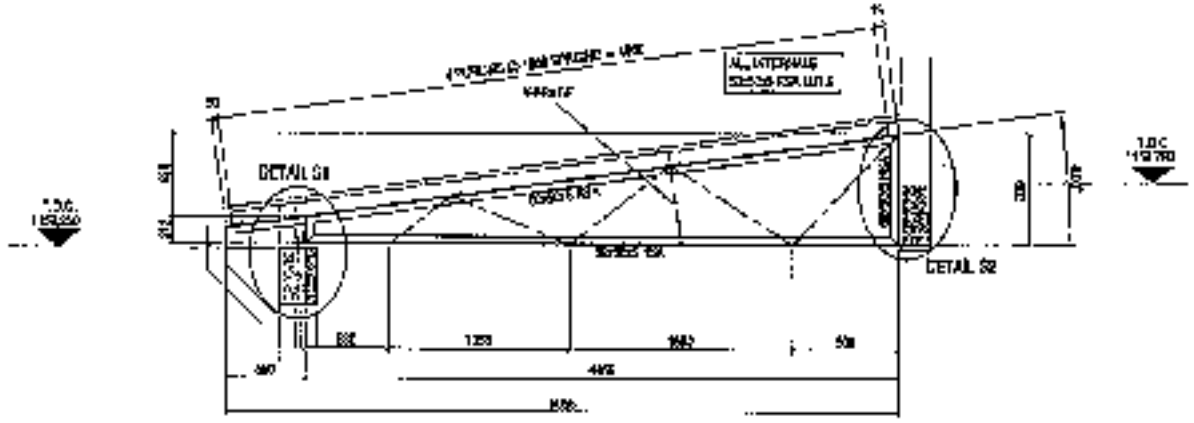
046383

ROOF 2 LAYOUT

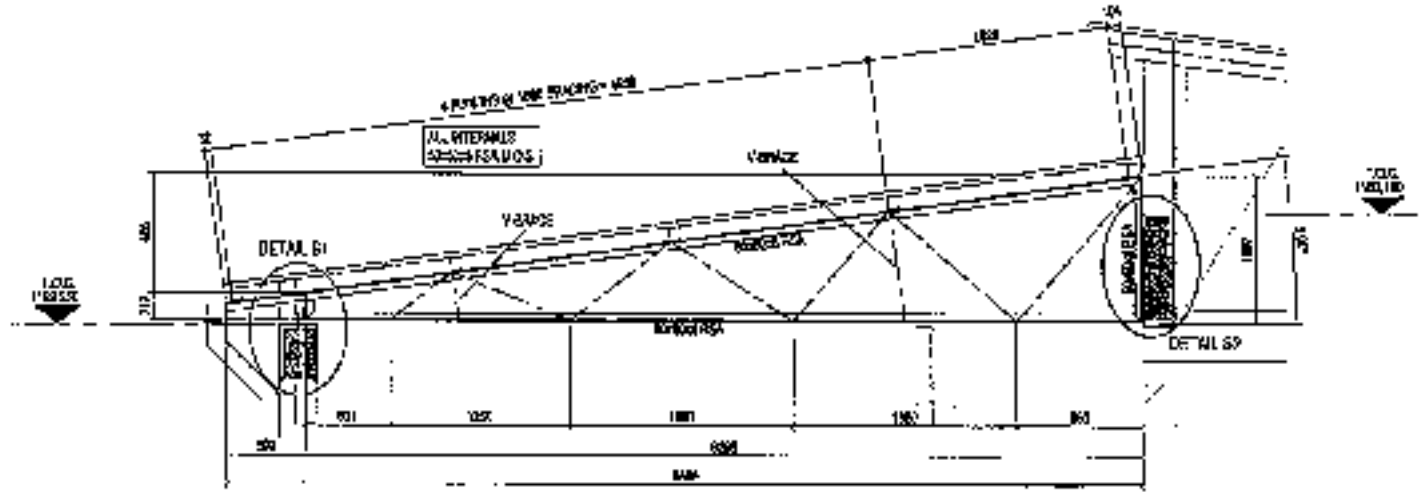
SK1274

A1

S200/4



TRUSS 2A
1-OFF REQD AS DRAWN



TRUSS 2B
5-OFF REQD AS DRAWN

FOR TENDER ONLY

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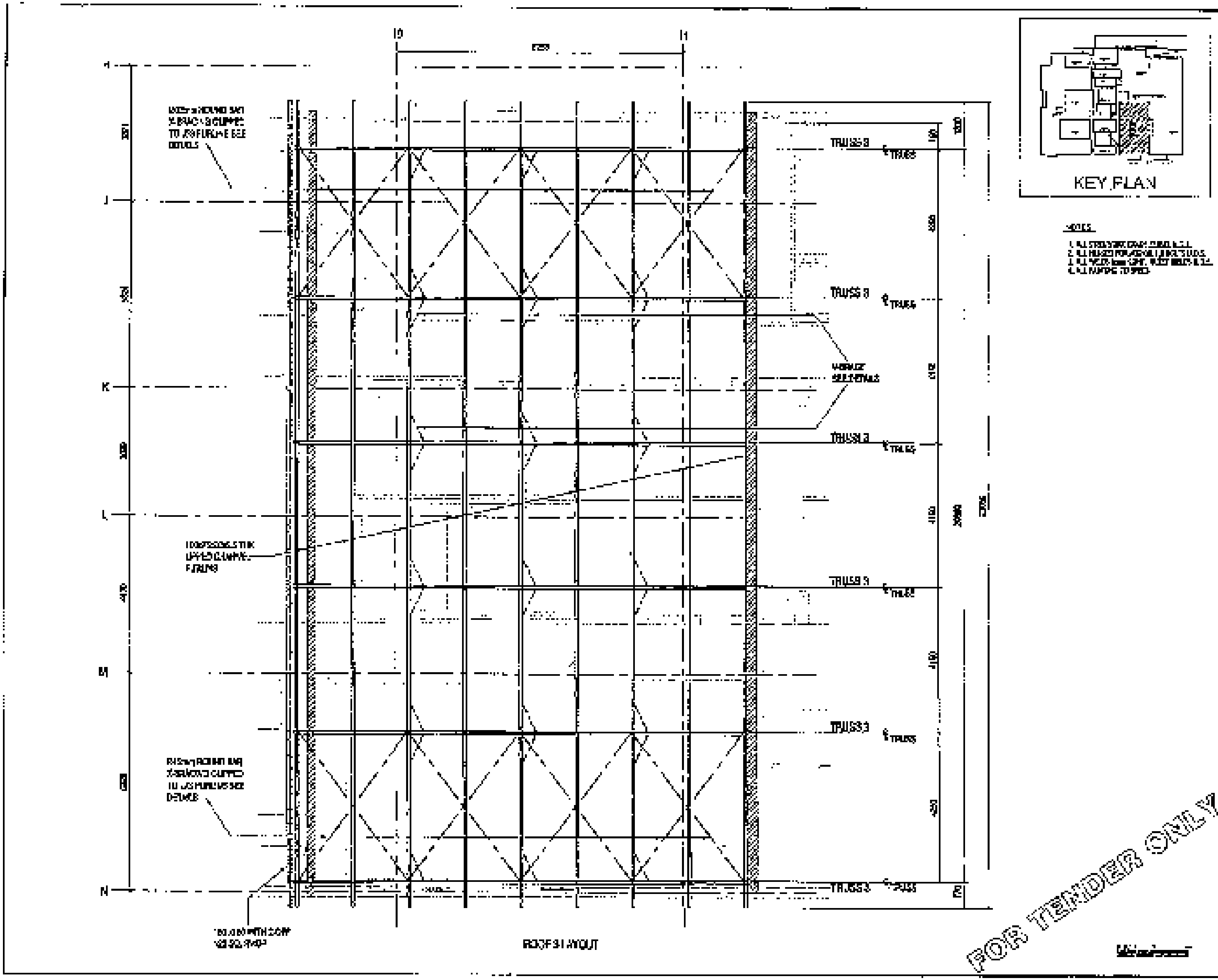
STRUCTURAL

D4838S

S2DWG



public works

STABILIS

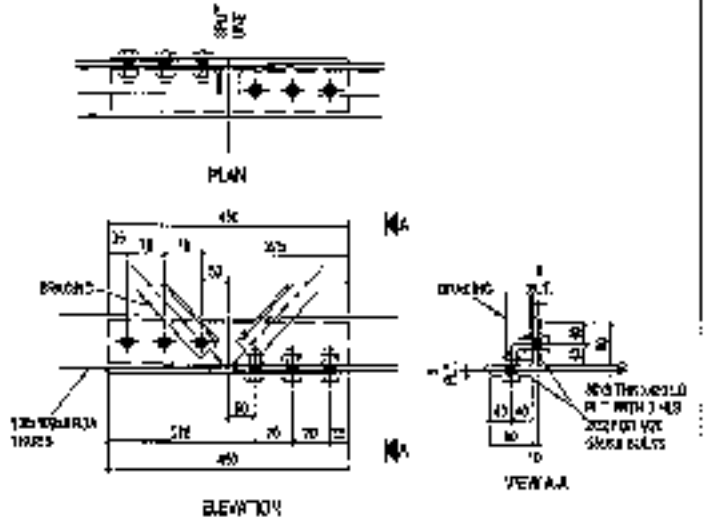
STRUCTURAL

JAN KEMPDORP
MAGISTRATES OFFICE

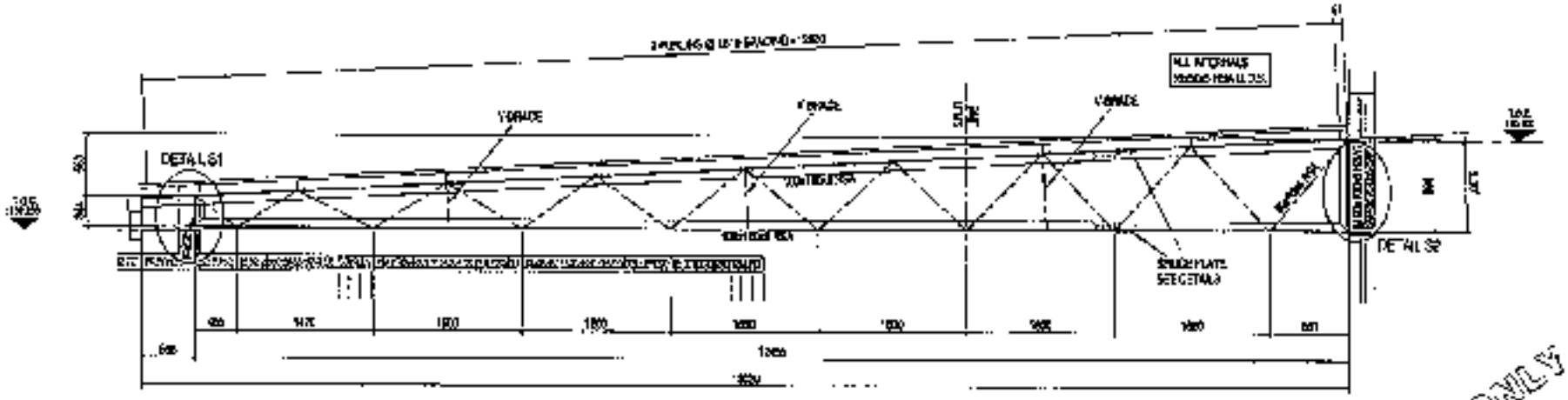
CONSTRUCTION OF
NEW BUILDING

ROOF 3 LAYOUT

S200/6



SPLICE DETAILS



TRUSS B
4 OFF REQ'D AS DRAWN

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public works

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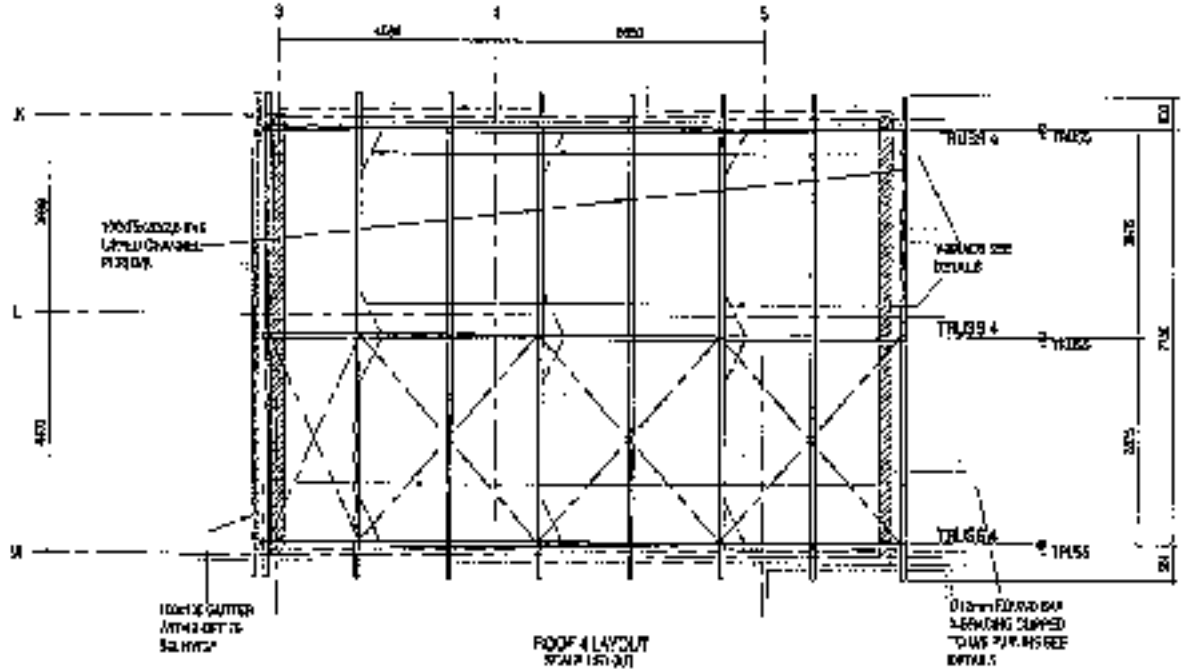
STRUCTURA

MAGISTRATES OFFICE

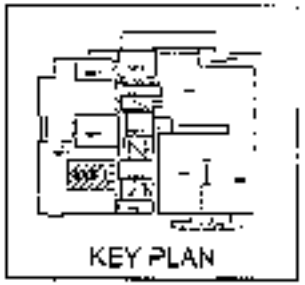
CONSTRUCTION OF NEW BUILDING

TRUSS B LAYOUT & DETAILS

S200/7

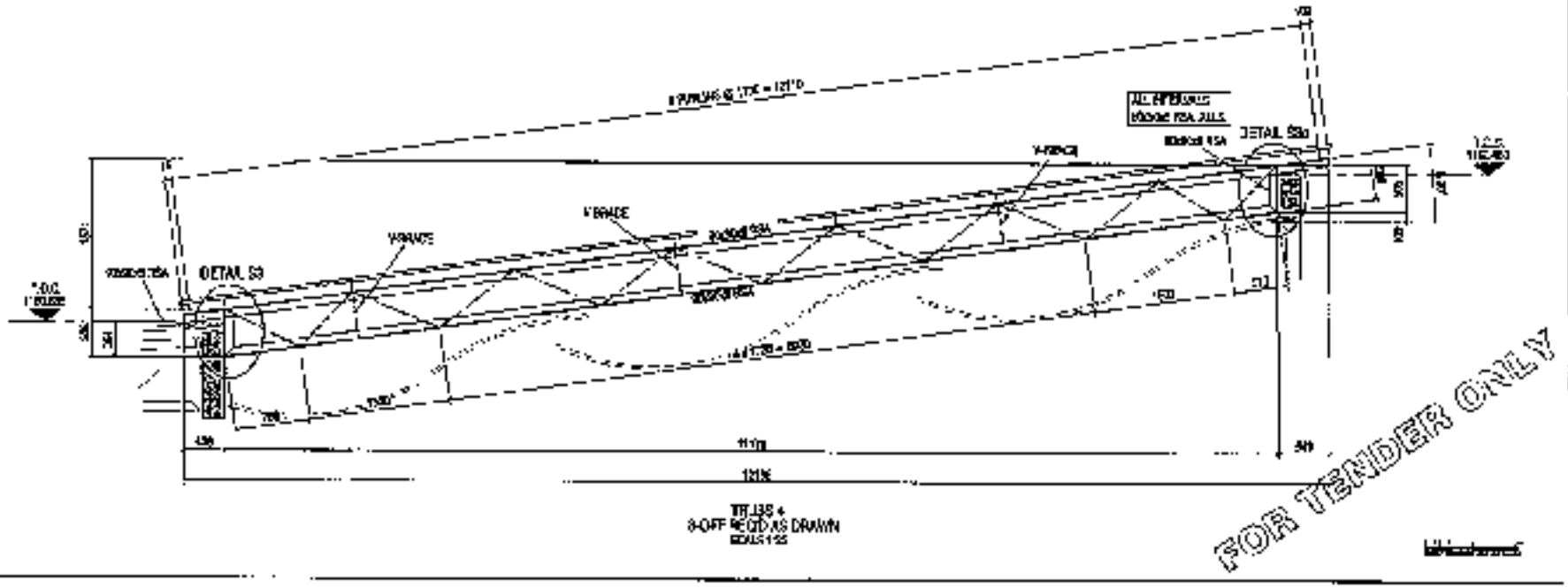


ROOF 4 LAYOUT



KEY PLAN

NOTES



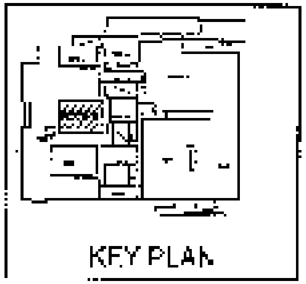
TRUSS 4
8-OFF REQ'D AS DRAWN

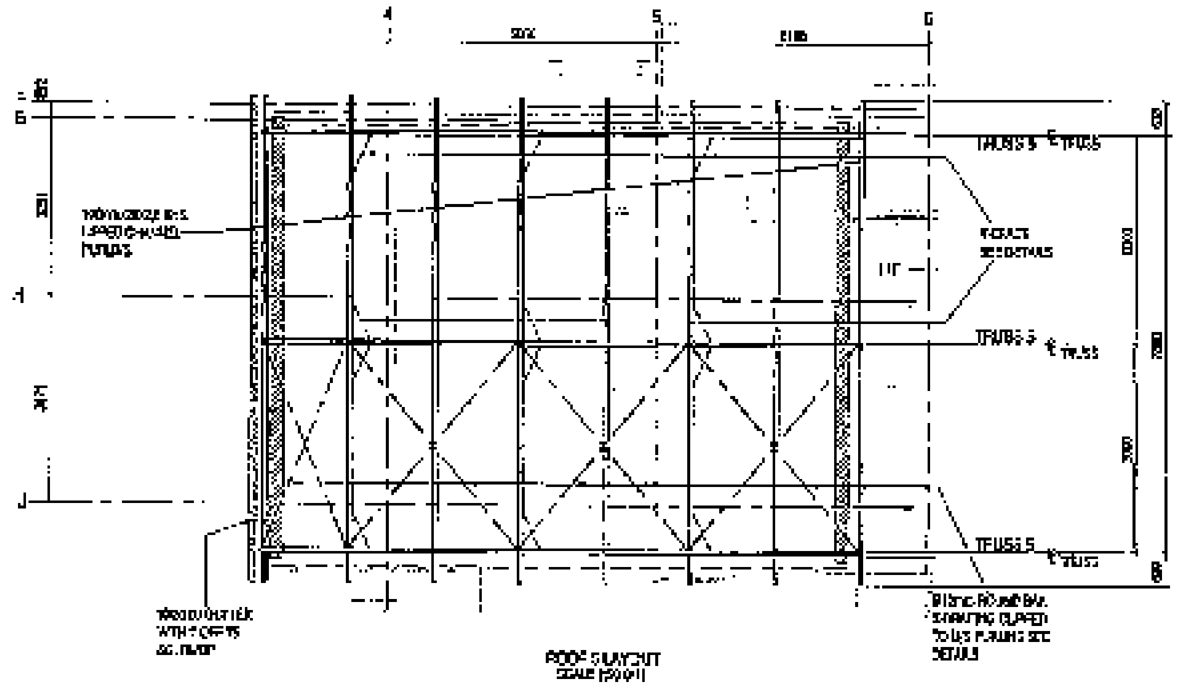
FOR TENDER ONLY

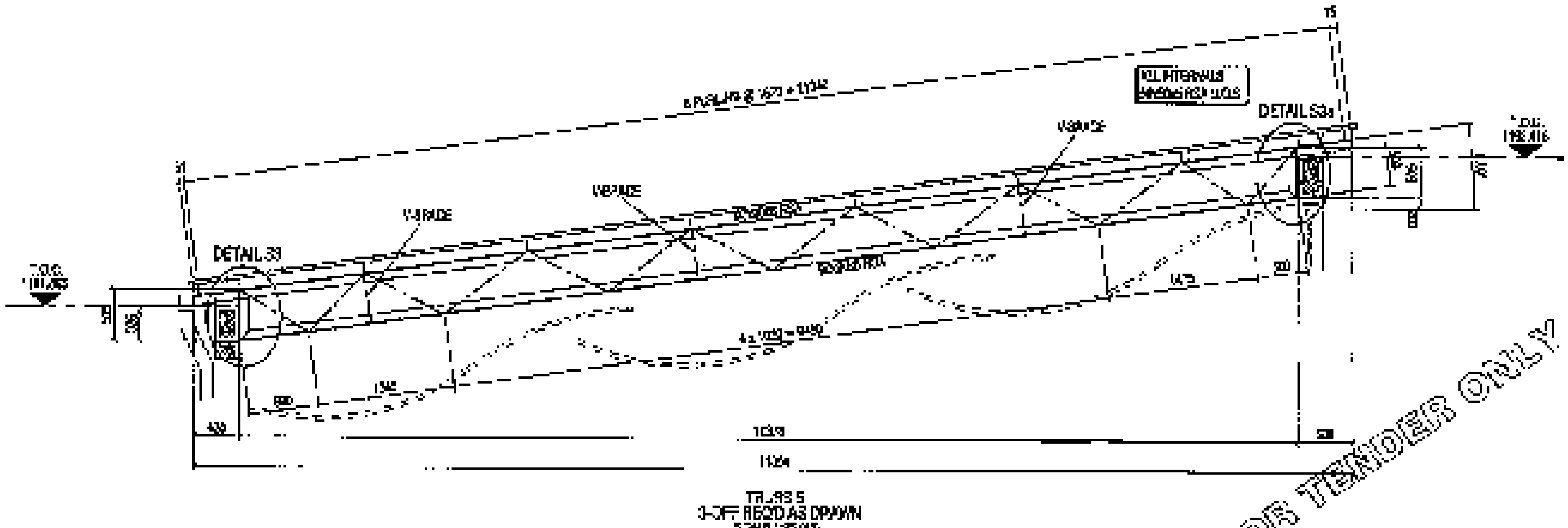
STRUCTURAL

DRAWING

ROOF 4 LAYOUT







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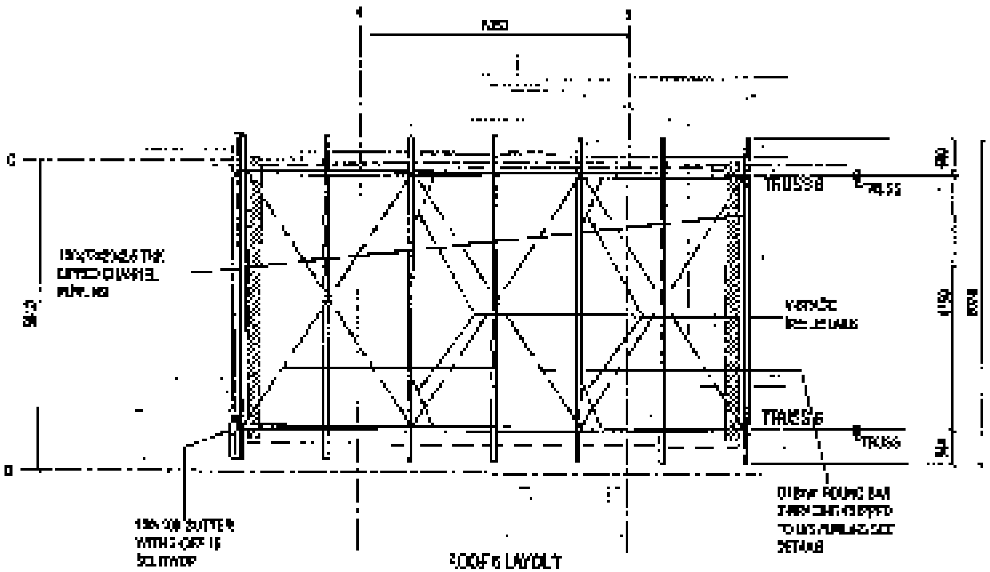
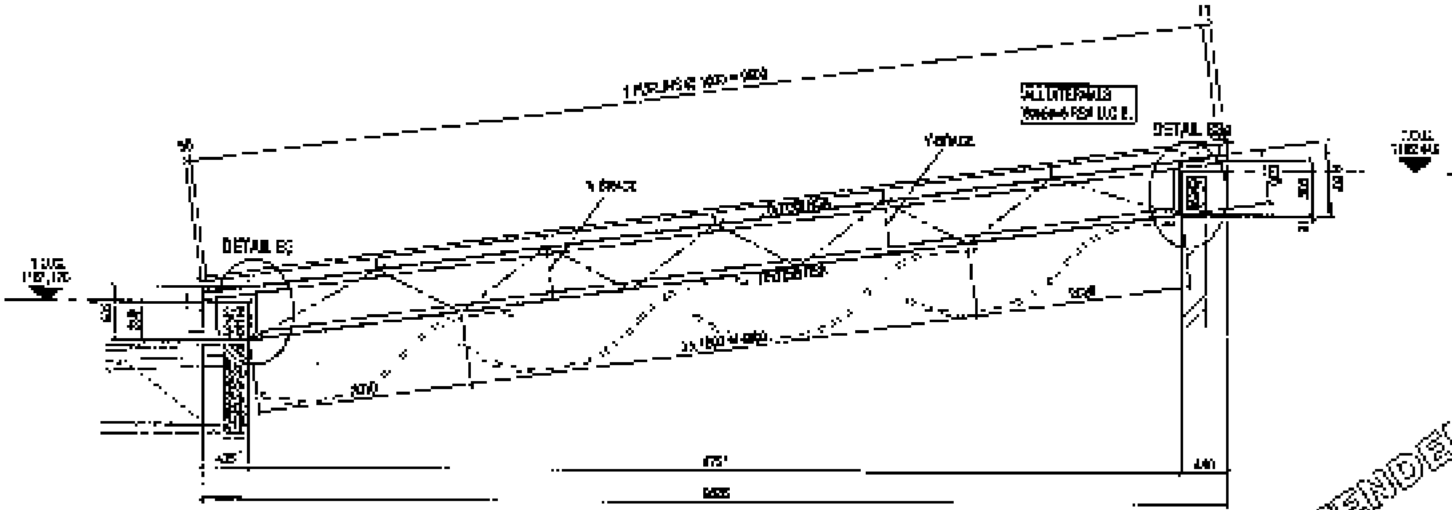
MAGISTRATE'S OFFICE
CONSTRUCTION OF
NEW BUILDING

ROOF LAYOUT &
TRUSS LAYOUT & DETAILS

S200/9



ROOF 6 LAYOUT



TRUSS 6
2-OFF REQ'D AS DRAWN

KEY PLAN

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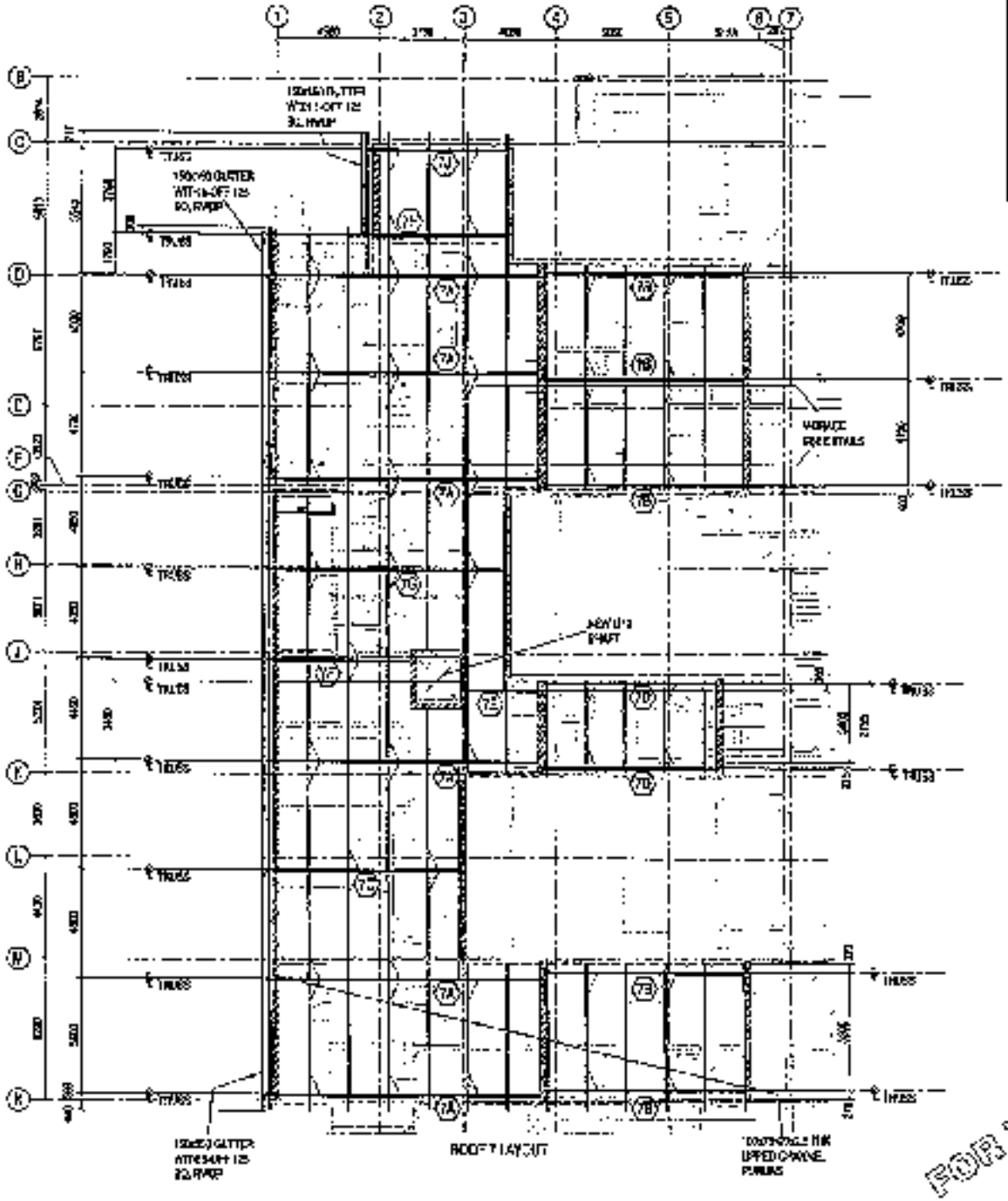
STRUCTURAL

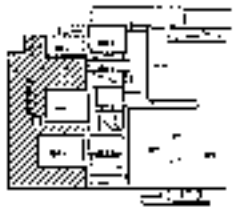
STAARLIS

VAN KEMPEN
MAGISTRATES OFFICE
CONSTRUCTION OF
NEW BUILDING

ROOF 6 LAYOUT &
TRUSS 6 LAYOUT & DETAILS

A1





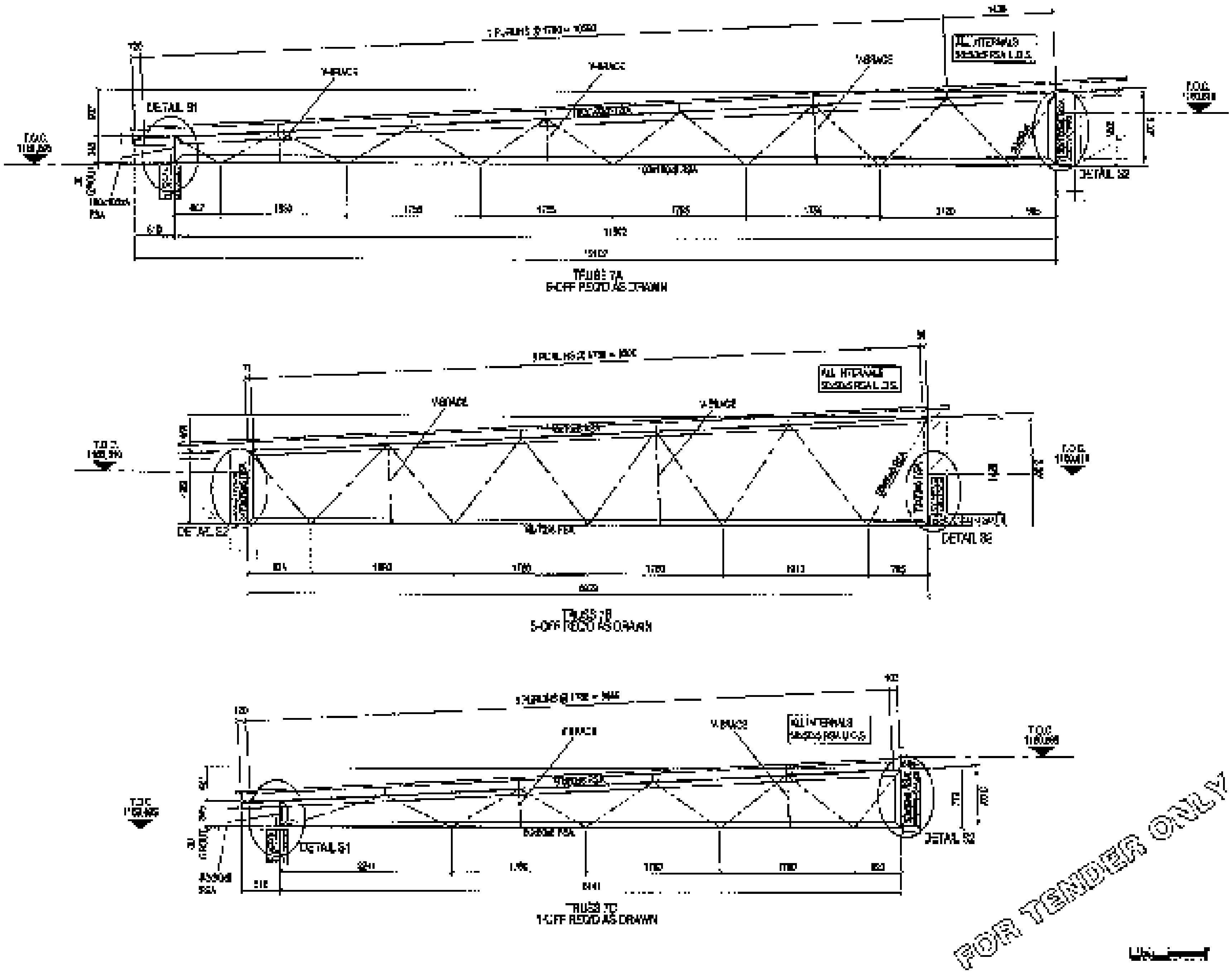
KEY PLAN

FOR TENDER ONLY

public works

STRUCTURAL

S200/11



FOR TENDER ONLY

public works

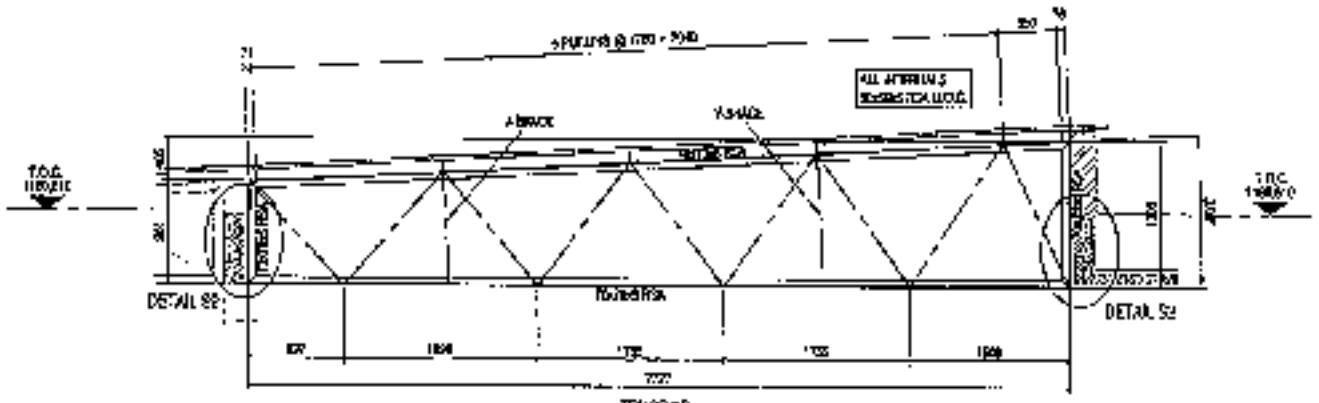
STABILIS

STRUCTURAL

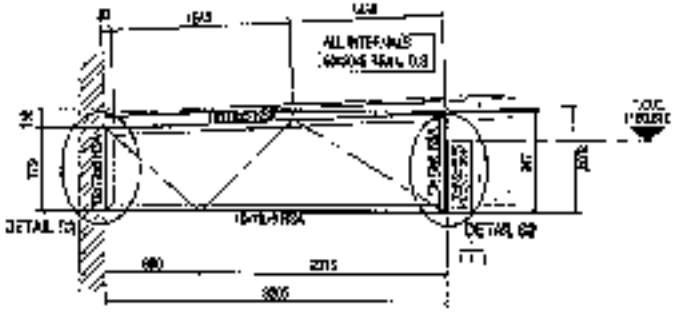
JAN KEMPDORP
MAGISTRATES OFFICE
CONSTRUCTION OF
NEW BUILDINGS

TRUSS 7A TO TRUSS 7C
LAYOUTS & DETAILS

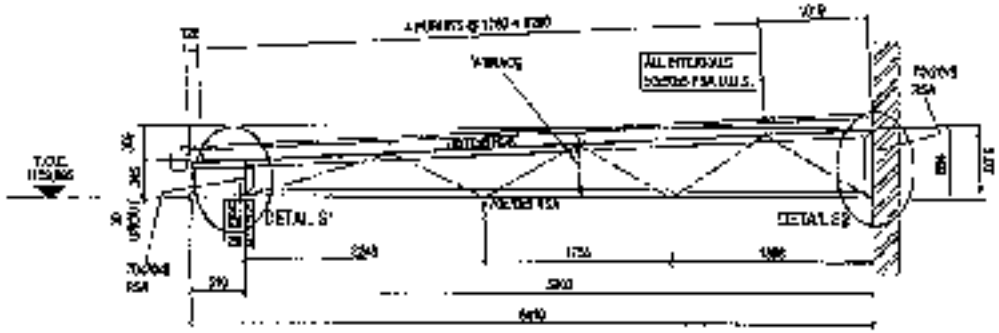
S230/12



TRUSS T0
3-OFF REQD AS DRAWN



TRUSS T8
1-OFF REQD AS DRAWN



TRUSS T7
1-OFF REQD AS DRAWN

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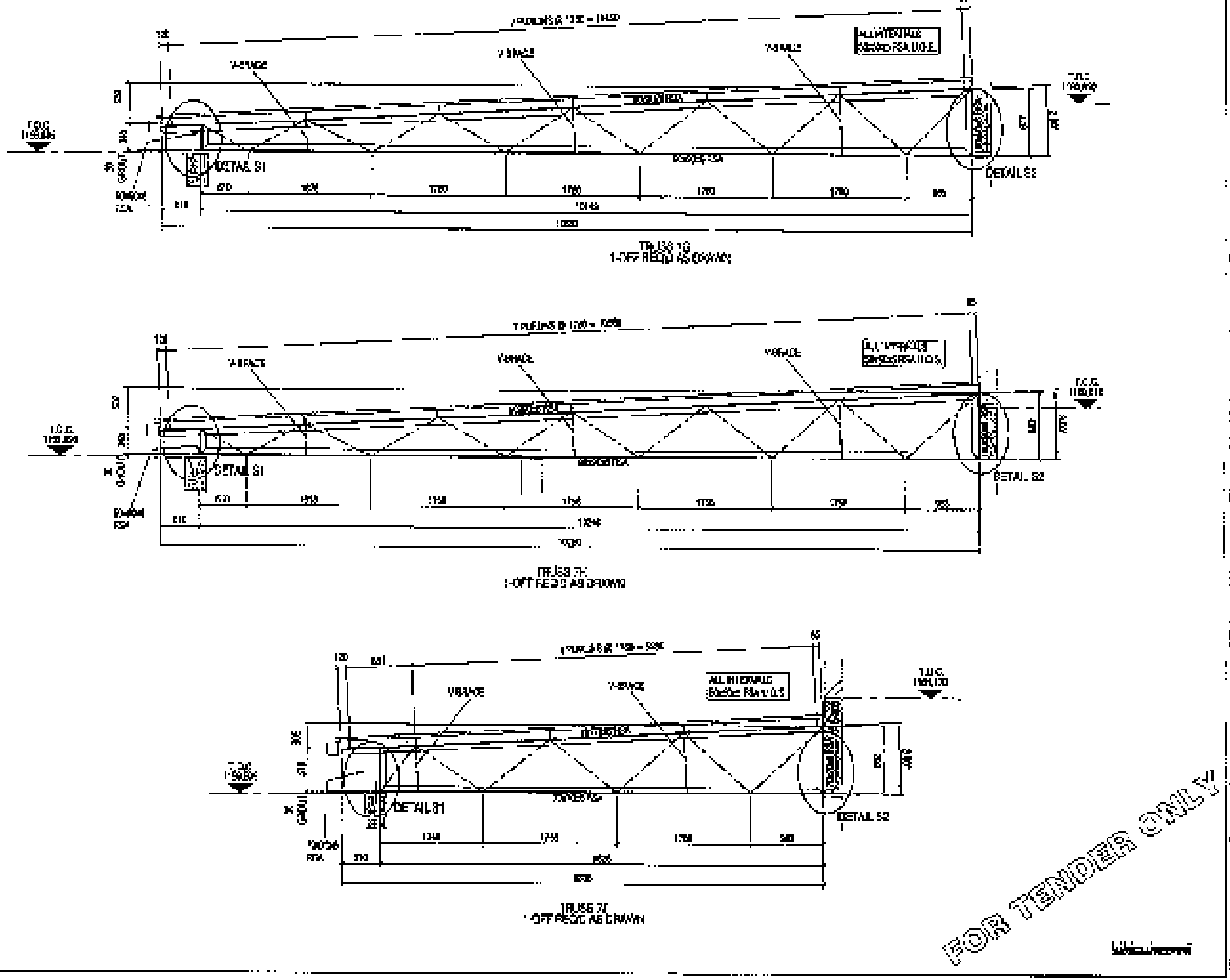
public works

STRUCTURAL

046383

S200113



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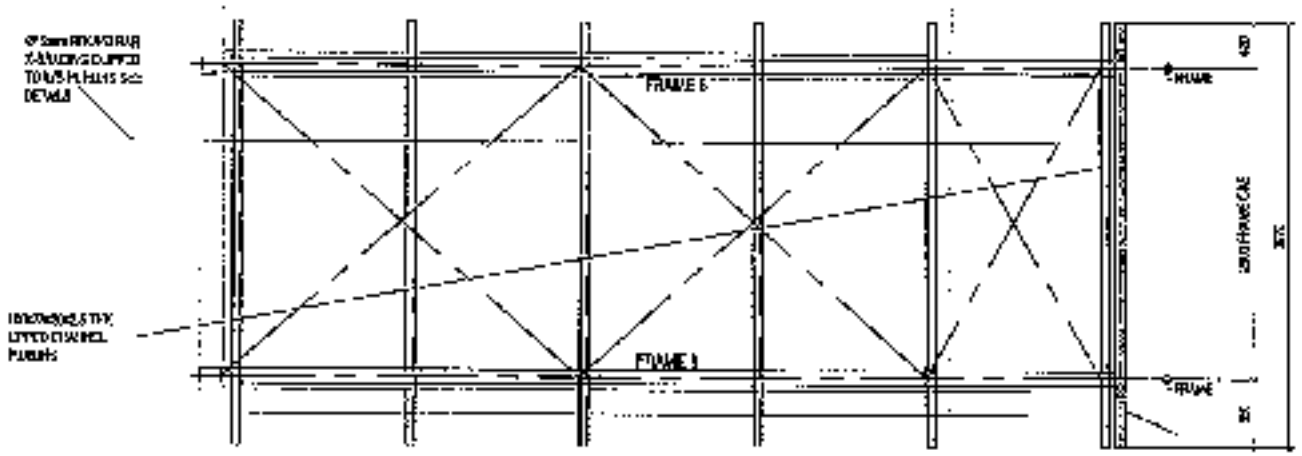
STRUCTURAL

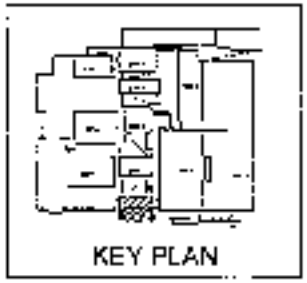
LAIT KEMPDORP MAGISTRATES OFFICE
CONSTRUCTION OF

ROOF TRUSS 1G, TRUSS 7H & TRUSS 7J
LAYOUT & DETAILS

5200/14

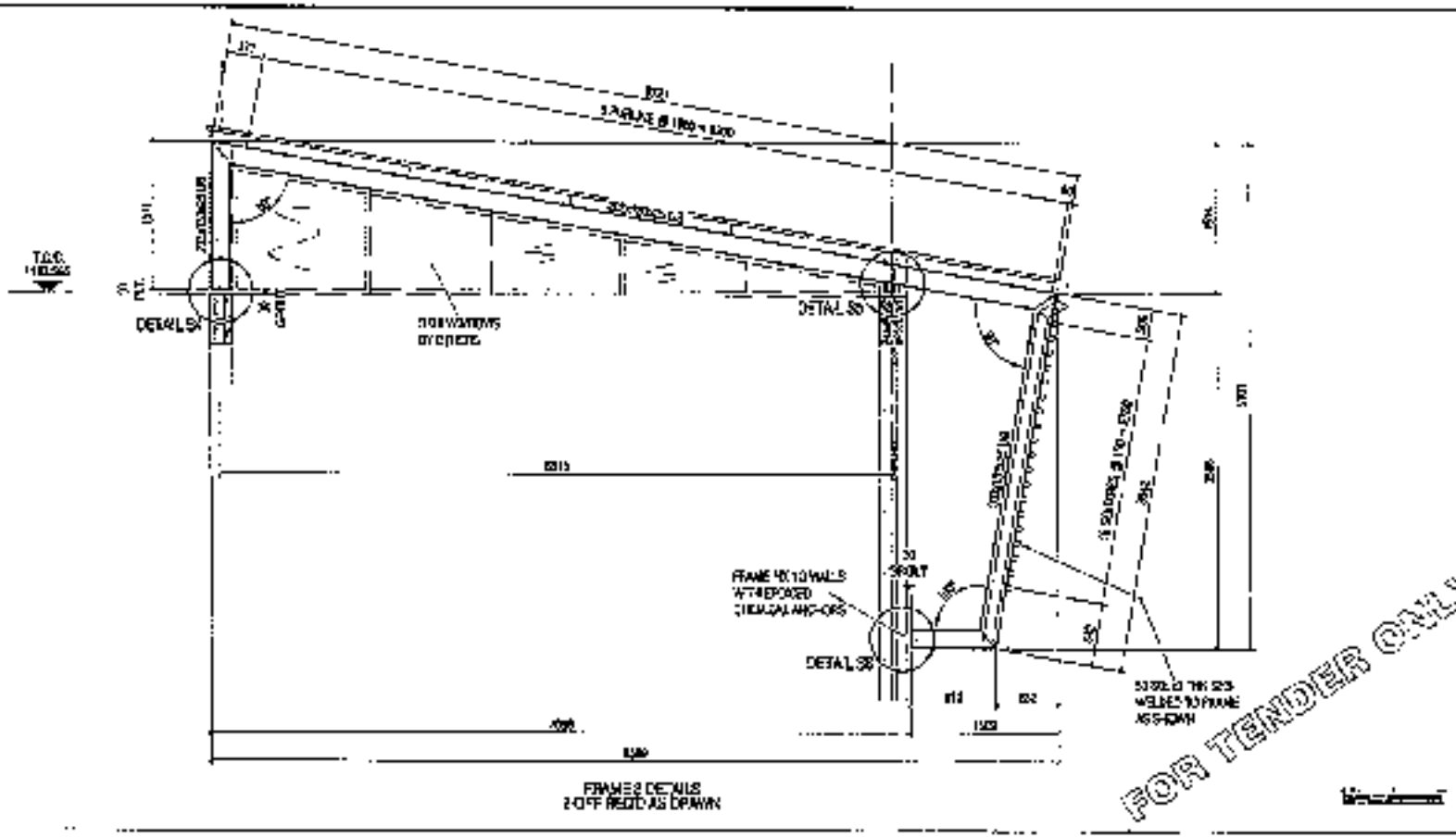


ROOF B LAYOUT



KEY PLAN

NOTES:



FRAME 2 DETAILS
2 OFF REQD AS DRAWN

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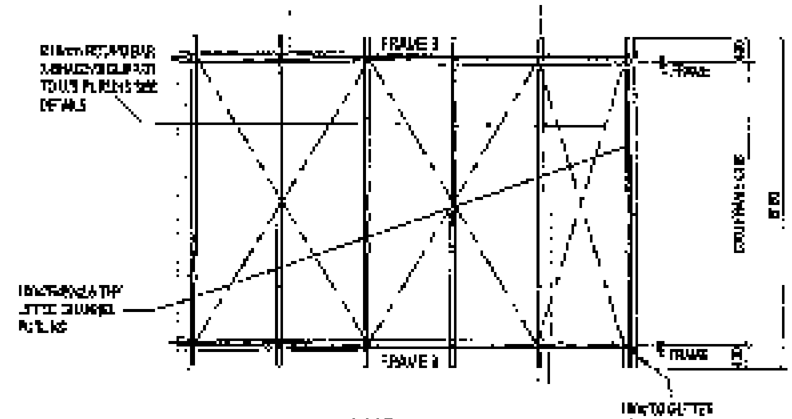
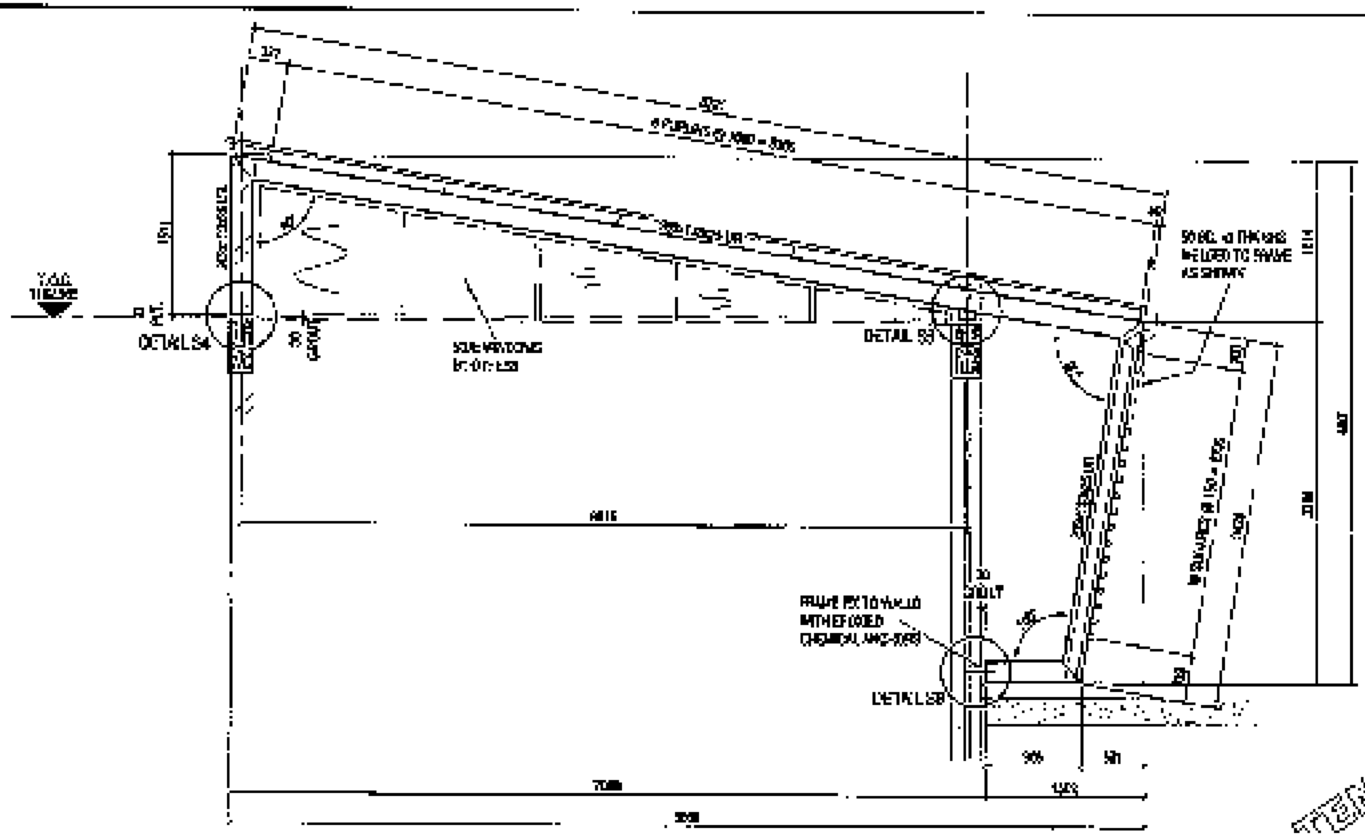
STRUCTURAL

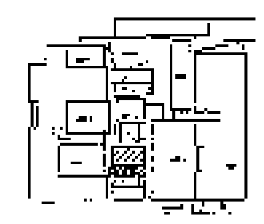
S000/15



ROOF 3 LAYOUT



FRAME 3 DETAILS



KEY PLAN

NOTES:

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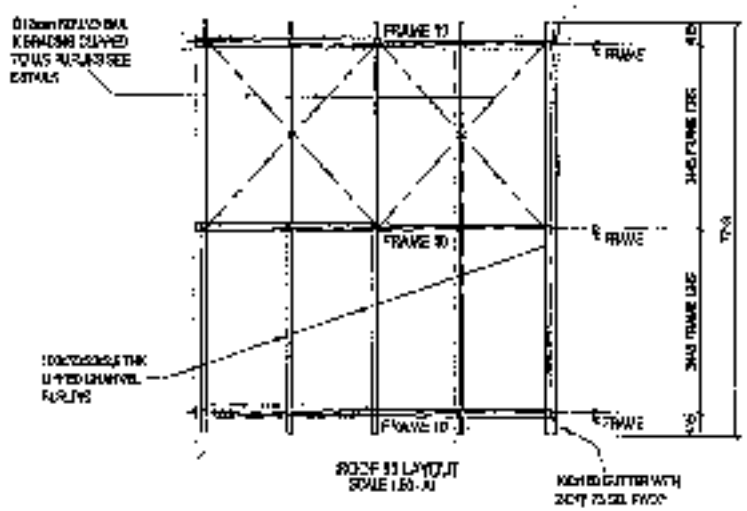
MAGISTRATES OFFICE

ROOF 3 LAYOUT &
TRUSS 3 LAYOUT & DETAILS

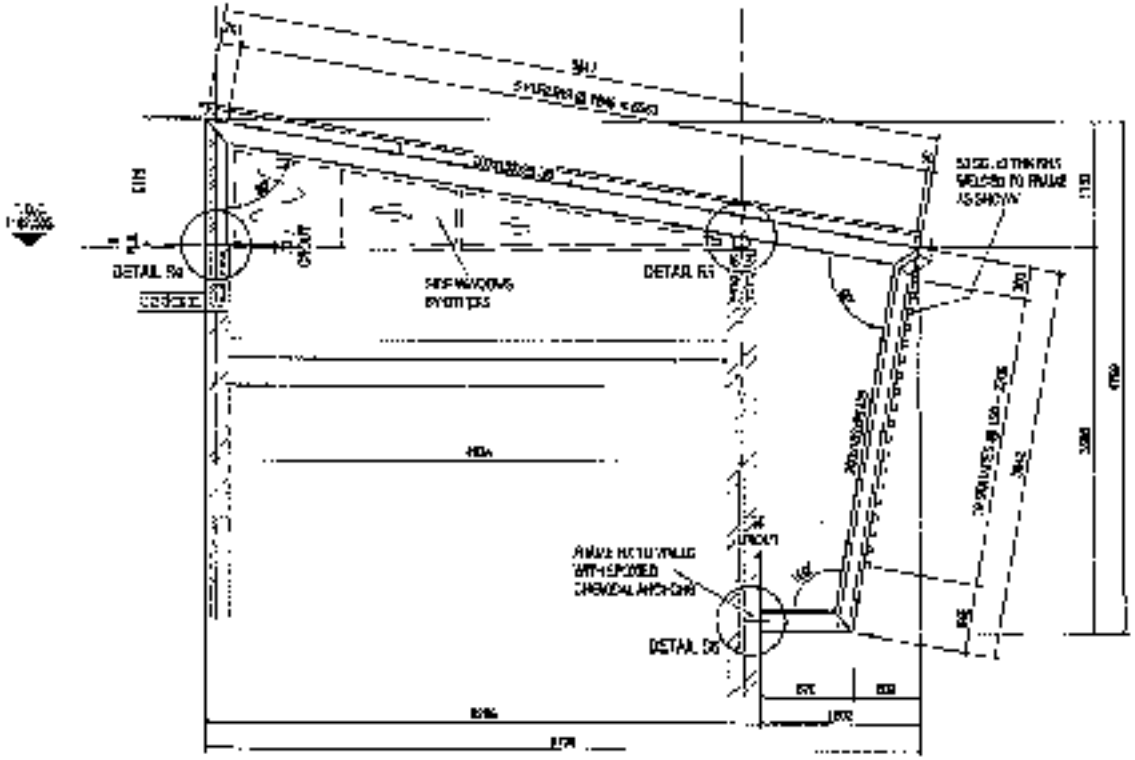
S200/6



ROOF 33 LAYOUT
SCALE 1:50 - A1

KEY PLAN

NOTES:

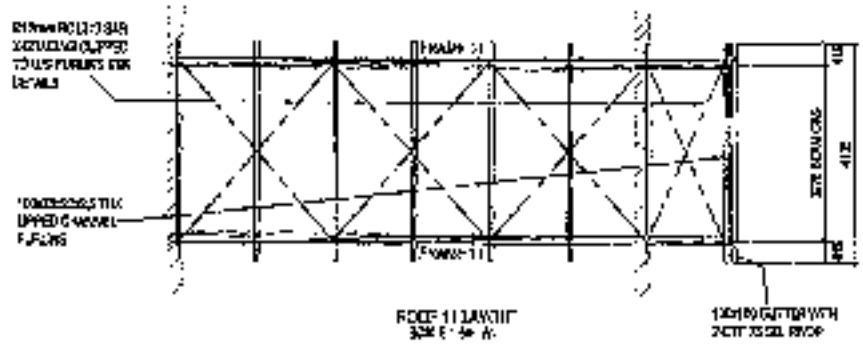


FRAME 10 DETAILS
3-OFF REQD AS SHOWN
SCALE 1:20 - A1

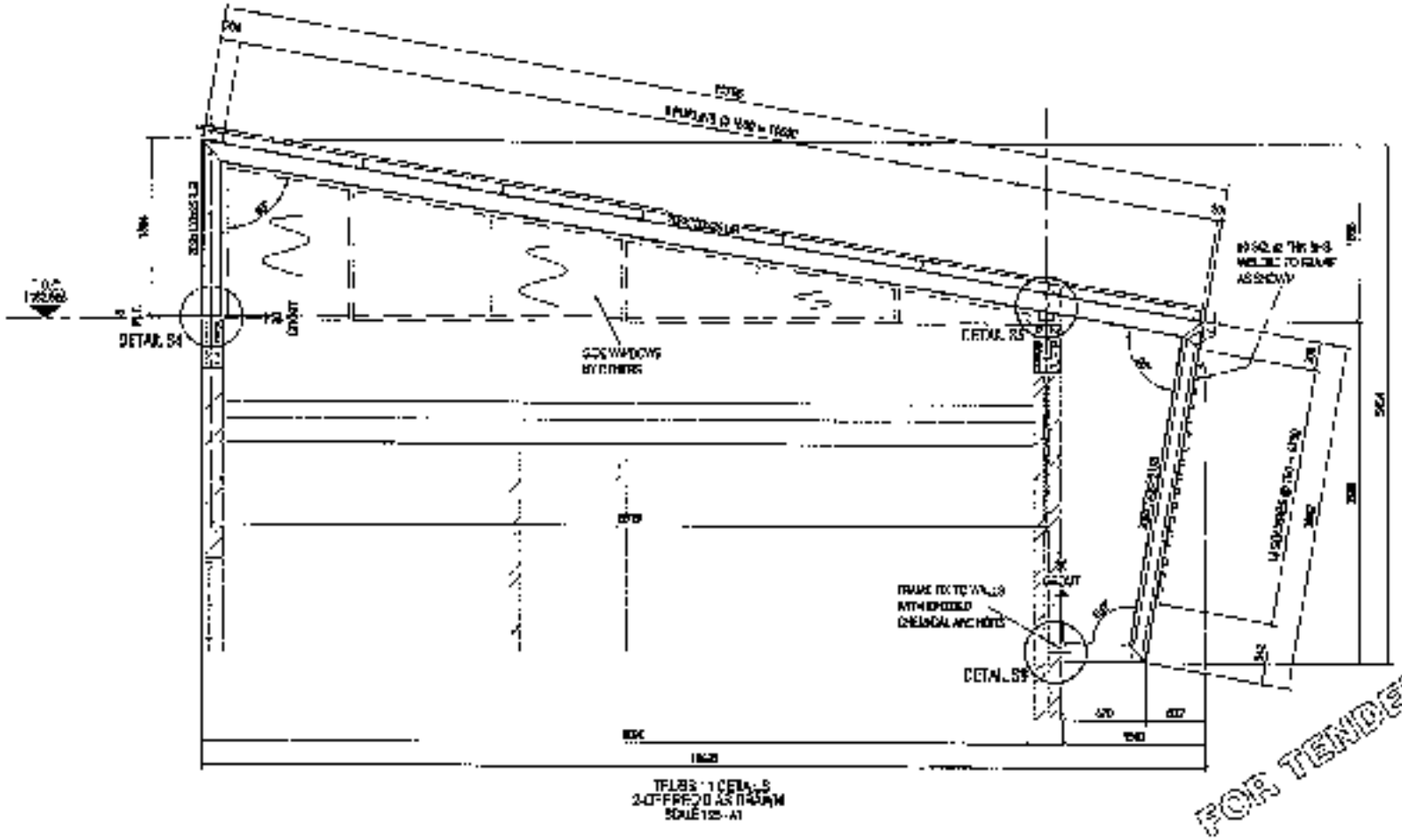
STABILUS

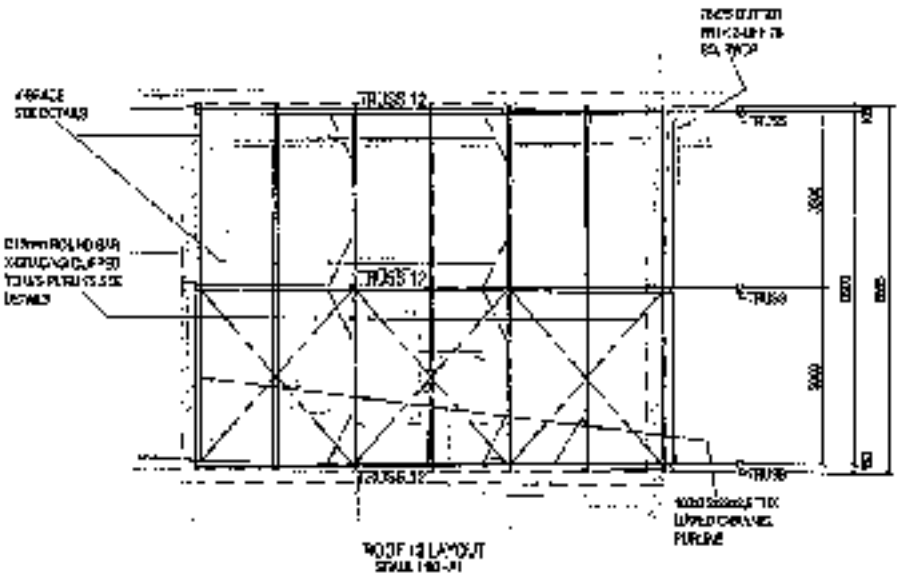
STRUCTURAL

S230/17



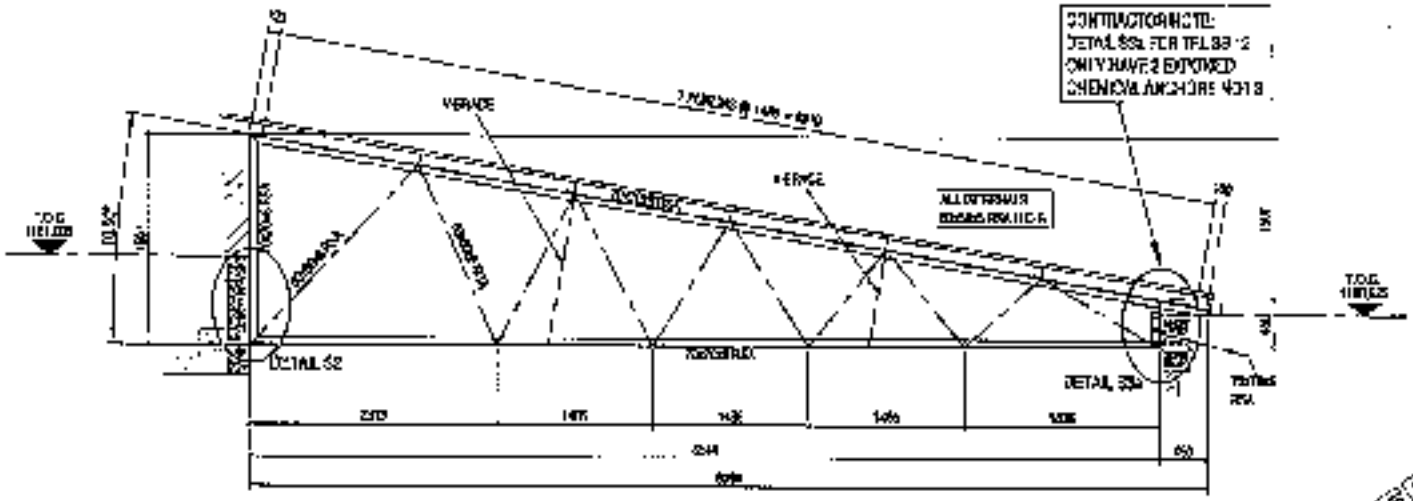

KEY PLAN


DETAIL S4
DETAIL S5
DETAIL S6
FOR TENDER ONLY



ROOF 12 LAYOUT

KEY PLAN



TRUSS 12
3-OFF ROOF AS DRAWN

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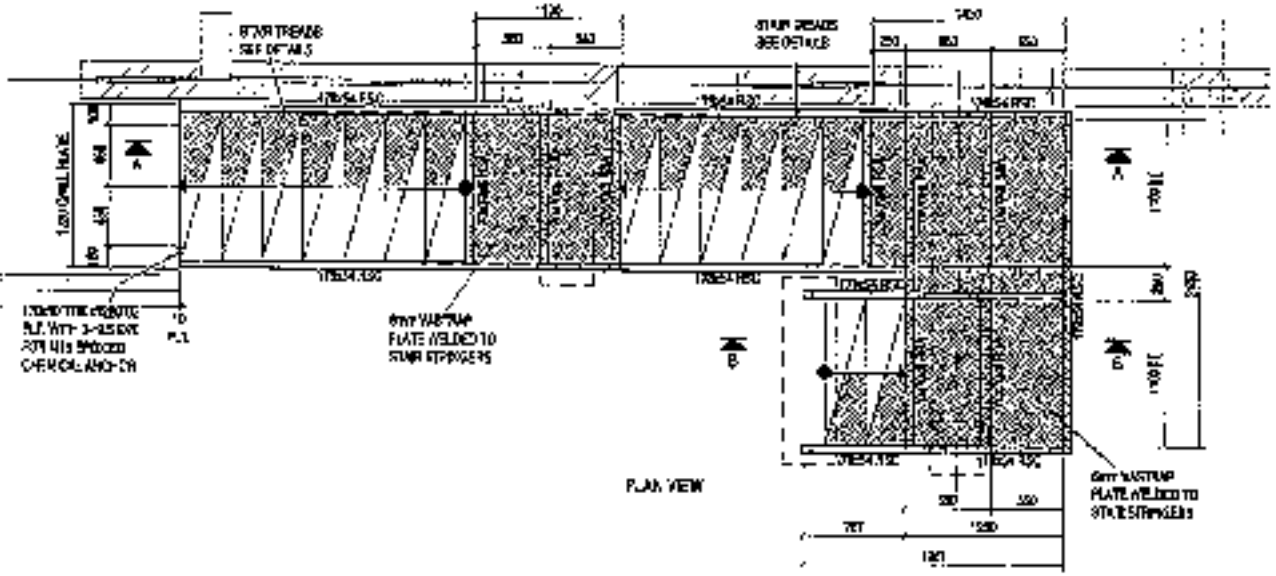
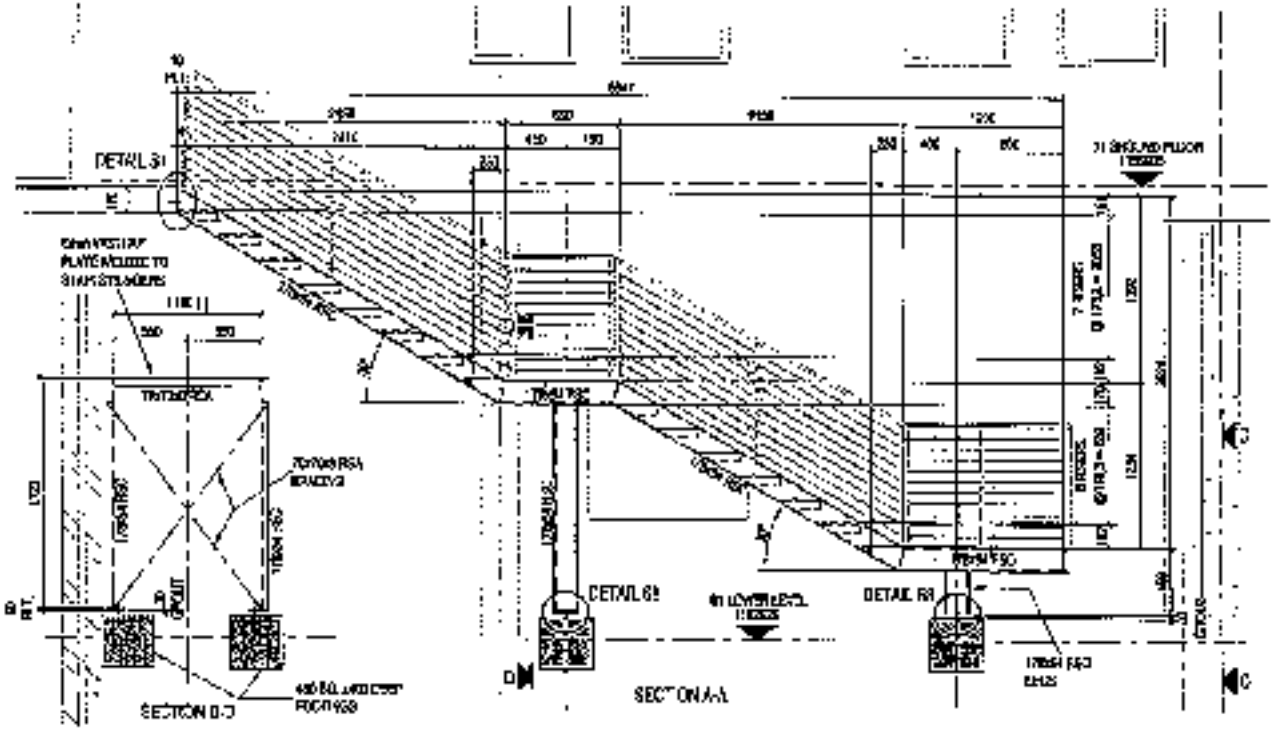
public works

STRUCTURAL

S20/19





FOR TENDER ONLY

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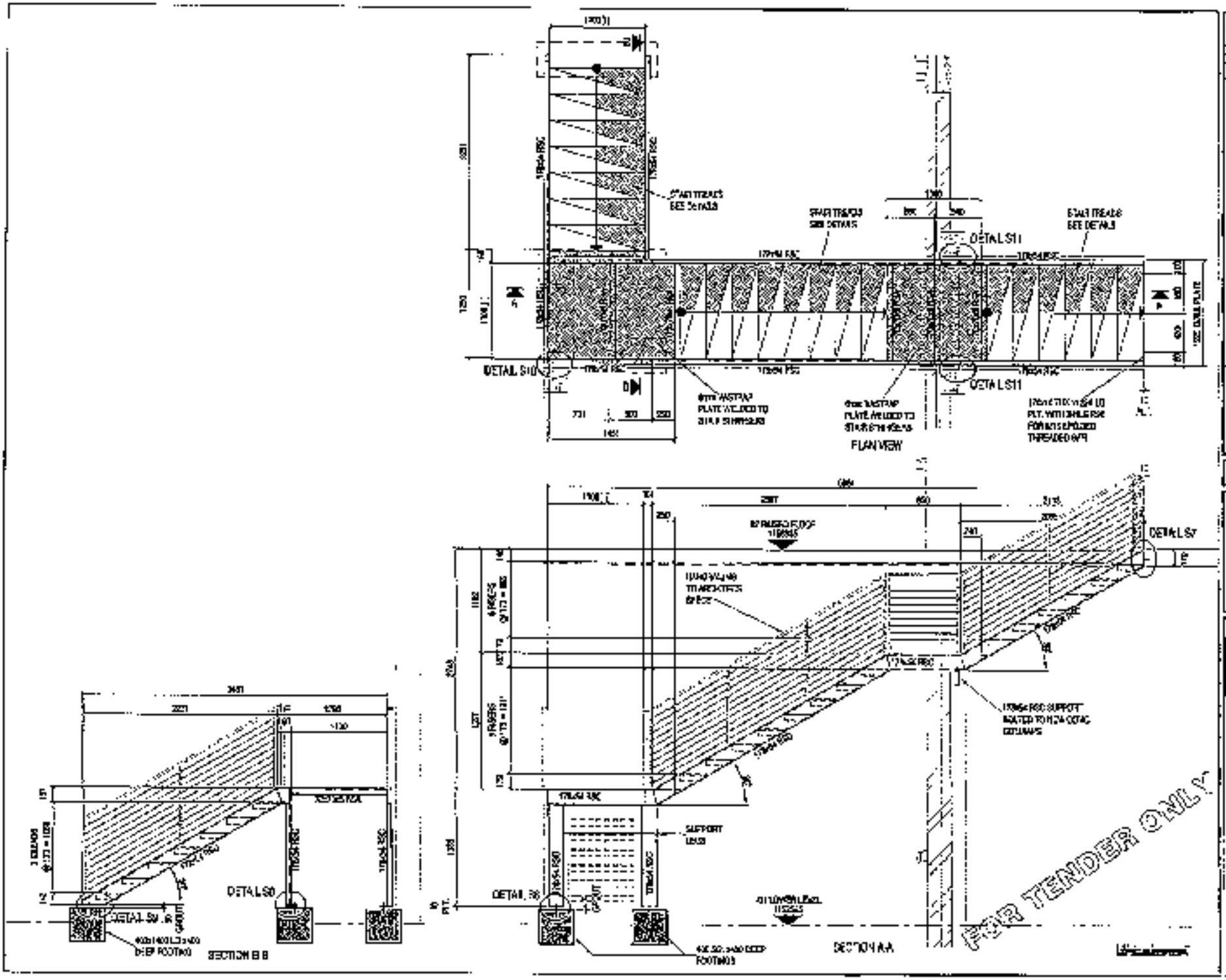
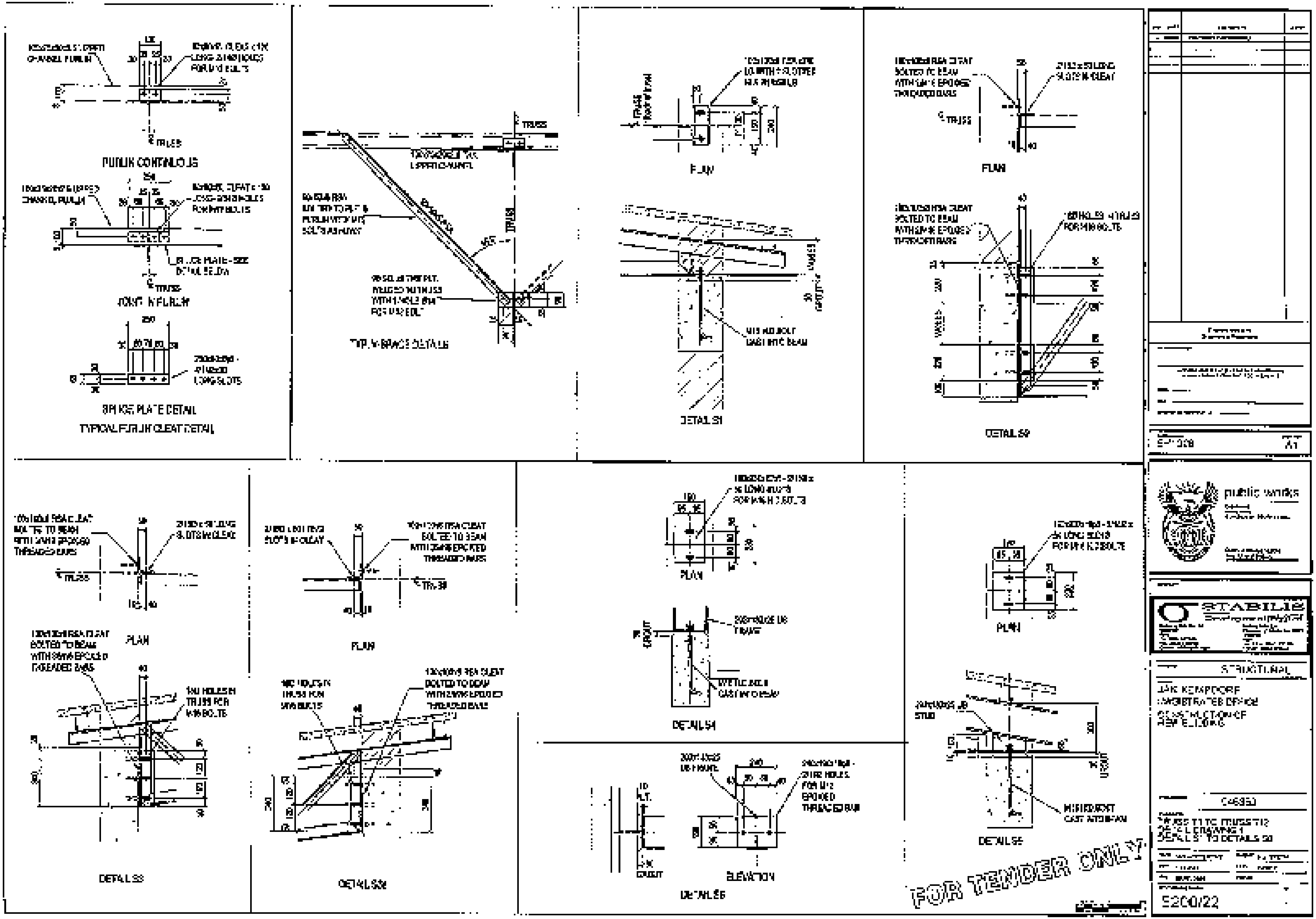
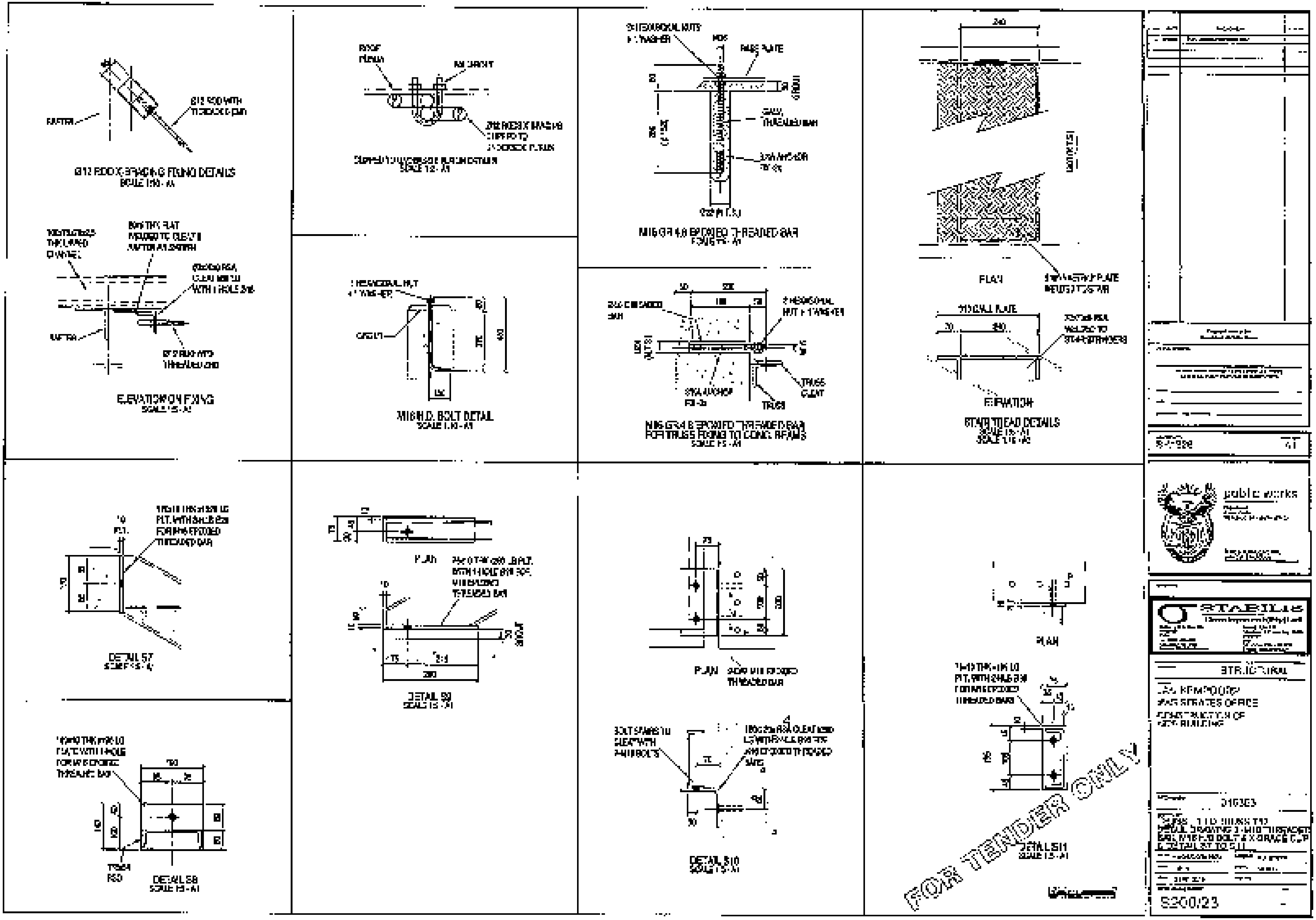
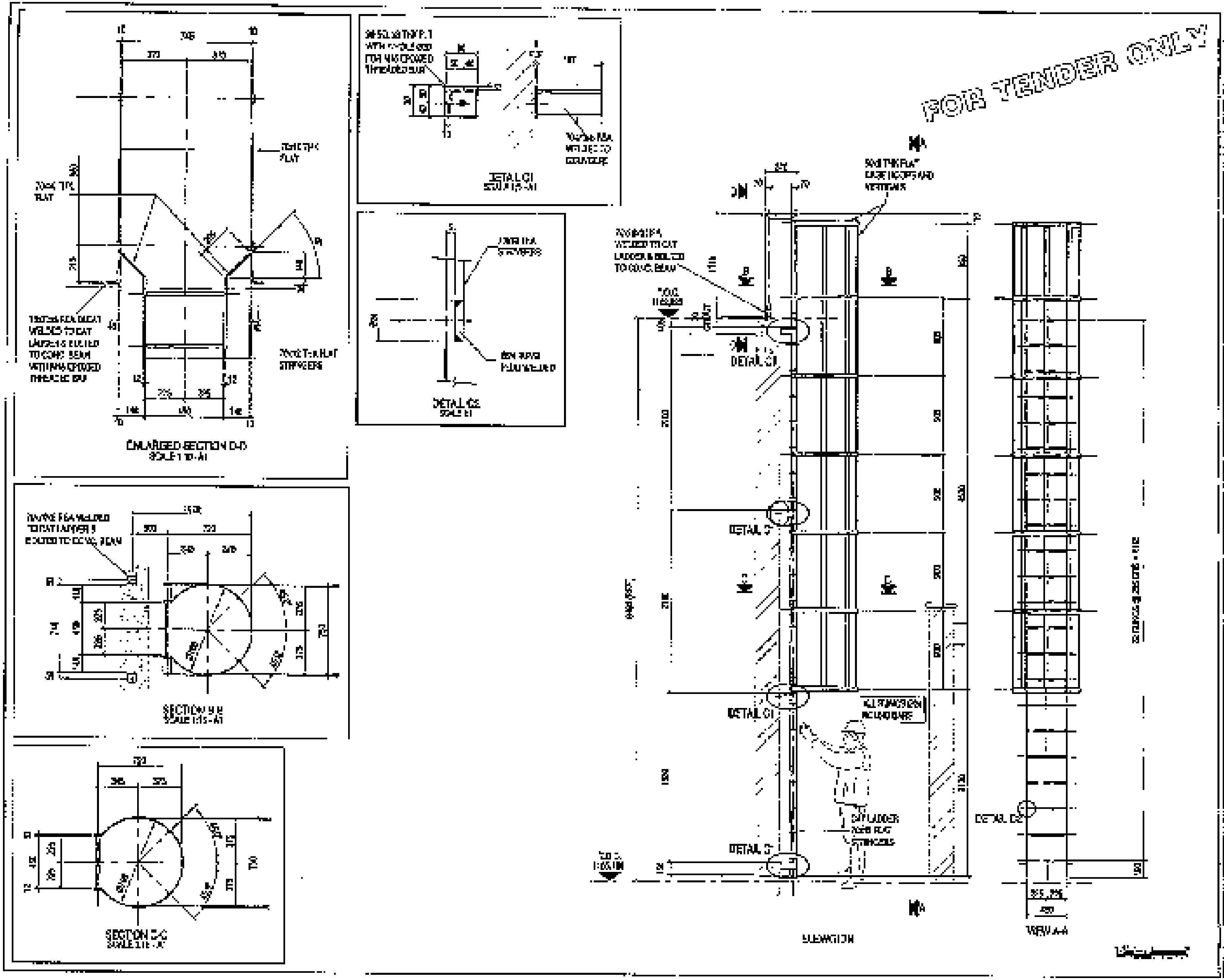
STRUCTURAL

S2011/20


DETAIL S10
DETAIL S11
PLAN VIEW
DETAIL S7
DETAIL S8
SECTION A-A
SECTION B-B
(FOR TENDER ONLY)
STABILIS
public works
STRUCTURAL
S200/21


PURLIN CONTINUOUS
JOINT IN PURLIN
SPLICE PLATE DETAIL
TYPICAL PURLIN CLEAT DETAIL
TYP. W-BRACE DETAILS
PLAN
DETAIL S1
DETAIL S2
DETAIL S3
DETAIL S4
DETAIL S5
DETAIL S6
DETAIL S9
ELEVATION
TRUSS
public works
STABILIS
STRUCTURAL
JAN KEMPDORP
MAGISTRATES OFFICE
CONSTRUCTION OF
NEW BUILDING
CASED
S200/22
FOR TENDER ONLY


Ø12 ROD X-BRACING FIXING DETAILS
ELEVATION ON FIXING
M16 H.D. BOLT DETAIL
M16 GR 4.8 EPOXIED THREADED BAR
M16 GR 4.8 EPOXIED THREADED BAR FOR TRUSS FIXING TO CONC. BEAMS
STAIR TREAD DETAILS
PLAN
ELEVATION
DETAIL S7
DETAIL S8
DETAIL S9
DETAIL S10
DETAIL S11
public works
STABILIS
STRUCTURAL
FOR TENDER ONLY
S200/23



public works

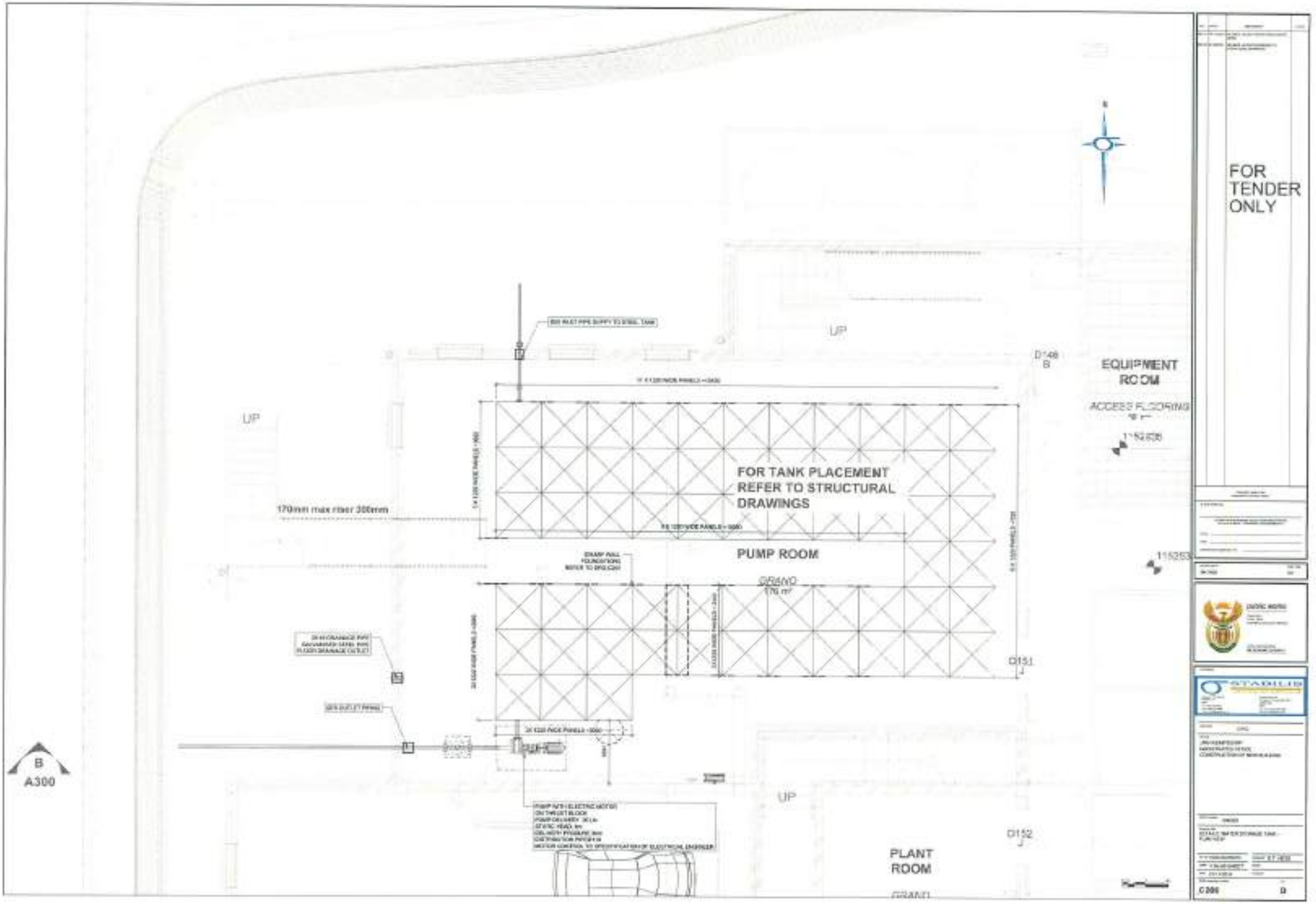
STABILIS

STRUCTURAL

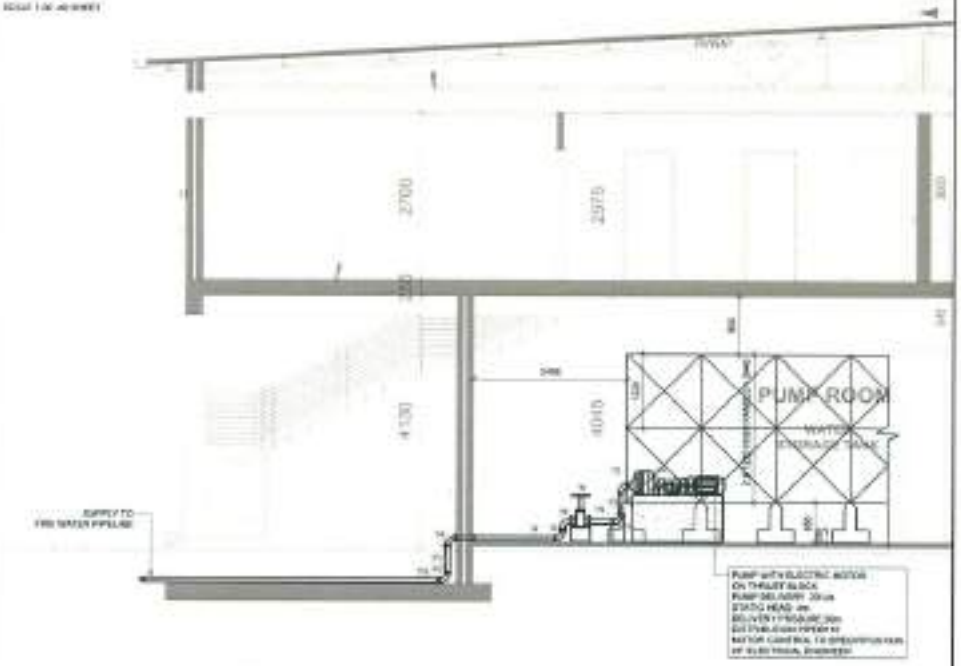
LTV KEMPOORD

CONSTRUCTION OF NEW BUILDING

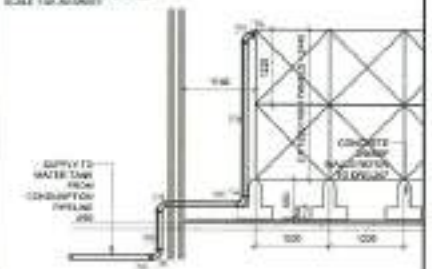
E200/24


FOR TENDER ONLY
EQUIPMENT ROOM
ACCESS FLOORING
FOR TANK PLACEMENT REFER TO STRUCTURAL DRAWINGS
PUMP ROOM
170mm max riser 300mm
UP
D148
B
D151
D152
PLANT ROOM
B
A300
C200
D

ELEVATION OF TANK - SECTION B-B
OUTLET FROM WATER TANK TO FIRE FIGHTING PIPELINE



ELEVATION OF TANK - SECTION
INLET TO WATER TANK



PIPING SCHEDULE FOR STORAGE TANK

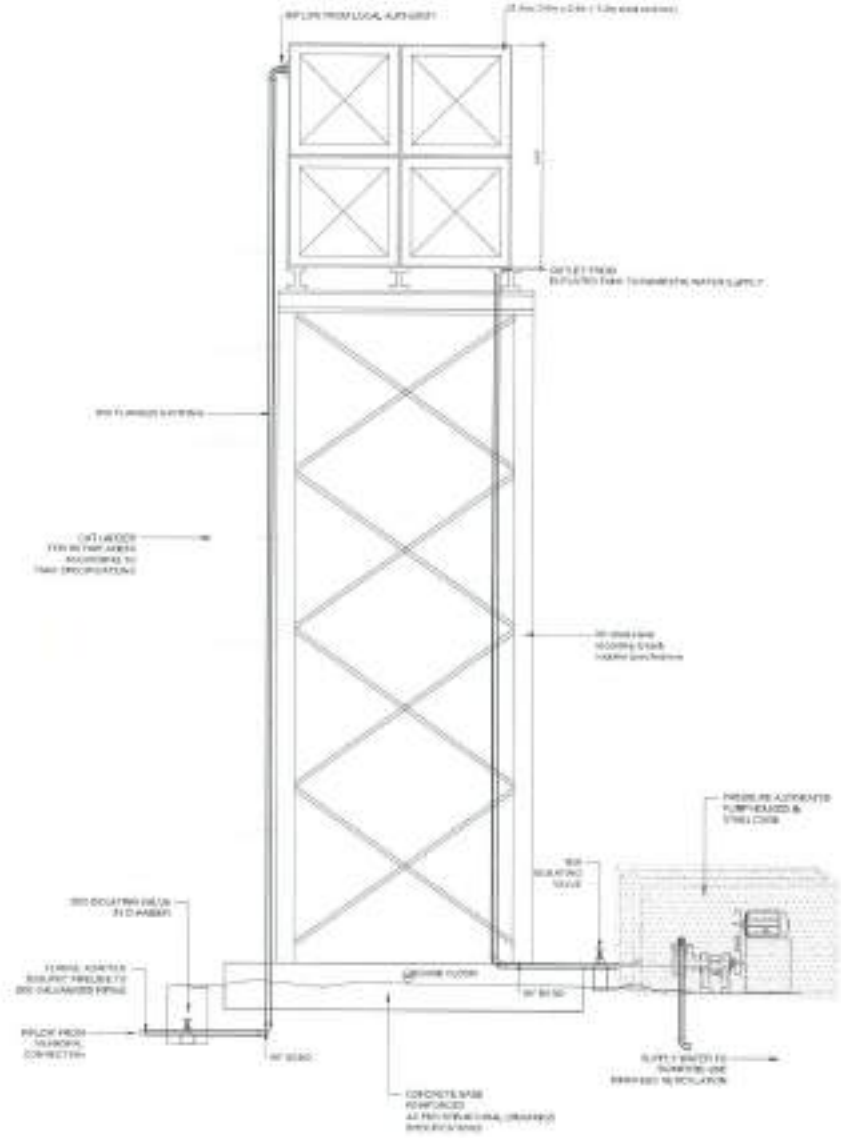
PIPE MARK OR FITTING	SIZE	DESCRIPTION
T1	-	FLANGE ADAPTER FITTING FOR TANK SUCTION OUTLET
T2	80	90° BEND
T3	80	PIPE 328 LONG
T4	80	90° BEND
T5	80	PIPE 368 LONG
T6	80	ISOLATING VALVE
T7	80	90° BEND
T8	80	90° BEND
T9	80	PIPE 1800 LONG
T10	80	90° BEND
T11	80	90° BEND
T12	80	PIPE 415 LONG
T13	-	FLANGE ADAPTER GALVANISED PIPE 80Ø TO UPVC Ø110
T14	-	FLANGE ADAPTER FITTING FOR TANK INLET Ø90
T15	80	90° BEND
T16	80	PIPE 2531 LONG
T17	80	90° BEND
T18	80	PIPE 1000 LONG
T19	80	90° BEND
T20	80	PIPE 587 LONG
T21	80	90° BEND
T22	-	FLANGE ADAPTER GALVANISED PIPE 80Ø TO UPVC Ø110

*ALL STEEL PIPING TO BE HOT DIPPED GALVANISED

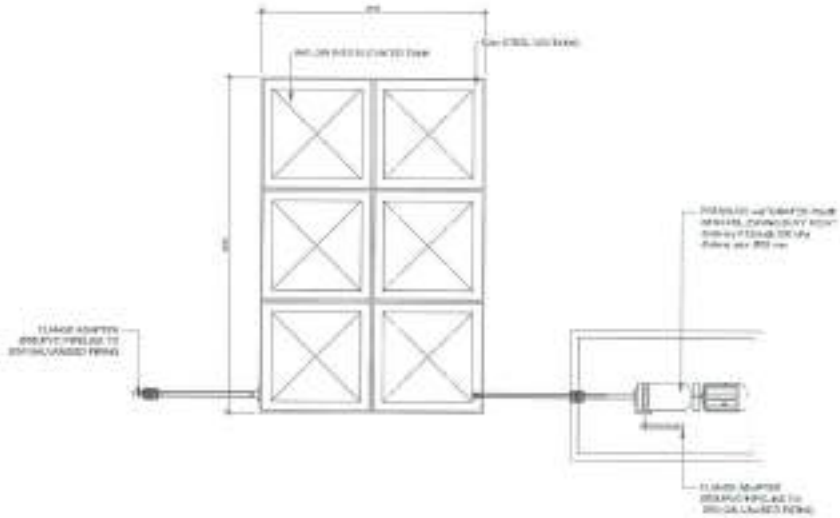
PIPING SCHEDULE FOR STORAGE TANK

FOR TENDER ONLY

C297 D



ELEVATED POTABLE WATER STORAGE
PRESSURE TANK
ELEVATION 1



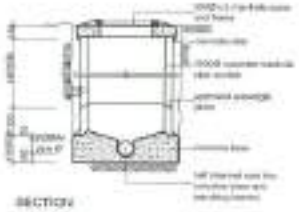
ELEVATED POTABLE WATER STORAGE
PRESSURE TANK PLAN VIEW
ELEVATION 1

FOR
TENDER
ONLY

public works

G208 B

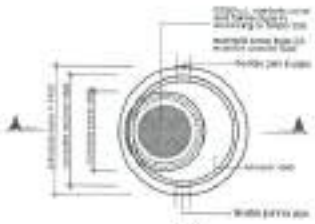
PLAN



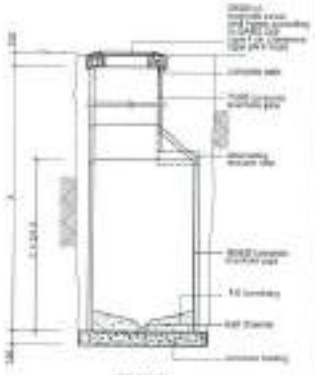
SECTION

PRE-CAST CONCRETE MANHOLE
TYPE B
FOR DEPTHS 1-2.5 m DEEP

DETAIL INTERLOCKING JOINT

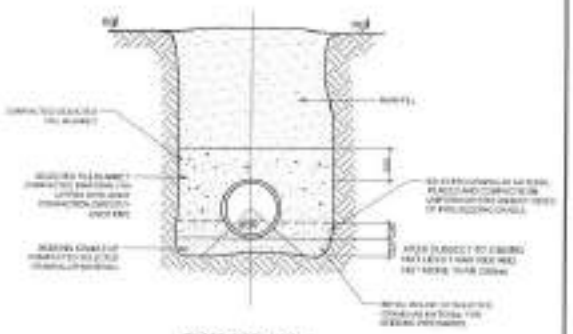


PLAN

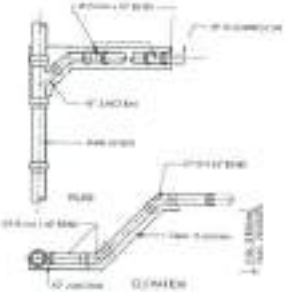


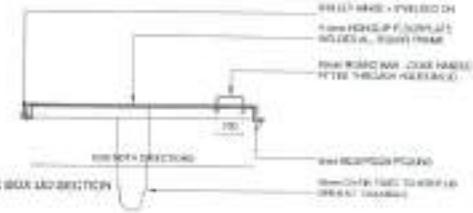
SECTION

PRE-CAST CONCRETE MANHOLE
TYPE C
FOR DEPTHS >2.5 m DEEP

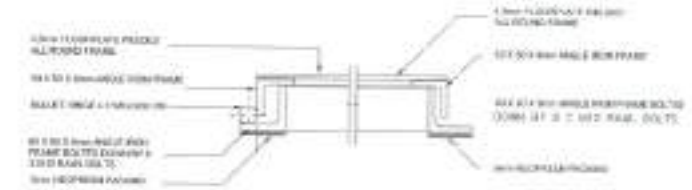


CLASS C BEDDING





VALVE BOX LID SECTION



VALVE BOX LID DETAIL

TYPICAL CHAMBER LID

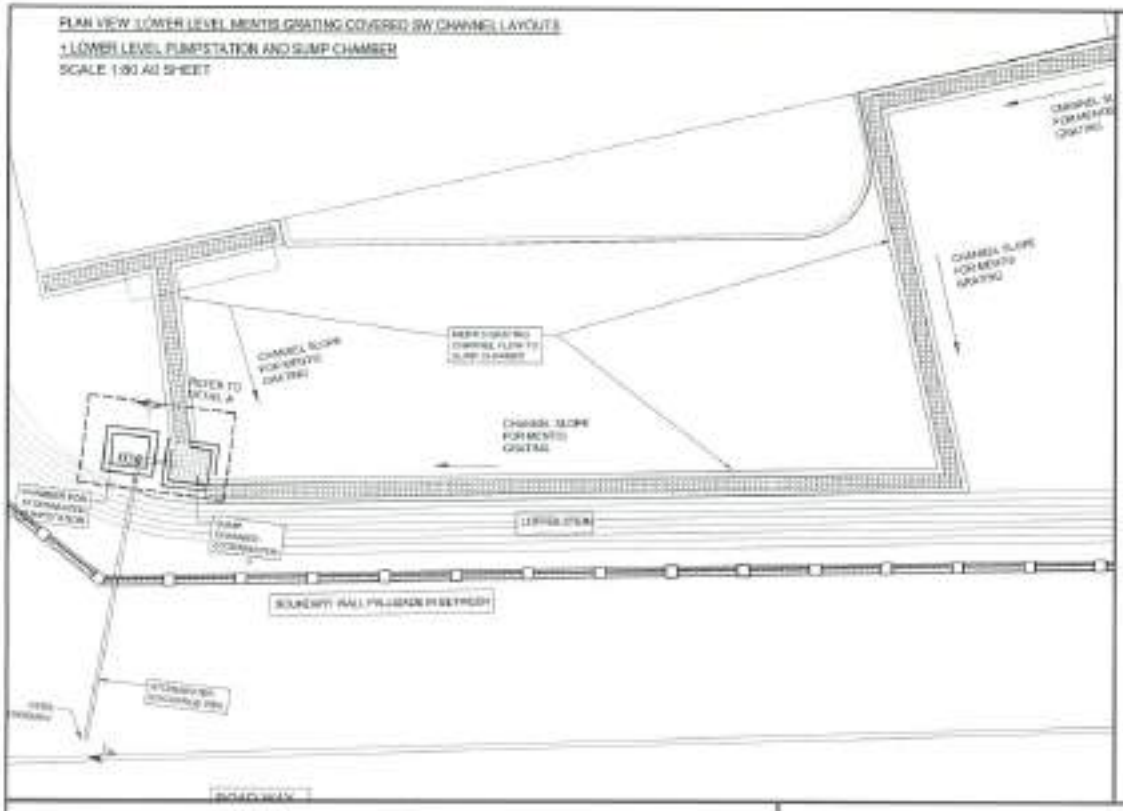
FOR TENDER ONLY

C302 C

PLAN VIEW LOWER LEVEL MENTIS GRATING COVERED SW CHANNEL LAYOUTS

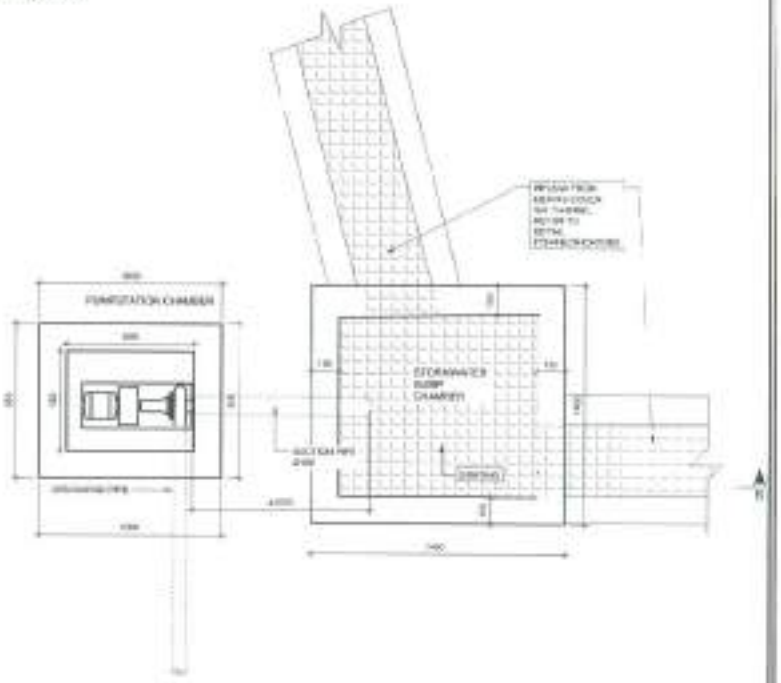
1 LOWER LEVEL PUMPSTATION AND SUMP CHAMBER

SCALE 1:50 A0 SHEET



PLAN VIEW OF PUMPSTATION CHAMBER AND SUMP CHAMBERS

SCALE 1:50 A0 SHEET

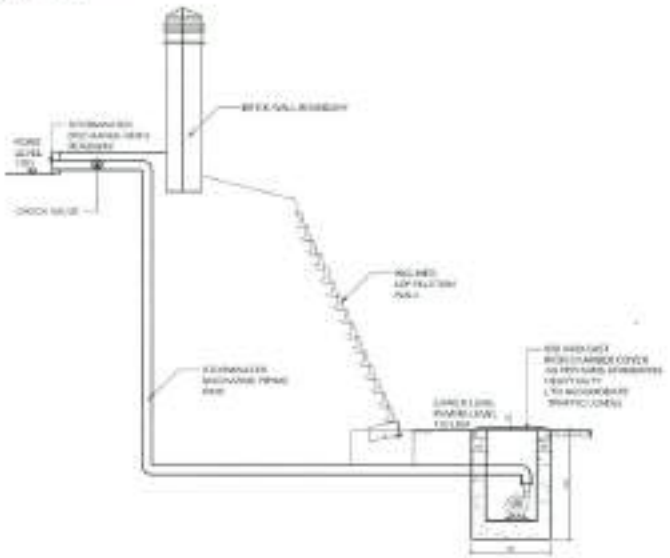


FOR TENDER ONLY

CROSS SECTION A-A

STORMWATER SUMP CHAMBER AND PUMPSTATION CHAMBER EXCHANGE PIPE

SCALE 1:50 A0 SHEET



CROSS SECTION SECTION B-B

STORMWATER SUMP CHAMBER AND PUMPSTATION

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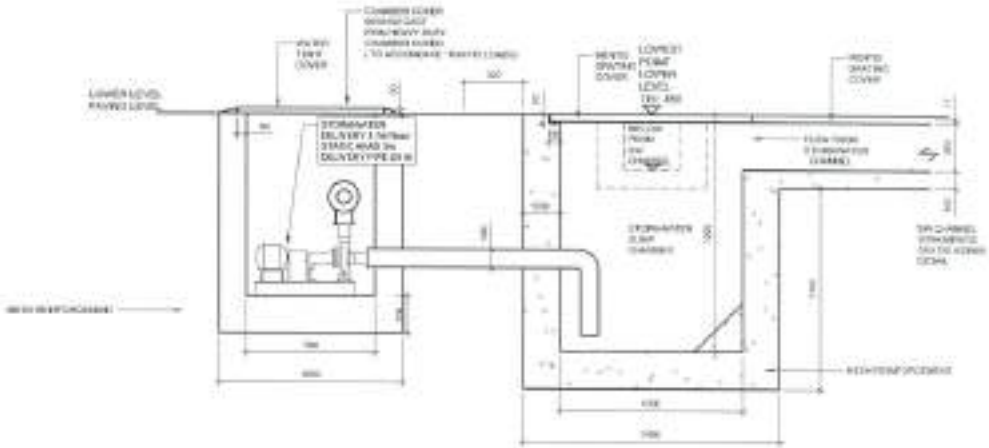

C480