

## PART 2: PRICING DATA

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## C2.1 Pricing instructions: Option B

### 1. The *conditions of contract*

#### 1.1. How the contract prices work and assesses it for progress payments

Clause 11 in NEC3 Engineering and Construction Contract, June 2005 and 2013 (ECC) Option B states:

**Identified  
and defined  
terms**

11

11.2

(21) The Bill of Quantities is the *bill of quantities* as changed in accordance with this contract to accommodate implemented compensation events and for accepted quotations for acceleration.

(22) Defined Cost is the cost of the components in the Shorter Schedule of Cost Components whether work is subcontracted or not excluding the cost of preparing quotations for compensation events.

(28) The Price for Work Done to Date is the total of

- the quantity of the work which the *Contractor* has completed for each item in the Bill of Quantities multiplied by the rate and
- a proportion of each lump sum which is the proportion of the work covered by the item which the *Contractor* has completed.

Completed work is work without Defects which would either delay or be covered by immediately following work.

(31) The Prices are the lump sums and the amounts obtained by multiplying the rates by the quantities for the items in the Bill of Quantities.

This confirms that Option B is a re-measurement contract and the bill comprises only items measured using quantities and rates or stated as lump sums. Value related items are not used. Time related items are items measured using rates where the rate is a unit of time.

## 1.2. Function of the Bill of Quantities

Clause 55.1 in Option B states, "Information in the Bill of Quantities is not Works Information or Site Information". This confirms that instructions to do work or how it is to be done are not included in the Bill, but in the Works Information. This is further confirmed by Clause 20.1 which states, "The *Contractor* Provides the Works in accordance with the Works Information". Hence the *Contractor* does **not** Provide the Works in accordance with the Bill of Quantities. The Bill of Quantities is only a pricing document.

## 1.3. Guidance before pricing and measuring

Employers preparing tenders or contract documents, and tendering contractors are advised to consult the sections dealing with the bill of quantities in the NEC3 Engineering and Construction Contract (June 2005) Guidance Notes before preparing the *bill of quantities* or before entering rates and lump sums into the *bill*.

Historically bill of quantities based contracts in South Africa have been influenced by the different approaches of the civil engineering and building sectors of the industry through their respective discipline based standard forms of contract and methods of measurement. This is particularly apparent in the approach to the Preliminary and General bill. On the other hand, because ECC caters for a number of disciplines in the same contract, including electrical works, a different approach not currently found in local methods of measurement to the Preliminary & General bill items may have been used.

The NEC approach to the P & G bill assumes use will be made of method related charges for Equipment applied to Providing the Works based on durations shown in the Accepted Programme, fixed charges for the use of Equipment that is required throughout the construction phase, time related charges for people working in a supervisory capacity for the period required, and lump sum charges for other facilities or services not directly related to performing work items typically included in other parts of the bill.

## 2. Measurement and payment

### 2.1. Symbols

The units of measurement described in the Bill of Quantities are metric units abbreviated as follows:

Abbreviation	Unit
%	percent
h	hour
ha	hectare
kg	kilogram
kl	kilolitre
km	kilometre
km-pass	kilometre-pass
kPa	kilopascal
kW	kilowatt
l	litre
m	metre
mm	millimetre
m <sup>2</sup>	square metre
m <sup>2</sup> -pass	square metre pass
m <sup>3</sup>	cubic metre
m <sup>3</sup> -km	cubic metre-kilometre
MN	meganewton

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MN.m	meganewton-metre
MPa	megapascal
No.	number
Prov sum <sup>1</sup>	provisional sum
PC-sum	prime cost sum
R/only	Rate only
sum	Lump sum
t	ton (1000kg)
W/day	Work day

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## 2.2. General assumptions

- 2.2.1. Unless otherwise stated, items are measured net in accordance with the drawings, and no allowance has been made in the quantities for waste.
- 2.2.2. The Prices and rates stated for each item in the Bill of Quantities shall be treated as being fully inclusive of all work, risks, liabilities, obligations, overheads, profit and everything necessary as incurred or required by the *Contractor* in carrying out or providing that item.
- 2.2.3. Clause 63.13 in Option B provides that these rates and Prices may be used as a basis for assessment of compensation events instead of Defined Cost.
- 2.2.4. Where this contract requires detailed drawings, designs or other information to be provided, and no rates or prices are included in the *bill* specifically for such matters, then the *Contractor* is deemed to have allowed for all costs associated with such requirements within the tendered rates and Prices in the Bill of Quantities.

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<sup>1</sup> Provisional Sums should not be used unless absolutely unavoidable. Rather include specifications and associated bill items for the most likely scope of work, and then change later using the compensation event procedure if necessary. This is because tenderers cannot programme effectively for unknown scopes of work

- 2.2.5. An item against which no Price is entered will be treated as covered by other Prices or rates in the *bill of quantities*. If a number of items are grouped together for pricing purposes, this will be treated as a single lump sum.
- 2.2.6. The quantities contained in the Bill of Quantities may not be final and do not necessarily represent the actual amount of work to be done. The quantities of work assessed and certified for payment by the *Project Manager* at each assessment date will be used for determining payments due and not the quantities given in the Bill of Quantities.
- 2.2.7. The short descriptions of the items of payment given in the *bill of quantities* are only for the purposes of identifying the items. More detail regarding the extent of the work entailed under each item is provided in the Works Information.

### **2.3. Departures from the *method of measurement***

### **2.4. Amplification of or assumptions about measurement items**

For the avoidance of doubt the following is provided to assist in the interpretation of descriptions given in the *method of measurement*. In the event of any ambiguity or inconsistency between the statements in the *method of measurement* and this section, the interpretation given in this section shall be use.

**TRANSNET NATIONAL PORTS AUTHORITY**

TENDER NUMBER: TNPA/2022/05/0366/RFP

DESCRIPTION OF THE WORKS: FOR THE UPGRADE AND THE EXTENTION OF PORT CONTROL TOWER  
BUILDING IN THE PORT OF RICHARDS BAY

**SUMMARY OF SECTIONS**

SECTION	DESCRIPTION	AMOUNT R	TOTALS
<b>PART A:</b>	<b><u>PRELIMINARY AND GENERAL</u></b>		<b>R</b> -
	SCHEDULE A1: PRELIMINARY AND GENERAL	R -	
<b>PART B:</b>	<b><u>BUILDING WORKS</u></b>		<b>R</b> -
	SCHEDULE B1: ALTERATIONS	R -	
	SCHEDULE B2: CONCRETE, FORMWORK AND	R -	
	SCHEDULE B3: MASONRY	R -	
	SCHEDULE B4: WATERPROOFING	R -	
	SCHEDULE B5: CARPENTRY AND JOINERY	R -	
	SCHEDULE B6: FLOOR COVERINGS	R -	
	SCHEDULE B7: IRONMONGERY	R -	
	SCHEDULE B8: STRUCTURAL STEELWORK	R -	
	SCHEDULE B9: METALWORK	R -	
	SCHEDULE B10: PLASTERING	R -	
	SCHEDULE B11: TILING	R -	
	SCHEDULE B12: PLUMBING AND DRAINAGE	R -	
	SCHEDULE B13: GLAZING	R -	
	SCHEDULE B14: PAINTING	R -	
	SCHEDULE B15: GREEN BUILDING CONSIDERATIONS	R -	
	SCHEDULE B16: PROVISIONAL AMOUNTS	R -	
	SCHEDULE B17: GENERAL SITE CLEARANCE	R -	
	SCHEDULE B18: FENCING	R -	
	SCHEDULE B19: CABLE DUCTS	R -	
	SCHEDULE B20: MAINTENANCE	R -	
	SCHEDULE B21: GENERATOR ROOM	R -	
<b>PART C:</b>	<b><u>CIVIL WORKS</u></b>		<b>R</b> -
	SCHEDULE C1: SITE CLEARANCE	R -	
	SCHEDULE C2: EARTHWORKS (ROADS, SUBGRADE)	R -	
	SCHEDULE C3: SEWERS	R -	
	SCHEDULE C4: WATER RETICULATION	R -	
	SCHEDULE C5: WATER BUILDING CONNECTIONS	R -	

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SECTION	DESCRIPTION	AMOUNT R	TOTALS
	SCHEDULE C6: CABLE DUCTS	R -	
	SCHEDULE C7: STORMWATER AND SUBSURFACE DRAINS	R -	
	SCHEDULE C8: SUBBASE	R -	
	SCHEDULE C9: KERBING AND CHANNELLING	R -	
	SCHEDULE C10: BASE	R -	
	SCHEDULE C11: ASPHALT BASE AND SURFACING	R -	
	SCHEDULE C12: ANCILLARY ROADWORKS	R -	
<b>PART D:</b>	<b>ELECTRICAL SERVICES</b>		R -
	SCHEDULE D1: PRELIMINARY AND GEBERAL - TIME/FIXED/VALUE RELATED	R -	
	SCHEDULE D2: SITE LIGHTING AND EXTERNAL WORKS	R -	
	SCHEDULE D3: DISTRIBUTION BOARDS	R -	
	SCHEDULE D4: WIREWAYS, CONDUIT AND ACCESSORIES	R -	
	SCHEDULE D5: LIGHTING INSTALLATION AND LIGHT FITTINGS	R -	
	SCHEDULE D6: POWERPOINT OUTLETS	R -	
	SCHEDULE D7: ISOLATORS AND POWER SUPPLY	R -	
	SCHEDULE D8: TELKOM, DATA AND ELECTRONIC POINTS	R -	
	SCHEDULE D9: ADDITIONAL EQUIPMENY	R -	
	SCHEDULE D10: CABLES, WIRING AND EARTHWIRE	R -	
	SCHEDULE D11: ADDITIONAL ELECTRICAL ITEMS	R -	
	SCHEDULE D12: ADDITIONAL ELECTRICAL WORKS: COMPLETION	R -	
<b>PART E:</b>	<b>ELECTRONICS</b>		R -
	SCHEDULE E1: PRELIMINARY AND GEBERAL - TIME/FIXED/VALUE RELATED	R -	
	SCHEDULE E2: VARIOUS ELECTRONIC SERVICES AND SYSTEMS	R -	
	SCHEDULE E3: FIRE DETECTION SYSTEM	R -	
	SCHEDULE E4: ACCESS CONTROL SYSTEM	R -	
	SCHEDULE E5: CCTV SYSTEM	R -	
	SCHEDULE E6: DIGITAL VIDEO PROJECTOR OUTLETS	R -	

**TRANSNET NATIONAL PORTS AUTHORITY**

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BUILDING IN THE PORT OF RICHARDS BAY

**SUMMARY OF SECTIONS**

SECTION	DESCRIPTION	AMOUNT R	TOTALS
	SCHEDULE E7: BUILDING MANAGEMENT SYSTEM	R -	
	SCHEDULE E8: ELECTRONIC SERVICES: COMPLETION	R -	
<b>PART F:</b>	<b>HVAC</b>		<b>R -</b>
	SCHEDULE F1: PRELIMINARY AND GENERAL	R -	
	SCHEDULE F2: GROUND FLOOR: AIR CONDITIONING INSTALLATION	R -	
	SCHEDULE F3: GROUND FLOOR: VENTILATION INSTALLATION	R -	
	SCHEDULE F4: FIRST FLOOR: AIR CONDITIONING INSTALLATION	R -	
	SCHEDULE F5: FIRST FLOOR: VENTILATION INSTALLATION	R -	
	SCHEDULE F6: SECOND FLOOR: AIR CONDITIONING INSTALLATION	R -	
	SCHEDULE F7: SECOND FLOOR: VENTILATION INSTALLATION	R -	
	SCHEDULE F8: THIRD FLOOR: AIR CONDITIONING INSTALLATION	R -	
	SCHEDULE F9: THIRD FLOOR: VENTILATION INSTALLATION	R -	
	SCHEDULE F10: SERVER ROOM: AIR CONDITIONING INSTALLATION	R -	
	SCHEDULE F11: ROOF LEVEL: VENTILATION INSTALLATION	R -	
<b>PART G:</b>	<b>FIRE PROTECTION</b>		<b>R -</b>
	SCHEDULE G1: FIRE WATER INSTALLATION	R -	
	SCHEDULE G2: FIRE HYDRANTS, HOUSE REELS AND PORTABLE FIRE EXTINGUISHERS	R -	
	SCHEDULE G3: SIGNAGE	R -	
	<b>Sub-Total</b>		<b>R -</b>
	<b>Plus: 5% Contengencies</b>		<b>R -</b>
	<b>Sub-Total</b>		<b>R -</b>
	<b>Plus: 14% VAT</b>		<b>R -</b>
	<b>TOTAL</b>		<b>R -</b>

**SCHEDULE A: PRELIMINARY AND GENERAL**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
	SANS 1200A	<b>PRELIMINARY AND GENERAL</b>				
A.1	8.3	<b>FIXED-CHARGE AND VALUE- RELATED ITEMS</b>				
A.1.1	8.3.1	Contractual Requirements	Sum			
	8.3.2	<b>Establish facilities on Site:</b>				
A1.2	8.3.2.1	<b>a) Facilities for Engineer (SANS 1200 AB)</b>				
A1.2.1		1 Name board	Sum			
A1.2.2		Office/Conference Room	Sum			
A1.2.3		Survey Equipment	Sum			
A1.2.4		Other Obligations	Sum			
A1.3	8.3.2.2	<b>b) Facilities for Contractor</b>				
A1.3.1		Offices and storage sheds	Sum			
A1.3.2		Workshops	Sum			
A1.3.3		Laboratories	Sum			
A1.3.4		Ablution and latrine facilities	Sum			
A1.3.5		Tools and equipment	Sum			
A1.3.6		Water supplies, electric power and communications.	Sum			
A1.3.7		Dealing with water	Sum			
A1.3.8		Access	Sum			
A1.3.9		Plant	Sum			
A1.4	PSA 8.5	Obtaining of and allowance for payment of all applicable wayleaves	Sum			
A1.5	PSA 8.6	Compliance to the OHS Act including all site programmes, inductions etc.	Sum			
A1.6	PSA 8.6	Compliance to the NEMA Act and Tenders Environmental Management Plan	Sum			
A1.7	PSA 8.7	Compliance to the Quality Control Management Plan	Sum			
A1.8	8.3.3	Other fixed-charge obligations (Specify) ..... .....	Sum			
TOTAL CARRIED FORWARD						

**SCHEDULE A: PRELIMINARY AND GENERAL**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
A1.9	8.3.4	Remove Engineer's and Contractor's Site establishment on completion	Sum			
A.2	8.4	<b>TIME-RELATED ITEMS</b>				
A.2.1	8.4.1	Contractual Requirements	Sum			
	8.4.2	<b>Operate and maintain facilities on the Site:</b>				
A2.2	8.4.2.1	<b>a) Facilities for Engineer for duration of construction:</b>				
A2.2.1		1 Name board	Sum			
A2.2.2		Office/Conference Room	Sum			
A2.2.3		Survey Equipment	Sum			
A2.2.4		Other obligations	Sum			
A2.3	8.4.2.2	<b>b) Facilities for Contractor for duration of construction, except where otherwise stated:</b>				
A2.3.1		Offices and storage sheds	Sum			
A2.3.2		Workshops	Sum			
A2.3.3		Laboratories	Sum			
A2.3.4		Ablution and latrine facilities	Sum			
A2.3.5		Tools and equipment	Sum			
A2.3.6		Water supplies, electrical power and communications	Sum			
A2.3.7		Dealing with water	Sum			
A2.3.8		Access	Sum			
A2.3.9		Plant	Sum			
A2.3.10	8.4.3	Supervision	Sum			
A2.3.11	8.4.4	Company and head office overhead costs	Sum			
A2.4	PSA 8.5	Obtaining of and allowance for payments of all applicable wayleaves	Sum			
A2.5	PSA 8.6	Compliance to OSH Act including site programme, induction etc	Sum			
A2.6	PSA 8.6	Compliance to the NEMA Act and Tenders Environmental Management Plan	Sum			
TOTAL CARRIED FORWARD						

**SCHEDULE A: PRELIMINARY AND GENERAL**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
A2.7	PSA 8.7	Compliance to the Quality Control Management Plan	Sum			
A2.8	8.4.5	Other time-related obligations (Specify) ..... .....	Sum			
<b>A3</b>	8.5	<b>SUMS STATED PROVISIONALLY BY ENGINEER</b>				
A3.1		<b>Survey beacons/pegs</b>				
A3.1.1		Search for, record, reference and protect survey stations, benchmarks, erf boundary pegs and other reference pegs	Item	1	25 000.00	25 000.00
A3.1.2		Overhead charges and profit on Item A3.1.1	%	25 000		
A3.1.3	8.8.5	Re-establish erf boundary pegs by a registered Land Surveyor when pegs have been ordered to be removed by the Engineer	Item	1	15 000.00	15 000.00
A3.1.4	8.5	Overhead, charges and profit on item A3.1.3	%	15 000		
A3.2		<b>Existing Services</b>				
A3.2.1		Locating, protection, alteration and relocation of existing services carried out by others.	Item	1	10 000.00	10 000.00
A3.2.2		Overheads charges and profit on item A3.2.1	%	10 000		
A3.3		<b>Testing</b>				
A3.3.1	PSA8.4	Testing of materials by Engineer (additional to that specified in the SABS)	Item	1	30 000.00	25 000.00
A3.3.2		Overheads, charges and profit on item A3.3.1	%	30 000		
A3.4		<b>As-Built</b>				
A3.4.1	PSA8.5	Location and accessing of all installed services and recording of as-built levels and positions, including the topographical survey of the site carried out by others	Item	1	25 000.00	25 000.00
A3.4.2		Overheads, charges and profit on item A3.4.1	%	25 000		
TOTAL CARRIED FORWARD						

**SCHEDULE B1: ALTERATIONS**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		<p>For preambles see "Model Preambles for Trades"</p> <p><b><u>SUPPLEMENTARY PREAMBLES</u></b></p> <p><b><u>View site</u></b></p> <p>Before submitting his tender the contractor shall visit the site and satisfy himself as to the nature and extent of the work to be done and the value of the materials contained in the buildings or portions of the buildings to be demolished. No claim for any variations of the contract sum in respect of the nature and extent of the work or of inferior or damaged materials will be entertained</p> <p><b><u>Explosives</u></b></p> <p>No explosives whatsoever may be used in demolitions</p> <p><b><u>General</u></b></p> <p>The contractor shall carry out the whole of the work with as little mess and noise as possible and with a minimum of disturbance to adjoining premises and their tenants. He shall provide proper protection and provide and erect any temporary tarpaulins that may be necessary during the progress of the works, all to the satisfaction of the project manager, and remove when directed</p> <p>The contractor will be required to take all dimensions affecting the existing building on the site and he will be held solely responsible for the accuracy of all such dimensions</p> <p>Where existing surfaces are described to be prepared for new floor finishes, the screeds are to be scraped clean of loose materials and glue and vacuumed, cleaned and treated with one coat "Pavelite Bond" and levelled with two coats "Pavelite" screed levelling compound all in accordance with "Floorworx" technical bulletin for floor coverings No 15</p> <p>Any water supply pipes and other piping that may be met with and found necessary to disconnect or cut, shall be effectually stopped off or grubbed up and removed, and any new connections that may be necessary shall be made with proper fittings, to the satisfaction of the project manager</p>				
TOTAL CARRIED FORWARD						

**SCHEDULE B1: ALTERATIONS**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
		<p>Any water supply pipes and other piping that may be met with and found necessary to disconnect or cut, shall be effectually stopped off or grubbed up and removed, and any new connections that may be necessary shall be made with proper fittings, to the satisfaction of the project manager</p> <p><b><u>Prices</u></b></p> <p>Prices for doors, fanlights, fittings, frames, linings, etc which are to be re-used shall be deemed to include for thorough overhauling before refixing, including taking off, easing and rehangng, cramping up, re-wedging as required and making good cramps, dowels, etc, and easing, oiling, adjusting and repairing ironmongery if necessary, replacing any glass damaged in removal or subsequently and stopping up all nail and screw holes with tinted plastic wood to match the timber</p> <p>Prices for doors, windows, etc with frames where described as to be taken out shall be deemed to include for the removal of all beads, architraves, ironmongery, etc. Doors with frames which are to be re-fixed are to be provided with new architraves (architraves measured elsewhere)</p> <p>Prices to take out and remove doors and frames shall be deemed to include for removing door stops, cabin hooks, etc and making good of holes</p> <p>Prices for building up of openings in existing walls shall be deemed to include for levelling and preparing of cement screeds, pavings, granolithic, etc, for raising of masonry</p> <p>Prices for making good of finishes shall be deemed to include making good of the masonry and concrete surfaces onto which the new finishes are applied</p>				
TOTAL CARRIED FORWARD						

**SCHEDULE B1: ALTERATIONS**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B1.1		<b><u>TEMPORARY BARRIERS, SCREENS, ETC</u></b>	Item			
		<b><u>BUDGETARY ALLOWANCES</u></b>				
		<b><u>Temporary barriers, screens, etc, including</u></b>				
		Provide an amount of R50 000.00 (Fifty Thousand Rand) for temporary barriers, screens, etc. including removal on completion				
B1.2		<b><u>REMOVAL OF EXISTING WORK</u></b>	Item			
		Allow for watering the works by spraying to prevent any nuisance from dust, etc and supply, erect and remove at completion all temporary dust screens, etc required				
B1.3		Allow for protecting all existing work liable to suffer damage (ie. walls, finishes, floors, windows, etc) from damage during the building operations, alterations, etc and make good all work damaged with new material to match existing to the approval of the project manager	Item			
B1.4		Allow for the assistance for moving the necessary furniture and materials to provide access to the work. Any furniture remaining in the rooms shall be properly protected and the contractor shall be responsible for any damages caused to such items	Item			
B1.5		<b><u>Break up and remove reinforced concrete.</u></b> Beams and balustrade walls	m <sup>3</sup>	3		
B1.6		150mm Slabs including "1,0mm Klip-Lok" permanent formwork (temporary support structure)	m <sup>2</sup>	135		
B1.7		<b><u>Break down and remove masonry</u></b> 110mm Brick walls	m <sup>2</sup>	50		
B1.8		230mm Brick walls	m <sup>2</sup>	20		
B1.9		<b><u>Take out and remove doors, windows, etc from brickwork</u></b> Glazed aluminium window not exceeding 2.5m <sup>2</sup>	No	2		
B1.10		Glazed aluminium window exceeding 2.5m <sup>2</sup> and not exceeding 5m <sup>2</sup>	No	2		
TOTAL CARRIED FORWARD						

**SCHEDULE B1: ALTERATIONS**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
2		Glazed aluminium window exceeding 7.5m <sup>2</sup> and not exceeding 10m <sup>2</sup>	No	2		
B1.12		Glazed aluminium door including composite sidelights and window exceeding 2,5m <sup>2</sup> and not exceeding 5m <sup>2</sup>	No	1		
B1.13		Glazed aluminium door including adjacent window exceeding 2,5m <sup>2</sup> and not exceeding 5m <sup>2</sup>	No	1		
B1.14		Glazed aluminium shopfront including single door exceeding 2,5m <sup>2</sup> and not exceeding 5m <sup>2</sup>	No	1		
B1.15		Glazed stainless steel raking window exceeding 5m <sup>2</sup> and not exceeding 7.5m <sup>2</sup>	No	2		
B1.16		Glazed stainless steel raking window exceeding 12.5m <sup>2</sup> and not exceeding 15m <sup>2</sup>	No	3		
		<b><u>Take out and remove doors, windows, etc from brickwork to be demolished</u></b>				
B1.17		Timber single door and frame not exceeding 2.5m <sup>2</sup>	No	8		
B1.18		Timber double door and frame exceeding 2.5m <sup>2</sup> and not exceeding 5m <sup>2</sup>	No	4		
B1.19		Aluminium single door frame not exceeding 2.5m <sup>2</sup>	No	7		
		<b><u>Take out and remove doors, windows, etc, including thresholds, sills, etc and building up openings in brick walls, including making good cement plaster on both sides (making good paint work elsewhere)</u></b>				
B1.20		Timber single door and frame 0.93 x 2.09m high overall from 230mm brick wall	No	1		
B1.21		Timber double door and frame 1.62 x 2.09m high overall from 230mm brick wall	No	2		
B1.22		Glazed steel window 1.51 x 1.25m high from 230mm brick wall	No	2		
		<b><u>Taking up and removing waterproof membrane including bitumen residue</u></b>				
B1.23		Bituminous membrane from roof	m <sup>2</sup>	258		
TOTAL CARRIED FORWARD						

**SCHEDULE B1: ALTERATIONS**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B1.24		<u>Take out and remove sundry joinery work, fittings, etc.</u> Metal powers skirting frame plugged to walls 2nd flr secretary	m	20		
B1.25		Timber skirtings	m	75		
B1.26		<u>Hacking up and remove granolithic, screeds, plaster, etc. from concrete or brickwork and preapre surface for new screed, plaster, tile finishes, etc. and prepare screeds for new floor finishes.</u> Screed from floors and prepare fro new surface bed	m <sup>2</sup>	2		
B1.27		Ceramic tile on terrazzo floors and concrete surface bed to create ramp 85mm high extreme	m <sup>2</sup>	1		
B1.28		<u>Hacking up/off and removing ceramic tiles including removing mortar bed or adhesive from concrete or brickwork and preparing surfaces for new screed, plaster, tile finish, etc.</u> Tiles comprising ceramic tiles over terrazzo to floors	m <sup>2</sup>	34		
B1.29		Tiles comprising ceramic tiles over terrazzo to treads and risers of stairs	m <sup>2</sup>	19		
B1.30		Tiles to walls	m <sup>2</sup>	1		
B1.31		Tile skirtings 100mm high	m	42		
B1.32		<u>Take out and remove sundry</u> Fire extinguisher housing	No	1		
B1.33		<u>Take out/off and remove sundry metalwork</u> U-shaped step rungs, built into concrete, overall girth 770mm (ex radar)	No	10		
B3.34		Steel ball and pipe type balustrades 1,50 x 1,15m high from concrete slabs, including making good concrete and waterproofing finish	No	1		
TOTAL CARRIED FORWARD						

**SCHEDULE B1: ALTERATIONS**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B1.35		<u>Take down and remove structural steelwork</u>  Temporary platform approximately 135m <sup>2</sup> on plan and 16.6m high, and hand over steel from structure to client	item	1		
B1.36		<u>Take out and remove piping, including blanking off as necessary and making good floor and wall finishes (making good tiling and paintwork elsewhere)</u>  Piping not exceeding 50mm diameter	m	10		
B1.37		Piping exceeding 50mm and not exceeding 100mm diameter	m	10		
B1.38		Piping exceeding 100mm and not exceeding 150mm diameter  <u>Take out and remove sanitary fittings, including cutting off, disconnecting and blanking off short lengths of piping and making good floor and wall finishes (making good tiling and paint work elsewhere)</u>  <u>Take out and remove piping, including blanking off as necessary and making good floor and wall finishes (making good tiling and paintwork elsewhere)</u>	m	10		
B1.39		Piping not exceeding 50mm diameter	m	10		
B1.40		Piping exceeding 50mm and not exceeding 100mm diameter	m	10		
B1.41		Piping exceeding 100mm and not exceeding 150mm diameter  <u>Take out and remove sanitary fittings, including cutting off, disconnecting and blanking off short lengths of piping and making good floor and wall finishes (making good tiling and paint work elsewhere)</u>	m	10		
B1.42		Pressure pump for fire hose reels including pressure gauge	No	1		
TOTAL CARRIED FORWARD						

**SCHEDULE B1: ALTERATIONS**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
		<b><u>OPENINGS THROUGH EXISTING WALLS.</u></b>				
		<b><u>Break out and form openings through walls for new doors and frames, including prestressed concrete lintels, make good plaster on both sides and into reveals and with 20MPa concrete thresholds with steel trowelled finish (new doors and frames and make good paint work elsewhere)</u></b>				
B1.43		Opening for door with steel frame 0.88 x 2.06m high overall through 230mm brick wall	No	2		
B1.44		Opening for double door 2.80 x 2.66m high overall through 230mm brick wall	No	1		
		<b><u>Break out and form openings through walls for new windows, including prestressed concrete lintels, make good plaster on both sides and into reveals and with 150mm wide cill setsloping and slightly projecting on the outside and 32 x 144mm hardwood sills on inside (new windows and make good paint work elsewhere)</u></b>				
B1.45		Opening for window 5.7 x 0.6m high through 230mm brick wall	No	1		
		<b><u>CUTTING THROUGH FLOORS AND</u></b>				
		<b><u>Cutting through</u></b>				
B1.46		250mm Thick reinforced concrete slab for opening 900 x 200mm	No	2		
B1.47		250mm Thick reinforced concrete slab for opening 945 x 300mm	No	3		
		<b><u>PREPARATORY WORK TO EXISTING SURFACES</u></b>				
		<b><u>Preparatory work to existing surfaces</u></b>				
B1.48		Hacking treads and risers of stairs and prepare for topping	m <sup>2</sup>	12		
B1.49		Hacking faces of existing painted walls to receive tiling	m <sup>2</sup>	68		
B1.50		Scabble surface of existing concrete and prepare for new 100mm thick surface bed	m	9		
TOTAL CARRIED FORWARD						

**SCHEDULE B1: ALTERATIONS**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
		<b><u>MAKE GOOD FINISHES, ETC.</u></b>				
		<b><u>Make good screeds</u></b>				
B1.51		Floors with "Pavelite"	m <sup>2</sup>	50		
B1.52		Floors where 110mm walls were removed	m	25		
B1.53		Floors where 230mm walls were removed	m	20		
		<b><u>Make good internal cement plaster</u></b>				
B1.54		Walls where 110mm walls were removed	m	15		
B1.55		Walls where 230mm walls were removed	m	25		
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE B2: CONCRETE, FORMWORK AND REINFORCEMENT**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		<p>For preambles see "Model Preambles for Trades 2008"</p> <p><b><u>SUPPLEMENTARY PREAMBLES</u></b></p> <p><u>Cost of tests</u></p> <p>The costs of making, storing and testing of concrete test cubes as required under clause 7 Tests of SABS 1200 G shall include the cost of providing cube moulds necessary for the purpose, for testing costs and for submitting reports on the tests to the principal agent. The testing shall be undertaken by an independent firm or institution nominated by the contractor to the approval of the principal agent. (Test cubes are measured separately)</p> <p><u>Breeze concrete</u></p> <p>Breeze concrete shall consist of twelve parts clean dry furnace ash, free from coal or other foreign matter, to one part cement (1:12); the ash graded up to particles which will pass a 16,5mm ring from a minimum which fails to pass a 4,75mm mesh. The finer materials from the screening are to be first mixed with the cement into a mortar and the ash added afterwards and thoroughly incorporated</p> <p><u>Lightweight concrete</u></p> <p>Lightweight concrete shall have a density of 600kg/m<sup>3</sup> for the top 50mm and 400kg/m<sup>3</sup> for the remaining thickness. The minimum thickness at outlets, channels, etc. shall be 50mm</p> <p><u>Formwork</u></p> <p>Descriptions of formwork shall be deemed to include use and waste only (except where described as 'left in' or 'permanent'), for fitting together in the required forms, wedging, plumbing and fixing to true angles and surfaces as necessary to ensure easy release during stripping and for reconditioning as necessary before re-use</p> <p>The vertical strutting shall be carried down to such construction as is sufficiently strong to afford the required support without damage and shall remain in position until the newly constructed work is able to support itself</p> <p>Formwork to soffits of solid slabs etc. shall be deemed to be to slabs not exceeding 250mm thick unless otherwise described</p>				
TOTAL CARRIED FORWARD						

**SCHEDULE B2: CONCRETE, FORMWORK AND REINFORCEMENT**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
		Formwork to soffits of slabs, beams, etc. shall be deemed to be propped up exceeding 1,5m and not exceeding 3,5m high unless otherwise described				
		Formwork to sides of bases, pile caps, ground beams, etc. will only be measured where it is prescribed by the engineer for design reasons. Formwork necessitated by irregularity or collapse of excavated faces will not be measured and the cost thereof shall be deemed to be included in the allowance for taking the risk of collapse of the sides of the excavations, provision for which is made in Earthworks				
		<b><u>LIGHT WEIGHT CONCRETE</u></b>				
		<b><u>Lightweight concrete</u></b>				
B2.1		Topping to stairs	m <sup>3</sup>	0.5		
		<b><u>REINFORCED CONCRETE CAST ON/IN FORMWORK</u></b>				
		<b><u>25MPa/19mm concrete</u></b>				
B2.2		Surface beds cast on existing surface	m <sup>3</sup>	0.2		
		<b><u>30MPa/19mm concrete</u></b>				
B2.3		Topping to existing slabs	m <sup>3</sup>	1		
B2.4		Slabs including beams and inverted beams	m <sup>3</sup>	92		
B2.5		Bond-dek slab	m <sup>3</sup>	11		
B2.6		Isolated beams	m <sup>3</sup>	1		
B2.7		Lift walls	m <sup>3</sup>	9		
B2.8		Walls	m <sup>3</sup>	7		
B2.9		Stub walls	m <sup>3</sup>	1		
B2.10		Balustrade walls	m <sup>3</sup>	13		
B2.11		Balustrade walls extension	m <sup>3</sup>	1		
B2.12		Plinths	m <sup>3</sup>	5		
B2.13		Columns	m <sup>3</sup>	5		
B2.14		Bases at carport	m <sup>3</sup>	8		
TOTAL CARRIED FORWARD						

**SCHEDULE B2: CONCRETE, FORMWORK AND REINFORCEMENT**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B2.15		<b><u>TEST CUBES</u></b> Making and testing set of three (3) 150 x 150 x 150mm concrete strength test cubes	No	30		
		<b><u>ROUGH FORMWORK (DEGREE OF ACCURACY II)</u></b> <b><u>Rough formwork to sides</u></b>				
B2.16		Walls one face only	m <sup>2</sup>	81		
B2.17		Stub walls	m <sup>2</sup>	11		
B2.18		Inner face of shaft walls	m <sup>2</sup>	26		
B2.19		Outer face of walls flush with perimeter of concrete structure	m <sup>2</sup>	12		
B2.20		Inner face of balustrade walls	m <sup>2</sup>	142		
B2.21		Outer face of balustrade walls	m <sup>2</sup>	170		
B2.22		Rectangular columns	m <sup>2</sup>	50		
B2.23		Beams	m <sup>2</sup>	65		
B2.25		Edges, risers, ends and reveals not exceeding 300mm high or wide	m	66		
B2.26		Sloping and stepped outer edges of stairs 350mm high extreme	m	6		
		<b><u>Rough formwork to soffits</u></b>				
B2.27		Slabs	m <sup>2</sup>	358		
B2.28		Slabs over shafts	m <sup>2</sup>	10		
		<b><u>Rough formwork to sides and soffits</u></b>				
B2.29		Beams	m <sup>2</sup>	35		
B2.30		Isolated beams	m <sup>2</sup>	10		
		<b><u>Boxing in rough formwork to form</u></b>				
B2.31		Drip grooves in soffit	m	140		
B2.32		20 x 20mm Chamfers at top or bottom angles	m	180		
TOTAL CARRIED FORWARD						

**SCHEDULE B2: CONCRETE, FORMWORK AND REINFORCEMENT**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B2.33		<b><u>Rough formwork to form</u></b> Opening exceeding 1m and not exceeding 2m girth through 140mm Bond-dek slab including cutting shutter	No	2		
B2.34		Opening 900 x 2100mm through 230mm thick wall	No	1		
B2.35		<b><u>0.8mm Galvanised steel Bond-Dek permanent decking system to soffits</u></b> Decking for slabs fixed to steel bearers, including cutting and fitting around shear studs	m <sup>2</sup>	95		
B2.36		<b><u>VOID FORMING</u></b> <b><u>Sagex grade X' expanded polystyrene material cut or formed into void forming shape as described, adequately secured in position on formwork</u></b> 150mm Thick laid on concrete slab and maintained in position	m <sup>2</sup>	50		
B2.37		350mm Thick laid on concrete slab and maintained in position	m <sup>2</sup>	15		
B2.38		<b><u>MOVEMENT JOINTS, ETC</u></b> <b><u>Two layers of 375 micron dampproof course (One layer of 0.6mm galvanised steel sheet) in slip joints between horizontal concrete and brick surfaces including cement mortar bed</u></b> Not exceeding 300mm wide	m	15		
B2.39		<b><u>Expansion joints with 10mm Jointex closed cell expanded polyethylene with tear off strip between vertical concrete and brick surfaces</u></b> Not exceeding 300mm high to edges of surface beds	m	7		
B2.40		<b><u>REINFORCEMENT</u></b> <b><u>High tensile steel dowel bars</u></b> 12mm Diameter dowel bar 450mm long with one end drilled 150mm deep and epoxy glued with Epidermix 395 into top of existing concrete slab and other end cast into balustrade wall	No	650		
TOTAL CARRIED FORWARD						

**SCHEDULE B2: CONCRETE, FORMWORK AND REINFORCEMENT**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B2.41		20mm Diameter dowel bar 1100mm long with one end embedded in top of concrete  <b><u>Fabric reinforcement</u></b>	No	20		
B2.42		Type 193 in concrete surface beds, slabs, etc  <b><u>Mild and high tensile steel reinforcing to structural concrete work (Bars of all diameters, shapes and lengths)</u></b>	m <sup>2</sup>	175		
B2.43		RC Slaabs and Beams	t	8.0		
B2.44		Lift and stairwell RC Walls	t	1.35		
B2.45		Balustrade walls	t	1.1		
B2.46		Plinths	t	0.5		
B2.47		Columns	t	0.6		
B2.48		Bases at carport	t	0.5		
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE B3: MASONARY**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		For preambles see "Model Preambles for Trades 2008"				
		<b><u>BRICKWORK</u></b>				
		<b><u>SUPPLEMENTARY PREAMBLES</u></b>				
		<b><u>Sizes in descriptions</u></b>				
		Where sizes in descriptions are given in brick units, 'one brick' shall represent the length and 'half brick' the width of a brick				
		<b><u>Bagged and sealed walls</u></b>				
		Walls in two skins described as 'bagged and sealed' shall be deemed to include having the outer face of the inner skin bagged with 1:6 cement and sand mixture and sealed with two coats bitumen emulsion waterproofing coating				
		<b><u>SUPERSTRUCTURE</u></b>				
		<b><u>Brickwork of clay Maxi bricks in class II mortar</u></b>				
B3.1		90mm Walls around stanchions	m <sup>2</sup>	7		
		<b><u>Brickwork of NFP bricks in class II mortar</u></b>				
B3.2		Half brick walls	m <sup>2</sup>	60		
B3.3		One brick walls	m <sup>2</sup>	25		
B3.4		One brick walls of two half brick skins with inner skin bagged and sealed	m <sup>2</sup>	6		
		<b><u>BRICKWORK SUNDRIES</u></b>				
		<b><u>Sundries</u></b>				
B3.5		150mm Wide cill set sloping and slightly projecting	m	157		
		<b><u>2.5mm Galvanised brick reinforcement</u></b>				
B3.6		75mm Wide reinforcement built in horizontally	m	848		
B3.7		150mm Wide reinforcement built in horizontally	m	283		
		<b><u>Prestressed concrete fabricated lintels</u></b>				
B3.8		110 x 70mm Lintels in lengths not exceeding 3m	m	48		
TOTAL CARRIED FORWARD						

**SCHEDULE B3: MASONARY**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
		<b><u>SLATE TILES. ETC</u></b>				
		<b><u>300 x 300 x 13mm thick slate tiles as per 'Tile Africa' colour silver blue fixed strictly as per manufacturers specification and finished off with grey quarry grout</u></b>				
B3.9		On external walkway floors	m <sup>2</sup>	128		
B3.10		On lift shaft external walls	m <sup>2</sup>	40		
		<b><u>PAVINGS</u></b>				
		<b><u>200 x 98.5 x 50mm Thick "Corobrik Meadow" paving bricks with butt joints on and including 25mm thick sand bed with 1:6 cement and sand mixture swept into joints and hosed down, including preparation of ground or filling</u></b>				
B3.11		Pavings in stretcher bond to falls	m <sup>2</sup>	86		
B3.12		200mm Wide brick-on-flat header course edgings on and including 50mm thick mortar beds, including necessary excavation	m	35		
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE B4: WATERPROOFING**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
B4.1		<p>For preambles see "Model Preambles for Trades 2008"</p> <p><b><u>SUPPLEMENTARY PREAMBLES</u></b></p> <p><b><u>Waterproofing</u></b></p> <p>Waterproofing of roofs, basements, etc. shall be laid under a ten year guarantee. Waterproofing to roofs shall be laid to even falls to outlets etc. with necessary ridges, hips and valleys. Descriptions of sheet or membrane waterproofing shall be deemed to include additional labour to turn-ups and turn-downs</p> <p><b><u>DAMPPROOFING OF WALLS AND FLOORS</u></b></p> <p><b><u>One layer of 375 micron "Gundle Brikgrip Blue" embossed damp proof course</u></b></p> <p>In walls</p> <p><b><u>WATERPROOFING TO ROOFS, BASEMENTS, ETC</u></b></p> <p><b><u>Prime with one coat bitumen primer and one layer 4mm fully bonded waterproof membrane comprising two bitumen layers reinforced with woven spun bonded polyester fabric and coated with polyethylene film for heat bonding, laid with 100mm side and 150mm end laps including additional membrane to internal and external angles and sealing into outlets</u></b></p>	m <sup>2</sup>	5		
B4.2		On balcony and walkways	m <sup>2</sup>	83		
B4.3		On flat roofs	m <sup>2</sup>	310		
B4.4		Turn-ups and turn-downs exceeding 300mm high	m <sup>2</sup>	306		
B4.5		Sealing edges at turn-ups and turn-downs	m	214		
B4.6		Cover flashing strips not exceeding 300mm girth, including sealing top edges with mastic in and including grooves in masonry or concrete	m	214		
B4.7		<p><b><u>PROTECTIVE ROOFING PAINT</u></b></p> <p><b><u>Two coats "Derbigum Roofcote" bituminous aluminium paint on waterproofing to</u></b></p> <p>Roofs</p>	m <sup>2</sup>	310		
TOTAL CARRIED FORWARD						

**SCHEDULE B4: WATERPROOFING**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B4.8		<u>19mm Washed crushed stone dressing evenly spread with larger stones around outlets on waterproofing</u>  50mm Thick to flat roofs	m <sup>2</sup>	270		
B4.9		<u>SEALING STRIPS, JOINT SEALANTS, ETC</u>  <u>Sikaflex Pro-3WF polyurethane sealing compound</u>  10 x 10mm In expansion joints in floors including removing polyurethane tear off strip	m	7		
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE B5: CARPENTRY AND JOINERY**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		For preambles see "Model Preambles for Trades 2008"				
		<b><u>SUPPLEMENTARY PREAMBLES</u></b>				
		<b><u>Fixing</u></b>				
		Items described as 'nailed' shall be deemed to be fixed with hardened steel nails or pins, or to be shot-pinned, to brickwork or concrete				
		Items described as 'plugged' shall be deemed to include screwing to fibre, plastic or metal plugs at not exceeding 500mm centres, and where described as 'bolted', the bolts have been given elsewhere				
		<b><u>Joinery</u></b>				
		Descriptions of frames shall be deemed to include frames, transomes, rails, etc.				
		Descriptions of hardwood joinery shall be deemed to include sinking and pelleting heads and nuts of bolts				
		<b><u>Meranti doors top hung sliders</u></b>				
B5.1		40mm Double door size overall 1210 x 2032mm high	No	1		
		<b><u>Semi-solid flush doors with commercial veneer on both sides hung to steel frames</u></b>				
B5.2		40mm Door size 813 x 2032mm high	No	29		
B5.3		40mm Double door in one and a half leafs size overall 1384 x 2032mm high	No	1		
		<b><u>Wrought meranti doors hung to steel frames</u></b>				
B5.4		44mm 810 x 2032mm high hardwood meranti framed, ledged and braced rebated door	No	2		
		<b><u>Fire doors with a treated commercial veneer suitable for painting</u></b>				
B5.5		Approved Class B door 813 x 2032mm high including pressed steel frame for half brick wall and preparing frame for door closer and lock	No	1		
		<b><u>SKIRTINGS</u></b>				
		<b><u>Wrought meranti</u></b>				
B5.6		22 x 100mm Skirtings, nailed	m	135		
TOTAL CARRIED FORWARD						

**SCHEDULE B5: CARPENTRY AND JOINERY**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B5.7		<u><b>BEADS, ARCHITRAVES, ETC</b></u> <u><b>Wrought hardwood</b></u> 32 x 144mm Window sills	m	83		
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE B6: FLOOR COVERINGS, WALL LININGS, ETC.**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		For preambles see "Model Preambles for Trades 2008"				
		<b><u>SUPPLEMENTARY PREAMBLES</u></b>				
		Floor coverings, wall linings, etc. shall, where applicable, be fixed with adhesive as recommended by the manufacturers of the flooring, linings, etc.				
		<b><u>FLOOR COVERINGS</u></b>				
		<u>450 x 450mm Belgotex Nexus or similar approved fibre bonded polypropylene carpet tiles installed in accordance with SANS 10186</u>				
B6.1		Tungsten - Synergy' carpet tiles on floors	m <sup>2</sup>	59		
B6.2		Weavers Choice - Synergy' carpet tiles on floors	m <sup>2</sup>	36		
B6.3		Berberpoint - Sedan' carpet tiles on floors	m <sup>2</sup>	190		
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE B7: IRONMONGERY**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		For preambles see "Model Preambles for Trades 2008"				
		<b><u>SUPPLEMENTARY PREAMBLES</u></b>				
		Where applicable the manufacturers' names or product catalogue titles are given in sub-headings preceding the items Prices are to be based on the specific products/articles specified. If tenderers wish to offer alternative products/articles for certain items, these items are to be clearly marked and the alternative specification given with supporting brochures etc. clarifying the features of the products/articles offered On request returnable samples are to be provided to the principal agent for consideration				
		<b><u>Finishes to ironmongery</u></b>				
		Where applicable finishes to ironmongery are indicated by suffixes in accordance with the following list: BS Satin bronze lacquered CH Chromium plated SC Satin chromium plated SE Silver enamelled GE Grey enamelled AN Anodised natural AS Anodised silver AB Anodised bronze AG Anodised gold ABL Anodised black PB Polished brass PL Polished and lacquered PT Epoxy coated SD Sanded				
		<b><u>HINGES, BOLTS, ETC</u></b>				
		<b><u>"EREBU" or Similar</u></b>				
B7.1		Heavy duty adjustable roller bolt	No	1		
		<b><u>"HOWICK" or Similar</u></b>				
B7.2		H400 150 x 20mm AL lever flush bolt	No	1		
B7.3		H409 600 x 20mm AL lever flush bolt	No	1		
		<b><u>"DORMA" or Similar</u></b>				
B7.4		DBB-SS-009 102 x 75 x 3mm Ball bearing butt hinges	No	84		
		<b><u>"DURO" or Similar</u></b>				
B7.5		485 100SS 100 x 76 x 2.6mm stainless steel butt hinges	No	3		
		<b><u>LOCKS</u></b>				
		<b><u>"DORMA" or Similar</u></b>				
B7.6		D036S europrofile cylinder sash lock (SS)	No	27		
TOTAL CARRIED FORWARD						

**SCHEDULE B7: IRONMONGERY**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B7.7		D038R rebated conversion kit for Euro Profile  <u>"CISA" or Similar</u>	No	1		
B7.8		C2000 G300-10-12 65mm double cylinder en1303 security grade 3, nickel plated finish  <u>"UNION" or Similar</u>	No	28		
B7.9		CZ 682-24-52 SC GOWER 3 lever lock set	No	1		
B7.10		803DMG Panic latch to suit door 813mm wide  <u>HANDLES</u>  <u>"DORMA" or Similar</u>	No	1		
B7.11		SH816 Two-tone solid stainless steel level handles with rose or cylinder hole escutcheons	No	56		
B7.12		Pair of stainless steel DPH207 "T" straight back-to-back pull handles size 500 x 25mm	No	2		
B7.13		DCE002 SS Euro Profile escutcheon  <u>"UNION" or Similar</u>	No	2		
B7.14		37651AS Helping hand WC indicator bolt  <u>PUSH PLATES AND KICK PLATES</u>	No	1		
B7.15		0.9mm Thick satin finished stainless steel kick plate size 813 x 300mm high  <u>SLIDING GEAR</u>  <u>"Hillaldam" or Similar</u>	No	1		
B7.16		Hillaldam Panther bi-parting both each side sliding door gear fixed complete to face of wall including 211 pelmet for single interior semi-solid timber double door not exceeding 2100mm high and 32 - 44mm thick, not exceeding 30kg and not exceeding 900mm wide, with each leaf size 600 x 2032mm high  <u>SUNDRIES</u>  <u>"DORMA" or Similar</u>	No	1		
B7.18		DHC-SS-013B stainless steel hat and coat hook with rubber buffer	No	29		
B7.19		DDS-SS-017 stainless steel door stop	No	17		
TOTAL CARRIED FORWARD						

**SCHEDULE B7: IRONMONGERY**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
		<b><u>"UNION" or Similar</u></b>				
B7.19		AL8700 SS stainless steel door stop	No	2		
B7.20		AL5063E-06ASE10 Male or female indicator plate	No	4		
B7.21		AL5063E-06ASE11 Female indicator plate	No	4		
B7.22		152 x 152 x 3mm Aluminium paraplegic indicator plate	No	1		
		<b><u>BATHROOM FITTINGS</u></b>				
		<b><u>Tuff or Similar</u></b>				
B7.23		5 Roll Tuff Roll lockable toilet roll holder	No	14		
B7.24		Tuff Floors Shower Mat flexible PVC interlocking self draining safety flooring mats colour Black, size 500 x 500 x 7mm, laid loose on substrate, in accordance with manufacturer's recommendations.	No	3		
		<b><u>Franke or Similar</u></b>				
B7.25		Franke HF2400 HD 1,5mm thick Grade 304 18/10 stainless steel automatic hands free hand dryer (code: 359961), size 284 x 202 x 248mm deep with 2 vandal proof lock screws and key wrench, plugged and screwed to the wall with stainless steel screws, 200 W motor connected to 230/240 volt power supply all with 5 year warranty	No	2		
B7.26		Franke Stratos STRX 605 1,5mm thick Grade 304 18/10 satin stainless steel waste disposal bins (code: 359730), size 300 x 270 x 520mm high, capacity of 34 litres and cylinder lock with standard Franke key, plugged and screwed to the wall with stainless steel screws.	No	11		
B7.27		Franke Stratos STRX 600 1,5mm thick Grade 304 18/10 satin stainless steel paper towel dispenser (code: 359700), size 300 x 270 x 340mm high with a capacity of 300-400 towels and cylinder lock with standard Franke key, plugged and screwed to the wall with stainless steel screws.	No	11		
B7.28		Franke CNTX 21 32mm diameter Grade 304 18/10 stainless steel angle bars (code: 359880), size 415 x 415 x 95mm deep with Franke Fine Grip surface, plugged and screwed to the wall with stainless steel screws.	No	1		
TOTAL CARRIED FORWARD						

**SCHEDULE B7: IRONMONGERY**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B7.29		Franke CNTX 1100 32mm diameter Grade 304 18/10 stainless steel angle bars (code: 359976), size 1100 x 95mm deep with Franke Fine Grip surface, plugged and screwed to the wall with stainless steel screws.	No	1		
B7.30		Franke Stratos soap dispenser	No	10		
		<b><u>BLINDS</u></b>				
		<b><u>"VERTEX' vertical blinds, colour blue minimum glare and fixed above window reveal</u></b>				
B7.31		Window size 800 x 1200mm high (W4)	No	2		
B7.32		Window size 1000 x 750mm high (W24)	No	1		
B7.33		Window size 1520 x 600mm high (W6)	No	2		
B7.34		Window size 1800 x 1200mm high (W3)	No	1		
B7.35		Window size 2220 x 600mm high (W19)	No	1		
B7.36		Window size 2400 x 1780mm high (W11, 12)	No	2		
B7.37		Window size 2400 x 2350mm high (W16)	No	1		
B7.38		Window size 2650 x 600mm high (W5)	No	2		
B7.39		Window size 2735 x 600mm high (W7)	No	1		
B7.40		Window size 1000 x 1780mm high (W1)	No	2		
B7.41		Window size 2130 x 1780mm high (W1)	No	2		
B7.42		Window size 3240 x 900mm high (W2)	No	3		
B7.43		Window size 3470 x 600mm high (W8)	No	1		
B7.44		Window size 3530 x 1920mm high (W14)	No	2		
B7.45		Window size 3530 x 2050mm high (W18)	No	1		
B7.46		Window size 4655 x 2020mm high (W21)	No	2		
B7.47		Window size 4700 x 2050mm high (W23)	No	2		
B7.48		Window size 5700 x 600mm high (W15)	No	1		
B7.49		Window size 5860 x 600mm high (W10)	No	1		
B7.50		Window size 5020 x 1920mm high (W17, W31)	No	2		
TOTAL CARRIED FORWARD						

**SCHEDULE B7: IRONMONGERY**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B7.51		Window size 5870 x 2050mm high (W22, W32)	No	2		
B7.52		Window size 5870 x 1780mm high (W13)	No	4		
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE B8: STRUCTURAL STEELWORK**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
		<b><u>SUNDRY STEELWORK</u></b>				
		<b><u>Bearers to Bond-dek slab</u></b>				
B8.10		80 x 80 x 5mm Angle section bearers holed for bolts at 500mm centres	kg	472		
B8.11		40 x 40 x 3mm Angle section runner	kg	30		
B8.12		IPE 200 bearer	kg	30		
B8.13		12mm Expansion bolt	No	54		
		<b><u>Welded bearers unde existing slab (1st floor)</u></b>				
B8.14		80 x 80 x 6mm Angle section bearers twice holed for bolts at 400mm centres	kg	20		
B8.15		102 x 133 x 13kg/m T section bearers twice holed at 400mm centres	kg	21		
B8.16		M12 Chemical anchor with loose bolt	No	22		
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE B8: STRUCTURAL STEELWORK**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		For preambles see "Model Preambles for Trades 2008"				
		<b><u>SUPPLEMENTARY PREAMBLES</u></b>				
		<b><u>Descriptions</u></b>				
		Descriptions of bolts shall be deemed to include nuts and washers				
		Descriptions of L-shaped and U-shaped anchor bolts shall be deemed to include bending, threading, nuts and washers and embedding in concrete				
		Descriptions of expansion anchors and bolts and chemical anchors and bolts shall be deemed to include nuts, washers and mortices in brickwork or concrete				
		<b><u>STEEL COLUMNS AND BEAMS</u></b>				
		<b><u>Welded columns in single lengths with flat base, cap, bearer and connection plates, bolted to concrete</u></b>				
B8.1		203 x 203mm x 46kg/m H-section columns	kg	300		
B8.2		152 x 152 x 23 H-section columns	kg	2500		
		<b><u>Bolts</u></b>				
B8.3		M16 Chemical anchors epoxy glued with Epidermix 395 including drilling concrete 240mm deep	No	32		
		<b><u>Beams</u></b>				
B8.4		IPE180	kg	1500		
B8.5		203 x 133 x 25 UB Rafter	kg	3000		
B8.6		254 x 146 x 31 UB Rafter	kg	1500		
B8.7		305 x 165 x 41 UB Rafter	kg	1000		
		<b><u>Purlins</u></b>				
B8.6		C120 x 55 Purlin at carport	kg	1700		
		<b><u>Bracing</u></b>				
B8.7		90 x 90 x 6 equal angle bracing	kg	250		
B8.8		70 x 70 x 8 equal angle bracing	kg	180		
		<b><u>Connections</u></b>				
B8.9		Connection to all steelwork	kg	700		
TOTAL CARRIED FORWARD						

**SCHEDULE B9: METAL WORK**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		<p>For preambles see "Model Preambles for Trades 2008"</p> <p><b><u>SUPPLEMENTARY PREAMBLES</u></b></p> <p><b><u>Descriptions of bolts, anchors, etc.</u></b></p> <p>Descriptions of bolts shall be deemed to include nuts and washers</p> <p>Descriptions of expansion anchors and bolts and chemical anchors and bolts shall be deemed to include nuts, washers and mortices in brickwork or concrete</p> <p>Items described as 'holed for bolt(s)' shall be deemed to exclude the bolts unless otherwise described</p> <p>Items described as 'plugged' shall be deemed to include screwing to fibre, plastic or metal plugs at not exceeding 600mm centres</p> <p><b><u>Aluminium doors, windows, etc.</u></b></p> <p>Doors and windows shall comply with AAAMSA design criteria. Glazing shall comply with SAGGA regulations. Glass shall be type laminated performance glass as shown on the window schedules/drawings appended to these bills of quantities (as described in the headings to window descriptions). Glass thickness shall comply with SAGGA regulations irrespective of thicknesses shown on the schedules/drawings. Doors and windows shall be supplied with protective tape and plastic and shall be removed only once surrounding trades have been completed. For purpose made windows and doors, refer to drawings annexed to (issued separately with?) these bills of quantities</p> <p>The following certificates shall be provided prior to commencement of site work: 1) A copy of the relevant AAAMSA Performance Test Certificate from the manufacturer/contractor supplying the architectural aluminium product 2) A Certificate of Conformance confirming that anodising or powder coating has been processed in accordance with SANS 999 and SANS 1796 respectively</p>				
TOTAL CARRIED FORWARD						

**SCHEDULE B9: METAL WORK**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B9.1		<p>3) A powder guarantee of not less than 15 years issued by the powder manufacturer. The specific conditions contained in this guarantee shall form part of the powder coating process</p> <p>4) A Certificate of Conformance confirming that glazing has been installed in accordance with SANS 0137, ensuring that safety glazing materials have been installed in the mandatory areas and that each individual pane of safety glazing materials has been permanently marked</p> <p>5) A warranty from the manufacturer of the laminated safety glass and/or hermetically sealed glazing units guaranteeing the products against delamination and colour degradation for a period of not less than five years</p> <p><b><u>GALVANISED STEEL DOORS</u></b></p> <p><b><u>Purpose made welded Generator Room Door</u></b></p> <p>Grade 3CR12 steel double louvre door comprising 100 x 50 x 5mm welded channel frame, 70 x 150 x 5mm locking plates, 40 x 60 x 3mm angle iron weather bar set into the floor, fitted with one sliding bolt, one monkey tailed bolt and six stainless steel hinges, finished with two coats two pack Sigmacover primer and two finish coats Sigmadur glass or other approved epoxy coat system, the whole set up and bolted to walls with ten rag bolts (D14 - BVi drawing 32442.00-609-01 T1)</p> <p><b><u>ALUMINIUM WINDOWS, DOORS, SHOPFRONTS, ETC</u></b></p> <p><b><u>Reference BVi drawing No 32442.00-610-01 TO</u></b></p> <p><b><u>Purpose made natural anodised aluminium windows unless otherwise stated glazed with 4mm or 6mm thick safety Cool Gray glazing including all necessary ironmongery fixed in concrete surround with AAMSA aluminium products</u></b></p>	No	1		
B9.2		Window size 800 x 1200mm high (W4)	No	2		
B9.3		Window size 1000 x 750mm high (W24)	No	1		
B9.4		Window size 1100 x 1780mm high (W1)	No	2		
B9.5		Window size 1520 x 600mm high (W6)	No	2		
TOTAL CARRIED FORWARD						

**SCHEDULE B9: METAL WORK**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B9.6		Window glazed with 6mm safety glass Cool Gray, size 2130 x 1780mm high (W1)	No	2		
B9.7		Window size 2220 x 600mm high (W19)	No	1		
B9.8		Window glazed with 6mm safety glass Cool Gray, size 2400 x 1780mm high (W11, W12)	No	2		
B9.9		Window size 2400 x 2350mm high (W16)	No	1		
B9.10		Window size 2650 x 600mm high (W5)	No	2		
B9.11		Window glazed with 6mm safety glass Cool Gray, size 3240 x 900mm high (W2)	No	3		
B9.12		Window size 3470 x 600mm high (W8)	No	1		
B9.13		Window glazed with 6mm safety glass Cool Gray, size 3530 x 2050mm high (W18)	No	1		
B9.14		Window glazed with 6mm safety glass Cool Gray, size 3530 x 1920mm high (W14)	No	1		
B9.15		Window glazed with 6mm safety glass Cool Gray, size 4655 x 2020mm high (W21)	No	2		
B9.16		Window size 5700 x 600mm high (W15)	No	1		
B9.17		Window size 5870 x 1780mm high (W13)	No	4		
B9.18		Window glazed with 6mm safety glass Cool Gray, size 4700 x 2050mm high (W23)	No	2		
B9.19		Window glazed with 6mm safety glass Cool Gray, size 5870 x 1920mm high (W31)	No	1		
B9.20		Window glazed with 6mm safety glass Cool Gray, size 5870 x 2050mm high (W22, W32)	No	3		
B9.21		Window glazed with 6mm safety glass Cool Gray, size 5870 x 1920mm high (door elsewhere measured) (W17)	No	1		
B9.22		Sun safety glass (W3)	No	1		
B9.23		Window raking with five equal rectangular fixed sashes and two 6mm safety double glazed glass side triangular sashes, size 12440/13430 x 2300mm high (W28/W29)	No	1		
		<b><u>Standard aluminium frame plugged to brickwork or concrete</u></b>				
B9.24		Frame to suit door size 813 x 2032mm high	No	29		
B9.25		Frame to suit door site 1384 x 2032	No	1		
TOTAL CARRIED FORWARD						

**SCHEDULE B9: METAL WORK**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B9.26		<u>Standard natural anodised aluminium door and frame glazed as described with 6mm FAD BAN toughend laminated glass and '3M' vinyl sand blast film with 20mm border, opening leafs fitted with DPH207 'T' 500 x 25mm stainless steel 'T' shaped straight back to back pull handles, DORMA D037D stainless steel euro-profile cylinder dead lock, CISA C2000 OG300-10-12 65mm double cylinder en1303 security grade 3 nickel plated, DORMA DCE-002 stainless steel euro profile escutcheon, EREBUS HEAVY duty adjustable roller bolt and one and a half pairs DORMA DBB-SS-009 102 x 75 x 3mm stainless steel ball bearing butt hinges</u>  Single half glass door with standard aluminium frame, size 813 x 2032mm high (D2, D8, D11)	No	11		
B9.27		Double door each leaf half glass with standard aluminium frame and fitted with DORMA D038R rebate conversion kit euro-profile locks with D037D/37 deadlock strike, one HOWICK H400 150 x 20mm aluminium lever flush bolt, one HOWICK H409 600 x 20mm aluminium lever action flush, DORMA DPS-SS-032 dust proof socket, size 1614 x 2032mm high (D1)	No	3		
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE B10: PLASTERING**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		For preambles see "Model Preambles for Trades 2008"				
		<b><u>PLASTERING</u></b>				
		<b><u>SCREEDS</u></b>				
		<b><u>Screeds wood floated on concrete</u></b>				
B10.1		30mm Thick on floors and landings	m <sup>2</sup>	110		
B10.2		30mm Thick on floors to receive waterproof membrane	m <sup>2</sup>	11		
B10.3		30mm Thick on floors on waterproof membrane to receive slate tiles (external)	m <sup>2</sup>	126		
B10.4		Average 80mm thick on floors to falls to receive waterproof membrane	m <sup>2</sup>	83		
B10.5		Average 80mm thick on floors to falls and currents to receive waterproof membrane	m <sup>2</sup>	259		
B10.6		30mm Thick on treads and risers of stairs	m <sup>2</sup>	23		
B10.7		50 x 50mm Triangular fillets against walls, plinths, etc.	m	306		
		<b><u>INTERNAL PLASTER</u></b>				
		<b><u>Cement plaster wood floated for tiles, on brickwork</u></b>				
B10.8		Walls	m <sup>2</sup>	110		
B10.9		Narrow widths	m <sup>2</sup>	4		
		<b><u>Cement plaster wood floated for tiles, on concrete</u></b>				
B10.10		Walls	m <sup>2</sup>	11		
B10.11		Narrow widths	m <sup>2</sup>	8		
		<b><u>Cement plaster steel trowelled, on brickwork</u></b>				
B10.12		Walls	m <sup>2</sup>	365		
B10.13		Narrow widths	m <sup>2</sup>	8		
		<b><u>Cement plaster steel trowelled, on concrete</u></b>				
B10.14		Walls	m <sup>2</sup>	96		
B10.15		Narrow widths	m <sup>2</sup>	6		
TOTAL CARRIED FORWARD						

**SCHEDULE B10: PLASTERING**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B10.16		Ceilings	m <sup>2</sup>	45		
		<b><u>EXTERNAL PLASTER</u></b>				
		<b><u>Cement plaster wood floated, on brickwork</u></b>				
B10.17		Walls	m <sup>2</sup>	20		
B10.18		Narrow widths	m <sup>2</sup>	25		
		<b><u>Cement plaster wood floated, on concrete</u></b>				
B10.19		Walls	m <sup>2</sup>	476		
B10.20		Ceilings	m <sup>2</sup>	308		
B10.21		Narrow widths	m <sup>2</sup>	27		
		<b><u>Cement plaster steel trowelled, on brickwork or concrete</u></b>				
B10.22		Sills 175mm girth with sloping top, edges and projecting soffits including drip mould	m	110		
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE B11: TILING**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		For preambles see "Model Preambles for Trades 2008"				
		<b><u>SUPPLEMENTARY PREAMBLES</u></b>				
		<b><u>Fixing</u></b>				
		Tiling described as 'fixed with adhesive on power floated concrete' shall be deemed to include for approved tiling key-coat				
		Ceramic, porcelain, marble and granite tiles are to be fixed and grouted with suitable adhesives and grouts from the Tal Professional Ceresit Tylon or other approved range of products as recommended by the manufacturer of the tiles				
		<b><u>WALL TILING</u></b>				
		<b><u>200 x 200mm x 5mm 1st Grade white glazed ceramic tiles fixed with adhesive to plaster (plaster elsewhere) (Prime Cost R200.00/m² excluding VAT)</u></b>				
B11.1		On walls	m²	409		
B11.2		Narrow widths	m²	5		
B11.3		100mm High cut skirting tile	m	134		
		<b><u>FLOOR TILING</u></b>				
		<b><u>310 x 310mm x 8mm full body 1st grade pi 5grade 5 porcelain tile as 'Tile Africa - Kerastar range colour Cronos' fixed with 'Goldstar' porcelain fix adhesive to screed (screed elsewhere) and flush pointed with 'Goldstar' light grey grout</u></b>				
B11.4		On floor and landings	m²	307		
B11.5		On risers 195mm high of cut tiles	m	57		
B11.6		On treads 250mm wide of cut tiles	m	46		
B11.7		100mm High cut skirting tile	m	127		
B11.8		100mm High cut skirting tile to treads and risers	m	43		
		<b><u>EDGE TRIMS, NOSINGS, ETC</u></b>				
		<b><u>"M-Trim"</u></b>				
B11.9		8mm high mill finish aluminium straight edge trim (Code : ASE080.MF)	m	93		
TOTAL CARRIED FORWARD						

**SCHEDULE B11: TILING**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B11.10		25 x 10mm high mill finish aluminium tile-in stair nosing (Code : ATIN100.MF)	m	30		
		<b><u>TOILET ROLL HOLDERS. ETC.</u></b>				
		<b><u>"Vaal" vitreous china</u></b>				
B11.11		White recessed single soap dish	No	5		
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE B12: PLUMBING AND DRAINAGE**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		For preambles see "Model Preambles for Trades 2008"				
		<b><u>SUPPLEMENTARY PREAMBLES</u></b>				
		<b><u>Design and supply</u></b>				
		The contractor's attention is specifically drawn to the fact that the work in this bill has been measured provisionally and it is expected of the contractor to design the complete system and within one month, after appointment and in consultation with the Project Manager, lodge his final measurement and subcontract value to the Project Manager for acceptance, after which the whole installation will under no circumstances be remeasured or revalued				
		<b><u>RAINWATER DISPOSAL</u></b>				
		<b><u>Class 6 modified uPVC pipes</u></b>				
B12.1		110mm Pipes cast in concrete columns	m	60		
		<b><u>Extra over class 6 modified uPVC pipes for steel fittings</u></b>				
B12.2		110mm Bend	No	10		
		<b><u>"Saint-Gobain Full-Flow" ductile iron outlets</u></b>				
B12.3		100mm 180 Degree vertical dome roof outlet	No	6		
B12.4		100mm 90 Degree side dome roof outlet	No	2		
B12.5		100mm 45 Degree side dome roof outlet	No	2		
		<b><u>SOIL DRAINAGE</u></b>				
		<b><u>Class 34 uPVC pipes</u></b>				
B12.6		110mm Pipes vertically or ramped to rodding eyes, etc (no excavations)	m	8		
B12.7		110mm Pipes laid in and including trenches not exceeding 1m deep	m	46		
B12.8		110mm Pipes laid in and including trenches exceeding 1m and not exceeding 2m deep	m	12		
		<b><u>Extra over class 34 uPVC pipes for uPVC fittings</u></b>				
B12.9		110mm Bend	No	32		
B12.10		110mm Junction	No	12		
B12.11		110mm Access pipe	No	4		
TOTAL CARRIED FORWARD						

**SCHEDULE B12: PLUMBING AND DRAINAGE**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B12.12		110mm Access bend	No	32		
B12.13		110mm Access double junction	No	4		
		<u><b>uPVC gulleys</b></u>				
B12.14		110mm Gulley not exceeding 0.75m deep	No	3		
		<u><b>Sundries</b></u>				
B12.15		Concrete encasing to 110mm horizontal pipes	m	3		
B12.16		250 x 250 x 40mm Precast concrete inspection eye marker slab set in ground	No	4		
B12.17		110mm uPVC "ABC" cleaning eye	No	4		
B12.18		100mm Cast iron "ABC" cleaning eye	No	2		
B12.19		Jointing of new 110mm with existing 110mm uPVC pipe	No	2		
B12.20		Cut into side of existing inspection chamber for and connect 110mm pipe, including inserting 110mm channel junction and making good concrete benching	No	4		
B12.21		Testing soil drainage system	Item			
		<u><b>SANITARY FITTINGS</b></u>				
		<u><b>"Franke" stainless steel or similar</b></u>				
B12.22		Franke Quinline QLX622' inset single bowl sink and drainer set on cupboard (elsewhere), size 500 x 1500mm	No	1		
B12.23		Franke Quinline QLX622' inset double bowl sink and drainer set on cupboard (elsewhere), size	No	4		
		<u><b>"Vaal" or similar</b></u>				
B12.24		510 x 400mm "Daisy" lavatory basin (Code 7031) with one taphole including integrated overflow with chainstay bolted to wall with 10mm bolts (Code 8448Z0)	No	1		
B12.25		550 x 400mm "Springbok" basin (code 7031), with two tapholes, including integrated overflow and chainstay holes fixed to wall on and including two semi-concealed cast iron brackets (code 8118ZD)	No	11		
TOTAL CARRIED FORWARD						

**SCHEDULE B12: PLUMBING AND DRAINAGE**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B12.26		Orchid' white vitreous china wall hung washdown suite (product code 439020) comprising 90deg outlet open rim pan with top inlet (product code 439020) with double flap wooden seat (product code 8523Z0) and flush valve (elsewhere measured), fitted on and including bolt-through-the-wall bracket (product code 8084Z0) and bolted to wall	No	13		
B12.27		Orchid' white vitreous china wall hung washdown suite (product code 439020) comprising 90deg outlet open rim pan with top inlet (product code 439020) with double flap wooden seat (product code 8523Z0) and flush valve (elsewhere measured), fitted on and including floor bracket (product code 8082Z0) bolted to concrete floor	No	1		
B12.28		415 x 275 x 315mm 'Flatback' white vitreous china wall mounted urinal (product code 705326) including 38mm chromium plated domical grating (product code 8787Z0) and chromium plated top inlet spreader (product code 8543) and exposed flush valve (elsewhere measured), fitted on and including two hanger brackets (product code 8127Z0) plugged and screwed to wall.	No	3		
<b><u>WASTE UNIONS, ETC</u></b>						
<b><u>"Cobra Watertech" or similar</u></b>						
B12.29		32mm 301CP basin waste union	No	12		
B12.30		40mm 316CP bath or sink waste union	No	5		
<b><u>TRAPS, ETC</u></b>						
<b><u>"Marley" rubber or similar</u></b>						
B12.31		32mm Plain "P" or "S" trap	No	12		
B12.32		40mm Reseal "P" or "S" trap	No	2		
B12.33		40 x 300mm Double bowl wash trough or sink combination with reseal "P" trap	No	3		
<b><u>"Cobra Watertech" or similar</u></b>						
B12.34		50mm VA2.342RB shower trap with VA3.334-4RB shower waste and CP grating	No	3		
B12.35		40mm 365/40CP bottle trap	No	3		
<b><u>VALVES, TAPS, ETC</u></b>						
<b><u>"Cobra Watertech" or similar</u></b>						
TOTAL CARRIED FORWARD						

**SCHEDULE B12: PLUMBING AND DRAINAGE**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B12.36		15mm 1003/125 Gate valve	No	4		
B12.37		22mm 1003/125 Gate valve	No	3		
B12.38		28mm 1003/125 Gate valve	No	2		
B12.39		35mm 1003/125 Gate valve	No	1		
B12.40		42mm 1003/125 Gate valve	No	1		
B12.41		15mm 832/350F Angle valve with 350mm flexible hose connector	No	37		
B12.42		15mm Chrome plated code 128-15 'Star' underwall F x F stoptap	No	6		
B12.43		15mm Chrome plated 'Star' raised nose pillar tap (code 111-15)	No	11		
B12.44		15mm CP Gala single taphole sink mixer with swivel spout outlet and connection tubes (code GA-670)	No	5		
B12.45		15mm Chrome plated elbow action wall-type mixer with swanneck swivel spout outlet (code 515/055-21)	No	1		
B12.46		15mm Chrome plated 'Vandalmaster' vandal-resistant showerhead with self-cleaning nozzle (code KP2.6)	No	3		
B12.47		20mm Chrome plated junior urinal flushmaster (non hold open) with integral shut-off valve and wallplate (code FJ6.000).	No	3		
B12.48		32mm FM2.100CP "Flushmaster" exposed back entry toilet flushvalve	No	14		
B12.49		15mm Diameter x 224mm girth chrome plated swanneck flushpipe (code FJT5.5).	No	3		
<b><u>SANITARY PLUMBING</u></b>						
<b><u>uPVC pipes</u></b>						
B12.50		40mm Pipes	m	20		
B12.51		50mm Pipes	m	24		
B12.52		110mm Pipes	m	30		
B12.53		110mm Pipes exceeding 1m and not exceeding 2m below suspension level	m	25		
<b><u>Extra over uPVC pipes for fittings</u></b>						
B12.54		50mm Stop end	No	12		
B12.55		50 x 32mm BSP adaptor	No	4		
TOTAL CARRIED FORWARD						

**SCHEDULE B12: PLUMBING AND DRAINAGE**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B12.56		50 x 38mm BSP adaptor	No	4		
B12.57		110 x 50mm Eccentric reducer	No	12		
B12.58		40mm Bend	No	10		
B12.59		50mm Bend	No	13		
B12.60		110mm Bend	No	19		
B12.61		40mm Junction	No	5		
B12.62		50mm Junction	No	7		
B12.63		110mm Junction	No	4		
B12.64		110 x 50mm Reducing junction	No	6		
B12.65		50mm Double junction	No	2		
B12.66		110mm Double junction	No	4		
B12.67		110 x 50 x 50mm Reducing double junction	No	3		
B12.68		110mm Pan connector	No	12		
B12.69		110mm Bent pan connector	No	1		
B12.70		110mm Access bent pan connector	No	1		
B12.71		110mm Inspection pipe	No	8		
B12.72		40mm Access bend	No	15		
B12.73		50mm Access bend	No	11		
B12.74		110mm Access bend	No	10		
B12.75		110mm Access bend with vent horn	No	3		
B12.76		40mm Access junction	No	5		
B12.77		50mm Access junction	No	3		
B12.78		110mm Access junction	No	18		
B12.79		110 x 50mm Access reducing junction	No	2		
B12.80		110mm Access double junction	No	2		
B12.81		110 x 50 x 50mm Access reducing double junction	No	1		
B12.82		50mm Two way vent valve	No	3		
B12.83		110mm Two way vent valve	No	1		
TOTAL CARRIED FORWARD						

**SCHEDULE B12: PLUMBING AND DRAINAGE**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B12.84		<u><b>Sundries</b></u> Testing sanitary plumbing pipe system	Item			
		<u><b>WATER SUPPLIES</b></u>				
		<u><b>Class 10 HDPE pipes</b></u>				
B12.85		32mm Pipes laid in and including trenches	m	40		
B12.86		40mm Pipes laid in and including trenches	m	10		
B12.87		50mm Pipes laid in and including trenches	m	6		
		<u><b>Extra over class 10 HDPE pipes for "Plasson" fittings</b></u>				
B12.88		50 x 40mm Reducer	No	2		
B12.89		32mm Bend	No	8		
B12.90		40mm Bend	No	3		
B12.91		50mm Bend	No	1		
B12.92		40mm Tee	No	2		
B12.93		50mm Tee	No	1		
		<u><b>Class 2 copper pipes</b></u>				
B12.94		15mm Pipes	m	50		
B12.95		22mm Pipes	m	6		
B12.96		28mm Pipes	m	15		
B12.97		35mm Pipes	m	50		
B12.98		42mm Pipes	m	20		
		<u><b>Extra over class 2 copper pipes for capillary fittings</b></u>				
B12.99		15mm Fittings	No	20		
B12.100		22mm Fittings	No	20		
B12.101		28mm Fittings	No	20		
B12.102		35mm End cap	No	1		
B12.103		35mm Reducer	No	4		
B12.104		35mm Elbow	No	4		
B12.105		42mm Elbow	No	4		
TOTAL CARRIED FORWARD						

**SCHEDULE B12: PLUMBING AND DRAINAGE**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B12.106		35mm Tee	No	2		
B12.107		42mm Tee	No	4		
B12.108		35mm Reducing tee	No	6		
B12.109		42mm Reducing tee	No	2		
		<b><u>Sundries</u></b>				
B12.110		Testing water pipe system	Item			
		<b><u>ELECTRIC WATER HEATERS</u></b>				
		<b><u>Franke Kitchen Systems (Pty) Ltd or similar</u></b>				
B12.111		ZIP Hydroboil code 5 litre white powder coated water boiler as manufactured by Franke Kitchen Systems, plugged and screwed to wall size 289 x 180 x 431mm	No	5		
		<b><u>SLEEVES</u></b>				
		<b><u>Plastic sleeves for pipes not exceeding 100mm diameter</u></b>				
B12.112		Not exceeding 250mm long	No	4		
B12.113		Exceeding 250mm and not exceeding 500mm long	No	2		
		<b><u>Plastic sleeves for pipes exceeding 100mm and not exceeding 200mm diameter</u></b>				
B12.114		Not exceeding 250mm long	No	6		
B12.115		Exceeding 250mm and not exceeding 500mm long	No	2		
		<b><u>HOLES</u></b>				
		<b><u>Core drilling of holes for pipes not exceeding 50mm diameter through</u></b>				
B12.116		230mm Thick reinforced concrete component	No	5		
B12.117		250mm Thick reinforced concrete component	No	5		
		<b><u>Core drilling of holes for pipes exceeding 50mm and not exceeding 100mm diameter through</u></b>				
B12.118		170mm Thick reinforced concrete component	No	3		
TOTAL CARRIED FORWARD						

**SCHEDULE B12: PLUMBING AND DRAINAGE**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B12.119		250mm Thick reinforced concrete component	No	3		
		<u>Core drilling of holes for pipes exceeding 100mm and not exceeding 150mm diameter through</u>				
B12.120		170mm Thick reinforced concrete component	No	15		
B12.121		250mm Thick reinforced concrete component	No	15		
		<u>AS-BUILT DRAWINGS</u>				
B12.122		Allow for an updated set of as-built drawings to be handed to the Employer at completion of the contract	Item			
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE B13: GLAZING**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
B13.1		<p>For preambles see "Model Preambles for Trades 2008"</p> <p><b><u>GLASS TOPS, SHELVES, DOORS, MIRRORS, ETC</u></b></p> <p><b><u>6mm "Images" silver mirrors bevelled 20mm wide all around, holed for and fixed with chromium plated dome capped mirror screws with rubber buffers to plugs in walls</u></b></p> <p>Mirror 400 x 800mm high with four screws</p>	No	12		
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE B14: PAINTING**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		<p>For preambles see "Model Preambles for Trades 2008"</p> <p><b><u>SUPPLEMENTARY PREAMBLES</u></b></p> <p><b><u>PREPARATORY WORK TO EXISTING WORK</u></b></p> <p><b><u>Previously painted plastered surfaces</u></b></p> <p>Surfaces shall be thoroughly washed down and allowed to dry completely before any paint is applied. Blistered or peeling paint shall be completely removed and cracks shall be opened, filled with a suitable filler and finished smooth</p> <p><b><u>Previously painted metal surfaces</u></b></p> <p>Surfaces shall be thoroughly rubbed and cleaned down. Blistered or peeling paint shall be completely removed down to bare metal</p> <p><b><u>Previously painted wood surfaces</u></b></p> <p>Surfaces shall be thoroughly cleaned down. Blistered or peeling paint shall be completely removed and cracks and crevices shall be primed, filled with suitable filler and finished smooth</p> <p><b><u>PAINT SPECIFICATIONS</u></b></p> <p><b><u>Painting, etc.</u></b></p> <p>All painting shall be done in accordance with Plascon specifications unless otherwise described</p> <p><b><u>PAINTWORK, ETC TO NEW SURFACES ON</u></b></p> <p><b><u>ON INTERNAL FLOATED PLASTER SURFACES</u></b></p> <p><b><u>Prepare and apply one coat Plascon Plaster Primer (UC 56) and two coats Polvin Super Acrylic (EPL)</u></b></p>				
B14.1		Walls	m <sup>2</sup>	43		
B14.2		Ceilings	m <sup>2</sup>	45		
		<p><b><u>Prepare and apply one coat Plascon Plaster Primer (UC 56) thinned 20% and two coats Double Velvet (VEL)</u></b></p>				
B14.3		Walls	m <sup>2</sup>	838		
TOTAL CARRIED FORWARD						

**SCHEDULE B14: PAINTING**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B14.4		<u>Prepare and apply one coat Plascon Plaster Primer (UC 56) thinned 20% and two coats Velvaglo (VLO)</u> Walls	m <sup>2</sup>	4		
B14.5		<u>ON EXTERNAL FLOATED PLASTER SURFACES</u> <u>Prepare and one coat Plaster Primer (UC 56) and two coats Wall &amp; All (WAA)</u> Walls	m <sup>2</sup>	605		
B14.6		Ceilings <u>ON SMOOTH SCREED SURFACES</u> <u>Prepare existing surfaces and apply one coat Flowprime Solvent Free Epoxy Primer and Base Coat (spread rate - 0.25kg/mm<sup>2</sup>), apply B &amp; E 1.1mm scatter layer (spread rate - 0.4kg/mm<sup>2</sup>) and Peran STB Slurry (spread rate - 1.6 litre/mm<sup>2</sup>) and one coat Blue 7200 Coloured Quartz to a minimum 4mm thickness, and apply Peran STB sealer coat (spread rate - 6mm<sup>2</sup>/litre) all in accordance with approved Flowcrete specifications by approved applicators</u>	m <sup>2</sup>	308		
B14.7		On floors <u>ON METAL SURFACES</u> <u>Prepare and apply Metalcare Galvanised Iron Cleaner (GIC 1) to all bare galvanised areas one coat Metalcare Galvanised Iron Primer (GIP 1) and two coats Velvaglo Satin (VLO)</u>	m <sup>2</sup>	54		
B14.8		Door frames <u>ON WOOD SURFACES</u> <u>Prepare and apply one coat of Plascon Woodcare Pretreatment (WWP 1), one coat Wood Primer (UC 2) and two coats Velvaglo Satin (VLO)</u>	m <sup>2</sup>	4		
B14.9		Doors	m <sup>2</sup>	116		
B14.10		Skirtings, rails, etc not exceeding 300mm girth	m	218		
TOTAL CARRIED FORWARD						

## SCHEDULE B14: PAINTING

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
		<u>PAINTWORK, ETC TO EXISTING SURFACES ON</u>  <u>ON INTERNAL FLOATED PLASTER SURFACES</u>  <u>Remove loose and peeling paint back to a firm edge by scraping, sanding or other suitable means, feather the edges with 100 grit sandpaper and ensure surface is dust free, remove surface contaminants using Polycell Sugar Soap solution, prepare and apply one coat Professional Plaster Primer (PP 700) to bare and repaired areas and two coats of Polvin Super Acrylic (EPL)</u>				
B14.11		Walls	m <sup>2</sup>	34		
B14.12		Ceilings	m <sup>2</sup>	94		
B14.13		Sloping soffits of stairs	m <sup>2</sup>	17		
		<u>Remove loose and peeling paint back to a firm edge by scraping, sanding or other suitable means, feather the edges with 100 grit sandpaper and ensure surface is dust free, remove surface contaminants using Polycell Sugar Soap solution, prepare and apply one coat Professional Plaster Primer (PP 700) to bare and repaired areas and two coats of Double Velvet (VEL)</u>				
B14.14		Walls	m <sup>2</sup>	658		
		<u>Remove loose and peeling paint back to a firm edge by scraping, sanding or other suitable means, feather the edges with 100 grit sandpaper and ensure surface is dust free, remove surface contaminants using Polycell Sugar Soap solution, prepare and apply one coat Professional Plaster Primer (UC 56) to bare and repaired areas and two coats of Velvaqlo (VLO)</u>				
B14.15		Walls	m <sup>2</sup>	10		
		<u>ON EXTERNAL FLOATED PLASTER SURFACES</u>  <u>Remove loose and peeling paint back to a firm edge by scraping, sanding or other suitable means, feather the edges with sandpaper and ensure surface is dust free, remove surface contaminants using Polycell Sugar Soap solution, prepare and apply one coat Professional Plaster Primer (PP 700) and two coats of Polvin Super Acrylic (EPL)</u>				
TOTAL CARRIED FORWARD						

**SCHEDULE B14: PAINTING**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B14.16		Walls  <u>Remove loose and peeling paint back to a firm edge by scraping, sanding or other suitable means, feather the edges with sandpaper, remove surface contaminants using Polycell Sugar Soap solution, prepare and apply one coat Professional Plaster Primer (PP 700) to bare and repaired areas and two coats of Wall &amp; All (WAA)</u>	m <sup>2</sup>	141		
B14.17		Walls	m <sup>2</sup>	972		
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE B15: GREEN BUILDING CONSIDERATIONS**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
B15.1		<u><b>CYCLING FACILITIES</b></u> Supply, deliver to site position and mount a lockable cycling rack within the port control tower building	Item			
B15.2		<u><b>LANDSCAPE IRRIGATION</b></u> Supply, deliver to site and position a 5000 litre plastic water tank for the accumulation of rainwater from the building's gutters.	Item			
B15.3		<u><b>RECYCLING OF WASTE STORAGE</b></u> Supply, deliver to site and position an arrangement of colour-coded waste accumulation bins	Item			
B15.4		Supply and position associated signage to promote correct usage of waste bins.	Item			
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE B16: PROVISIONAL SUMS**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		For preambles see "Model Preambles for Trades 2008"				
		<b><u>SUPPLEMENTARY PREAMBLES</u></b>				
		<b><u>General</u></b>				
		Work for which budgetary allowances are provided will be measured and valued accordance clause 5 of the NEC Engineering and Construction contract June 2005 and deducted in whole or in part if not required without any compensation for loss or profit on the said allowances				
		Prime cost amounts and provisional sums are nett. Prime cost amounts include for delivery to site of all articles concerned. Provisional sums are for material and equipment supplied and installed complete by firms of specialists				
		<b><u>Profit and general attendance upon selected subcontractors</u></b>				
		The item "Allow for profit and general attendance upon selected subcontractors, the following:ce" which follows each selected subcontractor, shall be deemed to allow for the contractor's profit if required and to cover all the contractor's costs incurred in providing free of charge to the selected				
		1. The services as set out in clause 26 of the Contract				
		2. Making good in all trades and cleaning down and removal of rubbish on completion				
		<b><u>SUBCONTRACTORS WORK</u></b>				
		<b><u>Ceilings, partitions and bulkheads</u></b>				
B16.1		Provide an amount of R220 000.00 (Two Hundred and Twenty Thousand Rand) for suspended ceilings, bulkheads and partitions finished complete	Item			R 220,000.00
B16.2		Allow for profit	Item			
B16.3		Allow for general attendance	Item			
		<b><u>Toilet Partitions</u></b>				
B16.4		Provide an amount of R40 000.00 (Forty Thousand Rand) for toilet partitions including doors and ironmongery complete	Item			R 40,000.00
B16.5		Allow for profit	Item			
B16.6		Allow for general attendance	Item			
TOTAL CARRIED FORWARD						

## SCHEDULE B16: PROVISIONAL SUMS

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
B16.7		<b><u>Computer flooring</u></b> Provide an amount of R350 000.00 (Three Hundred and Fifty Thousand Rand) for computer flooring (Operators 3rd floor )	Item			R 350,000.00
B16.8		Allow for profit	Item			
B16.9		Allow for general attendance	Item			
B16.10		<b><u>Fittings, furniture and equipment</u></b> Provide an amount of R750 000 (Seven Hundred and Fifty Thousand Rand) for fittings, furniture and equipment	Item			R 750,000.00
B16.11		Allow for profit	Item			
B16.12		Allow for general attendance	Item			
B16.13		<b><u>Timber joinery</u></b> Provide an amount of R180 000.00 (One Hundred and Eighty Thousand rand) for timber	Item			R 500,000.00
B16.14		Allow for profit	Item			
B16.15		Allow for general attendance	Item			
B16.16		<b><u>Passenger Elevator</u></b> Supply and install the following elevator as per specification and SANS 50081-1 8 Person, 630kg Passenger lift, Lift shall be 4 stops (ground, first, second and third floors), travelling at a speed of 1m/s. The lift car shall have minimum internal dimensions of 1100mm (wide) x 1400mm (deep). The lift car shall have 1 entrance with a door of 800mm (wide) x 2100mm (high).	No	1		
B16.17		Install	No	1		
B16.18		<b><u>Completion</u></b> <b>Test and Commission</b> Test and commission entire lift installation to adhere to the SANS: 50081-1	Sum	1		
B16.19		Issue electrical Certificate of Compliance	Sum	1		
B16.20		<b>Maintenance</b> Provision of full maintenance of lift equipment for the full period of 12 calender months after completion. The maintenance period starts after practical completion is achieved.	Sum	1		
TOTAL CARRIED FORWARD						

**SCHEDULE B16: PROVISIONAL SUMS**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
		<b><u>Completion:</u></b>				
B16.21		Any training to client and staff	Sum	1		
B16.22		Update and prepare "As Built" drawings	Item	1		
B16.23		Supply complete operating manuals of entire lift	Item	1		
		<b><u>Telephone data cabling and Specialist Equipment</u></b>				
B16.24		Provide an amount of R1 000 000.00 (One	Item			R 1,750,000.00
B16.25		Allow for profit	Item			
B16.26		Allow for general attendance	Item			
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE B17: GENERAL SITE CLEARANCE**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		For preambles see "Model Preambles for Trades 2008"				
		<b><u>SITE CLEARANCE</u></b>				
B17.1		Clear & grub site including removal of kerbs & asphalt surfacing	m <sup>2</sup>	1020		
B17.2		Carefully dismantle existing steel pallisade fence panels ± 1.95m wide x 2,4 m high and store on site for re-use	No	70		
B17.3		Disconnect and remove existing CCTV cables and store on site for re-use	m	40		
B17.4		Demolish existing concrete ground beam under perimeter pallisade fence and remove to spoil including cast in support poles	m	137		
B17.5		Demolish existing septic tank and remove to spoil	Sum			
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE B18: FENCING**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		For preambles see "Model Preambles for Trades"				
		<b><u>EARTHWORKS (small works)</u></b>				
B18.1		Restricted excavation for fence groundbeams	m <sup>3</sup>	71		
		<b><u>CONCRETE (small works)</u></b>				
B18.2		Smooth shutter to sides of groundbeam	m <sup>2</sup>	78		
B18.3		Reinforcement to groundbeams and post bases etc	T	3		
B18.4		Strength concrete grade 25/19 in groundbeams and post bases etc	m <sup>3</sup>	46		
		<b><u>Uniform surface finishes</u></b>				
B18.5		Steel-floated finish	m <sup>2</sup>	39		
B18.6		Supply and erect new palisade fence posts to match existing	No	100		
B18.7		Re-erect steel palisade fence panels from on site storage	No	100		
B18.8		Extra over item 4.7 for modifying existing fence panels to suit odd spacing requirements less than the standard width	No	10		
B18.9		Clean, prime and paint palisade fence panels and support posts to Transnet painting specification	m	196		
B18.10		Supply and erect new double leaf steel palisade vehicle gates to detail on Dwg. painting to Transnet specification	SUM	1		
B18.11		Supply, install, move and remove on completion temporary security fence to site boundary as per detail	m	196		
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE B19: CABLE DUCTS**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
		<b><u>CIVIL WORKS</u></b>				
		<b><u>CABLE DUCTS</u></b>				
B19.1		Excavate in all materials 1,0m deep for 100mm dia cable ducts, backfill, compact and dispose of surplus material	m	120		
B19.2		Supply, lay, bed, backfill and prove 160mm HDPE corrugated duct	m	120		
B19.3		Construct new cable manholes complete to detail	No	4		
B19.4		Remove existing LD MH cover and frame and replace with Besaans duPlessis type 2A HD cover and frame. Rate to include for adjusting existing manhole walls to suit new cover & finished roadway level.	No	6		
		<b><u>CONCRETE (small works)</u></b>				
B19.5		Construct complete with holding down bolts, nuts washers etc CCTV pole bases as per detail	No	3		
B19.6		Erect CCTV poles and cameras from on site storage	No	3		
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE B20: GENERATOR ROOM**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
B20	SANS 1200D	<b>EARTHWORKS</b>				
	8.3.3	Excavate in all materials including hand excavation for new structures and working space inclusive of 45° side batters up to 1,8m depth as required and use for the following:				
B20.1.1		Spoil at an approved spoil site	m <sup>3</sup>	30		
B20.1.2		Stock pile on site and use as backfill material to 93% MOD AASHTO (100% for sand)	m <sup>3</sup>	30		
B20.2		<b>SURFACEBED PREPARATION</b>				
B20.2.1		Compact in-situ material under surfacebed to 98% MOD AASHTO (100%) for sand	m <sup>2</sup>	30		
B20.2.2	8.3.4	Imported G7 fill material compacted to 95% MOD AASHTO as backfilling to structure	m <sup>3</sup>	30		
B20.3	SABS 1200 G	<b>REINFORCED CONCRETE STRUCTURES</b>				
B20.3.1	8.2	<b>FORMWORK</b>				
B20.3.1.1	8.2.1	Rough Formwork				
B20.3.1.1.1	8.2.5	Plane vertical to edge of foundation (450 mm deep)	m	20		
B20.3.1.2	8.2.2	Smooth Formwork				
B20.3.1.2.1	8.2.1	Plane vertical to edge of ground floor slab (450mm high)	m	20		
B20.3.1.2.2	8.2.5	Plane vertical to plinths (700mm)	m	8		
B20.3.1.2.3	8.2.1	Plane vertical to sides roof slab (255mm high)	m	24		
B20.3.1.2.4	8.2.5	Plane horizontal to soffit of roof slab	m <sup>2</sup>	36		
B20.3.1.2.5	8.2.1	Plane vertical to sides of columns (280 x 350mm column)	m <sup>2</sup>	15		
B20.3.1.2.6		20mm splays to all visible concrete edges	m	25		
B20.4	8.3.1	<b>REINFORCEMENT</b>				
	8.3.1	High tensile steel:				
B20.4.1		Diameter smaller than 20mm	kg	1 600		
B20.5	PSG 8.2	<b>CONCRETE</b>				
B20.5.1	8.4.2	50mm blinding layer 15 MPa/20mm concrete including woodfloated finish	m <sup>2</sup>	36		
B20.5.2	8.4.3	Concrete Strength grade 30 MPa/20mm to:				
B20.5.2.1		Foundations including stub columns	m <sup>3</sup>	2		
B20.5.2.2		Columns	m <sup>3</sup>	2		
Total Carried Forward						

**SCHEDULE B20: GENERATOR ROOM**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward						
B20.5.2.3		Plinths	m <sup>3</sup>	2		
B20.5.2.4		150mm Surface Bed	m <sup>3</sup>	4		
B20.6	PSG8-2	<b>GRANOLITHIC SCREED</b>				
B20.6.1		Granolithic screed 50 mm thick to Generator Room floor	m <sup>2</sup>	35		
B20.6.2		Granolithic screed 50 mm thick to roof slab	m <sup>2</sup>	35		
B20.7	8.4.4	<b>UNFORMED SURFACE FINISHES</b>				
B20.7.1	8.4.4 (a)	Wood-floated finish to top of walls, eaves beams, slabs, water and cable channels, platforms, floors and plinths etc.	m <sup>2</sup>	36		
B20.8	8.5 PSG8.3	<b>JOINTS</b>				
B20.8.1		150mm PVC water stop inclusive of supply placing and fixing for casting	m	36		
B20.9	8.8 PSG 8.9	<b>SLEEVE PIPES</b>				
B20.9.1		110mm diam PVC sleeve pipe for Electric cabling (Supply and Install) from Pump room to Generator room	m	25		
B20.1	SABS 1200 HA	<b>SUNDRIES</b>				
	8.3.9	Supply and install the following loose items:				
B20.10.1		Top hat sections at trenches	No	6		
B20.10.2		25 mm thick HDPE trench covers	m <sup>2</sup>	3		
B20.11		<b>BUILDERS WORKS</b>				
B2.11.1	PSA 8.10	<b>BRICKWORK</b>				
		Brick walls on foundations for Generator room and fuel room				
B20.11.1.1		280 cavity brick wall	m <sup>2</sup>	84		
B20.11.1.2		230 brick wall	m <sup>2</sup>	18		
B20.11.1.3		150mm brickforce	m	48		
B20.11.1.4		E/O for building in wall ties @ 4.5 per m <sup>2</sup>	No	26		
B20.11.1.5		Hoop iron fixing between brickwork and RC column	No	8		
B20.11.1.6		E/O for door and window reveals	m	2		
B20.11.1.7		DPC - cranked at base of brickwall	m	6		
B20.11.2	PSA 8.10	<b>DOORS AND FRAMES</b>				
Total Carried Forward						

**SCHEDULE B20: GENERATOR ROOM**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward						
B20.11.2.1		Winlocks				
B20.11.2.1.1		Supply and install 600 x 600 Winlocks into brickwork	No	6		
B20.11.2.2		Steel Doors				
		Supply and build in steel frame and install doors				
B20.11.2.2.1		2 x Transformer louver doors with 3,55m <sup>2</sup> air intake capacity (3CR12 & Epoxy coating)	No	1		
B20.11.2.2.2		Steel Door - Type C	No	1		
B20.11.3	PSA 8.10	<b>FINISHES</b>				
		Walling				
B20.11.3.1		Plaster finish (2 coat cement plaster) to external face	m <sup>2</sup>	147		
B20.11.4	PSA 8.10	<b>PAINTING</b>				
		Painting generally				
B20.11.4.1		Sika guard - 720 Epochem to inside walls and floors of termination manhole	m <sup>2</sup>	25		
B20.11.4.2		Sika guard - 63N Epoxy coating to inside walls and floors of termination manhole	m <sup>2</sup>	25		
B20.11.4.3		Prime and 2 coat gloss enamel paint to plastered brick walls	m <sup>2</sup>	147		
B20.11.4.4		Floor paint to Generator room floor and fuel room floor	m <sup>2</sup>	50		
B20.11.5	PSA 8.10	<b>FITTINGS</b>				
B20.11.5.1		Vermin screens to both faces of all Winlouvres	m <sup>2</sup>	5		
B20.11.5.2		4mm float glass glazing to Winblocks	m <sup>2</sup>	2		
B20.11.5.3		Padlock to doors A, B and C	Sum	1		
B20.11.5.4		Drop bolts to bottom of each leaf of double doors (8.3.1)	No	2		
B20.11.5.5		Rubber faced, stopper brackets to 8.3.1	No	6		
Total Carried Forward To Summary						

**SCHEDULE C1: SITE CLEARANCE**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
C1	SANS 1200 C	<b>SITE CLEARANCE</b>				
C1.1	8.2.1	Clear and grub site including trees up to 1m girth and boulders up to 0,15m <sup>3</sup>	ha	0.2		
C1.2	8.2.8	Demolish and remove to an approved dump site identified by the Contractor, including haulage for:				
C1.2.1		Rubble	m <sup>3</sup>	50		
C1.2.2		Existing asphalt up to 40mm thick	m <sup>2</sup>	20		
C1.2.3		Extra over C1.2.2 for neat cutting of edges	m	20		
C1.3	8.2.10	Topsoil				
C1.3.1		Remove topsoil to a nominal depth of 150mm above road box cut and stockpile for re-use	m <sup>3</sup>	225		
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE C2: EARTHWORKS**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
C2	SANS 1200 DM	<b>EARTHWORKS (ROADS, SUBGRADE)</b>				
C2.1		<b>TREATMENT OF ROAD-BED</b>				
C2.1.1	8.3.3 (a)	Road-bed preparation and compaction of in-situ material to 90% MOD AASHTO maximum density (100% for sand) to 200mm depth	m <sup>2</sup>	1 500		
C2.2		<b>EARTHWORKS</b>				
C2.2.1	8.3.4	Cut to fill from road prism, compacted to 90% of MOD AASHTO maximum density (100% for sand) to:				
C2.2.1.1		Behind kerbs and in the islands	m <sup>3</sup>	60		
C2.2.2	8.3.5	Construct G7 selected layer compacted to 93% MOD AASHTO maximum density (100% for sand) from:				
C2.2.2.1		Commercial Sources	m <sup>3</sup>	450		
C2.2.2.2	8.3.6	Extra over item C2.4.1 inclusive for excavating and breaking down material in:				
C2.2.2.2.1		Intermediate Excavation	m <sup>3</sup>	25		
C2.2.2.2.2		Hard Rock Excavation	m <sup>3</sup>	10		
C2.2.3		Cut to spoil at an approved dump site identified by the Contractor, including haulage.				
C2.2.3.1		Soft excavation	m <sup>3</sup>	650		
C2.2.4	PSDM 8.1.1	Trial holes up to 2,0m deep	No	3		
C2.2.5	PSDM 8.1.2	Extra over Item C2.4.1 for the removal of unsuitable material below roadbed to spoil, at a dump site identified by the Contractor, including haulage for:				
C2.2.5.1		0m <sup>2</sup> - 100m <sup>2</sup>	m <sup>3</sup>	200		
TOTAL CARRIED FORWARD						

**SCHEDULE C2: EARTHWORKS**

ITEM	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
C2.2.5.2		100m <sup>2</sup> - 300m <sup>2</sup>	m <sup>3</sup>	250		
C2.3	SABS 1200 DM	<b>SUNDRIES</b>				
C2.3.1	PSDM 8.5	Extra-over items C2.1 and C2.4.1 for temporary stockpiling of material on written instruction from Engineer only.	m <sup>3</sup>	300		
C2.5	8.3.13	<b>SURFACE FINISHES</b>				
C2.5.1	PSDM 8.3	Shaping in erven and verges	ha	0.02		
C2.5.2		Respread topsoil from stockpile to a thickness of 150mm upon completion of earthworks	m <sup>3</sup>	32		
C2.5.3		Straw stabilizing of erven	ha	0.02		
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE C3: SEWERS**

ITEM	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
	SANS 1200 DB	<b>EARTHWORKS (PIPE TRENCHES)</b>				
C3	8.3.2	<b>EXCAVATION</b>				
C3.1	PSDB 8.1 8.3.2 (a)	Excavate in all materials for trenches, select, backfill, compact and dispose of all surplus material for main pipes with:  Dia up to 110 mm for depths:  Over                      and                      Up to				
C3.1.1		0,5 m                      1,5 m	m	72		
C3.1.5	8.3.2 (b)	Extra-over item C3.1 for:				
C3.1.5.1		Intermediate excavation	m <sup>3</sup>	5		
C3.1.5.2		Hard excavation	m <sup>3</sup>	10		
C3.1.6	8.3.2(c)	Excavate unsuitable material from trench bottom	m <sup>3</sup>	15		
C3.1.7	PSDB 8.4 (c)	Excavate by hand in soft material to expose existing services	m <sup>3</sup>	8		
C3.2	8.3.3	<b>EXCAVATION ANCILLARIES</b>				
C3.2		Make up deficiency in backfill material:				
C3.2.1	8.3.3.1(a)	From stockpile or other necessary excavations on site	m <sup>3</sup>	26		
C3.2.2	8.3.3.1(b)	From stockpile/borrow pit off site	m <sup>3</sup>	8		
C3.2.3	PS DB 8.2.1	Compaction in road reserves, parking areas and walkways (layers of 150mm thickness)	m <sup>3</sup>	10		
C3.2.4	PSDB 8.6	Disposal of Surplus or unsuitable materials from trench excavations to an approved spoil site identified by the Contractor, including haulage.	m <sup>3</sup>	28		
C3.3	SANS	<b>BEDDING (PIPES)</b>				
C3.3.1	8.2.1	Provision of bedding material compacted to 93%				
C3.3.1.1		Selected granular material	m <sup>3</sup>	16		
C3.3.1.2			m <sup>3</sup>	11		
TOTAL CARRIED FORWARD						

**SCHEDULE C3: SEWERS**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
C3.4	8.3.3.4	<b>OVERHAUL</b>				
C3.4.1		Short haul between 0,5 and 1km	m³	20		
C3.4.2	PSLB 8.2	Graded crushed stone for wet conditions	m³	5		
C3.4.3	8.2.4	Encasing of pipes with grade 20/19 Mpa concrete	m³	2		
C3.5	SANS 1200 LD	<b>SEWERS</b>				
C3.5.1	8.2.1	Supply, lay, joint, bed for flexible pipes and test uPVC class 34 sewer pipes for:				
C3.5.1.1		110mm dia	m	72		
C3.5.2		Supply, install, bed for flexible pipes and test HDPE PE100, PN 10 Raisingmain pipes for:				
C3.5.2.1		75mm dia coil	m	121		
C3.5.3	8.2.2	Extra-over item C3.5.1 for specials				
C3.5.3.1		110mm x 110mm uPVC Pipe Y-junction	No	2		
C3.5.3.2		End caps for 110mm dia uPVC pipe	No	4		
C3.6	8.2.2	Extra-over for item C3.5.1 for specials:				
		45° uPVC Long radius pipe bends				
C3.6.1		110 mm dia	No	3		
C3.8	8.2.3	<b>MANHOLES</b>				
C3.8.1		Fibre cement manholes complete to dwg no. S2 with 1000 mm chamber and shaft with SABS EN124 D400 heavy duty hinged ductile iron cover and frame for depths:				
		Over and Up to				
C3.8.1.1		0,5m 1,5m	No	5		
C3.8.1.2	8.2.4	Extra-over item C3.8				
		D400 heavy duty hinged ductile iron cover and frame:	No	3		
TOTAL CARRIED FORWARD						

**SCHEDULE C3: SEWERS**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
C3.8.2		<b>DISCHARGE MANHOLE</b>				
C3.8.2.1		Cement manholes complete to dwg no.133-01 with 1000 mm chamber and shaft with SABS EN124 D400 medium duty hinged ductile iron cover and frame for depth:				
		Over and Up to				
C3.8.2.1,1		0,5m 1,5m	No	1		
C3.8.3		<b>PUMP SUMP</b>				
C3.8.3.1		Alterations on the existing structure and make it sound, complete with a 1000mm x 2000mm x 100mm reinforced top slab as per drg no. 133-01	No	1		
C3.9	8.2.2	Extra-over item C3.8.3.1 for specials				
C3.9.1		0,75Kw Stand-free Pump	No.	2		
C3.9.2		Flanged 80mm Ductile Iron 90° bend	No.	4		
C3.9.3		Flanged 80mm Cast Iron 90° bend	No.	2		
C3.9.4		Flanged 80mm Non- Return Valve	No.	2		
C3.9.5		Flanged 80mm Gate Valve	No.	2		
C3.9.6		Flanged 80mm x 80mm x 75mm T-piece	No.	1		
C3.9.7		Mild Steel 50x50x6L Frame with 500x500x6mm	No.	2		
C3.8		<b>SUNDRIES</b>				
C3.8.1	8.2.9	Marker posts for stubs	No	4		
C3.8.2	PS LD 8.2	Break into existing manhole and connect with 160mmø uPVC for depth:				
		Over and Up to				
C3.8.2.1		2,5 m 3,5 m	No	1		
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE C4: WATER RETICULATION**

ITEM	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
	SANS 1200 DB	<b>EARTHWORKS (PIPE TRENCHES)</b>				
C4	8.3.2	<b>EXCAVATION</b>				
C4.1	PS DB 8.1 8.3.2(a)	Excavate in all materials for trenches, select, backfill, compact and dispose of all surplus material for main pipes with:  Dia up to 90 mm dia for depths:  Over                      and                      Up to				
C4.1.1		0,5 m    1,5 m	m	76		
C4.1.2	8.3.2(b)	Extra-over items C4.1.1 for:				
C4.1.2.1		Intermediate excavation	m³	15		
C4.1.2.2		Hard rock excavation	m³	10		
C4.1.3	PSDB 8.1 8.3.2(c)	Excavate unsuitable material from trench bottom	m³	20		
C4.1.3.1	PSDB 8.4 8.3.8.1 (c)	Excavate by hand in soft material to expose existing services	m³	10		
C4.2	8.3.3	<b>EXCAVATION ANCILLARIES</b>				
C4.2.1		Make up deficiency on backfill material:				
C4.2.1.1	8.3.3.1 (a)	From stockpile or other necessary excavations on site	m³	40		
C4.2.2	PSDB 8.2.1 8.3.3.3	Compaction in road reserves, parking areas and walkways (layers of 150mm thickness)	m³	42		
C4.2.3	PSDB 8.6	Disposal of Surplus or unsuitable materials from trench excavations from site to an approved spoil site identified by the Contractor, including haulage.	m³	65		
C4.3	SANS 1200 LB	<b>BEDDING (PIPES)</b>				
C4.3.1	8.2.1	Provision of bedding material compacted to 93% of MAASHTO density (100% for sand) with material from stockpile/other excavations on site				
C4.3.1.1		Selected granular material	m³	6		
C4.3.1.2		Selected fill material	m³	5		
C4.3.2	8.2.1	Provision of bedding material compacted to 93% of MAASHTO density (100% for sand) with material from commercial source				
C4.3.2.1		Selected granular material	m³	10		
TOTAL CARRIED FORWARD						

**SCHEDULE C4: WATER RETICULATION**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
<b>BROUGHT FORWARD</b>						
C4.3.2.2		Selected fill material	m³	7		
C4.4	8.3.3.4	<b>OVERHAUL</b>				
C4.4.1		Short haul between 0,5 and 1km	m³	38		
C4.5	SANS 1200 L	<b>MEDIUM-PRESSURE PIPELINES</b>				
C4.5.1	8.2.1 PSL 8.1	Supply, lay and bed class 12 uPVC pipes on bedding for flexible pipes, test, flush and disinfect the following pipes:				
C4.5.1.1		90 mm dia Class 12 uPVC	m	35		
C4.5.1.2		75 mm dia Class 12 uPVC	m	41		
C4.6		<b>SPECIALS AND FITTINGS</b>				
	8.2.2	Supply, lay, and bed for flexible pipes, joint, including cut pipes to lengths where required, test, flush and disinfect with necessary couplings				
C4.6.1		<b>BENDS</b>				
		Class 16 Ductile Iron				
C4.6.1.1		75mm dia 90.00 deg	No	1		
C4.6.1.2		90mm dia 45.00 deg	No	1		
C4.7		<b>TEE PIECES</b>				
C4.6.1.3		Socket 75x 75x75mm dia T-piece	No	1		
C4.6.1.3		Flanged 110 x 110 x 90mm dia T-piece	No	1		
C4.8		<b>VALVES</b>				
	PSL 8.2	Supply, in valve box and install on concrete				
C4.8.1		RSV Gate Valves (AVK or similar approved)				
C4.8.1.1		75mm dia	No	1		
C4.8.1.2		90mm dia	No	1		
C4.8.2		Fire hydrants complete with 90° Bend				
C4.8.2.1		75mm dia	No	2		
<b>TOTAL CARRIED FORWARD</b>						

**SCHEDULE C4: WATER RETICULATION**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
<b>BROUGHT FORWARD</b>						
C4.8		<b>ANCILLARIES</b>				
C4.8.1	PS L 8.3	Anchor/Thrust blocks and pedestals	m³	5		
C4.8.2		Markers for valves and firehydrants as per dwg	No	1		
C4.8.3		75mm Flanged Adapter	No	2		
C4.8.4		90mm Flanged Adapter	No	1		
C4.9	PSL 8.6 8.2.13 8.2.14	<b>VALVE CHAMBERS AND MANHOLES</b>				
C4.9.1		Isolating valve chambers according to drawing W1 on:				
C4.9.1.1		75mm main up to 1,5m depth	No	1		
C4.9.1.1		90mm main up to 1,5m depth	No	1		
C4.9.1.2		Fire hydrant chambers complete to dwg no W2 for depths up to 1,5 m	No	2		
C4.10		<b>SUNDRIES</b>				
C4.10.1	PSL 8.7	80mm Combination bulk water network completion with chamber as per dwg 104-01	No	1		
<b>TOTAL CARRIED FORWARD TO SUMMARY</b>						

**SCHEDULE C5: WATER - BUILDING CONNECTIONS**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
	SANS	<b>EARTHWORKS (PIPE TRENCHES)</b>				
C5	PS DB 8.1 8.3.2(a)	Excavate in all materials for trenches, select, backfill, compact and dispose of all surplus material for erf connection pipes with:				
C5.1		Dia up to 25 mm for depths:				
		Over                      and                      Up to				
C5.1.1		0,5 m                                      1,5 m	m	50		
C5.1.2	8.3.2(b)	Extra-over items C5 for:				
C5.1.2.1		Intermediate excavation	m³	10		
C5.1.2.2		Hard rock excavation	m³	5		
C5.1.3	PS DB 8.4	Excavate by hand in soft material to expose	m³	5		
C5.2	8.3.3	<b>EXCAVATION ANCILLARIES</b>				
C5.2.1		Make up deficiency in backfill materials:				
C5.2.1.1	8.3.3.1 (a)	From stockpile or other necessary excavations on site	m³	30		
C5.2.2	PS DB 8.2.1 8.3.3.3	Compaction in road reserves, parking areas and walkways	m³	2		
C5.2.3	PSDB 8.6	Disposal of Surplus of unsuitable materials from trench excavations from site to an approved spoil site identified by the Contractor, including haulage.	m³	10		
C5.3	SANS 1200 LB	<b>BEDDING (PIPES)</b>				
C5.3.1	8.3.3.4	<b>OVERHAUL</b>				
C5.3.1.1		Long haul in excess of 1km	m³	15		
C5.4	SANS 1200 LF	<b>BUILDING CONNECTIONS (WATER)</b>				
C5.4.1	8.2.2	Supply, lay and bed HDPE PE 100 PN16 pipes on bedding for flexible pipes complete with couplings, end caps and plugs, test, flush and disinfect the following pipes:				
C5.4.1.1		25 mm dia	m	29		
C5.4.2	8.2.3	Extra-over for item C5.4.1 for special				
C5.4.2.1		25mm dia stop cock	No	4		
TOTAL CARRIED FORWARD						

**SCHEDULE C5: WATER BUILDING CONNECTIONS**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
C5.4.3	PSLF8.1	Saddles suitable for HDPE pipes on uPVC main pipes complete to dwg. no W3 with all required fittings on:				
C5.4.3.1		25mm on 75mm dia main	No	4		
C5.4	8.2.8	Supply and install marker posts	No	4		
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE C6: CABLE DUCTS**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
C6	SABS 1200 LC	<b>EARTHWORKS (PIPE TRENCHES)</b>				
	8.3.2	<b>EXCAVATION</b>				
	PS DB 8.1	Excavate in all materials for trenches, select,				
C6.1		Electrical Cable duct trenches				
C6.1.1		Single 50mm dia duct road crossing up to 1.0m	m	12		
C6.1.2		Single 110mm dia duct road crossing up to 1.0m	m	45		
C6.1.3		2 x 160mm dia duct road crossing up to 1.0m	m	47		
C6.1.4	8.3.2(a)	Extra-over item C6.1 for:				
C6.1.4.1		Intermediate excavation	m <sup>3</sup>	10		
C6.1.4.2		Hard excavation	m <sup>3</sup>	5		
C6.1.5	PS DB 8.4	Excavate unsuitable material from trench bottom	m <sup>3</sup>	25		
C6.2	8.3.3	<b>EXCAVATION ANCILLARIES</b>				
C6.2.1		Make up deficiency in backfill material				
C6.2.2	8.3.3.1 (a)	From stockpile or other necessary excavations on	m <sup>3</sup>	40		
C6.2.3	PS DB 8.3.3.3	Compaction in road reserves, parking areas and	m <sup>3</sup>	1		
C6.2.4	PSDB 8.6	Disposal of Surplus or unsuitable materials from trench excavations from site to an approved spoil site identified by the Contractor, including haulage	m <sup>3</sup>	70		
C6.3	SABS 1200	<b>BEDDING (PIPES)</b>				
C6.3.1	8.2.1	Provision of bedding material compacted to 93%				
C6.3.1.1		Selected granular material	m <sup>3</sup>	6		
C6.3.1.2		Selected fill material	m <sup>3</sup>	8		
C6.3.2	8.2.1	Provision of bedding material compacted to 93% of MAASHTO density (100% for sand) with material from commercial source				
TOTAL CARRIED FORWARD						

**SCHEDULE C6: CABLE DUCTS**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
<b>BROUGHT FORWARD</b>						
C6.3.2.1		Selected granular material	m <sup>3</sup>	8		
C6.3.2.2		Selected fill material	m <sup>3</sup>	10		
C6.3.3	8.3.3.4	<b>OVERHAUL</b>				
C6.3.3.1		Short haul between 0,5 and 1km	m <sup>3</sup>	20		
C6.4	SABS 1200LC	<b>CABLE DUCTS</b>				
C6.4.1	8.2.5	Supply, lay, bed and seal ends of electrical ducts, including draw wires				
C6.4.1.1		50mm dia. Class 34 uPVC pipes	m	12		
C6.4.1.2		110mm dia. Class 34 uPVC pipes	m	45		
C6.4.1.3		160mm dia. Class 34 uPVC pipes	m	94		
C6.4.2	8.2.8	Cable markers	No	8		
<b>TOTAL CARRIED FORWARD TO SUMMARY</b>						

**SCHEDULE C7: STORMWATER AND SUBSURFACE DRAINAGE**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
<b>BROUGHT FORWARD</b>						
C7		<b>CATCHPITS</b>				
C7.1		Supply and install combination inlet catchpits with barrier kerbs to drawing. no. SW6 for depths:				
		Over and Up to				
C7.1.1		0,5 m 1,5 m	No	3		
C7.1.2		Extra over catchpit with BK2 inlet	No	3		
C7.2	8.2.2	<b>GABIONS</b>				
		Gabion boxes of double twist hexagonal 3mm nominal diameter PVC-coated galvanized wire manufactured to SANS 1580:				
C7.2.1		1m x 1m x 0,5m gabion boxes	m <sup>3</sup>	6		
C7.3	8.2.4	<b>GEOTEXTILE</b>				
		"A" Range Nonwoven, Needle punched, Continuous Filament, Polyester Geotextile Manufactured to ISO 9001:2008				
C7.3.1		Class A4 Bidum or similar approved	m <sup>2</sup>	12		
C7.3.2		Class Needle punched or similar approved	m <sup>2</sup>	16		
<b>TOTAL CARRIED FORWARD TO SUMMARY</b>						

**SCHEDULE C8: SUBBASE**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
C8	SANS 1200 ME	<b>SUBBASE</b>				
	8.3.3	Construct subbase with material from commercial sources compacted to 95% of MAASHTO density				
C8.1		150 mm G5 material for Parking area	m <sup>3</sup>	225		
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE C9: KERBING AND CHANNELLING**

ITEM	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
C9	SABS	<b>KERBING AND CHANNELLING</b>				
	8.2.1	Precast concrete kerbs and channels on concrete				
C9.1		Barrier kerbs				
C9.1.1		Radius < 20 m	m	21		
C9.1.2		Radius > 20 m and straight	m	244		
C9.2		Barrier kerbs and channels				
C9.2.1		Radius < 20 m	m	20		
C9.2.2		Radius > 20 m and straight	m	90		
C10		<b>L11 TERRAFORCE RETAINING BLOCKS</b>	m	90		
C10.1		Provide 2 rows terraforce retaining block type L11	m	101		
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE C10: BASE**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
C10	SANS 1200 MF	<b>BASE</b>				
C10.1	8.3.3	Construct base with material from commercial sources compacted to 98% MAASHTO density for:				
		b) Graded crushed stone				
C10.1.1		150 mm G4 material to streets	m <sup>3</sup>	182		
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHUDULE C11: ASPHALT BASE AND SURFACING**

ITEM	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
C11	SABS 1200 MH	<b>ASPHALT BASE AND SURFACING</b>				
C11.1		<b>PRIME COAT</b>				
C11.1.1	8.5.1	Prime coat using:				
C11.1.1.1		Colprime E on streets (0,8 l/m²)	m²	1 280		
C11.1.2	8.5.5	Variations in quantities of prime:				
C11.1.2.1		Colprime E	ℓ	50		
C11.2		<b>TACK COAT</b>				
C11.2.1	8.5.3	Spray surface using emulsion				
C11.2.1.1		60% Anionic stable grade emulsion diluted with water in a ratio of 1:1 on streets (1 l/m²)	m²	450		
C11.3		<b>ASPHALT SURFACING</b>				
C11.3.1	8.5.4	Medium continuously graded asphalt surfacing using 60/70 Binder content on:				
C11.3.1.1		a) 30mm on parking areas and access roads	m²	1 280		
C11.3.2	8.5.5	Variations in quantities of bituminous binder:				
C11.3.2.1		Colprime E Bitumen	ℓ	50		
C11.3.2.2		60% Anionic stable grade Emulsion	ℓ	50		
C11.3.2.3		60/70 Penetration grade Bitumen	ℓ	50		
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE C12: ANCILLARY ROADWORKS**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
C12	SANS	<b>ANCILLARY ROADWORKS</b>				
		<b>PERMANENT TRAFFIC SIGNS</b>				
C12.1	PS MM 8.3.1	Sign faces of 1,4 mm thick Chromadek steel plate (Type G275) up to 2,0 m² including pedestal				
C12.1.1		Type R1	No.	1		
C12.2	8.4	<b>ROAD MARKINGS</b>				
	PS MM 8.4.1	Non-reflectorized paint applied at nominal rate of 0,42 l/m² for:				
C12.2.1		a) White lines (Broken or unbroken)				
C12.2.1.1		100 mm wide	m	140		
C12.2.1.2		300 mm wide (WM2)	m	12		
C12.2.2		d) Yellow Characters and Symbols				
C12.2.2.1		Fire Hydrant Symbols	No.	3		
C12.2.3	8.4.2	Variation in rate of application from that stated for item PS MM 8.4.1				
C12.2.3.1		a) White paint	ℓ	15		
C12.2.3.2		b) Yellow paint	ℓ	8		
TOTAL CARRIED FORWARD TO SUMMARY						

**SECTION D1: PRELIMINARY AND GENERAL - TIME/FIXED/VALUE RELATED**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
D1	<b>PRELIMINARY AND GENERAL</b>				
D1.1	<b>TIME RELATED</b> Allow for all TIME related items of the Principal Building Agreement as well as any special requirements relating to this sub-contract  List all TIME related items as required - specify				
D1.1.1	a)	Sum	1		
D1.1.2	b)	Sum	1		
D1.1.3	c)	Sum	1		
D1.1.4	d)	Sum	1		
D1.1.5	e)	Sum	1		
D1.2	<b>FIXED CHARGE RELATED</b> Allow for all FIXED charge related items in terms of the Principal Building Agreement as well as any special requirements relating to this sub-contract  List all FIXED charge related items as required - specify				
D1.2.1	a)	Sum	1		
D1.2.2	b)	Sum	1		
D1.2.3	c)	Sum	1		
D1.2.4	d)	Sum	1		
D1.2.5	e)	Sum	1		
D1.3	<b>VALUE RELATED</b> Allow for all VALUE related items in terms of the Principal Building Agreement as well as any special requirements relating to this sub-contract  List all VALUE related items as required - specify				
D1.3.1	a)	Sum	1		
D1.3.2	b)	Sum	1		
D1.3.3	c)	Sum	1		
D1.3.4	d)	Sum	1		
D1.3.5	e)	Sum	1		
Total Carried Forward To Summary					

**SECTION D2: SITE LIGHTING AND EXTERNAL WORKS**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
D2	<b>CIVIL WORKS RELATED TO ELECTRICAL WORKS</b>				
D2.1	<b>TRENCH EXCAVATION</b>				
D2.1.1	400mm wide x 450mm deep	m	380		
D2.1.2	Select from excavation materials and install a sandbedding in trench - 100mm deep and 400mm wide (50mm above and 50mm deep below the cable).	m <sup>3</sup>	16		
D2.1.3	Danger tape	m	380		
D2.1.4	Backfilling of trenches with excavated soil after cables have been laid and tested, complete with compacting of backfilling, levelling off of trenches and removing and dumping of surplus excavated material.	m <sup>3</sup>	48		
D2.2	<b>MANHOLES</b>				
	Supply and construct double brick wall manholes for cable junction boxes and draw pits.				
D2.2.1	600mm x 600mm X 800mm deep manhole with medium duty manhole lids.	No	9		
D2.3	<b>SLEEVES</b>				
	Supply and install the following uPVC Class 9 complete:				
D2.3.1	Ø160mm diameter	m	24		Rate Only
D2.3.2	Ø110mm diameter	m	560		
D2.3.3	Ø50mm diameter	m	50		
	Supply and install the following PVC sleeves, complete:				
D2.3.4	Ø32mm diameter	m	80		
D2.4	<b>LIGHT FITTINGS</b>				
	Supply and install, including all switchgear, starters, ballasts etc. All fittings to bare the SANS mark or SANS Mark of Compliance.				
	Type J1: Flood light luminaire complete with 36W LED lamps; 5000K at 700mA; 3467 lumens. LM6 die cast aluminium housing with control gear and lamp housed in separate compartments for optimal thermal management. Diffuser type: Opti glass 4mm. Powder coated. With built in heat sink and all accesories. IP65 rated. Colour: Black.				
D2.4.1	Supply	No	14		
D2.4.2	Install	No	14		
D2.5	<b>GRP POLE</b>				
	Glass Fibre Reinforced Polyster pole (GRP) complete with base plate, gland plate, MCB and side entry spigot (3.6m GRP pole).				
D2.5.1	Supply	No	14		
D2.5.2	Install	No	14		
Total Carried Forward					

**SECTION D2: SITE LIGHTING AND EXTERNAL WORKS**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward					
D2.6	<b>ELECTRICAL WORKS RELATED TO SITE SECURITY SERVICES</b>				
	Supply cable to CCTV kiosks. Supply, install and terminate 10mm <sup>2</sup> x 4 Core CU armoured cable inside trenching including 6mm <sup>2</sup> insulated earth wire. Install cable according to SANS 10142 requirements with sand and danger tape. Trenches measured elsewhere.				
D2.6.1	Supply	m	320		
D2.6.2	Install	m	320		
D2.6.3	Terminate	No	6		
Total Carried Forward To Summary					

**SECTION D3: DISTRIBUTION BOARDS**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
D3	<b>DISTRIBUTION BOARDS</b>				
	Supply, install, connect and commission the new distribution board in position as indicated on drawings. Complete with internal equipment, switchgear, wiring, trays, panels, labels, architraves, busbars and conductor connections. Equipment type to be ABB, Schneider, Hager or Eaton. DIN rail mounted. All control equipment, components, contactors and circuit breakers to be SANS approved or bare SANS mark of approval. Installation to comply to latest wiring code SANS 10142-1.				
D3.1	Quote for upgrading of the existing distribution board for the MDB: Essential as per the single line diagrams.				
D3.1.1	Supply	Sum	1		
D3.1.2	Install	Sum	1		
D3.2	Quote for upgrading of the existing distribution board for the MDB: UP1 as per the single line diagrams.				
D3.2.1	Supply	Sum	1		
D3.2.2	Install	Sum	1		
D3.3	Quote for upgrading of the existing distribution board for the MDB: UP2 as per the single line diagrams.				
D3.3.1	Supply	Sum	1		
D3.3.2	Install	Sum	1		
D3.4	Quote for the supply and installation of the distribution board for SDB-Guard House: Essential complete with frame architrave, panels, 30% spare capacity, internal busbars, wiring and switching equipment as per the single line diagram drawings.				
D3.4.1	Supply	Sum	1		
D3.4.2	Install	Sum	1		
D3.5	Quote for the supply and installation of the distribution board for SDB-Guard House: UPS complete with frame architrave, panels, 30% spare capacity, internal busbars, wiring and switching equipment as per the single line diagram drawings.				
D3.5.1	Supply	Sum	1		
D3.5.2	Install	Sum	1		
D3.6	Quote for the upgrading, supply and installation of the distribution board for SDB-Ground Floor: Essential complete with frame architrave, panels, 30% spare capacity, internal busbars, wiring and switching equipment as per the single line diagram drawings.				
D3.6.1	Supply	No	1		
D3.6.2	Install	No	1		
Total Carried Forward					

**SECTION D3: DISTRIBUTION BOARDS**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward					
D3.7	Quote for supply and installation of the distribution board for SDB-Ground Floor: UPS complete with frame architrave, panels, 30% spare capacity, internal busbars, wiring and switching equipment as per the single line diagram drawings.				
D3.7.1	Supply	No	1		
D3.7.2	Install	No	1		
D3.8	Quote for the upgrading, supply and installation of the distribution board for SDB-First Floor: Essential complete with frame architrave, panels, 30% spare capacity, internal busbars, wiring and switching equipment as per the single line diagram drawings.				
D3.8.1	Supply	No	1		
D3.8.2	Install	No	1		
D3.9	Quote for supply and installation of the distribution board for SDB-First Floor: UPS complete with frame architrave, panels, 30% spare capacity, internal busbars, wiring and switching equipment as per the single line diagram drawings.				
D3.9.1	Supply	No	1		
D3.9.2	Install	No	1		
D3.10	Quote for the upgrading, supply and installation of the distribution board for SDB-Second Floor: Essential complete with frame architrave, panels, 30% spare capacity, internal busbars, wiring and switching equipment as per the single line diagram drawings.				
D3.10.1	Supply	No	1		
D3.10.2	Install	No	1		
D3.11	Quote for supply and installation of the distribution board for SDB-Second Floor: UPS complete with frame architrave, panels, 30% spare capacity, internal busbars, wiring and switching equipment as per the single line diagram drawings.				
D3.11.1	Supply	No	1		
D3.11.2	Install	No	1		
D3.12	Quote for supply and installation of the distribution board for SDB-Third Floor: Essential complete with frame architrave, panels, 30% spare capacity, internal busbars, wiring and switching equipment as per the single line diagram drawings.				
D3.12.1	Supply	No	1		
D3.12.2	Install	No	1		
D3.13	Quote for supply and installation of the distribution board for SDB-Third Floor: UPS complete with frame architrave, panels, 30% spare capacity, internal busbars, wiring and switching equipment as per the single line diagram drawings.				
Total Carried Forward					

**SECTION D3: DISTRIBUTION BOARDS**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward					
D3.13.1	Supply	No	1		
D3.13.2	Install	No	1		
D3.14	Quote for supply and installation of the distribution board for SDB-Roof: Essential complete with frame architrave, panels, 30% spare capacity, internal busbars, wiring and switching equipment as per the single line diagram drawings.				
D3.14.1	Supply	No	1		
D3.14.2	Install	No	1		
D3.15	Quote for supply and installation of the distribution board for SDB-Roof: UPS complete with frame architrave, panels, 30% spare capacity, internal busbars, wiring and switching equipment as per the single line diagram drawings.				
D3.15.1	Supply	No	1		
D3.15.2	Install	No	1		
D3.16	Quote for supply and installation of the distribution board for SDB-Server Room 1: UPS 1, complete with frame architrave, panels, 30% spare capacity, internal busbars, wiring and switching equipment as per the single line diagram drawings.				
D3.16.1	Supply	No	1		
D3.16.2	Install	No	1		
D3.17	Quote for supply and installation of the distribution board for SDB-Server Room 2: UPS 2, complete with frame architrave, panels, 30% spare capacity, internal busbars, wiring and switching equipment as per the single line diagram drawings.				
D3.17.1	Supply	No	1		
D3.17.2	Install	No	1		
Total Carried Forward To Summary					

**SECTION D4: WIREWAYS, CONDUIT AND ACCESSORIES**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
D4	<b>WIREWAYS, CONDUIT AND ACCESSORIES</b>				
D4.1	<b>CONDUIT</b>				
	Supply and install, including bends, saddles, wastes and all accessories				
	Galvanised type:				
	32mm diameter conduit				
D4.1.1	Supply	m	1		Rate Only
D4.1.2	Install	m	1		Rate Only
	25mm diameter conduit				
D4.1.3	Supply	m	930		
D4.1.4	Install	m	930		
	20mm diameter conduit				
D4.1.5	Supply	m	120		
D4.1.6	Install	m	120		
	PVC type:				
	50mm diameter conduit				
D4.1.7	Supply	m	60		
D4.1.8	Install	m	60		
	32mm diameter conduit				
D4.1.9	Supply	m	90		
D4.1.10	Install	m	90		
	25mm diameter conduit				
D4.1.11	Supply	m	800		
D4.1.12	Install	m	800		
	20mm diameter conduit				
D4.1.13	Supply	m	220		
D4.1.14	Install	m	220		
D4.2	<b>CABLE LADDER</b>				
	Galvanised medium duty metal cable ladder with all accessories.				
	Running length shall include component of horizontal, internal, external bends and T-junctions.				
	200mm wide cable ladder				
D4.2.1	Supply	m	18		
D4.2.2	Install	m	18		
	150mm wide cable ladder				
D4.2.3	Supply	m	1		Rate Only
D4.2.4	Install	m	1		Rate Only
Total Carried Forward					

**SECTION D4: WIREWAYS, CONDUIT AND ACCESSORIES**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward					
D4.3	<b>CABLE TRAY</b> Galvanised perforated medium duty metal cable tray complete with all accessories. To be O-line, cabstrut or similar approved. Running length shall include component of horizontal, internal, external bends and T-junctions. Suspended fixing with 8mm threaded bars and horizontal channel to be included at maximum distance of 1200mm.  400 mm wide medium duty wire mesh cable tray with suspension brackets as described above.				
D4.3.1	Supply	m	60		
D4.3.2	Install	m	60		
	300 mm wide medium duty wire mesh cable tray with suspension brackets as described above.				
D4.3.3	Supply	m	160		
D4.3.4	Install	m	160		
	200 mm wide medium duty wire mesh cable tray with suspension brackets as described above.				
D4.3.5	Supply	m	150		
D4.3.6	Install	m	150		
	150 mm wide medium duty wire mesh cable tray with suspension brackets as described above.				
D4.3.7	Supply	m	100		
D4.3.8	Install	m	100		
	100 mm wide medium duty wire mesh cable tray with suspension brackets as described above.				
D4.3.9	Supply	m	90		
D4.3.10	Install	m	90		
D4.4	<b>CABLE DUCTING AND TRUNKING</b> Galvanised wiring ducting complete with all joints and accessories. To be O-line, cabstrut or similar approved. Running length shall include component of horizontal elbows, internal elbows, external elbows, end caps and T-junctions. No sharp bends shall be accepted - all elbows shall have sufficient bending radii for wiring. Installation shall include suspension items including 8mm threaded rod, horizontal channel and all accessories.  127mm x 76mm (OL9000/P9000) wiring ducting with covers and male WAGO plugs at 1m gap.				
D4.4.1	Supply	m	240		
D4.4.2	Install	m	240		
	76mm x 76mm (OL8000/P8000) wiring ducting with covers.				
D4.4.3	Supply	m	120		
Total Carried Forward					

**SECTION D4: WIREWAYS, CONDUIT AND ACCESSORIES**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward					
D4.4.4	Install Double compartment modular PVC power skirting. Colour: White	m	120		
D4.4.5	Supply	m	60		
D4.4.6	Install Double compartment GMS, epoxy powder painted power skirting. Colour: Black	m	60		
D4.4.7	Supply	m	150		
D4.4.8	Install	m	150		
Total Carried Forward To Summary					

**SECTION D5: LIGHTING INSTALLATION AND LIGHT FITTINGS**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
D5	<b>LIGHTING INSTALLATION</b>				
D5.1	<b>LIGHT FITTINGS</b> Supply and install, including all switchgear, starters, ballasts, etc. All fittings is to bare the SANS mark or SANS mark of compliance.  Type A1: 1200mm x 300mm Recessed 40W LED light fitting including DALI dimmable ballasts. Minimum specification: System lumen = 3251; System power = 40W. LED life rated at 60 000 hours at 1050mA. Colour rendering: 4000K. Ultra thin thickness, colour: white. Light fitting to include all accessories, 2x aluminium side panel trays, 5 pin WAGO plug and 3m cabtyre.				
D5.1.1	Supply	No	1		Rate Only
D5.1.2	Install  Type C1: 600mm x 600mm Recessed 40W LED light fitting, DALI control ballasts. Minimum specification: System lumen = 3636; System power = 40W. LED life rated at 60 000 hours at 900mA. Colour rendering: 4000K. Ultra thin thickness. Colour: white. Light fitting to include all accessories, 5 pin plug WAGO plug and 3m cabtyre.	No	1		Rate Only
D5.1.3	Supply	No	72		
D5.1.4	Install  Type C2: 600mm x 600mm Recessed 40W LED light fitting, including DALI control ballasts and 1 hour battery backup packs. Minimum specification: System lumen = 3636; System power = 40W. LED life rated at 60 000 hours at 900mA. Colour rendering: 4000K. Ultra thin thickness. Colour: white. Light fitting to include all accessories, 5 pin plug WAGO plug and 3m cabtyre.	No	72		
D5.1.5	Supply	No	48		
D5.1.6	Install  Type C3: 600mm x 600mm Recessed 40W LED light fitting, including DALI dimmable ballasts. Minimum specification: System lumen = 3636; System power = 40W. LED life rated at 60 000 hours at 900mA. Colour rendering: 4000K. Ultra thin thickness. Colour: white. Light fitting to include all accessories, 5 pin plug WAGO plug and 3m cabtyre.	No	48		
D5.1.7	Supply	No	20		
D5.1.8	Install	No	20		
Total Carried Forward					

**SECTION D5: LIGHTING INSTALLATION AND LIGHT FITTINGS**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward					
D5.1.9	Type E1: 1200mm x 100mm Surface mounted luminaire complete with 28W LED lamps, extruded aluminium housing, DALI control ballast, matt opal transmission diffuser, powder coated finish, ECG switchgear and all accessories. Minimum specification: System lumen = 3792, System power = 28W, Rated current = 700mA. Colour rendering: 4000k. Fittings to include 3m cabtyre with 5 pin WAGO plug. Colour: White. Supply	No	4		
D5.1.10	Install	No	4		
D5.1.11	Type E2: 1200mm x 100mm Surface mounted luminaire complete with 28W LED lamps including 1 hour battery backup packs, extruded aluminium housing, DALI control ballast, matt opal transmission diffuser, powder coated finish, ECG switchgear and all accessories. Minimum specification: System lumen = 3792, System power = 28W, Rated current = 700mA. Colour rendering: 4000k. Fittings to include 3m cabtyre with 5 pin WAGO plug. Colour: White. Supply	No	12		
D5.1.12	Install	No	12		
D5.1.13	Type F1: 1200mm Vapour proof luminaire complete with 53W LED lamps including polycarbonate body and diffuser, ECG switch gear and all accessories. Minimum specification: System lumen = 5385, System power = 53W, Rated current = 500mA. Colour rendering: 4000k IP65 rated. Supply	No	8		
D5.1.14	Install	No	8		
D5.1.15	Type H1: 240mm Recessed mounted round luminaire with 16W LED. Minimum specification: System lumen = 1100, System power = 16W. Colour rendering: 4000k. Aluminium extruded frame and translucent diffuser. Cut-out = 220mm, Ultra thin 13mm thickness. Colour: White. Supply	No	45		
D5.1.16	Install	No	45		
D5.1.17	Type I1: Surface mounted rectangular bulkhead Luminaire with eyelid complete with LM6 die-cast aluminium housing, UV stabilized opal high impact acrylic diffuser and powder coated finish. Minimum specification: System lumen = 1450, System power = 18W, rated current = 700mA. Colour rendering: 3000K. Light fitting to include all accessories. Colour: Black. Supply	No	61		
D5.1.18	Install	No	61		
Total Carried Forward					

**SECTION D5: LIGHTING INSTALLATION AND LIGHT FITTINGS**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward					
	Type G1: Recessed downlight with 10W LED lamp including ECG. Minimum specification: System lumen = 865, System power = 10W, rated current = 500mA, Colour rendering: 3100K.				
D5.1.19	Supply	No	23		
D5.1.20	Install	No	23		
	10A Photo cell - Daylight switch placed inside empty bulkhead fitting.				
D5.1.21	Supply	No	1		
D5.1.22	Install	No	1		
	360° Occupancy/Motion Detection Sensor, 230V, 16A, AC1 as per Smartspot Beck Tridonic DALI-S sensor or better approved.				
D5.1.23	Supply	No	48		
D5.1.24	Install	No	48		
D5.2	<b>LIGHTING AUTOMATION SYSTEM</b>				
	CX1030-0000 Beckhoff embedded PC incl 1 gig, including OS software				
D5.2.1	Supply	No	1		
D5.2.2	Install	No	1		
	CX1100-0012 Beckhoff embedded-PC power supply				
D5.2.3	Supply	No	1		
D5.2.4	Install	No	1		
	BK9100 Beckhoff controller				
D5.2.5	Supply	No	1		
D5.2.6	Install	No	1		
	KL6811 DALI/DSI master and DALI power supply				
D5.2.7	Supply	No	12		
D5.2.8	Install	No	12		
	KL9010 Bus end terminal				
D5.2.9	Supply	No	1		
D5.2.10	Install	No	1		
	Power supply 24V 2,5A AC input 100-240V				
D5.2.11	Supply	No	1		
D5.2.12	Install	No	1		
	NEXTdb serv latest version standard including NEXTmod				
D5.2.13	Supply	No	1		
D5.2.14	Install	No	1		
	NEXTmod status reporting				
D5.2.15	Supply	No	1		
Total Carried Forward					

**SECTION D5: LIGHTING INSTALLATION AND LIGHT FITTINGS**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward					
D5.2.16	Install	No	1		
D5.2.17	Termination and commissioning	Sum			
	8 Port Beckhoff Ethernet switch				
D5.2.18	Supply	No	2		
D5.2.19	Install	No	2		
	KL1408 8-channel digital input terminal 24VDC				
D5.2.20	Supply	No	6		
D5.2.21	Install	No	6		
	1.5mm <sup>2</sup> x 2 core screened cable for DALI control wiring				
D5.2.22	Supply	m	360		
D5.2.23	Install	m	360		
	1.5mm <sup>2</sup> x 5 core cabtyre for DALI lighting wiring				
D5.2.24	Supply	m	450		
D5.2.25	Install	m	450		
D5.3	<b>LIGHT SWITCHES</b>				
	Supply and install light switches complete with cover plates connecting to wiring and fitted in switch box. Each light switch installation shall be conduited and wired to the distribution board.				
	16A one lever one way switch inside 100mm x 50mm x 50mm PVC box				
D5.3.1	Supply	No	6		
D5.3.2	Install	No	6		
	16A one lever two way switch inside 100mm x 50mm x 50mm PVC box				
D5.3.3	Supply	No	1		Rate Only
D5.3.4	Install	No	1		Rate Only
	16A two lever one way switch inside 100mm x 50mm x 50mm PVC box				
D5.3.5	Supply	No	1		Rate Only
D5.3.6	Install	No	1		Rate Only
	16A Rotating DALI lighting dimmer control switch inside 100mm x 50mm x 50mm PVC box.				
D5.3.7	Supply	No	4		
D5.3.8	Install	No	4		
	16A one lever one way bell push button type dimmable switch, switch dim or better approved.				
D5.3.9	Supply	No	4		
D5.3.10	Install	No	4		
D5.4	<b>DRAW BOXES</b>				
Total Carried Forward					

**SECTION D5: LIGHTING INSTALLATION AND LIGHT FITTINGS**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward					
	Supply and install the following conduit boxes, complete with conduit connected.				
	Rectangular Galvanised type:				
	100mm x 50mm x 50mm				
D5.4.1	Supply	No	1		Rate Only
D5.4.2	Install	No	1		Rate Only
	100mm x 100mm x 50mm				
D5.4.3	Supply	No	1		Rate Only
D5.4.4	Install	No	1		Rate Only
	Ø50mm Round x 25mm deep round galvanised box				
D5.4.5	Supply	No	60		
D5.4.6	Install	No	60		
	Retangular PVC type:				
	100mm x 50mm x 50mm				
D5.4.7	Supply	No	100		
D5.4.8	Install	No	100		
	100mm x 100mm x 50mm				
D5.4.9	Supply	No	160		
D5.4.10	Install	No	160		
	Ø50mm round x 50mm deep round PVC box				
D5.4.11	Supply	No	160		
D5.4.12	Install	No	160		
	Ø50mm Round x 25mm deep round PVC box				
D5.4.13	Supply	No	150		
D5.4.14	Install	No	150		
Total Carried Forward To Summary					

**SECTION D6: POWERPOINT OUTLETS**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
D6	<b>POWER POINT OUTLETS</b>				
	Supply and install switched socket outlets complete with cover plates connecting to wiring and installed in boxes.				
D6.1	Single 16A 3-pin switched socket outlets installed in 4x4 box				
D6.1.1	Supply	No	1		Rate Only
D6.1.2	Install	No	1		Rate Only
D6.2	Single "Dedicated" UPS 16A 3-pin switched socket outlets installed in 4x4 box				
D6.2.1	Supply	No	1		Rate Only
D6.2.2	Install	No	1		Rate Only
D6.3	Double 16A 3-pin switched socket outlets installed in 4x4 box				
D6.3.1	Supply	No	60		
D6.3.2	Install	No	60		
D6.4	Double "Dedicated" UPS 16A 3-pin switched socket outlets installed in 4x4 box				
D6.4.1	Supply	No	12		
D6.4.2	Install	No	12		
D6.5	Single 16A 3-pin switched socket outlet installed on powerskirting including cover plate.				
D6.5.1	Supply	No	160		
D6.5.2	Install	No	160		
D6.6	Single 16A 3-pin "Dedicated" UPS switched socket outlet installed on powerskirting including cover plate.				
D6.6.1	Supply	No	80		
D6.6.2	Install	No	80		
D6.7	Flush floor outlet box with universal modular outlet plate for 24 modules				
D6.7.1	Supply	No	6		
D6.7.2	Install	No	6		
D6.8	32A 3-Pin (2P+E) wall mounted connection socket outlet (with box).				
D6.8.1	Supply	No	16		
D6.8.2	Install	No	16		
D6.9	5A unswitched socket outlet for light fitting installation				
D6.9.1	Supply	No	1		Rate Only
D6.9.2	Install	No	1		Rate Only
Total Carried Forward					

**SECTION D6: POWERPOINT OUTLETS**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward					
D6.10	WAGO 5 pin female plug installed on trunking				
D6.10.1	Supply	No	100		
D6.10.2	Install	No	100		
Total Carried Forward To Summary					

## SECTION D7: ISOLATORS AND POWER SUPPLY

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
D7	<b>ISOLATORS</b> Supply and install weather proof surface mount isolators as ammended in the SANS 10142 specification for maintenance purposes of mechanical and other equipment.				
D7.1	60A triple pole				
D7.1.1	Supply	No	8		
D7.1.2	Install	No	8		
D7.2	30A triple pole				
D7.2.1	Supply	No	8		
D7.2.2	Install	No	8		
D7.3	60A double pole				
D7.3.1	Supply	No	6		
D7.3.2	Install	No	6		
D7.4	30A double pole				
D7.4.1	Supply	No	16		
D7.4.2	Install	No	16		
	Supply and install surface mounted isolators as ammended in the SANS 10142 specification for maintenance purposes of mechanical and other equipment				
D7.5	60A triple pole				
D7.5.1	Supply	No	2		
D7.5.2	Install	No	2		
D7.6	30A triple pole				
D7.6.1	Supply	No	4		
D7.6.2	Install	No	4		
D7.7	60A double pole				
D7.7.1	Supply	No	12		
D7.7.2	Install	No	12		
D7.8	30A double pole				
D7.8.1	Supply	No	56		
D7.8.2	Install	No	56		
Total Carried Forward To Summary					

**SECTION D8: TELKOM, DATA AND ELECTRONIC POINTS**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
D8	<b>TELKOM DATA</b>				
D8.1	Supply and install the following Telkom and Data points including cover plate with draw wire.				
	Telephone outlet RJ11 in 4x4 box				
D8.1.1	Supply	No	1		Rate Only
D8.1.2	Install	No	1		Rate Only
	Data outlet RJ45 in 4x4 box				
D8.1.3	Supply	No	16		
D8.1.4	Install	No	16		
	Telephone outlet RJ11 in powerskirting				
D8.1.5	Supply	No	1		Rate Only
D8.1.6	Install	No	1		Rate Only
	Data outlet RJ45 in powerskirting				
D8.1.7	Supply	No	64		
D8.1.8	Install	No	64		
	Data outlet point in floor box				
D8.1.9	Supply	No	8		
D8.1.10	Install	No	8		
	TV outlet point in 4x4 box				
D8.1.11	Supply	No	4		
D8.1.12	Install	No	4		
D8.2	<b>ACCESS CONTROL OUTLET POINTS</b>				
	Supply and install the following access control outlet points with draw wires				
	Biometric reader point wall mounted (Ø25mm PVC conduit and Ø50mm round PVC box outlet point inside wall)				
D8.2.1	Supply	No	4		
D8.2.2	Install	No	4		
	Access control enclosure point in ceiling space				
D8.2.3	Supply	No	2		
D8.2.4	Install	No	2		
	Access control card reader point wall mounted				
D8.2.5	Supply	No	2		
D8.2.6	Install	No	2		
	Green break glass point wall mounted				
D8.2.7	Supply	No	2		
D8.2.8	Install	No	2		
	Electro magnetic lock point in upper door corner				
Total Carried Forward					

**SECTION D8: TELKOM, DATA AND ELECTRONIC POINTS**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward					
D8.2.9	Supply	No	2		
D8.2.10	Install	No	2		
	Door release button point wall mounted				
D8.2.11	Supply	No	1		Rate Only
D8.2.12	Install	No	1		Rate Only
	Door contact point, door corner				
D8.2.13	Supply	No	1		Rate Only
D8.2.14	Install	No	1		Rate Only
D8.3	<b>FIRE DETECTION OUTLET POINTS</b>				
	Supply and install the following fire detection points with draw wires.				
	Ceiling/soffit Fire detection outlet point (Ø25mm Bosal conduit and Ø50mm round Bosal box with cover)				
D8.3.1	Supply	No	100		
D8.3.2	Install	No	100		
D8.4	<b>SECURITY - CCTV OUTLET POINTS</b>				
	Ceiling/wall mounted CCTV outlet point (Ø25mm PVC conduit and Ø50mm round PVC box with cover)				
D8.4.1	Supply	No	46		
D8.4.2	Install	No	46		
D8.5	<b>DIGITAL VIDEO PROJECTOR POINTS</b>				
	Supply and install the following overhead projector points with draw wires.				
	Projector wall VGA patch box including Crabtree Diamond range cover plate				
D8.5.1	Supply	No	1		
D8.5.2	Install	No	1		
	Projector ceiling VGA outlet point				
D8.5.3	Supply	No	2		
D8.5.4	Install	No	2		
	Projector power skirting VGA outlet point on cluster box				
D8.5.5	Supply	No	2		
D8.5.6	Install	No	2		
Total Carried Forward					

SECTION D8: TELKOM, DATA AND ELECTRONIC POINTS

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward					
D8.6	<b>DRAW WIRE FOR LOW VOLTAGE EQUIPMENT AND SYSTEMS</b>  Supply and install the following draw wires in conduits for the Telecommunication, Data, Security and Access Control Systems.  Ø1,0mm draw wire				
D8.6.1	Supply	m	800		
D8.6.2	Install	m	800		
Total Carried Forward To Summary					

**SECTION D9: ADDITIONAL EQUIPMENT**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
D9	<b>ADDITIONAL EQUIPMENT</b>				
D9.1	<b>GENERATOR INSTALLATION</b>				
D9.1.1	Relocate existing 400kVA generator set to external building and connect to main building	Sum	1		
D9.2	<b>UPS INSTALLATION</b>				
	Supply and install and commission a 150kVA three phase IN, three phase OUT UPS unit including all accessories as per specifications. UPS to conform with current Transnet specifications and installed brands. 30 Minutes backup time, including UPS and batteries cabinet.				
D9.2.1	Supply	Item	2		
D9.2.2	Install	Item	2		
D9.2.3	Commission	Item	2		
D9.2.4	Quote for the removal and relocation of the existing 2x 20kVA UPS units and batteries.	Sum	1		
D9.3	<b>SERVICE OF EXISTING GENERATOR SET</b>				
D9.3.1	Quote for the major service of the existing 350 kVA diesel generator.	Sum	1		
D9.4	<b>EARTH MAT FOR DATA CENTRE</b>				
D9.4.1	Supply and install an earth grid mat for the Data Centre Room. Earth mat to cover area of 33m². Dedicated 70mm² earth wire to be connected to earth mat. Earth cable measured elsewhere.	Sum	1		
D9.5	<b>BUILDING LIGHTNING PROTECTION</b>				
D9.5.1	1) The electrical contractor to appoint a sub-lightning protection contractor eg) HHK, to supply and install a complete building lightning protection system and test and provide a Test Certificate of all readings taken on the day of testing.	Sum	1		
D9.6	<b>BULK SUPPLY - ELECTRICAL</b>				
D9.6.1	Allowance for the upgrade of the electrical bulk supply to the site	Item	1	400,000.00	400,000.00
Total Carried Forward To Summary					650,000.00

**SECTION D10: CABLES, WIRING AND EARTHWIRE**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
D10	<b>CABLES, WIRING AND EARTHWIRE</b>				
D10.1	<b>CABLES</b> Supply and install the following armoured PVC sheathed copper LT cables including terminations, glands, shroud, lugs, clamping, supports and all accessories. NOTE: For ordering of cables, measurement shall NOT be taken from this bill. Actual cable lengths shall be measured on site for ordering and installation purposes.				
	185mm <sup>2</sup> x 4 core cable				
D10.1.1	Supply	m	160		
D10.1.2	Install	m	160		
	150mm <sup>2</sup> x 4 core cable				
D10.1.3	Supply	m	120		
D10.1.4	Install	m	120		
	95mm <sup>2</sup> x 4 core cable				
D10.1.5	Supply	m	60		
D10.1.6	Install	m	60		
	70mm <sup>2</sup> x 4 core cable				
D10.1.7	Supply	m	60		
D10.1.8	Install	m	60		
	50mm <sup>2</sup> x 4 core cable				
D10.1.9	Supply	m	1		Rate Only
D10.1.10	Install	m	1		Rate Only
	35mm <sup>2</sup> x 4 core cable				
D10.1.11	Supply	m	160		
D10.1.12	Install	m	160		
	25mm <sup>2</sup> x 4 core cable				
D10.1.13	Supply	m	120		
D10.1.14	Install	m	120		
	16mm <sup>2</sup> x 4 core cable				
D10.1.15	Supply	m	80		
D10.1.16	Install	m	80		
	10mm <sup>2</sup> x 4 core cable				
D10.1.17	Supply	m	1		Rate Only
D10.1.18	Install	m	1		Rate Only
	6mm <sup>2</sup> x 4 core cable				
D10.1.19	Supply	m	160		
D10.1.20	Install	m	160		
Total Carried Forward					

**SECTION D10: CABLES, WIRING AND EARTHWIRE**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward					
	Supply and install the following unarmoured PVC sheathed copper LT cables including terminations, glands, shroud, lugs, clamping, supports and all accessories. NOTE: For ordering of cables, measurement shall NOT be taken from this bill. Actual cable lengths shall be measured on site for ordering and installation purposes.				
	70mm <sup>2</sup> x 4 core cable				
D10.1.21	Supply	m	1		Rate Only
D10.1.22	Install	m	1		Rate Only
	50mm <sup>2</sup> x 4 core cable				
D10.1.23	Supply	m	60		
D10.1.24	Install	m	60		
	35mm <sup>2</sup> x 4 core cable				
D10.1.25	Supply	m	1		Rate Only
D10.1.26	Install	m	1		Rate Only
	25mm <sup>2</sup> x 4 core cable				
D10.1.27	Supply	m	72		
D10.1.28	Install	m	72		
	16mm <sup>2</sup> x 4 core cable				
D10.1.29	Supply	m	85		
D10.1.30	Install	m	85		
	10mm <sup>2</sup> x 4 core cable				
D10.1.31	Supply	m	90		
D10.1.32	Install	m	90		
	6mm <sup>2</sup> x 4 core cable				
D10.1.33	Supply	m	1		Rate Only
D10.1.34	Install	m	1		Rate Only
	4mm <sup>2</sup> x 4 core cable				
D10.1.35	Supply	m	50		
D10.1.36	Install	m	50		
	2.5mm <sup>2</sup> x 4 core cable				
D10.1.37	Supply	m	20		
D10.1.38	Install	m	20		
D10.2	<b>CABLE TERMINATIONS</b> Cable terminations on both sides, from supply to load for various cable ranges. Each termination point is measured separately.				
D10.2.1	Cable range: 50mm <sup>2</sup> ≤ x ≤ 95mm <sup>2</sup>	No	4		
D10.2.2	Cable range: 16mm <sup>2</sup> ≤ x ≤ 35mm <sup>2</sup>	No	18		
D10.3	<b>TWIN AND EARTH CABLE</b>				
Total Carried Forward					

**SECTION D10: CABLES, WIRING AND EARTHWIRE**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward					
D10.3.1	4mm <sup>2</sup> Twin and Earth cable Supply	m	1		Rate Only
D10.3.2	Install	m	1		Rate Only
D10.3.3	2.5mm <sup>2</sup> Twin and Earth cable Supply	m	400		
D10.3.4	Install	m	400		
D10.3.5	1.5mm <sup>2</sup> Twin and Earth cable Supply	m	800		
D10.3.6	Install	m	800		
D10.4	<b>WIRING AND EARTH WIRING</b> Supply and install conductors in wire ways (including off-cuts and wastes). PVC insulated conductors installed in conduits or wire trunking.				
D10.4.1	70mm <sup>2</sup> Supply	m	120		
D10.4.2	Install	m	120		
D10.4.3	50mm <sup>2</sup> Supply	m	1		Rate Only
D10.4.4	Install	m	1		Rate Only
D10.4.5	35mm <sup>2</sup> Supply	m	60		
D10.4.6	Install	m	60		
D10.4.7	25mm <sup>2</sup> Supply	m	120		
D10.4.8	Install	m	120		
D10.4.9	16mm <sup>2</sup> Supply	m	72		
D10.4.10	Install	m	72		
D10.4.11	10mm <sup>2</sup> Supply	m	165		
D10.4.12	Install	m	165		
D10.4.13	6mm <sup>2</sup> Supply	m	85		
D10.4.14	Install	m	85		
Total Carried Forward					

**SECTION D10: CABLES, WIRING AND EARTHWIRE**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward					
D10.4.15	4mm <sup>2</sup> Supply	m	390		
D10.4.16	Install	m	390		
D10.4.17	2,5mm <sup>2</sup> Supply	m	11,500		
D10.4.18	Install	m	11,500		
D10.4.19	1,5mm <sup>2</sup> Supply	m	2,900		
D10.4.20	Install	m	2,900		
Total Carried Forward To Summary					

**SECTION D11: ADDITIONAL ELECTRICAL ITEMS**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
D11	<b>ADDITIONAL</b>				
D11.1	<b>SUB-DISTRIBUTION BOARD EQUIPMENT</b>				
	Quote for supply and installation of the following distribution board equipment as specified below. Make: ABB or Schneider.				
	Note: Rates are applicable to switchboard manufacturers and changes by the electrician on site.				
	500A TP 15kA MCB				
D11.1.1	Supply	No	2		Rate Only
D11.1.2	Install	No	2		Rate Only
	250A TP 15kA MCB				
D11.1.3	Supply	No	1		Rate Only
D11.1.4	Install	No	1		Rate Only
	200A TP 15kA MCB				
D11.1.5	Supply	No	1		Rate Only
D11.1.6	Install	No	1		Rate Only
	150A TP 15kA MCB				
D11.1.7	Supply	No	1		Rate Only
D11.1.8	Install	No	1		Rate Only
	100A TP 5kA MCB				
D11.1.9	Supply	No	1		Rate Only
D11.1.10	Install	No	1		Rate Only
	80A TP 5kA MCB				
D11.1.11	Supply	No	1		Rate Only
D11.1.12	Install	No	1		Rate Only
	60A TP 5kA CB				
D11.1.13	Supply	No	1		Rate Only
D11.1.14	Install	No	1		Rate Only
	40A TP 5kA CB				
D11.1.15	Supply	No	1		Rate Only
D11.1.16	Install	No	1		Rate Only
	40A TP Delay Curve 5kA CB				
D11.1.17	Supply	No	1		Rate Only
D11.1.18	Install	No	1		Rate Only
	30A TP 5kA CB				
D11.1.19	Supply	No	1		Rate Only
D11.1.20	Install	No	1		Rate Only
Total Carried Forward					

**SECTION D11: ADDITIONAL ELECTRICAL ITEMS**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward					
D11.1.21	30A TP Delay Curve 5kA CB Supply	No	1		Rate Only
D11.1.22	Install	No	1		Rate Only
D11.1.23	25A TP Delay Curve 5kA CB Supply	No	1		Rate Only
D11.1.24	Install	No	1		Rate Only
D11.1.25	20A TP 5kA CB Supply	No	1		Rate Only
D11.1.26	Install	No	1		Rate Only
D11.1.27	20A TP Delay Curve 5kA CB Supply	No	1		Rate Only
D11.1.28	Install	No	1		Rate Only
D11.1.29	10A TP 5kA CB Supply	No	1		Rate Only
D11.1.30	Install	No	1		Rate Only
D11.1.31	100A SP 5kA MCB Supply	No	1		Rate Only
D11.1.32	Install	No	1		Rate Only
D11.1.33	80A SP 5kA MCB Supply	No	1		Rate Only
D11.1.34	Install	No	1		Rate Only
D11.1.35	60A SP 5kA CB Supply	No	1		Rate Only
D11.1.36	Install	No	1		Rate Only
D11.1.37	40A SP 5kA CB Supply	No	1		Rate Only
D11.1.38	Install	No	1		Rate Only
D11.1.39	30A SP 5kA CB Supply	No	1		Rate Only
D11.1.40	Install	No	1		Rate Only
D11.1.41	30A SP Delay Curve 5kA CB Supply	No	1		Rate Only
D11.1.42	Install	No	1		Rate Only
D11.1.43	25A SP Delay Curve 5kA CB Supply	No	1		Rate Only
D11.1.44	Install	No	1		Rate Only
Total Carried Forward					

**SECTION D11: ADDITIONAL ELECTRICAL ITEMS**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward					
D11.1.45	20A SP 5kA CB Supply	No	1		Rate Only
D11.1.46	Install	No	1		Rate Only
D11.1.47	20A SP Delay Curve 5kA CB Supply	No	1		Rate Only
D11.1.48	Install	No	1		Rate Only
D11.1.49	10A SP 5kA CB Supply	No	1		Rate Only
D11.1.50	Install	No	1		Rate Only
D11.1.51	63A Earth leakage protection device 1 + N Supply	No	1		Rate Only
D11.1.52	Install	No	1		Rate Only
Total Carried Forward To Summary					

**SECTION D12: ADDITIONAL ELECTRICAL WORKS: COMPLETION**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
D12	<b>COMPLETION</b>				
D12.1	<b>TEST AND COMMISSION</b>				
D12.1.1	Test and commission entire electrical installation as required by SANS: 10142 requirements. Issue COC's for entire electrical installation under this contract.	Sum	1		
D12.2	<b>SUPPLEMENTARIES</b>				
D12.2.1	Any training to client and staff	Sum	1		
D12.2.2	Update and prepare "As Built" drawings	Item	3		
D12.2.3	Supply complete operating manuals of entire electrical installation	Item	4		
D12.3	Any additional items required by the contractor - specify				
	a)				
	b)				
	c)				
	d)				
	e)				
	f)				
	g)				
	h)				
	i)				
	j)				
	k)				
Total Carried Forward To Summary					

**SECTION E1: PRELIMINARY AND GENERAL - TIME/FIXED/VALUE RELATED**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
<b>E</b>	<b>PRELIMINARY AND GENERAL</b>				
<b>E1.1</b>	<b>TIME RELATED</b>				
	Allow for all TIME related items of the Principal Building Agreement as well as any special requirements relating to this sub-contract				
	List all TIME related items as required - specify				
E1.1.1	a)	Sum	1		
E1.1.2	b)	Sum	1		
E1.1.3	c)	Sum	1		
E1.1.4	d)	Sum	1		
E1.1.5	e)	Sum	1		
<b>E1.2</b>	<b>FIXED CHARGE RELATED</b>				
	Allow for all FIXED charge related items in terms of the Principal Building Agreement as well as any special requirements relating to this sub-contract				
	List all FIXED charge related items as required - specify				
E1.2.1	a)	Sum	1		
E1.2.2	b)	Sum	1		
E1.2.3	c)	Sum	1		
E1.2.4	d)	Sum	1		
E1.2.5	e)	Sum	1		
<b>E1.3</b>	<b>VALUE RELATED</b>				
	Allow for all VALUE related items in terms of the Principal Building Agreement as well as any special requirements relating to this sub-contract				
	List all VALUE related items as required - specify				
E1.3.1	a)	Sum	1		
E1.3.2	b)	Sum	1		
E1.3.3	c)	Sum	1		
E1.3.4	d)	Sum	1		
E1.3.5	e)	Sum	1		
Total Carried Forward To Summary					

**SECTION E2: VARIOUS ELECTRONIC SERVICES AND SYSTEMS**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
E2	<b>TELKOM AND DATA NETWORK INFRASTRUCTURE</b>				
E2.1	<b>SERVER ROOM EQUIPMENT</b>				
	MODRAC 43U 600mm x 1000mm floor stand rack with MODRAC 4 way fan unit, 43U 1000mm side panel lockable, 43U glass door, 43U steel doors, 43U panel mount, jointing kit, 43U 300mm x 1000mm extension closet, MODRAC 10 way power duct, MODRAC slimline chimney, 43U painted cable tray, MODRAC 730 flat shelf 100kg and 75mm lockable castor.				
E2.1.1	Supply	No	8		
E2.1.2	Install	No	8		
E2.1.3	System Configuration	Sum	1		
E2.1.4	Network setup, configuration and commissioning: Molex CAT 6 network certification for entire network and 100 field points.	Sum	1		
	Netconnect brush panel.				
E2.1.5	Supply	No	24		
E2.1.6	Install	No	24		
	24 Port Molex CAT 6 PCB Net-It Patch Panel.				
E2.1.7	Supply	No	24		
E2.1.8	Install	No	24		
	Highway CAT 6 24 Port Patch Panel (IPP).				
E2.1.9	Supply	No	24		
E2.1.10	Install	No	24		
	2m CAT 6 Molex Patch lead.				
E2.1.11	Supply	No	160		
E2.1.12	Install	No	160		
	3m CAT 6 Molex fly-lead.				
E2.1.13	Supply	No	160		
E2.1.14	Install	No	160		
Total Carried Forward					

**SECTION E2: VARIOUS ELECTRONIC SERVICES AND SYSTEMS**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward					
E2.2	<b>TRAINING CENTRE EQUIPMENT</b>				
	18U Wall mounted rack with glass front door, wall hinged, removable side panels and 24 port patch panel.				
E2.2.1	Supply	No	1		
E2.2.2	Install	No	1		
E2.3	<b>TELEPHONE AND DATA NETWORK OUTLET POINTS</b>				
	Supply and install the following telephone and data network points:				
	Telephone outlet RJ11 (Molex) including Crabtree Diamond range cover plate in 4x4 box.				
E2.3.1	Supply	No	1		Rate Only
E2.3.2	Install	No	1		Rate Only
	Data/Voice combo outlet RJ45 (Molex) including Crabtree Diamond range cover plate in 4x4 box.				
E2.3.3	Supply	No	36		
E2.3.4	Install	No	36		
	Telephone outlet RJ11 (Molex) including Crabtree Diamond cover plate in power skirting.				
E2.3.5	Supply	No	1		Rate Only
E2.3.6	Install	No	1		Rate Only
	Data/Voice combo RJ45 outlet (Molex) including Crabtree Diamond cover plate in power skirting.				
E2.3.7	Supply	No	64		
E2.3.8	Install	No	64		
	VOIP telephone to voice recorder switch outlet RJ45 (Molex) including Crabtree Diamond cover plate in power skirting.				
E2.3.9	Supply	No	8		
E2.3.10	Install	No	8		
Total Carried Forward					

**SECTION E2: VARIOUS ELECTRONIC SERVICES AND SYSTEMS**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward					
E2.3.11	Data/Voice combo outlet RJ45 (Molex) installed inside universal modular outlet. Supply	No	8		
E2.3.12	Install	No	8		
E2.3.13	TV outlet including Crabtree cover plate in 4x4 box. Supply	No	4		
E2.3.14	Install	No	4		
E2.4	<b>TELEPHONE AND DATA NETWORK CABLING</b>  Supply and install the following data network cabling in wireways including off-cuts and wastes, terminated on both ends to be fully utilised.  CAT 5e cable for data/telecommunication network				
E2.4.1	Supply	m	1		Rate Only
E2.4.2	Install	m	1		Rate Only
E2.4.3	CAT 6 cable for data network (LAN) system Supply	m	5,800		
E2.4.4	Install	m	5,800		
Total Carried Forward To Summary					

**SECTION E3: FIRE DETECTION SYSTEM**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
E3	<b>FIRE DETECTION SYSTEM - ZITON ZP3 SERIES</b>  The following fire detection equipment and accessories shall be fitted, wired, connected and commissioned completely as specified. Sundries to be included in rates.  Ziton ZP3 Control Panel with 4 loops wired to all sensors, complete with all wiring installed inside its dedicated enclosure.				
E3.1	Supply	No	1		
E3.2	Install	No	1		
E3.3	System Programming and Configuration	Sum	1		
E3.4	System Commission	Sum	1		
	Ziton ZP3 Control Panel repeater station with network card.				
E3.5	Supply	No	1		
E3.6	Install	No	1		
	Ceiling/Soffit mounted Optical smoke detector: ZP730				
E3.7	Supply	No	96		
E3.8	Install	No	96		
	Ceiling/Soffit mounted heat detector: ZP720				
E3.9	Supply	No	8		
E3.10	Install	No	8		
	Fire Sounder: ZP755HA				
E3.11	Supply	No	12		
E3.12	Install	No	12		
	Ziton ZP3 Fire relay to disable mechanical loads inside DB.				
E3.13	Supply	No	8		
E3.14	Install	No	8		
	Ziton ZP3 line isolators.				
E3.15	Supply	No	8		
E3.16	Install	No	8		
Total Carried Forward					

**SECTION E3: FIRE DETECTION SYSTEM**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward					
	Ziton ZP3 Manual call points installed at locations indicated on drawings.				
E3.17	Supply	No	10		
E3.18	Install	No	10		
	PH120 Fire resistant cable (120 minute rated)				
E3.19	Supply	m	40		
E3.20	Install	m	40		
	PH30 Fire resistant cable (30 minute rated)				
E3.21	Supply	m	1,200		
E3.22	Install	m	1,200		
	Eckoshield - 227 Modular (inverted) - 2x 25 litre cylinder gas supression system including 9 smoke detectors, detector panel with activation/deactivation, control equipment, dampers, wiring and all accessories for the server room. The volume of the room is 24m³. System shall be fully operational and compliant.				
E3.23	Supply	No	1		
E3.24	Install	No	1		
E3.25	Commission	Sum	1		
E3.26	Full witness testing	Sum	1		
	Integration: Full integration onto Transnet SCADA system for remote viewing and alarms.				
E3.27	Supply required hardware	No	1		
E3.28	Install required hardware	No	1		
E3.29	System Programming and Configuration	Sum	1		
E3.30	System Commission	Sum	1		
Total Carried Forward					

SECTION E3: FIRE DETECTION SYSTEM

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward					
E3.31	Any additional items required by the Contractor to complete the Fire Detection System as per specifications - Specify:  a)  b)  c)  d)  e)				
Total Carried Forward To Summary					

**SECTION E4: ACCESS CONTROL SYSTEM**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
E4	<b>ACCESS CONTROL SYSTEM</b>				
E4.1	The following access control equipment and accessories shall be fitted, wired, connected and commissioned completely as specified. Sundries to be included in rates.				
	24 Port network switch/hub				
E4.1.1	Supply	No	1		
E4.1.2	Install	No	1		
E4.1.3	System Programming and Configuration	Sum	1		
E4.1.4	System Commission	Sum	1		
	Access control system controller: ImproX EC2 controller, installed inside enclosure for fully operational system				
E4.1.5	Supply	No	2		
E4.1.6	Install	No	2		
	Access control enclosure complete with power supply, backup battery and I/O controller.				
E4.1.7	Supply	No	2		
E4.1.8	Install	No	2		
	Indoor biometric scanning device for 100 user profiles.				
E4.1.9	Supply	No	3		
E4.1.10	Install	No	3		
	Outdoor biometric scanning device inside weather proof enclosure for 100 user profiles.				
E4.1.11	Supply	No	1		
E4.1.12	Install	No	1		
	Outdoor card reader device inside weather proof enclosure, for 500 user profiles with card reader mounted on gooseneck.				
E4.1.13	Supply	No	2		
E4.1.14	Install	No	2		
Total Carried Forward					

**SECTION E4: ACCESS CONTROL SYSTEM**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward					
E4.1.15	Narrow stile electric lock with integrated door monitor, 1-35mm backset, monitored fail secure function. Supply	No	1		Rate Only
E4.1.16	Install	No	1		Rate Only
E4.1.17	Electric/magnetic door lock (300kg) completely installed and wired at the door. Wiring and operation of the door lock to be co-ordinated with the biometric scanning devices of the access control system Supply	No	8		
E4.1.18	Install	No	8		
E4.1.19	Magnetic door monitor switch to be incorporated in the door and door frame Supply	No	8		
E4.1.20	Install	No	8		
E4.1.21	Push button press switch acting as door release as part of the access control system Supply	No	4		
E4.1.22	Install	No	4		
E4.1.23	Green break glass unit Supply	No	8		
E4.1.24	Install	No	8		
E4.1.25	CAT 6 cable for access control system. Colour: Black. Supply	m	240		
E4.1.26	Install	m	240		
E4.1.27	1.0mm <sup>2</sup> x 4 core Mylar cable for access control system as specified Supply	m	90		
E4.1.28	Install	m	90		
E4.1.29	3m Boomgate (Jackknife) install complete and integrate into access control system. Supply	No	2		
E4.1.30	Install	No	2		
Total Carried Forward					

SECTION E4: ACCESS CONTROL SYSTEM

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward					
	Gooseneck with multiple level access points for Bioreader/Card reader and intercom call station. Supplied complete.				
E4.1.31	Supply	No	2		
E4.1.32	Install	No	2		
	Integration: Full integration onto Transnet SCADA system for remote viewing and alarms.				
E4.1.33	Supply	No	1		
E4.1.34	Install	No	1		
E4.1.35	System Programming and Configuration	Sum	1		
E4.1.36	System Commission	Sum	1		
E4.1.37	Any additional items required by the Contractor to complete the Access Control System as per specifications - Specify:				
	a)				
	b)				
	c)				
	d)				
	e)				
Total Carried Forward To Summary					

**SECTION E5: CCTV SYSTEM**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
E5	<b>CCTV SYSTEM</b>  The following IP based CCTV equipment and accessories shall be fitted, wired, connected and commissioned completely. Sundries to be included in rates.				
E5.1	<b>IP VIDEO CAMERA SYSTEM</b>  Hardware and equipment to incorporate, control, and process the IP video cameras at the Security Workstation as specified				
E5.1.1	Supply	No	1		
E5.1.2	Install	No	1		
E5.1.3	Surveillance system configuration and commissioning to be operational with existing system.	Sum	1		
	Network recording server (NVR) hardware and equipment to record and control all video streams as part of the IP video system as specified.				
E5.1.4	Supply	No	1		
E5.1.5	Install	No	1		
	Dedicated/specialised software and software licence required to operate and run the IP video camera system				
E5.1.6	Supply	No	1		
E5.1.7	Install	No	1		
	CAT 6 FTP cabling for the CCTV system as specified.				
E5.1.8	Supply	m	3,400		
E5.1.9	Install	m	3,400		
	CCTV ceiling mount: Wide angle HD dome camera, completely connected with power supply.				
E5.1.10	Supply	No	24		
E5.1.11	Install	No	24		
	CCTV wall mounted: Static colour IP HD camera in housing for indoor and outdoor use. Housing must be high impact rated and vandal resistant. Completely connected with power supply.				
E5.1.12	Supply	No	12		
E5.1.13	Install	No	12		
Total Carried Forward					

**SECTION E5: CCTV SYSTEM**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward					
E5.1.14	CCTV pole mounted: Static colour IP HD camera in housing for indoor and outdoor use. Housing must be high impact rated and vandal resistant. Completely connected with power supply. Supply	No	5		
E5.1.15	Install	No	5		
E5.1.16	CCTV steel structure mounted. High resolution, high zoom camera. Completely connected with power supply. Supply	No	2		
E5.1.17	Install	No	2		
E5.1.18	CCTV wall mounted: PTZ dome camera. Housing must be weather proof and high impact rated. Completely connected with power supply. Supply	No	6		
E5.1.19	Install	No	6		
E5.1.20	CCTV Distribution Kiosk: IP55 rated field enclosure for 10/100/1000 Base T Ethernet Media Converter Stand Alone Module complete with splice cassette, multiple output power supply, GBIC and all additional accessories to make installation complete. Supply	No	6		
E5.1.21	Install	No	6		
E5.1.22	Concrete pole for mounting of camera's. Pole length: 6m, mounting height of camera: 5m. Supply	No	5		
E5.1.23	Install	No	5		
E5.1.24	Integration: Full integration onto Transnet SCADA system for remote viewing and alarms. Supply	No	1		
E5.1.25	Install	No	1		
E5.1.26	System Programming and Configuration	Sum	1		
Total Carried Forward					

SECTION E5: CCTV SYSTEM

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward					
E5.1.27	System Commission Any additional items required by the Contractor to complete the  a)  b)  c)  d)  e)	Sum	1		
Total Carried Forward To Summary					

**SECTION E6: DIGITAL VIDEO PROJECTOR OUTLETS**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
E6	<b>DIGITAL VIDEO PROJECTOR OUTLETS</b>				
E6.1	Supply and install the following overhead projector outlets. Sundries to be included in rates.				
	Projector wall VGA patch box including Crabtree Diamond range cover plate.				
E6.1.1	Supply	No	1		Rate Only
E6.1.2	Install	No	1		Rate Only
	Projector ceiling VGA outlet point.				
E6.1.3	Supply	No	2		
E6.1.4	Install	No	2		
	Projector universal modular VGA outlet point (excluding box)				
E6.1.5	Supply	No	2		
E6.1.6	Install	No	2		
	VGA cable, including off cuts and wastes, terminated on both ends to be fully utilised				
E6.1.7	Supply	m	40		
E6.1.8	Install	m	40		
Total Carried Forward To Summary					

**SECTION E7: BUILDING MANAGEMENT SYSTEM**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
E7	<b>BUILDING MANAGEMENT SYSTEM</b>				
	Hardware: Master controller installed inside enclosure				
E7.1	Supply	No	1		
E7.2	Install	No	1		
	Hardware: Slave controller connected in daisy chain configuration with necessary Input and Output modules				
E7.3	Supply	No	4		
E7.4	Install	No	4		
	Digital Input				
E7.5	Supply	No	16		
E7.6	Install	No	16		
	Analogue Input				
E7.7	Supply	No	8		
E7.8	Install	No	8		
	Digital Output				
E7.9	Supply	No	8		
E7.10	Install	No	8		
	Integration: Full integration onto Transnet SCADA system for remote viewing and alarms.				
E7.11	Supply	No	1		
E7.12	Install	No	1		
E7.13	System Programming and Configuration	Sum	1		
E7.14	System Commission	Sum	1		
	Any additional items required by the Contractor to complete the Building Management System as per specifications - Specify:				
	a)				
	b)				
	c)				
	d)				
Total Carried Forward To Summary					

**SECTION E8: ELECTRONIC SERVICES: COMPLETION**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
<b>E8</b>	<b>COMPLETION</b>				
<b>E8.1</b>	<b>Test and Commission</b>				
E8.1.1	Test and commission entire electronic installation services to the satisfaction of the engineer and client.	Sum	1		
<b>E8.2</b>	<b>Maintenance</b>				
E8.2.1	Provision of full maintenance of electronic equipment and installation for the full period of 12 calendar months of the maintenance period. The maintenance period starts on the practical completion.	Sum	1		
<b>E8.3</b>	<b>Completion</b>				
E8.3.1	Any training to client and staff	Sum	1		
E8.3.2	Update and prepare "As Built" drawings	Item	4		
E8.3.3	Supply complete operating manuals of entire electrical installation	Item	4		
<b>E8.4</b>	<b>Additional items</b>				
E8.4.1	Any additional items required by the contractor - specify				
	a)				
	b)				
	c)				
	d)				
	e)				
	f)				
	g)				
	h)				
	i)				
	j)				
	k)				
Total Carried Forward To Summary					

**SCHEDULE F1: PRELIMINARY & GENERAL**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
<b>F1</b>		<b>PRELIMINARY AND GENERAL</b>  Note: All items shall be priced for whatever cost may be consider necessary for Preliminary and General to carry out the Mechanical Installations in full, as detailed in the drawings, Specifications and Schedules, which shall include, but shall not be limited, to the following:				
F1.1		Site establishment-over and above the main contractors	Sum	1		
F1.2		Complete set of co-ordinated workshop drawings for HVAC installation. To be submitted to Engineer for approval prior to construction.	Sum	1		
F1.3		3 sets of Operation and maintenance manuals including As-Built drawings on hard copy and CD as specified. Refer to tender specification.	Sum	1		
F1.4		Instructing and training the Employer's staff in operation of system and equipment prior to hand over to the Client (4 hours).	Sum	1		
F1.5		Provision of full maintenance of mechanical equipment and installation for the full 12 month period. The maintenance period shall start after practical completion is achieved. Service sheets to be submitted for every service carried out. Refer to tender specification.	Sum	1		
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE F2: GROUND FLOOR: AIR CONDITIONING INSTALLATION**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
<b>F2</b>		<b>AIR CONDITIONING</b> (REFER TO LAYOUT 32442.00-740-01)				
		Supply, delivery to site, installation and commissioning of the following complete air conditioning systems as specified in technical specification and as shown on the drawings:				
F2.1		Mid wall split air conditioning system complete with indoor, outdoor unit, refrigerant piping, condensate drainage, controls and corrosion protection of outdoor unit.				
F2.1.1		Indoor unit model: 2.8kW midwall Outdoor unit model: 2.8kW	No	1		
F2.1.2		Indoor unit model: 3.5kW midwall Outdoor unit model: 3.5kW	No	3		
F2.2		VRF air conditioning system complete with indoor units , outdoor unit, refrigerant piping, condensate drainage, controls and corrosion protection of outdoor unit.				
F2.2.1		2.8 kW VRF Midwall indoor unit	No	1		
F2.2.2		3.6 kW VRF Midwall indoor unit	No	1		
F2.2.3		7.0 kW VRF Ceiling Suspended indoor unit	No	1		
F2.2.4		11.2 kW VRF Ceiling Suspended indoor unit	No	1		
F2.3		Supply and install seamless high pressure refrigeration grade copper pipework for split systems. The piping shall be complete with fittings, joints and headers, tees, fixings, supports and insulation all in cable tray for the following external diameter (OD) sizes. Lokring piping and connection preferred.	Sum	1		
F2.4		Supply and install solvent welded Ø 32 uPVC condensate drain pipework as scheduled and specified complete with 100mm deep P-trap all necessary hangers, supports, fixings and fittings.				
F2.4.1		Ø 32 uPVC - 5 meters per unit	No	8		
F2.5		Supply and install control cabling between outdoor condensing unit and indoor unit	No	8		
F2.6		Supply and install wired remote controller with	No	8		
F2.7		Supply, install and connect the cable from electrical 1.5 meters per unit	No	4		
TOTAL CARRIED FORWARD						

**SCHEDULE F2: GROUND FLOOR: AIR CONDITIONING INSTALLATION**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
F2.8		Supply and install 3 core PVC flexible electrical 1.5 meters per unit	No	8		
F2.9		Install additional control control circuit to indoor units and interlock to motion detector in rooms.	No	8		
F2.10		Supply and install galvanised trunking to cover exposed refrigeration piping with accessories as specified. Galvanised trunking to be painted same colour as the exterior of the building.	Sum	1		
F2.11		Flushing and pressure testing of refrigeration piping.	No	5		
F2.12		Equipment labelling as per SABS	Sum	1		
F2.13		Testing and commissioning of systems	No	8		
F2.14		Apply anti-corrosion treatment on all the condenser coils to outdoor units of the following nominal capacities. Certificate of treatment to be submitted to the design engineer.				
F2.14.1		2.8 kW Nominal cooling capacity	No	1		
F2.14.2		3.5 kW Nominal cooling capacity	No	3		
F2.15		Removal of existing refrigerant pipework	Sum	1		
F2.16		Any other item not specified in the bill. Please specify.	Sum	1		
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE F3: GROUND FLOOR: VENTILATION INSTALLATION**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
<b>F3</b>		<b>VENTILATION : FRESH AIR SUPPLY AND EXTRACT SYSTEMS</b> (REFER TO LAYOUT 32442.00-740-01)				
F3.1		Supply and install extract air supply fan systems complete with sound attenuators, flexible collars, anti-vibration mountings, all necessary fittings, fixings and accessories as shown on drawing and specified. The systems must not exceed 45 dBA noise level taken 1m away from fans.				
F3.1.1		FAF G1 (Inline tube fan AMS TD2000/315 ) Duty: 320 l/s @ 180 Pa	No	1		
F3.1.2		FAF G2 (Inline tube fan AMS TD500/160 ) Duty: 80 l/s @ 180 Pa	No	1		
F3.1.3		FAF G3 (Wall mounted fan AMS Silent 200) Duty: 20 l/s @ 20 Pa	No	1		
F3.1.4		FAF G4 (Wall mounted fan AMS SILENT 200) Duty: 20 l/s @ 20 Pa	No	1		
F3.1.5		EAF G1 (Wall mounted fan AMS HXM 250) Duty: 180 l/s @ 20 Pa	No	1		
F3.1.6		EAF G2 (Wall mounted fan AMS HXM 250) Duty: 180 l/s @ 20 Pa	No	1		
F3.1.7		EAF G3 (Wall mounted fan AMS HXM 200) Duty: 75 l/s @ 20 Pa	No	1		
F3.2		Supply and install sound attenuators for the above fans complete with supports brackets and flanges.				
F3.2.1		Circular Type: Ø315 x 600mm(L)	No	2		
F3.3		Supply and install Aluminium Supply Air Grilles complete with all necessary fittings, fixings, supports and accessories as scheduled and specified.				
F3.3.1		Size: 150x150	No	1		
F3.3.2		Size: 200x200	No	5		
F3.4		Supply and install 0.6mm Galvanised Sheet Metal Ducting complete with all necessary hangers, brackets and accessories as scheduled and specified. The ducting shall be sealed properly in the joints.				
F3.4.1		Size: Ø150	m	20		
F3.4.2		Size: Ø200	m	3		
TOTAL CARRIED FORWARD						

**SCHEDULE F3: GROUND FLOOR: VENTILATION INSTALLATION**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
F3.4.3		Size: Ø250	m	5		
F3.4.4		Size: Ø315	m	10		
F3.4.5		Transformation: Ø150 to Ø200	No	5		
F3.4.6		Transformation: Ø250 to Ø315	No	1		
F3.4.7		Transformation: Ø150 to Ø250	No	5		
F3.4.8		Transformation: Ø150 to 400 x 300	No	2		
F3.4.9		Transformation: Ø150 to 200 x 200	No	2		
F3.5		Supply and install wire reinforced aluminium flexible ducting complete with clamps; duct sealant and fixings.				
F3.5.1		Size: Ø 150	m	15		
F3.6		Supply and install weather louvre complete with wire mesh, all necessary fittings, fixings, supports and accessories as scheduled and specified. All weather louvres shall be installed and fixed in 25mm thick timber frame. Installation of timber frame shall be by builder.				
F3.6.1		Size: 400 x 300 complete with filter	No	1		
F3.6.2		Size: 200 x 200 complete with filter	No	3		
F3.6.3		Size: 200 x 200	No	1		
F3.6.4		Size: 250 x 250	No	2		
F3.7		Supply and install Door Grille complete with all necessary fittings, fixings, supports and accessories as scheduled and specified				
F3.7.1		Size: 500 x 300	No	3		
F3.8		Supply and install air balancing dampers complete with all necessary fittings, fixings, supports and accessories as scheduled and specified				
F3.8.1		Size: Ø 150	No	6		
F3.9		Final Electrical connection from isolator to the fan	No	7		
F3.10		Equipment and Ductwork labelling as per SABS	Sum	1		
F3.11		Testing and commissioning of all air systems.	No	7		
F3.12		Any other item not specified in the bill. Please specify.	Sum	1		
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE F4: FIRST FLOOR: AIR CONDITIONING INSTALLATION**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
<b>F4</b>		<b>AIR CONDITIONING</b> (REFER TO LAYOUT 32442.00-740-02)				
F4.1		VRF air conditioning system complete with indoor units , outdoor unit, refrigerant piping, condensate drainage, controls and corrosion protection of outdoor unit.				
F4.1.1		3.6 kW VRF Midwall indoor unit	No	4		
F4.1.2		5.6 kW VRF Midwall indoor unit	No	1		
F4.2		Supply and install seamless high pressure refrigeration grade copper pipework for split systems. The piping shall be complete with fittings, joints and headers, tees, fixings, supports and insulation all in cable tray for the following external diameter (OD) sizes. Lokring piping and connection preferred.	Sum	1		
F4.3		Supply and install solvent welded Ø 32 uPVC condensate drain pipework as scheduled and specified complete with 100mm deep P-trap all necessary hangers, supports, fixings and fittings.				
F4.3.1		Ø 32 uPVC - 5 meters per unit	No	5		
F4.4		Supply and install control cabling between outdoor condensing unit and indoor unit	No	5		
F4.5		Supply and install wireless remote controllers with temperature display, temperature set point, 3 fan speeds, heat/cool mode and ON/OFF functions.	No	5		
F4.6		Supply, install and connect the cable from electrical isolator to condensing unit (1.5m per outdoor unit)				
F4.6.1		1.5 meters per unit	No	5		
F4.7		Supply and install 3 core PVC flexible electrical cable with plug (1.5m indoor unit)				
F4.7.1		1.5 meters per unit	No	5		
F4.8		Install additional control circuit to indoor units and antilock to motion detector in rooms	No	5		
TOTAL CARRIED FORWARD						

**SCHEDULE F4: FIRST FLOOR: AIR CONDITIONING INSTALLATION**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
F4.9		Supply and install galvanised trunking to cover exposed refrigeration piping with accessories as specified. Galvanised trunking to be painted same colour as the exterior of the building.	Sum	1		
F4.10		Flushing and pressure testing of refrigeration piping.	No	1		
F4.11		Equipment labelling as per SABS	Sum	1		
F4.12		Testing and commissioning of systems	No	5		
F4.13		Removal of existing refrigerant pipework	Sum	1		
F4.14		Any other item not specified in the bill. Please specify.	Sum	1		
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE F5: FIRST FLOOR: VENTILATION INSTALLATION**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
<b>F5</b>		<b>VENTILATION : FRESH AIR SUPPLY AND</b> (REFER TO LAYOUT 32442.00-740-02)				
F5.1		Supply and install extract air supply fan systems complete with sound attenuators, flexible collars, anti-vibration mountings, all necessary fittings, fixings and accessories as shown on drawing and specified. The systems must not exceed 45 dBA noise level taken 1m away from fans.				
F5.1.1		FAF F1 (Inline tube fan AMS TD2000/315 ) Duty: 180 l/s @ 150 Pa	No	1		
F5.1.2		EAF F1 (Inline tube fan AMSTD 2000/315) Duty: 275 l/s @ 150 Pa	No	1		
F5.2		Supply and install sound attenuators for the above fans complete with supports brackets and flanges.				
F5.2.1		Circular Type: Ø200 x 600mm(L)	No	2		
F5.2.2		Circular Type: Ø315 x 600mm(L)	No	2		
F5.3		Supply and install Aluminium Supply Air Grilles complete with all necessary fittings, fixings, supports and accessories as scheduled and specified.				
F5.3.1		Size: 150x150	No	4		
F5.3.2		Size: 200x150	No	1		
F5.4		Supply and install extract disc valve complete with clamps, fittings and supports.				
F5.4.1		Size: Ø 150	No	1		
F5.4.2		Size: Ø 200	No	4		
F5.5		Supply and install 0.6mm Galvanised Sheet Metal Ducting complete with all necessary hangers, brackets and accessories as scheduled and specified. The ducting shall be sealed properly in the joints.				
F5.5.1		Size: Φ150	m	20		
F5.5.2		Size: Ø200	m	20		
F5.5.3		Size: Ø250	m	10		
F5.5.4		Transformation: Ø150 to Ø200	No	3		
F5.5.5		Transformation: Ø200 to Ø250	No	2		
TOTAL CARRIED FORWARD						

**SCHEDULE F5: FIRST FLOOR: VENTILATION INSTALLATION**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
F5.5.6		Transformation: Ø250 to Ø315	No	1		
F5.5.7		Transformation: Ø250 to 500 x 450	No	1		
F5.6		Supply and install wire reinforced aluminium flexible ducting complete with clamps; duct sealant and fixings.				
F5.6.1		Size: Ø 150	m	10		
F5.7		Supply and install weather louvre complete with wire mesh, all necessary fittings, fixings, supports and accessories as scheduled and specified. All weather louvres shall be installed and fixed in 25mm thick timber frame. Installation of timber frame shall be by builder.				
F5.7.1		Size: 300 x 250 complete with filter	No	1		
F5.7.2		Size: 500 x 450	No	1		
F5.8		Supply and install Door Grille complete with all necessary fittings, fixings, supports and accessories as scheduled and specified				
F5.8.1		Size: 500 x 300	No	3		
F5.9		Supply and install air balancing dampers complete with all necessary fittings, fixings, supports and accessories as scheduled and specified				
F5.9.1		Size: Ø 150	No	2		
F5.9.1		Size: Ø 200	No	4		
F5.10		Final Electrical connection from isolator to the fan	No	2		
F5.11		Equipment and Ductwork labelling as per SABS	Sum	1		
F5.12		Testing and commissioning of all air systems.	No	2		
F5.13		Any other item not specified in the bill. Please specify.	Sum	1		
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE F6: SECOND FLOOR: AIR CONDITIONING INSTALLATION**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
<b>F6</b>		<b>AIR CONDITIONING</b> (REFER TO LAYOUT 32442.00-740-03)  Supply, delivery to site, installation and commissioning of the following complete air conditioning systems as specified in technical specification and as shown on the drawings:				
F6.1		VRF air conditioning system complete with indoor units , outdoor unit, refrigerant piping, condensate drainage, controls and corrosion protection of outdoor unit.				
F6.1.1		3.6 kW VRF Midwall indoor unit	No	2		
F6.1.2		7.1 kW VRF Midwall indoor unit	No	2		
F6.1.3		11.2 kW VRF Ceiling Suspended indoor unit	No	1		
F6.2		Supply and install seamless high pressure refrigeration grade copper pipework for split systems. The piping shall be complete with fittings, joints and headers, tees, fixings, supports and insulation all in cable tray for the following external diameter (OD) sizes. Lokring piping and connection preferred.	Sum	1		
F6.3		Supply and install solvent welded Ø 32 uPVC condensate drain pipework as scheduled and specified complete with 100mm deep P-trap all necessary hangers, supports, fixings and fittings.				
F6.3.1		Ø 32 uPVC - 5 meters per unit	No	5		
F6.4		Supply and install control cabling between outdoor condensing unit and indoor unit	No	5		
F6.5		Supply and install wireless remote controllers with temperature display, temperature set point, 3 fan speeds, heat/cool mode and ON/OFF functions.	No	4		
F6.6		Supply and install wired remote controller with temperature display, temperature set point, 3 fan speeds, heat/cool mode and ON/OFF functions.	No	1		
F6.7		Supply, install and connect the cable from electrical isolator to condensing unit (1.5m per outdoor unit)				
F6.7.1		1.5 meters per unit	No	5		
TOTAL CARRIED FORWARD						

**SCHEDULE F6: SECOND FLOOR: AIR CONDITIONING INSTALLATION**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
F6.8		Supply and install 3 core PVC flexible electrical cable with plug (1.5m indoor unit)				
F6.8.1		1.5 meters per unit	No	5		
F6.9		Install additional control control circuit to indoor units and antilock to motion detector in rooms.	No	5		
F6.10		Supply and install galvanised trunking to cover exposed refrigeration piping with accessories as specified. Galvanised trunking to be painted same colour as the exterior of the building.	Sum	1		
F6.11		Flushing and pressure testing of refrigeration piping.	No	1		
F6.12		Equipment labelling as per SABS	Sum	1		
F6.13		Testing and commissioning of systems	No	1		
F6.14		Removal of existing refrigerant pipework	Sum	1		
F6.15		Any other item not specified in the bill. Please specify.	Sum	1		
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE F7: SECOND FLOOR: VENTILATION INSTALLATION**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
<b>F7</b>		<b>VENTILATION : FRESH AIR SUPPLY AND</b> (REFER TO LAYOUT 32442.00-740-03)				
F7.1		Supply and install extract air supply fan systems complete with sound attenuators, flexible collars, anti-vibration mountings, all necessary fittings, fixings and accessories as shown on drawing and specified. The systems must not exceed 45 dBA noise level taken 1m away from fans.				
F7.1.1		FAF S1 (Inline tube fan AMS TD2300/315 ) Duty: 285 l/s @ 180 Pa	No	1		
F7.2		Supply and install sound attenuators for the above fans complete with supports brackets and flanges.				
F7.2.1		Circular Type: Ø315 x 600mm(L)	No	2		
F7.3		Supply and install Aluminium Supply Air Grilles complete with all necessary fittings, fixings, supports and accessories as scheduled and specified.				
F7.3.1		Size: 150x150	No	4		
F7.3.2		Size: 350x150	No	1		
F7.4		Supply and install 0.6mm Galvanised Sheet Metal Ducting complete with all necessary hangers, brackets and accessories as scheduled and specified. The ducting shall be sealed properly in the joints.				
F7.4.1		Size: Ø150	m	10		
F7.4.2		Size: Ø200	m	15		
F7.4.3		Size: Ø250	m	5		
F7.4.4		Transformation: Ø150 to Ø200	No	1		
F7.4.5		Transformation: Ø150 to Ø250	No	1		
F7.4.6		Transformation: Ø150 to Ø315	No	1		
F7.4.7		Transformation: Ø315 to 400 x 350	No	1		
F7.5		Supply and install wire reinforced aluminium flexible ducting complete with clamps; duct sealant and fixings.				
F7.5.1		Size: Ø150	m	5		
F7.5.2		Size: Ø200	m	1		
TOTAL CARRIED FORWARD						

**SCHEDULE F7: SECOND FLOOR: VENTILATION INSTALLATION**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
F7.6		Supply and install weather louvre complete with wire mesh, all necessary fittings, fixings, supports and accessories as scheduled and specified. All weather louvres shall be installed and fixed in 25mm thick timber frame. Installation of timber frame shall be by builder.				
F7.6.1		Size: 400 x 350 complete with filter	No	1		
F7.7		Supply and install Door Grille complete with all necessary fittings, fixings, supports and accessories as scheduled and specified				
F7.7.1		Size: 500 x 300	No	3		
F7.8		Supply and install air balancing dampers complete with all necessary fittings, fixings, supports and accessories as scheduled and specified				
F7.8.1		Size: Ø150	No	3		
F7.8.2		Size: Ø200	No	1		
F7.9		Final Electrical connection from isolator to the fan	No	1		
F7.10		Equipment and Ductwork labelling as per SABS	Sum	1		
F7.11		Testing and commissioning of all air systems.	No	1		
F7.12		Any other item not specified in the bill. Please specify.	Sum	1		
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE F8: THIRD FLOOR: AIR CONDITIONING INSTALLATION**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
<b>F8</b>		<b>AIR CONDITIONING</b> (REFER TO LAYOUT 32442.00-740-04)  Supply, delivery to site, installation and commissioning of the following complete air conditioning systems as specified in technical specification and as shown on the drawings:				
F8.1		Mid wall split air conditioning system complete with indoor, outdoor unit, refrigerant piping, condensate drainage, controls and corrosion protection of outdoor unit. 7.1 kW Nominal cooling capacity				
F8.1.1		Indoor unit model: 7.1 kW midwall Outdoor unit model: 7.1 kW	No	1		
F8.2		VRF air conditioning system complete with indoor units , outdoor unit, refrigerant piping, condensate drainage, controls and corrosion protection of outdoor unit.				
F8.2.1		7.1 kW VRF Midwall indoor unit	No	1		
F8.2.2		11.2 kW VRF Underside ceiling indoor unit	No	2		
F8.3		Supply and install seamless high pressure refrigeration grade copper pipework for split systems. The piping shall be complete with fittings, joints and headers, tees, fixings, supports and insulation all in cable tray for the following external diameter (OD) sizes. Lokring piping and connection preferred.	Sum	1		
F8.4		Supply and install solvent welded Ø 32 uPVC condensate drain pipework as scheduled and specified complete with 100mm deep P-trap all necessary hangers, supports, fixings and fittings.				
F8.4.1		Ø 32 uPVC - 5 meters per unit	No	4		
F8.5		Supply and install control cabling between outdoor condensing unit and indoor unit	No	4		
F8.6		Supply and install wireless remote controllers with temperature display, temperature set point, 3 fan speeds, heat/cool mode and ON/OFF functions.	No	2		
F8.7		Supply and install wired remote controller with temperature display, temperature set point, 3 fan speeds, heat/cool mode and ON/OFF functions.	No	2		
<b>TOTAL CARRIED FORWARD</b>						

**SCHEDULE F8: THIRD FLOOR: AIR CONDITIONING INSTALLATION**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
F8.8		Supply, install and connect the cable from electrical isolator to condensing unit (1.5m per outdoor unit)				
F8.8.1		1.5 meters per unit	No	4		
F8.9		Supply and install 3 core PVC flexible electrical cable with plug (1.5m indoor unit)				
F8.9.1		1.5 meters per unit	No	4		
F8.10		Install additional control control circuit to indoor units and antilock to motion detector in rooms.	No	4		
F8.11		Supply and install galvanised trunking to cover exposed refrigeration piping with accessories as specified. Galvanised trunking to be painted same colour as the exterior of the building.	Sum	1		
F8.12		Flushing and pressure testing of refrigeration piping.	No	4		
F8.13		Equipment labelling as per SABS	Sum	1		
F8.14		Testing and commissioning of systems	No	4		
F8.15		Apply anti-corrosion treatment on all the condenser coils to outdoor units of the following nominal capacities. Certificate of treatment to be submitted to the design engineer.				
F8.15.1		7.1 kW Nominal cooling capacity	No	1		
F8.16		Removal of existing refrigerant pipework	Sum	1		
F8.17		Any other item not specified in the bill. Please specify.	Sum	1		
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE F9: THIRD FLOOR: VENTILATION INSTALLATION**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
<b>F9</b>		<b>VENTILATION : FRESH AIR SUPPLY AND</b> (REFER TO LAYOUT 32442.00-740-04)				
F9.1		Supply and install extract air supply fan systems complete with sound attenuators, flexible collars, anti-vibration mountings, all necessary fittings, fixings and accessories as shown on drawing and specified. The systems must not exceed 45 dBA noise level taken 1m away from fans.				
F9.1.1		FAF S1 (Inline tube fan AMS TD1000/200 ) Duty: 180 l/s @ 180 Pa	No	1		
F9.2		Supply and install sound attenuators for the above fans complete with supports brackets and flanges.				
F9.2.1		Circular Type: Ø200 x 600mm(L)	No	2		
F9.3		Supply and install Aluminium Supply Air Grilles complete with all necessary fittings, fixings, supports and accessories as scheduled and specified.				
F9.3.1		Size: 150x150	No	2		
F9.3.2		Size: 200x200	No	2		
F9.4		Supply and install 0.6mm Galvanised Sheet Metal Ducting complete with all necessary hangers, brackets and accessories as scheduled and specified. The ducting shall be sealed properly in the joints.				
F9.4.1		Size: Ø150	m	20		
F9.4.2		Size: Ø200	m	5		
F9.4.3		Size: Ø250	m	5		
F9.4.4		Transformation: Ø200 to Ø250	No	3		
F9.4.5		Transformation: Ø250 to 300 x 300	No	1		
F9.5		Supply and install wire reinforced aluminium flexible ducting complete with clamps; duct sealant and fixings.				
F9.5.1		Size: Ø150	m	5		
F9.5.2		Size: Ø200	m	5		
TOTAL CARRIED FORWARD						

**SCHEDULE F9: THIRD FLOOR: VENTILATION INSTALLATION**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
F9.6		Supply and install weather louvre complete with wire mesh, all necessary fittings, fixings, supports and accessories as scheduled and specified. All weather louvres shall be installed and fixed in 25mm thick timber frame. Installation of timber frame shall be by builder.				
F9.6.1		Size: 300 x 300 complete with filter	No	1		
F9.7		Supply and install Door Grille complete with all necessary fittings, fixings, supports and accessories as scheduled and specified				
F9.7.1		Size: 500 x 300	No	2		
F9.8		Supply and install air balancing dampers complete with all necessary fittings, fixings, supports and accessories as scheduled and specified				
F9.8.1		Size: Ø150	No	2		
F9.8.2		Size: Ø200	No	1		
F9.9		Final Electrical connection from isolator to the fan	No	1		
F9.10		Equipment and Ductwork labelling as per SABS	Sum	1		
F9.11		Testing and commissioning of all air systems.	No	1		
F9.12		Any other item not specified in the bill. Please specify.	Sum	1		
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE F10: SERVER ROOM: AIR CONDITIONING INSTALLATION**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
<b>F10</b>		<b>AIR CONDITIONING</b> (REFER TO LAYOUT 32442.00-740-02)  Supply, delivery to site, installation and commissioning of the following complete air conditioning systems as specified in technical specification and as shown on the drawings:				
F10.1		Supply and install expansion down blow close control air conditioning unit, Liebert HPM Model D4H or similar approved to deliver 45.1kW Total Cooling.				
F10.1.1		45.1 kW CRAC airconditioning units.	No	2		
F10.1.2		Close circuit condensing units	No	4		
F10.2		Supply and install seamless high pressure refrigeration grade copper pipework for close control systems. The piping shall be complete with fittings, joints and headers, tees, fixings, supports and insulation all in cable tray for the following external diameter (OD) sizes. Lokring piping and connection preferred.	Sum	1		
F10.3		Supply and install solvent welded Ø 32 uPVC condensate drain pipework as scheduled and specified complete with 100mm deep P-trap all necessary hangers, supports, fixings and fittings.				
F10.3.1		Ø 32 uPVC - 5 meters per unit	No	2		
F10.4		Supply and install control cabling between outdoor condensing units and indoor units	Sum	1		
F10.5		Complete controls installation complete with interlock to existing site SCADA system	Sum	1		
F10.6		Supply, install and connect the cable from electrical isolator to condensing unit (1.5m per outdoor unit)				
F10.6.1		1.5 meters per unit	No	4		
F10.7		Supply, install and connect the cable from electrical isolator to indoor unit (1.5m per outdoor unit)				
F10.7.1		1.5 meters per unit	No	2		
F10.8		Supply and install galvanised trunking to cover exposed refrigeration piping with accessories as specified. Galvanised trunking to be painted same colour as the exterior of the building.	Sum	1		
TOTAL CARRIED FORWARD						

**SCHEDULE F10: SERVER ROOM: AIR CONDITIONING INSTALLATION**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
BROUGHT FORWARD						
F10.9		Flushing and pressure testing of refrigeration piping.	No	2		
F10.10		Equipment labelling as per SABS	Sum	1		
F10.11		Testing and commissioning of systems	Sum	1		
F10.12		Apply anti-corrosion treatment on all the condenser coils to outdoor units of the following nominal capacities. Certificate of treatment to be submitted to the design engineer.	Sum	1		
F10.13		Supply and install Aluminium Supply Air Grilles complete with all necessary fittings, fixings, supports and accessories as scheduled and specified.				
F10.13.1		Size: 600 x 600	No	8		
F10.14		Removal of existing refrigerant pipework	Sum	1		
F10.15		Any other item not specified in the bill. Please specify.	Sum	1		
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE F11: ROOF LEVEL: AIR CONDITIONING INSTALLATION**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE		AMOUNT R	
<b>F11</b>		<b>VRV OUT DOOR CONDENSER UNITS</b> (REFER TO LAYOUT 32442.00-740-05)						
F11.1		Supply and install VRF type outdoor air conditioning units, as per drawings. Each unit to be provided with antivibration pads. Outdoor condenser units to be mounted on concrete plinths at roof level. VRF system to be manufactured by Mitsubishi.	No	4				
F11.2		Supply and install CRAC type outdoor air conditioning units, as per drawings. Each unit to be provided with antivibration pads. Outdoor condenser units to be mounted on concrete plinths at roof level. VRF system to be manufactured by Mitsubishi.	No	2				
F11.3		Supply, install and connect the cable from electrical isolator to condensing unit (1.5m per outdoor unit)						
F11.3.1		1.5 meters per unit	No	6				
F11.4		Supply and install galvanised trunking to cover exposed refrigeration piping with accessories as specified. Galvanised trunking to be painted same colour as the exterior of the building.	Sum	1				
F11.5		Flushing and pressure testing of refrigeration piping.	No	6				
F11.6		Equipment labelling as per SABS	Sum	1				
F11.7		Testing and commissioning of systems	No	6				
F11.8		Connection of CRAC units to BMS system	PC Sum	1	R	15,000	R	15,000
F11.9		Apply anti-corrosion treatment on all the condenser coils to outdoor units of the following nominal capacities. Certificate of treatment to be submitted to the design engineer.						
F11.9.1		VRV Outdoor units	No	4				
F11.9.2		CRAC Outdoor units	No	2				
F11.10		Any other item not specified in the bill. Please specify.	Sum	1				
TOTAL CARRIED FORWARD TO SUMMARY								

**SCHEDULE G1: FIRE WATER INSTALLATION**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
G1		<b>FIRE WATER INSTALLATION</b>				
G1.1		Supply and install class 2 copper piping and fittings for fire water reticulation. Pipe to be installed against the wall or under the soffit. Pipe to be complete with labour, saddles, bracketing and accessories.				
G1.1.1		Ø 54mm class 2 copper piping	m	75		
G1.1.2		Ø 54mm class 2 copper elbow	No	10		
G1.1.3		Ø 54mm class 2 copper tee	No	4		
G1.1.4		Ø 54mm ball valve	No	4		
G1.1.5		Ø 54mm couplings	No	10		
G1.2		Supply and Install HDPE/Polyethylene plastic storage tanks for hose reel. Complete with ball-valve, overflow pipes, inlet float valve, non-return valves, shut-off valves and all necessary accessories.				
G1.2.1		9 000 Litres	No	2		
G1.2.2		Ø 54mm ball valve	No	8		
G1.2.3		Ø 54mm shut-off valve	No	4		
G1.2.4		Ø 54mm non-return valve	No	2		
G1.2.5		Ø 40mm class 2 copper elbows, fittings and couplings	m	15		
G1.2.6		Level control	No	1		
G1.2.7		Ø 54mm strainer	No	1		
G1.3		Supply and Install booster pumps for fire hose reel supply. Complete with pressure vessel, non-return valves, anti-vibration connections, shut-off valves, suction and delivery manifolds, Variable speed drive (VSD), float switches, flow switches, pressure sensors and all necessary accessories to ensure a successful installation. The pumps shall be installed as indicated on the drawings and in accordance to manufacturers' specification and recommendations.				
G1.3.1		Centrifugal multi-stage Booster pump delivery: 20 litres/min @ 400kPa	No	1		
G1.3.2		100 litres Pressure Vessel for the above pumps	No	1		
G1.3.3		Float switch (Water Level sensor)	No	1		
TOTAL CARRIED FORWARD						

**SCHEDULE G1: FIRE WATER INSTALLATION**

ITEM	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward						
G1.3.4		Flow switch	No	1		
G1.3.5		Pressure sensor	No	1		
G1.3.6		90mm diameter Pressure Gauge	No	1		
G1.3.7		Ø 54mm Solenoid Valve	No	1		
G1.3.8		Pumps' control panel c/w with VSD, relays, circuit breakers, wiring, connection, etc	No	1		
G1.3.9		All valves, pipe work, strainers and necessary fittings to complete pumps installation.	Sum	1		
G1.3.10		Service and re-use of existing pump in back-up	Sum	1		
G1.3.11		Testing and commissioning of fire water system.				
TOTAL CARRIED FORWARD TO SUMMARY						

**SCHEDULE G2: FIRE HYDRANTS, HOSE REELS AND PORTABLE FIRE EXTINGUISHERS**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
G2		<b>FIRE HYDRANTS, HOSE REELS AND PORTABLE FIRE EXTINGUISHERS</b>				
G2.1		Supply and install Fire Hose Reels (30m long) swing type c/w chromium plated 25mm valve, fittings, fixings and dial type (100mm) glycerine filled pressure gauge with union and isolating valve suitable for systems working pressure	No	2		
G2.2		Fire Hydrants				
G2.2.1		New external fire hydrant	No	2		
G2.2.2		Lockable fire box with 2 x Ø38 Duraline fire hoses adjacent to fire hydrant	No	1		
G2.2.3		Fire booster connection set	Sum	1		
G2.3		Fire evacuation chairs, complete with wall mounting bracket, similar or equal to EVAC+CHAIR 300H	No	2		
G2.4		1.2 mm x 1.2 mm SABS approved fire blanket	No	4		
G2.5		Supply and Install Portable Fire Extinguishers c/w wall brackets and accessories, following sizes:				
G2.5.1		2.5kg CO2 Fire Extinguisher	No	6		
G2.5.2		5.0kg CO2 Fire Extinguisher	No	3		
G2.5.3		4.5kg DCP Fire Extinguisher	No	5		
G2.6		Painting and labelling of all fire pipework as per SANS 10252	Sum	1		
G2.7		Flushing of pipework and pressure testing as per SANS 10287 and 10252	Sum	1		
G2.8		Fire suppression installation to server room complete with activation and fire detection interlock	Sum	1		
G2.9		Any other item necessary to complete installation	Sum	1		
TOTAL CARRIED FORWARD TO SUMMARY						

SCHEDULE G3: SIGNAGE						
ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
G3		<b>SIGNAGE</b>				
G3.1		SABS 1186-5 fire escape/evacuation signage	Sum	1		
G3.2		SABS 1186-5 fire equipment signage	Sum	1		
G3.3		Supply and install A3 size fire evacuation plans, mounted in aluminium frame with clear perspex protective cover.	No	5		
TOTAL CARRIED FORWARD TO SUMMARY						

**PART C3: SCOPE OF WORK**

<b>Document reference</b>	<b>Title</b>	<b>No of page</b>
C3.1	This cover page	1
	<i>Employer's Works Information</i>	169
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## C3.1 EMPLOYER'S WORKS INFORMATION

### SECTION 1

#### 1 Description of the *works*

##### 1.1 Executive overview

The port control tower was constructed in 1976 to accommodate pilots, staff office space and rest rooms for shift workers. It is further used as a crisis management centre for port business continuity programs and is now too small for current and envisaged future operational requirements. The building is required to be extended to accommodate training facilities, and a new operations floor is to be constructed above the existing operations floor. The existing internal office layout will be reconfigured to provide optimal use of the space. The building shall also include aspects of energy efficiency for water heating, waste handling and rain water usage.

A holistic air-conditioning and ventilation system shall be required to replace the existing split unit arrangement. This shall cater for the health and individual comfort needs of staff within the building as well as maintaining optimum working conditions for computer and server rooms. A new passenger elevator is required to replace the existing one and includes the serving of the new operations floor. A new fire system shall be provided to comply with all national regulations and interlock with the new air-conditioning and ventilation system as well as the new elevator. Electrical installation shall be carried out to enable the operation of the new systems as well as the current functions of the building. A new access control system including CCTV camera system shall be provided.

Additional parking will be created on site to service for the new facilities in accordance with statutory requirements to improve port services to clients and port users. Specialised instrumentation has been shall be relocated from the existing roof to a temporary steel framed structure to allow continued operation during construction of the new floors. Thereafter this equipment shall be relocated to the roof of the building.

Construction of this building started in 2015(?) and was put on hold due to design challenges. The building is therefore partially completed and requires completion of unfinished work and new works and making good damaged areas and deterioration after being left vacant for about 3 years.

The Contractor will be required to inspection the site and verify all remedial works to be undertaken and keep a pictorial record of the site and building condition.

##### **Location of Works**

All the work sites are situated within the boundaries of the port of Richards Bay, Meerensee area. The port control tower is accessed via public roads and is not located within the harbour fence line perimeter.

##### **Access to the works**

Access to the works shall be from existing public road networks; access to the port control tower shall be through the suburb of Meerensee, at the intersection of Challenor Ridge Road and Van Rooyenweg.

Access shall be subject to the Employer's security requirements and additional access to Meerensee may be formed through the dune vegetation.

## 1.2 Employer's objectives

The works that the Contractor is to perform involve the following:

- The alterations of the existing Port control building as per standards and requirements stated in this document;
- The civil, structural, mechanical and instrumentations as well as electrical works shall be constructed based on the design contained in this document.
- The completion of the works as set out in this document such that the current functions of the building is not impeded; and
- Any other work arising out of or incidental to the above, or required of the Contractor for the proper completion of the works in accordance with the true meaning and intent of the contract document.

## 1.3 Interpretation and terminology

The following abbreviations are used in this Works Information:

Abbreviation	Meaning given to the abbreviation
CA	Contract Administrator
PM	Project Manager
PEO	Project Environment Officer
TNPA	Transnet National Port Authority
AIA	Authorised Inspection Authority
BBBEE	Broad Based Black Economic Empowerment
CEMP	Construction Environmental Management Plan
CD	Compact Disc
CDR	Contractor Documentation Register
CDS	Contractor Documentation Schedule
CRL	Contractor Review Label
CSHEO	Contractor's Safety, Health and Environmental Officer
CM	Construction Manager
DTI	Department of Trade and Industry
DWG	Drawings
EO	Environmental Officer
HAW	Hazard Assessment Workshop
HAZOP	Hazard and Operability Study

HSSP	Health and Safety Surveillance Plan
INC	Independent Nominated Consultant
IP	Industrial Participation
IR	Industrial Relations
IPP	Industrial Participation Policy
IPO	Industrial Participation Obligation
IPS	Industrial Participation Secretariat
IRCC	Industrial Relations Co-ordinating Committee
JSA	Job Safety Analysis
CIRP	Contractor's Industrial Relations Practitioner
Native	Original electronic file format of documentation
PES	Project Environmental Specifications
PHA	Preliminary Hazard Assessment
PIRM	Project Industrial Relations Manager
PIRPMP	Project Industrial Relations Policy and Management Plan
PLA	Project Labour Agreements
PSIRM	Project Site Industrial Relations Manager
PSPM	Project Safety Program Manager
PSSM	Project Site Safety Manager
ProgEM	Programme Environmental Manager
ProjEM	Project Environmental Manager
QA	Quality Assurance
R&D	Research and Development
SANS	South African National Standards
SASRIA	South African Special Risks Insurance Association
SES	Standard Environmental Specification
SHE	Safety, Health and Environment
SHEC	Safety, Health and Environment Co-ordinator
SIP	Site Induction Programme
SMP	Safety Management Plan
SSRC	Site Safety Review Committee

## 2 Engineering and the *Contractor's* design

### 2.1 *Employer's* design

#### 2.1.1 The *Employer's* design for the *works* is:

The *Employer's* design for permanent structures was undertaken by an appointed *Consultant* who will be part of the *Employer's* team to assist with the design and supervision

The *Employer* shall supply the following information to the *Contractor*:

- Works Information;
- technical specifications;
- structural concrete drawings;
- Civil works drawings
- structural steelwork general arrangement drawings (excluding shop detailing drawings); and
- Architectural drawings.
- Electrical drawings
- Mechanical and Instrumentation drawings
- Fire drawings

2.1.2 The *Employer* grants the *Contractor* a licence to use the copyright in design data presented to the *Contractor* for the purpose of the *works* (and the *Contractor's* obligation under paragraph 2.2 of the *Employer's Works Information*) ONLY.

## **2.2 Parts of the works which the Contractor is to design**

2.2.1 The Contractor is to design the following parts of the works:

- a) formwork, scaffolding, concrete mix design and shop detailing for approval by the *Project Manager*;
- b) The *Contractor* shall provide all water reticulation and plumbing drawings including pipe routes and diameters, compiled by a services engineer.
- c) The *Contractor* shall design the new passenger elevator for the port control tower described within this document according to relevant national standards.
- d) The *Contractor* shall design all bolted or welded connections. Over designed connections shall be rectified on drawings or on Site at the Contractor's expense.
- e) The *Contractor* shall design the strength concrete mix in accordance with SANS 1200 G, and in accordance with the Employer's specifications.

2.2.2 The *Contractor* is responsible in his design for the overall integration of the design of the *works* with the design of the *Employer* as stated under 2.1 *Employer's* design above.

2.2.3 Unless expressly stated to form part of the design responsibility of the *Employer* as stated under 2.1 *Employer's* design above and whether or not specifically stated to form part of the design responsibility of the *Contractor* under this paragraph 2.2, all residual design responsibility and overall responsibility for the total design solution for the *works* rests with the *Contractor*.

## **2.3 Procedure for submission and acceptance of Contractor's design**

2.3.1 The *Contractor* shall address the following procedures:

- a) The Contractor shall submit detail drawings and material lists for checking by the Project Manager. The member sizes shown on the Project Manager's design drawings shall not be changed without the Project Manager's written consent.

## **2.4 b) Review and Acceptance of Contractor Documentation**

The *Contractor* submits documentation as the '*Works Information*' requires to the *Project Manager* for review and acceptance.

In undertaking the '*Works*' (including all incidental services required), the Supplier shall conform and adhere to the requirements of the '*Contractor Document Submittal Requirements*' Standard.

## **2.5 Other requirements of the Contractor's design**

2.5.1 The *Contractor's* design complies with the following:

- a) all requirements of SANS 1200; COLTO and
- b) all requirements of the *Employer's* standard specifications.
- c) The requirements for the harsh corrosion environment.
- d) Compliance to OHS Act and Construction Regulations and
- e) TNPA CEMP.

### **Review and acceptance of Contractor's documentation**

The Contractor shall submit two sets of shop detail drawings to the Project Manager for verification, prior to fabricating steelwork. The Project Manager shall mark up and return one set of shop detail drawings within 10 (ten) working days after receiving the Contractor's shop detailing

## **2.6 Use of Contractor's design**

2.6.1 The *Contractor* grants the *Employer* a licence to use the copyright in all design data presented to the *Employer* in relation to the *works* for any purpose in connection with the construction, re-construction, refurbishment, repair, maintenance and extension of the *works* with such licence being capable of transfer to any third party without the consent of the *Contractor*.

2.6.2 The *Contractor* vests in the *Employer* full title guarantee in the intellectual property and copyright in the design data created in relation to the *works*.

## **2.7 Design of Equipment**

2.7.1 The *Contractor* submits his design details for the following categories of his proposed principal Equipment to the *Project Manager* for his information only:

- Provide shop drawings for the elevator.

2.7.2 The following principal Equipment categories deployed for the *Contractor* to provide the *Works* require its design to be accepted by the *Project Manager* under ECC Clause 23.1.

## **2.8 As-built drawings, operating manuals and maintenance schedules**

2.8.1 The Contractor provides the following in both electronic (soft) and 2 x hard copies:

- The Contractor must provide the Employer all necessary as built-information, including possible surveyed items, required to update drawings and any other documentation. There must be no compensation for the provision of this data as this must be deemed to be included in the Contractor's Preliminary and General rates.

- The Contractor must provide the operation and maintenance manuals.
- The Contractor provides manuals in an A4 hard covered, red, grease and waterproof binder, using 2 ring type binders. The manuals are well indexed and user friendly and include a summarized Table of Contents.
- Drawings and charts larger than A4 are folded and those greater than A3 are enclosed in an A4 plastic pocket of adequate strength.
- The Contractor submits the draft Table of Contents to the Project Manager for acceptance prior to the compilation and official submittal of the manuals.
- The originals of all brochures must be issued to the Project Manager. When a general brochure is applicable to a range of equipment, then the specific item, catalogue number or model number must be stated, which is best achieved by introducing a separate index page, which cross-references the specific item to a tag number.
- The address, phone numbers, fax numbers and reference numbers of all Sub-Contractors must be provided.
- Where manuals include drawings that still need to be revised to As-Built status, and such manuals are required prior to As-Built status, the manual must not be considered to be in its final form until the As-Built version of each such drawing has been incorporated.
- Copies (hard and soft) of the Health and Safety file to be handed over the Project Manager upon completion.
- A typical example of what the binder/file(s) must be marked on the spine and the front cover is as follows:
  - Project Name
  - Manual Title, e.g. Installation, Maintenance and Operating Manual
  - FBS No. and Title
  - Manual Numbering (e.g. Volume 1 of 2, etc.)
  - Contract Number
  - Contractor Name

### **3 Construction Works**

#### **3.1 Temporary works, Site services & construction constraints**

##### **3.1.1 Employer's Site entry and security control, permits, and Site regulations**

- 3.1.1.1 The Contractor must comply with the Employer's Site entry and Port security control, permits and Site regulations. The Employer provides coded ID cards to all Contractors' employees for access/egress of personnel, plant, material and equipment within the Site boundaries.
- 3.1.1.2 Access must be subject to the Transnet National Ports Authority security requirements and regulations, which states that "access should be obtained for all the Contractor's personnel at Permit Office located at Sizakala Truck Staging Facility". The Contractor must make a cost and time allowance for obtaining the necessary permits, including

labour and transportation within his rates. All Contractor personnel must at all times wear their security identity (ID) card so as to be easily identifiable as being employed by the particular company concerned.

3.1.1.3 The Contractor must ensure that all materials, machinery or equipment brought by him onto the premises are recorded at the main gate(s) and/or checkpoint(s). Failure to do this may result in a refusal by the Employer to allow the materials, machinery or equipment to be removed from the premises.

3.1.2 The *Contractor* complies with the following requirements:

3.1.2.1 The Contractor shall be specifically excluded from entering the Employer's operational areas which are adjacent to the Site and Working Areas.

3.1.2.2 The Contractor shall plan and organise his work in such a manner so as to cause the least possible disruption to the Employer's operations.

3.1.2.3 The Contractor shall ensure the safe passage of Contractor's traffic to and around the Site and Working Areas at all times that includes providing flagmen, protective barriers, signage, etc. for protection, direction and control of traffic.

3.1.2.4 The Contractor shall ensure that any of his staff, labour and Equipment moving outside of his allocated Site and Working Areas does not obstruct the operations of the port. To this end access routes are allocated and coordinated by the Project Manager.

3.1.2.4 The Contractor shall ensure that all his construction staff, labour, and Equipment remains within his allocated and fenced off construction area.

3.1.2.5 All Contractor's staff and labour working within the port shall comply with the Employer's operational safety requirements and shall be equipped with all necessary PPE, high visibility apparel and, when working within two meters of the quay wall, floating apparel of the Employer:

3.1.3 People restrictions on Site; hours of work, conduct and records:

The Contractor shall keep daily records of his people engaged on the Site and working areas (including Subcontractors) with access to such daily records available for inspection by the Project Manager at all reasonable times

3.1.4 The *Contractor* complies with the following hours of work for his people (including Subcontractors) employed on the Site:

Normal working hours at the Port of Richards Bay are from 08:00 to 16:30, Monday to Friday, Inclusive. For any extended hours or overtime the Contractor shall apply in writing and obtain approval from the Project Manager / Employer.

3.1.5 The *Contractor* keeps daily records of his people engaged on the Site and Working Areas (including Subcontractors) with access to such daily records available for inspection by the *Project Manager* at all reasonable times.

3.1.6 Health and safety facilities on Site

3.1.7 The *Contractor* complies with the requirements stated under paragraph 2.3 of C3.1 *Employer's Works Information*.

3.1.8 Environmental controls, fauna & flora, dealing with objects of historical interest

3.1.9 The *Contractor* complies with the CEMP, SES and PES in the construction of the *works*, all as described under paragraph 2.4 of C3.1 *Employer's Works Information*.

3.1.10 Title to Materials from demolition and excavation

The Contractor shall have no title to all materials arising from excavation and demolition in the performance of the works with title to such materials remaining with the Employer.

Existing materials on site: the contractor to review and confirm the condition of all building material on site that includes re-bar; bricks, etc.

3.1.11 The Project Manager shall instruct the Contractor how to label, mark, set aside and/or dispose of such materials for the benefit of the Employer in accordance with ECC3 Clause 73.1.

3.1.12 The *Contractor* has no title to all Materials arising from excavation and demolition in the performance of the *works*, such Materials remaining with the Employer. The Project Manager shall instruct the Contractor how to label, mark, set aside and/or dispose of such Materials for the benefit of the Employer in accordance with ECC Clause 73.1.

3.1.13 Cooperating with and obtaining acceptance of others

The Employer (including the agents of the Employer) shall operate on Site during the entire duration of the contract period.

3.1.14 The *Contractor* performs the *works* and co-operates with: TNPA engineering and Consultant.

3.1.15 Publicity and progress photographs

The Contractor shall not advertise the contract or the project to any third party, nor communicate directly with the media (in any jurisdiction) whatsoever without the express written notification and consent of the Project Manager.

3.1.16 The Contractor provides a one (1) name board as per drawing provided. The sites will be identified and instructed by the Project Manager.

3.1.17 The name board must be erected within a month of the commencement date of the contract and must be placed at the positions indicated by the Project Manager. Any damage to these boards must be repaired within fourteen days of a written instruction issued by the Project Manager. No payment must be made in terms of the contract prior to the erection of the name board.

3.1.18 The Contractor shall obtain the permission and approval of the Project Manager before erecting any notice boards or using the details of the contract in any advertising media.

3.1.19 The Contractor shall provide a complete digital photographic record of the progress of the construction of the works to the Project Manager, monthly as part of the Contractor's monthly programme narrative report.

3.1.20 The *Contractor* does not advertise the contract or the project to any third party, nor communicate directly with the media (in any jurisdiction) whatsoever without the express written notification and consent of the *Project Manager*.

3.1.21 *Contractor's* Equipment

The Contractor shall keep daily records of his Equipment used on Site and the Working Areas (distinguishing between owned and hired Equipment) with access to such daily records available for inspection by the Project Manager at all reasonable times.

3.1.22 The *Contractor* keeps daily records of his Equipment used on Site and the Working Areas (distinguishing between owned and hired Equipment) with access to such daily records available for inspection by the *Project Manager* at all reasonable times.

3.1.23 Equipment provided by the *Employer*

No Equipment shall be provided by the *Employer*.

3.1.24 The *Employer* provides the following Equipment on the Site for the *Contractor's* use: None

3.1.25 The *Contractor* complies with the following conditions in using the *Employer's* Equipment: Not Applicable.

3.1.26 Site services and facilities:

For the duration of the contract, the Project Manager shall provide an area, free of charge, for the Contractor to establish his offices, lay down areas, stores, workshops, and other Contractor's Equipment.

The Contractor shall provide the following connections to services within the Site for the Contractor's use:

- a) 50mm Isolation valve for construction potable water; and circuit breaker for construction power at 380 Volts, 3-Phase and Neutral, 50Hz; and
- b) a connection to the Employer's water borne sewage network. Where no suitable connection to a sewerage system is feasible, portable chemical type toilets shall be used.

3.1.27 The *Employer* provides the following facilities for the *Contractor*:

- Potable water for consumption and construction
- Electricity

The contractor will have to make necessary arrangements to connect electricity and water to points provided by the client.

3.1.28 Wherever the *Employer* provides facilities (including, *inter alia*, temporary power, water, waste disposal, telecommunications etc.) for the *Contractor's* use within the Working Areas and the *Contractor* adapts such facilities for use, then the *Contractor* makes good and provides full reinstatement to the land (including all apparatus of the *Employer* and Others in, on or under the land) and surrounding areas to its original standard upon dismantling of such facilities and hand-back to the *Employer*.

3.1.29 Facilities provided by the *Contractor*:

- 3.1.30.1 The Contractor shall ensure that his Site establishment area is compliant with the relevant safety regulations and restrictions and is clearly sign posted.
- 3.1.30.2 All costs for preparation of the Site establishment area shall be for the Contractor's account.
- 3.1.30.3 The Contractor shall submit details of the layout of his Site establishment to the Project Manager for his acceptance.
- 3.1.30.4 The Contractor shall install a metering device, accepted by the Project Manager, immediately downstream at each of the Employer's connections from where he draws services. The Contractor shall provide the Project Manager details of his monthly consumption of potable water and power.
- 3.1.30.5 The Contractor shall be responsible for his own connection to the Employer's services and for the reticulation of his services from the connection point. The cost of meters, connections, reticulation and all other usage costs associated with the provision of services shall be for the Contractor's account.

- 3.1.30.6 The Contractor shall provide the Project Manager with a “Certificate of Compliance” (“COC”), by an “accredited” person as defined by the OHS Act, in respect of his Construction Power electrical installation. The Project Manager shall only make construction power available upon receipt of the COC.
- 3.1.30.7 The Supervisor (or his nominated representative) shall conduct routine inspections of the Contractor’s construction power reticulation and power tools. If found to be unsafe and / or non-compliant with statutory requirements, the electrical power supply shall be disconnected until the Contractor rectifies all defaults.
- 3.1.30.8 The Contractor shall provide, at his cost, a sufficient number of toilets and maintains them in a clean and sanitary working condition.
- 3.1.30.9 Wherever the Contractor provides facilities and all items of Equipment, involving, *inter alia*, offices, accommodation, laboratories, Plant and Material storage, etc., within the Working Areas, the Contractor shall make good and provide full reinstatement to the land (including all apparatus of the Employer in, on or under the land) and surrounding areas to its original standard, upon dismantling of such facilities and items of Equipment.
- 3.1.30.10 Upon completion, and within one month of the date of acceptance of the works, the Contractor shall completely remove from the Site and Working Areas all his Equipment, including the foundations of any structures, stores, office accommodation or any other asset belonging to him, and shall leave the Site and Working Areas in a tidy condition to the satisfaction of the Project Manager.
- 3.1.30.11 No excess or discarded materials or Equipment shall be buried or dumped within the port boundary.
- 3.1.30.12 Demolition of all temporary structures, surfaces etc. shall be first approved by the Project Manager prior to the work being carried out.
- 3.1.30.13 The Employer shall not provide any security for the Site and working areas. The Contractor shall provide same and indemnifies and holds indemnified the Project Manager and Employer against any claims and actions that may arise out of Site and Working Area security.
- 3.1.30.14 The Contractor shall sign the in-survey and out-survey and furnishes copies in accordance with the CDS to the Project Manager for record purposes.
- 3.1.30.15 Control of noise, dust, water and waste
- Before moving Plant and Material onto the Site and Working Areas and commencing operations, the Contractor shall submit his proposed methods of construction which demonstrate the measures taken to avoid and or reduce any nuisance arising from dust, noise and vibration for acceptance by the Project Manager.
- 3.1.30 The *Contractor* provides the following facilities for the *Project Manager* and *Supervisor*:
- Office with desk and three chairs,
  - Fridge
- 3.1.31 Wherever the *Contractor* provides facilities (either his own or for the *Project Manager* and/or *Supervisor*) and all items of Equipment, involving, *inter alia*, offices, accommodation, laboratories, Materials storage, compound areas etc, within the Working Areas, then the *Contractor* makes good and provides full reinstatement to the land (including all apparatus of

the *Employer* and Others in, on or under the land) and surrounding areas to its original standard, upon dismantling of such facilities and items of Equipment.

3.1.32 Unless expressly stated as a responsibility of the *Employer* as stated under 5.1.11 Site services and facilities, all residual requirements for the provision of facilities and all items of Equipment necessary for the *Contractor* to Provide the *Works* remains the responsibility of the *Contractor*.

3.1.33 Existing premises, inspection of adjoining properties and checking work of Others

3.1.34 The Contractor inspects and surveys the buildings/premises/facilities/various work sites in order to establish the existing building and site conditions and state of repair prior to construction and report the condition assessment to the project Manager. Contractor must take photos of before and after construction and keep records for submission to Project Manager whenever the need arises. All these records must be submitted to the Project Manager at completion of the project, this shall be deemed to have been included in the relevant rates, i.e. as built-information.

3.1.35 Survey control and setting out of the *works*

3.1.37.1 The *Employer* provides the following information and survey controls for the *Contractor*:

3.1.37.2 The Project Manager shall provide benchmarks and survey control points to the Contractor.

3.1.37.3 On completion of construction (or profiling of the relevant area) to the required tolerances, the Contractor must provide the out-survey, which records the final levels on a drawing, for acceptance by the Project Manager.

3.1.37.4 The Contractor must sign the in-survey and out-survey and furnish copies in accordance with the CDS to the Project Manager for record purposes

3.1.36 Excavations and associated water control

3.1.38.1 The Contractor must protect all excavations against any water ingress whether by seepage, rains, storms, floods or any other means at own cost.

3.1.38.2 The *Contractor* must immediately remove any water found in the excavation by pumping and provide all necessary Equipment (pumps, pipes, etc.) to do so. Water must be cleared in such a way that it cannot seep or flow back into the excavations.

3.1.38.3 Probability of Asbestos Contamination in Excavations:

- The *Contractor* must ensure his personnel are equipped with the necessary PPE and trained to recognise asbestos contamination.
- On encountering asbestos contamination, the *Contractor* must immediately stop all work in the affected area, summon the *Supervisor* and secure the area.
- The *Supervisor* must arrange for a specialist waste disposal *Contractor* to collect, bag, remove and dispose the contaminated material from the excavation.
- The *Contractor* must continue with the excavation of bulk earthworks on receipt of a written instruction from the *Supervisor*.

3.1.37 Underground services, other existing services, cable and pipe trenches and covers

3.1.39.1 As a guide only, the Project Manager must provide the Contractor with drawing(s) showing various known existing underground services for his information. It is however

possible that there is other existing services, which are not reflected and which may affect the works.

3.1.39.2 The Contractor must establish the location of the various existing services situated within the Site and Working Areas and record all such information on marked-up drawing(s) which remain available for reference at all times.

3.1.39.3 The Contractor shall make every effort to carefully locate all services, whether known or unknown, prior to beginning any works and shall make the necessary arrangements for protection or isolation thereof as necessary. On recovering new services, the Contractor must mark them on the drawings and these will become known services.

3.1.39.4 The Contractor must exercise due care and attention in carrying out any excavation work to avoid damage or disruption to existing services. The Contractor must accordingly consult the Project Manager prior to undertaking any excavation work.

3.1.39.5 Should the Contractor fail to exercise the requisite care and attention in carrying out the excavation work, the Contractor will be held liable for any claims arising out of damage caused by such excavation.

3.1.38 Where the *Contractor* encounters existing services (e.g. underground services/existing services cables/water and sewer pipes/manholes/stormwater pipes), the Contractor undertakes the following:

- Notify the *Project Manager* and Port Engineer's Office immediately.
- Treat all systems as live, wait for the instruction from *Project Manager*.
- Provide adequate support and or protection to the service(s).
- Mark up and describe the service(s) on a site plan for record purposes

3.1.39 Control of noise, dust, water and waste

3.1.40 The *Contractor* complies with the following:

Before moving Plant and Material onto the Site and Working Areas and commencing operations, the Contractor shall submit his proposed methods of construction which demonstrate the measures taken to avoid and or reduce any nuisance arising from dust, noise and vibration for acceptance by the Project Manager.

3.1.41 Sequences of construction or installation

3.1.42 The *Contractor* complies with the following:

The proposed general sequencing of the works is as follows:

- Submit and obtain approval of the works and equipment from *Employer* (Project File).
- Obtain Site Access.
- Inspect and determine the quantity of work to be done.
- Prepare and corrosion protect all Steel.
- Manufacture and deliver to site materials.
- Check Quality Control and Issue Warranty of Corrosion Protection system

3.1.43 Giving notice of work to be covered up

3.1.45.1 The *Contractor* must notify the *Supervisor/Project Manager* in writing of any elements of the works which are to be covered up. This notification must be given in no less than 24 (twenty-four) hours prior to the proposed covering up.

#### 3.1.44 Hook ups to existing *works*

#### 3.1.45 The *Contractor* complies with the following constraints in the execution of the *works*:

The Contractor shall comply with the following constraints and procedures of the Employer where the Project Manager arranges access for the Contractor after Completion:

- a) Safety, access control and work procedures as determined by the Employer's terminal operator.
- b) Work to be done by other specialist companies on their equipment related to Port Control work such and those will be
  - SANDF
  - RADAR and ANTENNAS for vessels communication
  - SERVER ROOM SPECIALIST
  - TFR NETWORKS

### 3.2 Completion, testing, commissioning and correction of Defects

#### 3.2.1 The *work* to be done by the Completion Date

On or before the Completion Date the Contractor shall have done everything required to Provide the Works including the work listed below which is to be done before the Completion Date and in any case before the dates stated. The Project Manager cannot certify Completion until all the work listed below has been done and is also free of Defects, which would have, in his opinion, prevented the Employer from using the works and others from doing their work.

Item of work	To be completed by
As built drawings as specified in the <i>Employer's</i> Works Information	Within 14 days prior to Completion.
Performance testing of the <i>works</i>	Sectional completion dates

#### 3.2.2 The *Contractor* is permitted to carry out the following *works* after Completion:

- 3.2.2.1 Only snag list and rectification of defects identified during retention phase and maintenance period for hot dip galvanising and/or corrosion protection.

#### 3.2.3 Use of the *works* before Completion has been certified

#### 3.2.4 The *Employer* uses the following part / parts of the *works* before Completion is certified by the *Project Manager* which do not constitute take over by the *Employer* for the reason(s) stated: Server room

#### 3.2.5 Materials facilities and samples for tests and inspections

##### 3.2.5.1 *Contractor* shall provide the following:

- all materials, facilities and apparatus required for any test and/or inspections required by the Works Information; and
- samples (e.g. concrete cube results, warranties for paintwork, galvanising, electrical and mechanical installations) as required by the Works Information.

- 3.2.6 The *Contractor* provides the *Employer* with the following [state what facilities will be made available and when, what Materials if any and samples in order for the *Supervisor* to perform his tests and inspections as described under paragraph 5.2.1 of C3.1 *Employer's Works Information*] as ECC Clause 40.2:
- 3.2.6.1 The *Contractor* must ensure that all the works specified on the *Employer's Works Information* is completed, functional to bring the works in use for its intended purpose and required documentation on completion is submitted to the *Project Manager*.
- 3.2.7 Commissioning – all pre-commissioning activities to be planned and the Employer to be informed to witness the commissioning.
- 3.2.8 The *Contractor* provides the following commissioning activities to bring the *works* in use in liaison with the *Employer*: Mechanical works
- 3.2.9 Start-up procedures required to put the *works* into operation. The employer to witness the process.
- 3.2.10 The *Contractor* performs the following duties and actions on behalf of the *Employer* to put the *works* into operation: Sign off all quality check list before commissioning.
- 3.2.11 Take over procedures is after or at the same time as completion.
- 3.2.12 The *Contractor* provides the following assistance to the *Employer*: Not applicable
- 3.2.13 The *Contractor* ensures that the documentation as described under paragraph 3.8 of the *Works Information* is presented to the *Project Manager* before Completion.
- 3.2.14 The *Contractor* ensures that the *Project Manager* has a full and accurate dossier of As-built documents that represent the Civil, building, structural, Mechanical, Electrical, Instrumentation, General Layout as appropriate status of the completed *works* (to include Plant within the *works*) to present to the *Employer*.
- 3.2.15 The *Contractor* ensures that the *Project Manager* has a full and accurate dossier of civil, building, structural, Maintenance and Operating Manuals as appropriate at the earlier of take-over or Completion.
- 3.2.16 Access given by the *Employer* for correction of Defects
- 3.2.17 The *Contractor* complies with the following constraints and procedures of the *Employer* where the *Project Manager* arranges access for the *Contractor* after Completion:
- 3.2.18 Performance tests after Completion
- 3.2.19 The *Contractor* performs the following performance tests after Completion of the *works*:
- 3.2.20 Training and technology transfer
- 3.2.21 The *Contractor* facilitates the following requirements for training *workshops* after Completion for the *works* in use:
- 3.2.22 The *Contractor* arranges for the following technology transfer to the *Employer* after Completion for the *works* in use:
- 3.2.23 Operational maintenance after Completion
- 3.2.24 The *Contractor* performs the following operational maintenance in relation to the *works* after Completion:

## 4 Plant and Materials Standards and Workmanship

### 4.1 Investigation, Survey and Site Clearance

- 4.1.1 The *Contractor* carries out the following investigations: i.e. existing facilities, services, servitudes, electrical connection, water services, building materials on site, etc. at the Site:  
Maintain a record of the conditions of all existing buildings, structures and services.

### 4.2 Building works

- 4.2.1 Where the Association of South African Quantity Surveyors Model Preamble for Trades 1999 are used within the Works Information, the following interpretations and meanings shall apply:
- 4.2.2 In case of any conflict in interpretation, ambiguity or discrepancy between any Model Preamble for Trades 1999 (whether standard or written as a particular project specification) contained in the *Works Information* and the *conditions of contract*, the *conditions of contract* take precedence within the ECC Contract.
- 4.2.3 In case of any conflict in interpretation, ambiguity or discrepancy between any Model Preamble for Trades 1999 (whether standard or written as a particular project specification) contained in this paragraph 4.2 of C3.1 *Employer's Works Information* and specific statements contained elsewhere in C3.1 *Employer's Works Information*, the specific statements contained elsewhere shall prevail, without prejudice to the *Project Manager's* express duty to resolve any ambiguity or inconsistency in the *Works Information* under ECC Clause 17.1.
- 4.2.4 Within the Model Preambles for Trades 1999, the following amendments and interpretations shall apply:
- Where the word or expression "Principal Agent" is used, read "*Project Manager*" or "*Supervisor*" as the context requires.
- Where the word or expression "*Contractor*" is used, read "*Contractor*".
- Where the word or expression "Engineer" is used, read "*Project Manager*" or "*Supervisor*" as the context requires.
- Where the Model Preambles for Trades 1999 mention "rates" for measured work and any contractual statements relating to payment, all such statements shall be discounted, with the ECC *conditions of contract* taking precedence.
- 4.2.5 Within the Model Preambles for Trades 1999, A. GENERAL, the following amendments and interpretations shall apply:
- Where the word or expression "bills of quantities" is used, this shall be discounted for the purposes of the *Works Information*. The ECC Contract Data - Part One states the main option to apply within the ECC Contract between the Parties.
- 4.2.6 Within the Model Preambles for Trades 1999, B. ALTERATIONS, B.2 MATERIALS FROM THE ALTERATIONS, CREDIT, ETC and C. EARTHWORKS, C1.4 Materials from demolitions shall not apply. C3.1 *Employer's Works Information* paragraph 3.1.6 states details of the *Contractor's* title

(if any) to Materials arising from excavations and/or demolitions and how such Materials are either to be disposed of or re-used in the *works*.

4.2.7 Within the Model Preamble for Trades 1999 Q. PLUMBING AND DRAINAGE, Q.24 TESTS shall be deemed to be included within paragraph 3.2.1 of C3.1 *Employer's Works Information*.

4.2.8 Within the Model Preamble for Trades 1999 U. EXTERNAL WORKS, U.3.8 Process control tests shall be deemed to be included within paragraph 3.2.1 of C3.1 *Employer's Works Information*.

4.2.9 The principles, meanings and interpretation stated and established within paragraphs 6.2.1 to 6.2.8 with respect to the Model Preambles for Trades 1999 equally apply to the other Model Preambles for Trades 1999 references used within this paragraph 4.2 of C3.1 *Employer's Works Information*.

#### 4.2.10 **Particular specifications provided by the Employer**

##### 4.2.10.1 Scope of demolition work

The *works* includes for demolition as follows:

- Demolishing walls, partitions, ceilings, floor finishes, doors, as specified on the demolition drawings, or in the bill of quantities; and
- The removal of all waste and or rubble from Site.
- The stabilization of the structure during all demolition works

##### 4.2.10.2 **The design and supply of access for all demolition works (scaffolding, etc.)** Existing services

- a) All known services are provided on the drawings. The Contractor shall take the necessary precautions to ensure that the services within the Site are not damaged. The existing water supply to the buildings shall be temporarily shut off at the closest valve to be determined on Site, prior to the removal of plumbing fittings and demolition.
- b) An alternate water supply line shall be constructed to provide water to existing ablutions. There shall be a phased sequence of demolition.
- c) The Contractor shall hand excavate the first 1m of any excavation, in order to prove services.
- d) As soon as any underground services not shown on the drawings are discovered, it shall be brought to the attention of the Project Manager. The Contractor must in collaboration with the Project Manager, ascertain whether or not the service is live. The Contractor shall not uplift any such service unless he is instructed to do so.
- e) The Contractor shall be held responsible for any damage to known services, (i.e. services that are within the Site and are shown on the

drawings), and shall take all necessary measures to protect them. In the event of a service being damaged, the Contractor shall immediately notify the Project Manager. The Contractor shall not repair any such service unless he is instructed to do so.

#### **4.2.11 Scope of work**

##### **4.2.11.1 Description of the scope of work - Building**

4.2.11.2 The construction requires the relocation of the existing fire escape stairs, to allow for development of the drivers ablutions at ground floor.

4.2.11.3 The drivers' rest rooms and ablutions shall be located at ground floor level. A new security entrance is located adjacent the existing lift shaft. All visitors to the Site shall be validated at this point. The training center shall be accessed from the car park area, and trainees shall not pass through security. Personnel using the training center shall share the drivers' ablution facilities, but shall not be able to access other areas of the ground floor. The Employer's staff may access the drivers' ablutions using the security door and ID tagging system.

4.2.11.4 The pilots' male and female dormitories are located at first floor level, along with the offices for the marine safety officer and marine safety manager's office. Ablutions, archive room, server room and disabled toilet are all located on the first floor level. The disabled toilet is accessed via the lift.

4.2.11.5 The second floor level consists of offices for the harbour master and deputy harbour master. Access to these offices is restricted via the secretary's office, which also contains a filing area. The operations co-coordinator's office, ablutions and board room is also located on the second floor level.

4.2.11.6 The existing roof is under reinforced, and cannot be used to support the loads imposed by the new operating floor. The operations floor requires service access below the floor. Therefore, a new slab shall be cast above the existing roof slab to form the new third floor level. The third floor shall support the new operator's floor, and also form the services duct required.

4.2.11.7 The berth planner and operations area is located on the new third floor. In order to facilitate safe access to this new floor, the existing staircase shall have a new concrete topping added above the existing staircase to accommodate the new level.

4.2.11.8 The existing lift shaft shall be extended to the new third floor level and a new lift shall be installed as specified in this document.

4.2.11.9 A new central air-conditioning system shall replace the split units currently in use, as specified in HVAC specification. A false floor shall be installed in the server room of the first floor to accommodate the specialized air-conditioning units in that area. The Contractor shall require chasing in of air-conditioning piping into walls as well as coring into walls for refrigerant piping, vent fans and ducting.

- 4.2.11.10 New lighting shall be installed throughout the structure as specified in Electrical specification. A fire detection and suppression system shall be installed in the building as specified in this document. The Contractor shall require coring through each floor for the installation of the new fire water main.
- 4.2.11.11 The existing earthworks profile surrounding the current building shall be reshaped to suit the additional parking bays required for the facility. The current entrance to the Site shall be relocated to suit the modified parking philosophy. A new gate house shall be constructed.
- 4.2.11.12 A new steelwork tower shall be constructed alongside the existing port control tower. This shall be accessed by scaffolding staircases, and shall be used to relocate the services currently situated on the roof of the port control tower which shall be raised in height.
- 4.2.11.13 Once the new additions and alterations are completed, the services shall be relocated to the roof of the new port control tower.
- 4.2.11.14 A dedicated demarcated area shall be allocated outside the building to house waste bins for paper, glass, plastics as well as general waste for recycling. The bins shall be colour-coded and easily identifiable. The area shall be easily accessible to waste removal vehicles and be self-contained to prevent spillage and pollution of the waste into the surrounding areas. Proper signage shall be provided to assist staff and visitors to promote correct waste disposal.
- 4.2.11.15 A lockable painted mild steel cycling rack shall be located in a demarcated area within the building, which shall encourage individuals to cycle to work.
- 4.2.11.16 The building design shall accommodate for gutters from the roof to channel rain water to dedicated storage tanks which shall be kept in close proximity to the building. The tank shall be located along the western fence-line and be used to water nearby gardens by hand.
- 4.2.11.17 The port control tower's heating and cooling requirements shall be satisfied in a holistic manner. It is envisaged that the rate and total quantity of heat rejected from the proposed variable refrigerant volume air-conditioning system will not justify its use as a source of heat for the building's hot water system. The heating requirements for the port control tower shall be as follows:
- 4.2.11.18 The hot water system shall instead utilise two heating technologies:
- a) Heat shall be collected using roof-mounted solar thermal panels and a heat pump. The solar panels effectiveness shall fluctuate according to environmental conditions and shall therefore be supplemented with heat provided by the heat pump. The hybrid solar thermal-heat pump system shall be optimised to maximize solar thermal heating for majority of the heating. During peak demand when there is insufficient solar irradiation, the system shall use the heat pump to heat the water efficiently, instead of a conventional electrical heating element.
  - b) Water to be heated shall be stored in a pressurised buffer tank with level-controlled water infilling. The water shall be individually circulated

between the tank and either the solar panel arrangement or the heat pump for heating. The separate circulation shall be achieved using individual pumps or a suitable valve arrangement.

- C) A suitable electronic control system including a solar controller and temperature sensors shall be provided to initiate the flow of water from the buffer tank into the solar panels when the temperature drops below a predetermined set-point. The control system shall also divert the flow from the solar panels to the heat pumps and start-up or shutdown the required circulating pump when the tank water temperature drops below a second predetermined set-point. The hot water tank shall be connected to the various hot water users via a suitable piping system.
- d) The Contractor shall guarantee the Plant and Material and workmanship delivered and installed by him. The guarantee shall be valid for a period of twelve months starting on the date when the Completion certificate is issued. The complete installation shall be guaranteed against Defects as a result of patent and latent defects of the Plant and Material, as well as against faulty workmanship. Fair wear and tear is excluded from the guarantee.
- e) The guarantee shall provide all parts, spares and appurtenances which become defective during the Defects correction period, to be replaced free of charge to the Employer. All costs of labour, out-of-town town allowances, materials and transportation required to replace such part of a defective installation shall be borne by the Contractor and shall be included in his guarantee.
- f) The major constraints that should be factored into the project are:
- i) a small construction area, leading to Site congestion;
  - ii) close proximity to the residential suburb of Meerensee, hence noise pollution from working late and over weekends shall not be allowed;
  - iii) the health and safety of the Employer's personnel working in a live building, to which substantial alterations are being made;
  - iv) limited access to deliver Plant and Material to Site; and
  - v) the ecologically sensitive area surrounding the Site.

#### 4.2.12 Particular specifications

The following specifications shall apply:

Model Preambles for trades 1999	Part J	Ceilings, partitions and access floors
Model Preambles for trades 1999	Part S	Paintwork
Model Preambles for trades 1999	Part I	Carpentry and joinery

Model Preambles for trades 1999	Part T	Paper hanging
SABS 0400 1990	Part T	TT13 ceilings
SABS 0400 1990	Part T	Wall finishes

#### 4.2.13 Floors

The works for the preparation and installation of floor finishes shall consist of installation and completion of floor finishes as specified on the finishing schedule notes for the building. Provision shall be made for 15% cut outs in computer access raised flooring.

##### 4.2.13.1 Particular specifications

The following specifications shall apply:

Model Preambles for trades 1999	Part G	Water proofing
Model Preambles for trades 1999	Part K	Floor coverings and wall linings
Model Preambles for trades 1999	Part P	Tiling
SABS 0400 1990	Part J	Floors

##### 4.2.13.2 General specifications and finishes

The finishing schedule notes should be strictly adhered to, but not limited to, for the completion of the works with regard to floor finishes.

#### 4.2.14 Doors

The works for the preparation and installation of doors shall consist of installation and completion of doors and finishes as specified on the drawings for the building.

##### 4.2.14.1 Particular specifications

The following specifications shall apply:

Model Preambles for trades 1999	Part L	Ironmongery
Model Preambles for trades 1999	Part I	Carpentry and Joinery
Model Preambles for trades 1999	Part S	Paintwork

SABS 0400 1990	Part T	Fire protection
SABS 0400 1990	Part N	Glazing

#### 4.2.14.2 General specifications and finishes

The door schedule drawings shall be strictly adhered to, but not limited to, for the completion of the works with regard to doors which shall include carpentry, shop-fitting and joinery.

#### 4.2.15 Brickwork and plastering

The *works* for the preparation and erection of brickwork and plastering include the following:

- i) The brickwork to various areas as detailed on the drawings listed in the drawing list; and
- ii) The construction of all new walls.

#### 4.2.15.1 Particular specifications

The following specifications shall apply:

Model Preambles for trades 1999	Part F	Masonry
Model Preambles for trades 1999	Part O	Plastering
Model Preambles for trades 1999	Part S	Paintwork
SABS 0400 1990	Part K	Walls
SABS 0400 1990	Part T	Fire protection

#### 4.2.15.2 General specifications and finishes

The drawings issued should be strictly adhered to, but not limited to, for the completion of the works with regard to brickwork and plastering.

#### 4.2.16 Tiling

All new tiling to kitchen ablution and shower areas shall be completed by a specialist tiler, to meet requirements shown on drawings. A general kitchen layout shall be made available to the Contractor, but the Contractor's Subcontractor must prepare final kitchen drawings for approval by the Employer.

#### 4.2.17 Paint work

The works for the painting of walls and surfaces include the preparation and painting as specified on the drawings for the building with particular attention to the different types of specifications.

**4.2.17.1 Particular specifications**

The following specifications shall apply:

Model Preambles for trades 1999	Part S	Painting
Dulux colour chart		
Dulux data and paint specification schedule for various paint types		

**4.2.17.2 General specifications and finishes**

The drawings and the finishing schedule issued should be strictly adhered to, but not limited to, for the completion of the works with regard to painting.

**4.2.18 Manufacturer's instructions and specifications**

All materials and products shall be used and installed in strict accordance with the manufacturer's instructions and specifications.

**4.2.19 Use of locally manufactured materials and products**

Materials and products manufactured in South Africa shall be used in carrying out the work to which this specification refers, unless an imported product is prescribed specifically, or when no suitable locally manufactured product for the specific use is available.

**4.2.20 Samples**

The Contractor shall furnish without delay, such samples and/ or certificates as called for or may be called for by the Supervisor / Project Manager. Materials and/or workmanship not corresponding with approved samples may be rejected. Samples for approval shall be required for paint colours, joinery finishes, furniture, wall finishes, ceiling finishes and floor finishes. These approved samples shall remain on Site for the duration of the works.

**4.2.21 Mortar joints and brickwork**

- a) Mortar joints to face brickwork generally shall be 8mm-16mm in thickness with level bedding joints, vertical perpend. Setting out of brick gauge shall be determined on Site as average sizes of bricks may vary. Weather struck joint profile shall be well rubbed with a standard jointing tool of suitable size to ensure that the entire exposed surface on the joint presents a smooth and polished appearance.

- b) Brickwork to comply with good brick laying practices as per Corobrik. Facebrick shall be selected and blended. Prior to bricklaying, proper setting out of brickwork shall be undertaken by the Contractor's bricklayer for variances in brick dimensions.
- c) Facebrick shall be kept clean and protected as the brickwork progresses.
- d) For any detail information required on stained or dirty facebrick, a Corobrik Office shall be contacted.
- e) The use of damp proof coursing (DPC) shall be provided and installed as per SANS 10021, to provide barrier against rising damp, water penetration from above and horizontal water penetration.

#### **4.2.22 Waterproofing**

- a) The Contractor shall furnish the Employer with a written guarantee covering materials and workmanship for all waterproofing specified or offered. This guarantee shall be signed by the Contractor and countersigned by the supplier of the Material used, and underwritten by a recognised insurance company. The guarantee shall be valid for a 10 year period.
- b) Should any maintenance be required during the guarantee period, the Contractor shall allow for the cost of such in his tender price as the Contractor shall be held solely responsible for any leaks that occur during the guarantee period.

#### **4.2.23 Glazing**

All laminated safety glass shall carry the manufacturer's warranty against all manufacturing defects and discoloration for a minimum period of 5 years. A stencil mark shall appear on a prominent place on all types of safety glass as per SANS.

#### **4.2.24 Windows**

Installation certificate by AAMSA approved *Contractor* is required for all shop front installations. All shop fronts and window sections shall be waterproof and able to withstand coastal winds.

#### **4.2.25 Timber trusses**

An engineer's certificate covering the design and installation of trusses shall be provided by the *Contractor* for the gate house.

#### **4.2.26 Protection of works**

The *Contractor* shall provide all necessary dust sheets, hoarding, etc. and shall exercise all necessary care to prevent marking surfaces, walls, floors, glass, electrical fittings, etc. and shall keep all parts of the works perfectly clean and free at all times from spotting,

accumulation of rubbish, debris of dirt arising from the operations. Any surface disfigured or otherwise damaged shall be completely renovated or replaced as necessary by the *Contractor* at his own expense to the *Supervisor's* approval. The premises shall be left clean and fit for occupation at completion of the work.

#### 4.2.27 Heat pump

The *Contractor* shall conform to the following minimum requirements for the selection of the heat pump.

Item	Description	Units	Value
Main Unit	Hot water output temperature	°C	50-55
	Maximum output temperature	°C	60
	Heating capacity	kW	23
	Heating capacity per hour	L/hr	≥530
	Rated input power	kW	6.2
	COP		3.7
	Suggested gas filling	kg	2.8
	Noise	dB(A)	50-55
Item	Description	Units	Value
Installation condition	Water pressure range	MPa	0.30~0.60
	Diameter of hydraulic connection	mm	25
	Mass	Kg	150
Working condition	voltage/frequency/ph	V/Hz/no.	AC380/50/3
	Rated input current	A	13.5
	Connecting ground requirement	Ω	≤0.1
	Ambient temperature range	°C	-7~43

#### 4.2.28 Civil and Structural works

4.2.28.1 Where the SANS 1200 series of Specifications are used within the Works Information, the following interpretations and meanings shall apply:

- a) In case of any conflict in interpretation, ambiguity or discrepancy between any SANS 1200 Specification (whether standard or written as a particular project specification) contained in the Works Information and the conditions of contract, the conditions of contract take precedence within the ECC3 contract.
- b) In case of any conflict in interpretation, ambiguity or discrepancy between any SANS 1200 Specification (whether standard or written as a particular project specification) contained in this paragraph 4.3 of the Employer's Works Information and specific statements contained elsewhere in C3.1 Employer's Works Information, the specific statements contained elsewhere shall prevail, without prejudice to the Project Manager's express duty to resolve any ambiguity or inconsistency in the Works Information under ECC3 Clause 17.1.

4.2.28.2 Within SANS 1200 A: GENERAL, the following amendments and interpretations shall apply:

- a) where the word or expression "Employer" is used, read "Employer";
- b) where the word or expression "Contractor" is used, read "Contractor";
- c) where the word or expression "Project Manager" is used, read "Project Manager" or "Supervisor" as the context requires; and
- d) where the word or expression "schedule of quantities" is used, this is deleted in entirety. Assessment and payment is in accordance with the conditions of contract (and the ECC3 main and secondary options stated therein).

4.2.28.3 Within SANS 1200 A: GENERAL 2.3 DEFINITIONS, the following apply:

- a) "Acceptable. Approved (Approval)" is interpreted as either a Project Manager or a Supervisor communication or instruction in relation to Works Information compliance, consistent with the conditions of contract as the context requires.
- b) "adequate" is deleted. The Project Manager notifies the Contractor where the Contractor has not complied with the Works Information.
- c) "measurement and payment" and the further definitions contained within 6.3 c) are deleted. Assessment and payment is in accordance with the conditions of contract (and the ECC3 main and secondary options stated therein).

4.2.28.3 Within SANS 1200 A: GENERAL 2.6 APPROVAL, the following applies:

- a) "Approval" by either the Project Manager and/or the Supervisor is without prejudice to ECC3 Clause 14.1 and, inter alia, ECC3 Clauses 13.1, 14.3 and 27.1.

- 4.2.28.4 SANS 1200 A: GENERAL 2.8 ITEMS IN SCHEDULE OF QUANTITIES, is deleted in entirety. Assessment and payment is in accordance with the conditions of contract (and the ECC3 main and secondary options stated therein).
- 4.2.28.5 SANS 1200 A: GENERAL 3.2 STRUCTURES AND NATURAL MATERIAL ON SITE, applies only to the extent that it is consistent with paragraph 3.1.6 of C3.1 Employer's Works Information.
- 4.2.28.6 Within SANS 1200 A: GENERAL 7.1 PLANT, the following applies:
- a) where the word or expression "Plant" is used, read "Equipment".
- 4.2.28.7 SANS 1200 A: GENERAL 7.2 CONTRACTOR'S OFFICES, STORES AND SERVICES, applies but the Project Manager resolves any inconsistency with statements included within paragraph 3.1.12 of C3.1 Employer's Works Information.
- 4.2.28.8 SANS 1200 A: GENERAL 3.1 SURVEY, applies only to the extent that it is consistent with paragraph 3.1.14 of C3.1 Employer's Works Information.
- 4.2.28.9 Within SANS 1200 A: GENERAL 3.2 WATCHING, BARRICADING, LIGHTING AND TRAFFIC CROSSINGS, the following applies:
- a) Where the word or expression "specification" is used, read "Works Information".
- 4.2.28.10 SANS 1200 A: GENERAL 3.4 PROTECTION OF OVERHEAD AND UNDERGROUND SERVICES applies only to the extent that it is consistent with the specific statements made elsewhere in C3.1 Employer's Works Information and in any case and at all times consistent with the conditions of contract.
- 4.2.28.11 Within SANS 1200 A: GENERAL 5 TESTING, the following applies:
- a) where the word or expression "Project Manager" is used, read "Supervisor".
- 4.2.28.12 SANS 1200 A: GENERAL 8 MEASUREMENT AND PAYMENT, is deleted in entirety. Assessment and payment is in accordance with the conditions of contract (and the ECC3 main and secondary options stated therein).
- 4.2.28.13 The principles, meanings and interpretation stated and established within paragraphs 6.3.1 to 6.3.15 with respect to SANS 1200 series and to SANS 1200 A: GENERAL equally apply to the other SANS 1200 specification references [state particulars of SANS 1200 used] used within this paragraph 6.3 of C3.1 Employer's Works Information.

#### **4.2.29 Electrical and mechanical project engineering works**

- 4.2.29.1 Where SANS 10142 and/or SANS 10198 specifications are used within the Works Information, then where the term "Equipment" (or the like) is used with the meaning of installation and items left behind in the works, then please read this term as "Plant" for ECC3 defined term compliance.

#### TRANSNET PROJECTS SPECIFICATIONS (Latest Revisions):

TPD-001-EL&PSPEC:	Technical specification for the supply and installation of electrical lighting and power in buildings other than dwelling houses.
TPD-003-CABLESPEC:	Technical specification for the installation of medium and low voltage cables.

#### 4.2.30 Concrete and Steelwork works

The following *Employer's* Specifications are to take precedence over SANS 1200.

HE9/2/6	Structural steelwork
HE9/2/8	Corrosion protection
HE9/2/9	General requirements and conditions
HE9/2/11	Reinforced Concrete and Structural Steel Structures

#### DRAWING LIST

Architectural drawings		
32442.00.201.03	03	Ground Floor Renovations
32442.00.201.04	03	First Floor Renovations
32442.00.201.05	03	Second Floor Renovations
32442.00.201.06	03	New Third Floor
32442.00.201.07	02	New roof
32442.00.202.01	02	Section A-A
32442.00.202.02	01	Section B-B
32442.00.202.03	01	Elevations
32442.00.609.01	01	Door Schedule
32442.00.610.01	01	Window Schedule
32442.00.610.02	01	Window Schedule
32442.00.611.01	02	Finishes Schedule

<b>Structural drawings</b>		
32442.00.201.08	03	Ground Floor Concrete layout
32442.00.201.09	03	First Floor Concrete layout
32442.00.201.10	03	Second Floor Concrete layout
32442.00.201.11	05	New Third Floor
32442.00.201.12	03	New roof
32442.00.202.04	02	Section A-A
32442.00.202.05	02	Section B-B
32442.00.202.06	02	Section C-C
32442.00.210.01	02	Connection Details
32442.00.210.01	01	Connection Details
<b>Sewer and Water layout</b>		
32442c.130/140-01	01	Sewer and water layout
32442c.130/140-01	01	Sewer and water layout
C32442.00c.104-01	00	Sewer details
32442.110.01	01	Road and Storm water layout
32442c.130/140-01	01	Sewer and water layout
32442c.131.01	02	Layout Plan and Longitudinal section of sewer pipe
C32442c.133.01	01	Raising main and pump detail layout

### 4.3 Civil Engineering and Structural Works

4.3.1 Where the SANS 1200 series of Specifications are used within the Works Information, the following interpretations and meanings shall apply:

4.3.2 In case of any conflict in interpretation, ambiguity or discrepancy between any SANS 1200 Specification (whether standard or written as a particular project specification) contained in the Works Information and the conditions of contract, the conditions of contract take precedence within the ECC contract.

- 4.3.3 In case of any conflict in interpretation, ambiguity or discrepancy between any SANS 1200 Specification (whether standard or written as a particular project specification) contained in this paragraph 4.3 of the *Employer's Works Information* and specific statements contained elsewhere in C3.1 *Employer's Works Information*, the specific statements contained elsewhere shall prevail, without prejudice to the Project Manager's express duty to resolve any ambiguity or inconsistency in the *Works Information* under ECC Clause 17.1.
- 4.3.4 Within SANS 1200 A: GENERAL, the following amendments and interpretations shall apply:
- Where the word or expression "Employer" is used, read "*Employer*";
- Where the word or expression "Contractor" is used, read "*Contractor*";
- Where the word or expression "Engineer" is used, read "*Project Manager*" or "*Supervisor*" as the context requires;
- Where the word or expression "schedule of quantities" is used, this is deleted in entirety. Assessment and payment is in accordance with the *conditions of contract* (and the ECC main and secondary options stated therein);
- 4.3.5 Within SANS 1200 A: GENERAL 2.3 DEFINITIONS, the following apply:
- "Acceptable. Approved (Approval)" is interpreted as either a *Project Manager* or a *Supervisor* communication or instruction in relation to Works Information compliance, consistent with the *conditions of contract* as the context requires;
- "Adequate" is deleted. The *Project Manager* notifies the *Contractor* where the *Contractor* has not complied with the *Works Information*;
- "Measurement and payment" and the further definitions contained within 6.3 c) are deleted. Assessment and payment is in accordance with the conditions of contract (and the ECC main and secondary options stated therein);
- 4.3.6 Within SANS 1200 A: GENERAL 2.6 APPROVAL, the following applies:
- "Approval" by either the *Project Manager* and/or the *Supervisor* is without prejudice to ECC Clause 14.1 and, inter alia, ECC Clauses 13.1, 14.3 and 27.1.
- 4.3.7 SANS 1200 A: GENERAL 2.8 ITEMS IN SCHEDULE OF QUANTITIES, is deleted in entirety. Assessment and payment is in accordance with the *conditions of contract* (and the ECC main and secondary options stated therein).
- 4.3.8 SANS 1200 A: GENERAL 3.2 STRUCTURES AND NATURAL MATERIAL ON SITE, applies only to the extent that it is consistent with paragraph 3.1.6 of C3.1 *Employer's Works Information*.
- 4.3.9 Within SANS 1200 A: GENERAL 7.1 PLANT, the following applies:
- Where the word or expression "Plant" is used, read "*Equipment*".
- 4.3.10 SANS 1200 A: GENERAL 7.2 CONTRACTOR'S OFFICES, STORES AND SERVICES, applies but the *Project Manager* resolves any inconsistency with statements included within paragraph 3.1.12 of C3.1 *Employer's Works Information*.
- 4.3.11 SANS 1200 A: GENERAL 3.1 SURVEY, applies only to the extent that it is consistent with paragraph 3.1.14 of C3.1 *Employer's Works Information*.
- 4.3.12 Within SANS 1200 A: GENERAL 3.2 WATCHING, BARRICADING, LIGHTING AND TRAFFIC CROSSINGS, the following applies:
- Where the word or expression "specification" is used, read "*Works Information*".

4.3.13 SANS 1200 A: GENERAL 3.4 PROTECTION OF OVERHEAD AND UNDERGROUND SERVICES applies only to the extent that it is consistent with the specific statements made elsewhere in C3.1 *Employer's Works Information* and in any case and at all times consistent with the *conditions of contract*.

4.3.14 Within SANS 1200 A: GENERAL 5 TESTING, the following applies:

Where the word or expression "Engineer" is used, read "*Supervisor*".

4.3.15 SANS 1200 A: GENERAL 8 MEASUREMENT AND PAYMENT, is deleted in entirety. Assessment and payment is in accordance with the conditions of contract (and the ECC main and secondary options stated therein).

4.3.16 The principles, meanings and interpretation stated and established within paragraphs 6.3.1 to 6.3.15 with respect to SANS 1200 series and to SANS 1200 A: GENERAL equally apply to the other SANS 1200 specification references [state particulars of SANS 1200 used ] used within this paragraph 6.3 of C3.1 *Employer's Works Information*.

## 4.3 CIVIL WORKS

### ENGINEERING AND THE *CONTRACTOR'S* DESIGN

#### 4.3.17 **Employer's design**

No design for permanent structures shall be undertaken by the *Contractor*. 4.3.17.1 The Employer shall supply the following:

- a) Works Information;
- b) Civil Technical specifications;
- c) Structural concrete drawings;
- d) Structural steelwork general arrangement drawings (excluding shop detailing drawings); and
- e) Architectural drawings.

The Employer grants the Contractor a license to use the copyright in design data presented to the Contractor for the purpose of the works only.

#### 4.3.18 **Contractor's design**

The Contractor shall design the following:

- a) Formwork, scaffolding, concrete mix design and shop detailing for approval by the Project Manager;
- b) The Contractor shall provide all water reticulation and plumbing drawings including pipe routes and diameters, compiled by a services engineer.

#### **4.3.19 Procedure for submission and acceptance of Contractor's design**

- a) The Contractor shall submit detail drawings and material lists for checking by the Project Manager. The member sizes shown on the Project Manager's design drawings shall not be changed without the Project Manager's written consent.
- b) The Contractor shall design all bolted or welded connections. Over designed connections shall be rectified on drawings or on Site at the Contractor's expense.
- c) The Contractor shall design the strength concrete mix in accordance with SANS 1200 G, and in accordance with the Employer's specifications.

#### **4.3.20 Review and acceptance of Contractor's documentation**

The Contractor shall submit two sets of shop detail drawings to the Project Manager for verification, prior to fabricating steelwork. The Project Manager shall mark up and return one set of shop detail drawings within 10 (ten) working days after receiving the Contractor's shop detailing.

#### **4.3.21 Requirements**

The Contractor's design shall comply with the following:

- a) all requirements of SANS 1200; and
- b) all requirements of the Employer's standard specifications.

#### **4.3.22 As-built drawings, operating manuals and maintenance schedules**

The Contractor shall mark up one set of drawings showing deviations from the Project Manager's drawings. The Project Manager shall convert the marked up drawings to AutoCad.

- 4.3.22.1 Number of copies of as-built/final documentation. The *Contractor* shall submit one copy of all as-built and final documentation.

#### **4.3.23 CONSTRUCTION**

##### **4.3.23.1 Civil scope of works:**

- a) Site clearance (where applicable),
- b) Water reticulation,
- c) Sewer reticulation,
- d) Stormwater management,
- e) Parking, kerbing and roadmarkings,
- f) Retaining structures,
- g) Fencing

In accordance with the drawings, and any other works arising thereof.

#### **4.2.23.1 Works, Site services and construction constraints**

People restrictions on Site; hours of work, conduct and records .The current port control building shall remain fully functional for the duration of the contract. The contractor to arrange with Project Manager before relocating of the server room and UPS room.

#### **4.3.24 Survey control and setting out of the works**

- a) Setting out of the works and survey control is based on Hartebeeshoek 94 (WGS 84 Ellipsoid) co-ordinate system. Levels are given relative to mean sea level.
- b) The *Project Manager* provides benchmarks and survey control points for the Contractor.
- c) The Contractor shall provide, no longer than two weeks before commencing bulk earthworks (or profiling in the relevant area), an in-survey of the construction area, recorded on a drawing to a scale of at least 1: 500, which forms the basis for calculations of earthwork quantities.
- d) The in-survey shall be carried out in collaboration with the Supervisor, on a 5m grid, with levels generally taken at right angles to the longest length of the area being surveyed. Relevant features, such as existing services and identification of ground survey control stations are also determined.
- e) On completion of construction (or profiling of the relevant area) to the required tolerances, the Contractor shall provide the out-survey, which records the final levels on a drawing, for acceptance by the Project Manager.
- f) The Contractor shall sign the in-survey and out-survey and furnish copies in accordance with the CDS to the Project Manager for record purposes.

#### **4.3.25 Excavations and associated water control**

The Contractor shall protect all excavations against any water ingress whether by seepage, rains, storms, floods or any other means.

The Contractor shall immediately remove any water found in the excavation by pumping and / or bailing and provide all necessary Equipment (pumps, pipes, etc) to do so. Water is cleared in such a way that it cannot seep or flow back into the excavations.

#### **4.3.26 Probability of asbestos contamination in excavations**

- a) The Contractor shall ensure his staff and labour is equipped with the necessary PPE and are trained to recognise asbestos contamination.

- b) On encountering asbestos contamination, the Contractor shall immediately stop all work in the affected area and shall then summons the Supervisor and secure the area.
- c) The Supervisor shall arrange for a specialist waste disposal Contractor to collect, bag, remove and dispose the contaminated material from the excavation or bulk earthworks.
- d) The Contractor shall continue with the excavation or bulk earthworks on receipt of a written instruction from the Supervisor.

#### **4.3.27 Underground services, other existing services, cable and pipe trenches and covers**

- a) The Project Manager shall provide the Contractor, as a guide only, with drawing(s) showing various known existing underground services for his information. It is however possible that there is other existing services, which are not reflected, and which may affect the works.
- b) The Contractor shall establish the location of the various existing services situated within the Site and Working Areas, and records all such information on “marked-up” drawing(s) which remain available for reference at all times.
- c) The Contractor shall exercise due care and attention in carrying out any excavation work to avoid damage or disruption to existing services. The Contractor shall consult the Project Manager prior to undertaking any excavation work.
- d) Should the Contractor fail to exercise the requisite care and attention in carrying out the excavation work, then the Contractor shall be held liable for any claims arising out of damage caused by such excavation.

## **4.4 Electrical & mechanical engineering works**

### **ELECTRICAL WORK**

- 4.4.1 Where SANS 10142 and/or SANS 10198 specifications are used within the Works Information, then where the term “Equipment” (or the like) is used with the meaning of installation and items left behind in the *works*, then please read this term as “Plant” for ECC defined term compliance.

#### **Abbreviations**

AMF	Auto man failure
CT	Current transformer
DB	Distribution board

DP	Double pole
LED	Light-emitting diode
LV	Low voltage
MCB	Miniature circuit breaker
MVA	Mega volt ampere
PABX	PBX-private branch exchange
UPS	Uninterrupted power supply
AFFL	Above finished floor level

#### 4.4.2 Description of the works

The Works Information covers the following works to be undertaken at the port control tower - port of Richards Bay:

- a) full design, supply, delivery, installation, testing and commissioning of all electrical Plant and Material required as per standards and requirements stated in this Works Information;
- b) the removal of all existing electrical equipment in the building except UPS units and UPS DB's and generator units; and
- c) the maintenance of the existing essential power supply.

### ENGINEERING AND THE *CONTRACTOR'S* DESIGN

#### 4.4.3 Employer's design

The design included in this Works Information as represented by specifications or included electrical drawings shall serve as a guide only and therefore does not relieve the *Contractor* of his responsibilities regarding the design and engineering performance of the installations.

#### 4.4.4 The Employer shall supply the following:

- a) Works Information;
- b) Electrical technical specifications;
- c) architectural drawings; and
- d) preliminary layout of power and lighting units.

#### 4.4.5 Works which the *Contractor* shall design

The *Contractor* shall design the following:

- a) complete electrical installation for the areas of the port control tower described within this Works Information according to relevant national standards;
- b) selection of appropriate Plant and Material and sizes to satisfy the requirements for each area of the building;
- c) all ducting including routes and diameters; and
- d) all distribution box's and cables.

4.4.6 Procedure for submission and acceptance of *Contractor's* design

Procedures for submission and acceptance of *Contractor's* designs are as follows:

- a) the *Contractor* shall be responsible for preparing detail drawings and material lists for checking by the *Project Manager*; and
- b) the *Contractor* shall be responsible for the complete design adhering to national building regulations SANS 10400.4.4.7      Review and acceptance of *Contractor's* documentation

The *Contractor* shall submit two sets of detail drawings to the *Project Manager* for verification. The *Project Manager* shall mark up and return one set of detailed drawings within 10 working days after receiving it.

4.4.8 Other requirements of the *Contractor's* design

The *Contractor's* design shall comply with the following:

- a) the Standard Regulations for the wiring of premises as issued by the South African National Standards (SANS 10142-1);
- b) the applicable SANS/IEC specifications or the BS specifications where no SANS specifications exist;
- c) the Occupational Health Safety Act No. 85 of 1993;
- d) the National Building Regulations – SANS 10400;
- e) the Municipal by-laws and any special requirements of the local supply authorities of the area or district concerned;
- f) Telkom Regulations;
- g) OHS Act 85 of 1993;
- h) National Building regulations and Building Standards Act 103 of 1977; and
- i) all requirements of the Employer's standard specifications.

4.4.9 As-built drawings, data books, installation, maintenance and operation manuals  
Supply of documents

- 4.4.9.1 The *Contractor* shall provide manuals in an A4 hard covered, red, grease and waterproof binder, using 2 ring type binders. The manuals shall be well indexed and user friendly and include a summarized table of contents.
- 4.4.9.2 Drawings and charts larger than A4 are folded and those greater than A3 shall be enclosed in an A4 plastic pocket of adequate strength.
- 4.4.9.3 The *Contractor* shall submit the draft table of contents to the Project Manager for acceptance prior to the compilation and official submittal of the manuals.
- 4.4.9.4 The originals of all brochures shall be issued to the Project Manager. When a general brochure is applicable to a range of Plant and Material, then the specific item, catalogue number or model number shall be stated, which is best achieved by introducing a separate index page, which cross-references the specific item to a tag number.
- 4.4.9.5 The address, phone numbers, fax numbers and reference numbers of all Subcontractors shall be provided.
- 4.4.9.6 Where manuals include drawings that still need to be revised to “as-built” status, and such manuals are required prior to ‘as-built’ status, the manual shall not be considered to be in its final form until the “as-built” version of each such drawing has been incorporated.
- 4.4.9.7 The required number of copies of the manual (s) shall be as specified by the Project Manager and submitted per type or model number of Plant and Material included in the contract, or as specified by the Project Manager.
- 4.4.9.8 A typical example of what the binder/file (s) shall be marked with on the spine and the front cover is as follows: -
- Project Name:
- Manual Title, e.g. Installation, Maintenance and Operating Manual:
- FBS No. and Title:
- Manual Numbering (e.g. Volume 1 of 2, etc.):
- Contract Number:
- Contractor* Name:
- The number of copies of as-built/final documentation: 5

#### **4.4.10 PLANT AND MATERIALS STANDARDS AND WORKMANSHIP**

- a) Investigation, survey and Site clearance
- The *Contractor* shall maintain a record of the conditions of all existing buildings, structures and services.
- b) Building works
- The *Contractor* shall carry out the following:
- i) removal of all existing redundant electrical equipment; and
  - ii) the removal of all waste and or rubble from Site created by the removal of existing electrical equipment.

c) Electrical works

The *Contractor* shall be responsible for the design, supply and installation of electrical Plant and Material.

#### 4.4.11 OVERVIEW – SCOPE OF WORKS

##### 4.4.11.1 Inclusions

The scope of work shall include manufacture, conveying and delivering, unloading, storing, unpacking, hoisting, setting, fitting and fixing in position, cutting and waste, patterns, models and templates, plant, temporary works, return of packings, establishment charges, profit and all other obligations arising out of the Works Information for the following:

- a) low voltage power cabling and cable supports;
- b) low voltage distribution boards;
- c) interior, emergency, exterior and security lighting;
- d) normal and dedicated single phase switch socket outlets;
- e) conduit, power skirting, under floor ducting, metal trunking, draw-boxes;
- f) single phase power points for:
  - i) extract fans;
  - ii) hot air hand dryers;
  - iii) hot water heaters;
  - iv) air-conditioning units; and
  - v) hydroboil.
- g) three phase power points for:
  - i) lifts; and
  - ii) air-conditioning units
- h) wireways for the following services:
  - i) computer and data wiring;
  - ii) telephone and PABX system;
  - iii) access control;
  - iv) security and intruder alert system;
  - v) thermostat wiring for air-conditioning control; and
- i) Earthing system.

In addition, the *Contractor* shall supply all necessary manpower, labour, supervision, Equipment, materials (installed and consumable), tools, services and testing devices for all aspects of this Works Information as indicated hereunder. This shall include:

Supply of all static and dynamic loading characteristics and resonant frequencies for the design of the foundation and support structure.

#### 4.4.11.2. Regulations, factories and By-Laws

The latest editions and/or amendments of the following Standards and Codes shall be considered a minimum requirement. In the event of differing requirements, the most stringent Code or Standard shall apply:

- a) Occupational Health and Safety (OHS) Act No. 85 of 1993.
- b) South African National Specifications.
- c) DIN or British Specifications.
- d) N.O.S.A. Safety Guidelines.
- e) The National Building Regulations
- f) The Wiring of Premises (SANS 10142-1).
- g) The Local Fire Office Regulations.
- h) The Municipal by-laws and any special requirements of the local Supply Authorities of the area or district concerned.
- i) The applicable BS Specifications or the IEC Specifications where no SABS or BS Specifications exist.

No claims for extras in respect of failure by the *Contractor* to comply with any of the above regulations shall be considered.

Where conflict exists between any of the above regulations and the specifications, the said conflict must be referred to the *Project Manager* in writing for his ruling.

#### 4.4.11.3 Works Information

This Works Information covers the following work:

The supply, delivery to Site, storage, erection, installation, testing, commissioning and energizing of the items detailed hereafter, handed over in satisfactory working condition to the complete satisfaction of the *Employer*, *Project Manager* and local authorities, including all labor, materials, workmanship, machinery, and test equipment which shall be necessary for successful Completion, all in accordance with the *Employer's* specifications and drawings. The system shall be ready for immediate use once handed over and shall be inclusive of subsequent maintenance for a period of 12 months.

#### 4.4.12 Scope of supply

4.4.12.1 Design, supply and install suitable new electrical equipment through the buildings.

4.4.12.2 Supply a 7 day timer in the electrical boards feeding the fans, with all air fans.

4.4.12.3 Testing and commissioning of the works

**General specifications**

Unless otherwise agreed by the *Contractor*, all Plant and Materials shall be manufactured in South Africa.

**Terminal points**

The terminal points of this contract are:

- a) main switch of all A/C plant DBs;
- b) main switch of all lift DBs;
- c) main switch of all hydro boilers; and
- d) main switch of all hand dryers.

4.4.13 **Project specification**

4.4.13.1 Supervision

The work shall at all times, for the duration of the contract be carried out under the supervision of a skilled and competent representative of the *Contractor* who is in possession of a valid wireman's license and who shall be able and authorised to receive and carry out instructions on behalf of the *Contractor*. A sufficient number of workmen shall be employed at all times to ensure satisfactory progress of the work.

4.4.13.2 Early delivery of built-in items

As soon as the contract has been awarded, the *Contractor* shall establish the full requirements relating to all built-in items, and arrange for their earliest manufacture and delivery to Site to suit the programme.

4.4.13.3 Deliveries to Site and off-loading

When despatching Plant or Material to Site, the *Contractor* shall arrange to have a responsible representative on Site to supervise and arrange the off-loading. The *Contractor* shall supply his own labour and Equipment necessary for the off-loading, and arrange for the storage and safekeeping of any special items. Machinery shall be despatched to Site to suit the plant erection programme and to minimise double handling on Site.

4.4.13.4 Handling Plant and Material into position

The handling of items of Plant and Materials into position shall be done with the aid of hoisting lugs situated over the hoist-well openings, or with crawl beams for external hoisting, where hoist-well openings have not been provided. The *Contractor* shall supply all the lifting Equipment required. Care shall be exercised at all times to protect walls, columns, brickwork, sheeting, etc., against any possible damage arising from careless handling.

4.4.13.5 Provisional building for Plant and Material

All conduit and accessories shall as far as possible be built in. All retaining devices like studs and bolts shall be supplied by the *Contractor*. Where a Defect is found, this shall be reported to the *Project Manager* timeously so that corrective action can be taken.

Under no circumstances shall delays and consequential cost be entertained due to the failure to ensure that the mountings are correct.

4.4.13.6 Bolts, nuts, washers, brackets and mounting accessories

All fixing and mounting accessories shall be hot dipped galvanised mild steel. In general, the contact between dissimilar metals shall be avoided. Should accessories manufactured from corrosive materials be used on site, the *Project Manager* shall instruct the *Contractor* to remove such accessories and replace them at the *Contractor's* expense. Where hot dipped galvanised items need to be cut on Site, they shall be cold galvanised immediately.

4.4.13.7 Scaffolding

The *Contractor* shall provide all the necessary scaffolding for the erection and painting of the various items where required.

4.4.13.8 Damage to buildings

The *Contractor* shall be held responsible at all times for all damage to the buildings and Plant and Materials due to negligence of any of his workmen or those of his Subcontractors. Any damage arising out of such negligence shall be repaired by the *Contractor* at their own cost.

4.4.13.9 Notices

The *Contractor* shall issue all notices and make the necessary arrangements with Supply Authorities, the Postmaster-General and Telkom, Provincial or National Road Authorities and other authorities as may be required with respect to the installation. The *Contractor* shall be held responsible for damage to any existing services brought to his attention by the relevant authorities and shall be responsible for the cost of repairs.3.6.10 Harmonic distortion

The Supply Authority shall not permit the connection of Plant and Material that generates harmonics. The limits are defined in IEC 6100-3-2. If such Plant and Material is found to have been supplied it must be modified, fitted with harmonic filters or replaced with an acceptable alternative.

4.4.13.10 Interchangeability of Plant and Material

4.4.13.11 Plant and Material to be supplied must be identical in all respects and it shall be possible to interchange such Plant and Material should it become necessary.

4.4.13.12 All Plant and Material must be suitable for 400/230 V supply voltage, 50 Hz supply frequency and must be approved by the Project Manager. In addition all Plant and Material shall be designed, manufactured and tested in accordance with the relevant South African Bureau of Standards Specification or otherwise the relevant British Specification.

4.4.13.13 All Plant and Material used as part of a fixed electrical installation shall bear the "SABS safety mark or SABS approved safety mark" and the necessary precautions shall be taken against corrosion, i.e. all metal shall be hot dipped galvanised in accordance with SANS 121, SANS 32 and SANS 10064.

4.4.13.14 Specification and drawings

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

4.4.13.16 The *Contractor* shall ensure that his copy of the Works Information is complete and that all electrical drawings as listed have been received from the *Project Manager*.

4.4.14 **Contract drawings**

The layout and extent of the electrical installation are shown on the drawings which form part of this document.

4.4.15 **Construction record drawings**

The *Project Manager* will issue the *Contractor* with a complete set of electrical drawings. The *Contractor* shall ensure that exact cable routes, manholes, sleeves, cable joints etc. are shown and dimensioned from a building reference point and any changes shall be marked in red. The construction record drawings shall be submitted 2 weeks before the Completion of the project (first delivery). Final computer generated drawings shall be produced by the *Project Manager*.

These final construction record drawings shall be signed by both the *Project Manager* and the *Contractor* before submission to the *Employer*.

4.4.16 **Technical specification**

4.4.16.1 Power supply

4.4.16.2 Normal mains supply

- a) The local supply authority shall provide the Site with LV supply by means of a cable.
- b) The *Contractor* shall connect the current UPS units in order to provide for the supply of essential circuits in the event of a supply authority outage of short duration; and to the standby generator for supply authority outages of longer duration.

4.4.16.3 **Metering**

- a) The *Contractor* shall provide LV metering for demands of up to 2 MVA which shall be a power monitor meter (Schneider 820 or equivalent) complete with CT's and fuse protection with facilities using modbus communication.
- b) Metering of the electrical supply shall be able to be monitored by the building management system in order to provide real time information regarding consumption, as well as load profiles.

4.4.16.4 Electrical power failure philosophy

The local regulatory authority shall supply the primary source of electrical power to the building. In the event of a power failure or power outage affecting the electrical supply to the building the following sequence of events shall take place to ensure that this disruption is minimised:

- a) The 3<sup>rd</sup> floor control office and air-conditioning equipment within the service room shall be feed by the generator/UPS units in case of power failures. The

control office shall operate as normal during the event of a power failure or power outage;

- b) The UPS units shall continue to supply the dedicated circuits, which essentially shall be all the computer and communications systems within the building. The UPS units shall be able to provide a back-up time of up to two hours;
- c) A relay in the incoming supply panel shall detect a power failure and shall signal the AMF panel on the standby diesel generator set. The Plant shall start automatically and when up to speed shall switch over via mechanical and electrical interlock and supply power to the building;
- d) Once the normal supply has been re-established the changeover switch shall revert to normal supply and the standby generator set switched-off;
- e) The standby generator shall be able to provide back up for any length of time provided the fuel tank is monitored and replenished regularly;
- f) During the period that the standby generator is supplying power to the building, only essential services such as the air conditioning plant for the building and the UPS room as well as the lifts and all dedicated switched socket outlets, shall be operational; and
- g) Emergency lighting with one hour integral battery back-up shall be provided.
- h) The existing UPS units and standby generator units in the ground floor shall be retained, but tests and checks shall be carried out to ensure their compliance with all applicable standards.

#### 4.4.16.5 Distribution boards

Distribution boards within the building shall be housed within a distribution cupboard that shall be aligned to risers and droppers between each floor. The cupboard door shall be non-lockable and clearly identified as an electrical distribution cupboard. A wall mounted distribution board shall be housed within the cupboard cavity. Each new board shall have a separate non-essential section. The distribution boards shall include space for the DALI equipment, accessories and internal wiring as specified by the *Contractor*. The *Contractor* shall be given the recommended supplier on the bill of quantities for the DALI system. Should the *Contractor* not accept the recommended supplier, then he shall offer an equal to be approved by the *Supervisor*.

A UPS essential distribution board section is currently present on Site which is supplied by the emergency generator during mains power failure. New non-essential and UPS essential distribution boards shall be provided for the 3<sup>rd</sup> floor control office. The essential services shall be reconnected into the existing UPS essential distribution boards. All distribution boards shall be pre-wired.

Refer to the distribution board specifications and single line diagrams.

The following non-essential DBs shall form part of the contract:

DB designation	DB location	Reference drawings
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DB-MAIN: ESS	Generator Room	32442.00-312-01
DB-MAIN: UPS 1	UPS Room	32442.00-312-01
DB-MAIN: UPS 1	UPS Room	32442.00-312-01
DB-GROUND FLOOR	DB Cupboard in Passage	32442.00-312-02
DB-FIRST FLOOR	DB Cupboard in Passage	32442.00-312-03
DB-SECOND FLOOR	DB Cupboard in Passage	32442.00-312-04
DB-THIRD FLOOR	DB Cupboard in Passage	32442.00-312-05
DB-ROOF	Tower Room	32442.00-312-06
DB-GUARD HOUSE	Guard Office	32442.00-312-02
DB-SERVER ROOM 1	Server Room	32442.00-312-03
DB-SERVER ROOM 2	Server Room	32442.00-312-03

The distribution boards shall comply with SANS 10142-1, SANS 60439 and SANS 1473 and the switchgear shall comply with SANS 60947.

The existing UPS distribution board units in each floor within the building shall be retained, but tests and checks shall be carried out to ensure their compliance with all applicable standards.

#### 4.4.16.6 Cables

The *Contractor* shall establish the correct lengths of cable on Site, before placing any orders. The transport of the cable to the required area shall be for the *Contractor's* account. After installation, the *Project Manager* shall measure exact cable lengths on Site. The *Contractor* shall not be reimbursed for any surplus cable or any Plant and Material over supplied.

#### 4.4.16.7 Low voltage cables and terminations

- All low voltage cables shall comply with SANS 1507 and shall be PVC/SWA/PVC cables. Main LV 4 core cables shall have copper conductors and shall have a separate insulated copper earth conductor. Cables shall bear the SABS mark.
- The earth conductors shall be bound to the cables at intervals not exceeding 1 meter. All cables shall bear the SABS mark. The total insulation must have the phase colour. All LV cables shall be installed in accordance with SANS 0198.
- Cable glands shall conform to SANS 1213. Cable glands shall be suitable for outdoor use with corrosion guard. Pratley Envirogland or equal and approved by the Project Manager shall be supplied.
- A complete cable schedule shall be issued to the *Contractor* after contract award. The *Contractor* shall provide a cable pulling schedule, with the final length measured on Site, which must be authorised by the Supervisor on Site prior to cables being cut of the drum.

4.4.16.8 Cable junction boxes

The *Contractor* shall supply IP68 rated three-way orange cable boxes which shall be Pratley Ezee-fit with a polycarbonate lid.

4.4.16.9 Identification of cables

- a) The *Contractor* shall identify all cables at all terminations by means of punched metallic bands or marked with labels or tags. Refer also to SANS 10142-1.
- b) The use of PVC tape with punched characters is not acceptable. The identification numbers of cables shall be shown on "as-built" drawings of the installation.

4.4.16.10 Cable laying

- a) The *Contractor* shall remove cable from the drum in such a manner that the cable is not subjected to twisting or tension exceeding that stipulated by the cable manufacturer.
- b) Cable rollers shall be used as far as possible to run out cables. Rollers shall be spaced so that the length of cable in the trench shall be totally suspended during the laying operation and sufficiently close to prevent undue sagging and the cable from touching the ground. Rollers shall also be placed in the trench in such a manner that they shall not readily capsize.
- c) Cable rollers shall have no sharp projecting parts liable to damage the cables.
- d) Where cables have to be drawn around corners, well-lubricated skid plates shall be used. The skid plates shall be securely fixed between rollers and shall constantly be examined during cable laying operations.
- e) Where cables have to be drawn through pipes or ducts, a suitable cable sock shall be used and particular care shall be exercised to avoid abrasion, elongation or distortion of any kind. In the case of oil filled cables, a cable sock may never be used. Special eyes, giving access to the interior of the cable, shall be utilised.
- f) The maximum allowable tension when pulling a cable, is 70 N/mm<sup>2</sup> of conductor area.
- g) The rates contained in the tender shall include for the installation of cables in pipes and ducts or below existing or newly installed services.
- h) The Supervisor shall be informed timeously of the intention to carry out all cable laying operations to allow an inspection of the works by the Supervisor if so required.

4.4.16.11 Cable slack

At every termination, sufficient slack shall be provided for future repairs to the cable end should this become necessary due to a fault or some unforeseen circumstances on Site.

4.4.16.12 Cable identification

Every power distribution cable, switchboard interconnecting cable, and any other cable, shall be provided at both ends of the run with an approved Bowthorpe Hellerman tag showing the size and details of the cable. All identifications shall correspond with the construction record drawings and single-line diagrams associated with the contract.

4.4.16.13 Cable in ducts

The total cross sectional areas of any cable installed in a duct shall not exceed 40% of the internal cross sectional area of the duct. After installation of the cable, duct stoppers shall be fitted to each end of each duct run and at the entry to all buildings to effectively seal to duct from ingress of vermin etc.

4.4.16.14 Cable joints

Low voltage cable joints in cable runs shall not be allowed.

4.4.16.15 Cable tests

- a) Each section of laid and jointed cable shall be tested in accordance with SANS 1507. The insulation resistance shall be measured with a 1000 volt Megger and the readings shall be tabulated and certified. Similarly the earth continuity resistance of each section of cable shall be measured and recorded. All low voltage cables must be tested on Site before final terminations after installation of cable glands, in the presence of Supervisor. All test results must be submitted to the Project Manager.
- b) Tests on completion of the installation and jointing of the various cables shall be carried out on Site in the presence of the Supervisor and the test results properly recorded and submitted in triplicate.
- c) On each completed section of laid and jointed cable, the insulation resistance shall be tested in accordance with specification for testing included elsewhere in this document.
- d) The cables shall be adequately supported at intervals during the whole operation.
- e) Particular care shall be exercised where it is necessary to draw cables through pipes and ducts to avoid abrasion, elongation or distortion of any kind. The ends of such pipes and ducts shall be sealed to approval after drawing in of the cables.

4.4.16.15 Cable sleeves

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

4.4.16.16 Balancing of load

The *Contractor* shall balance the load as equally as possible over the multiphase supply.

4.4.16.17 Conduit

- a) All conduit and conduit accessories shall be manufactured from uPVC and shall comply and be installed in accordance with SANS 950 and shall bear the SABS mark. All conduits shall be concealed in the building work where possible. Open wiring shall not be allowed in roof spaces or elsewhere. Galvanised draw wires must be provided in all conduits provided for other services.
- b) Bending and setting of conduit must be done with special bending apparatus manufactured for that purpose and are obtainable from the manufacturers of the conduit system.
- c) Conduit in brickwork shall be built in. Where chasing is unavoidable, this must be undertaken using an angle grinder, chasing by hammer and chisel is unacceptable. A vertical "V" slots for conduit shall be cut with an angle grinder.
- d) All conduit boxes etc. shall be securely fixed to the shuttering to prevent displacement when concrete is cast. Conduit having a wall thickness of less than 1.6 mm shall not be allowed in screeding laid on top of concrete slabs.
- e) The Supervisor may inspect the conduit installation before the casting of concrete, however, the responsibility for the correct positioning of the outlet boxes shall remain with the Contractor. Before any concrete is cast all conduit droppers to switchboards shall be neatly spaced and rigidly fixed.
- f) The *Contractor* shall inform the Supervisor at least 48 hours before each concrete pour. A competent person shall be present during every concrete pour. No claims for conduit damaged during the casting of concrete shall be accepted. The *Contractor* shall find an alternate route to the approval of the Supervisor.
- g) Draw boxes, if required shall be placed in unobtrusive positions. Blank cover plates on 300 x 300 mm boxes shall be fixed with four countersunk chrome screws.
- h) Wherever conduits cross expansion joints, an expansion box shall be installed, consisting of a suitably sized uPVC box with conduit sleeves of a larger size than the crossing conduits. These sleeves shall be run from the box to the expansion joint and crossing conduits shall be run through them up to 25 mm into the expansion box.
- i) Insulated heat resistant boxes shall be used for outlets of totally enclosed luminaires and fittings where excessive temperatures are likely to occur.
- j) Where outlet boxes or draw boxes are mounted onto finished-surfaces such outlets shall be mounted symmetrically.

- k) It shall not be sufficient to scale the position of any outlet off the drawings. The mounting heights of outlets shall be indicated on drawings. Outlets located on walls near a change of wall finish, (e.g. tiles) shall be arranged so that the cover plates fall completely within one surface finish. The *Contractor* shall ascertain the height of the surface finish changes before installation of outlet points.
- l) The loop-in system shall be used. This means that all wiring shall be done from below the ceiling space where applicable. Conduit in roof spaces shall be installed directly from outlet to outlet without draw-boxes and shall be secured with suitable clamps at 1m intervals. The *Contractor* shall provide additional supporting members as required.

4.4.16.18 Wiring channel

- a) All recessed lighting shall be supplied via 5A plugs mounted in 76mm x 63mm wiring channel with 5A knockouts. The channel shall be mounted in the ceiling void and shall link the relevant DB. The channel shall be galvanised with PVC covers.
- b) 126mm x 76mm wiring channel shall be mounted in the ceiling void and shall link the relevant DB / access duct. The channel shall be galvanised with PVC covers.
- c) One channel shall be provided for each of the following:
  - i) normal power;
  - ii) dedicated power;
  - iii) telephone; and
  - iv) data.

4.4.16.19 Power-skirting

- a) The *Contractor* shall be responsible for the supply and installation of all power skirting complete with corner pieces, splices, end pieces, junction pieces, supply conduits, cover plates and power outlets as specified and indicated on the drawings.
- b) The power-skirting shall comply with SANS 1197. The *Contractor* shall ensure that the power-skirting is installed to the satisfaction of the Supervisor before commencing with the wiring of the power-skirting.
- c) Three compartments with two cover power skirting shall be supplied and installed as indicated in the drawings. The compartments shall be power (normal and dedicated), telephone and computer data.
- d) The power-skirting shall be from uPVC power-skirting or equal and approved by the Supervisor.
- e) The channel and cover shall be manufactured from uPVC. Colour to be selected at a later stage.

4.4.16.20 Outlet covers

Outlet covers shall be supplied and installed to accommodate normal and dedicated socket outlets, telephone and computer data outlets as shown on the drawings. The *Contractor* shall supply and install the normal and dedicated switch socket outlets with covers and the covers for the telephone and computer data outlets.

4.4.16.21 Wiring

- a) All wiring used shall be PVC insulated 600/1000 V grade to SANS 1507. The minimum wiring shall be as follows unless otherwise stated on the relevant single line diagrams of the distribution boards:
- i) lighting and fan circuits - 2.5 mm<sup>2</sup> PVC insulated 600/1000 V Cu conductor + 2.5 mm<sup>2</sup> insulated earth wire in 20 mm diameter uPVC conduit.
  - ii) socket outlet – 4 mm<sup>2</sup> PVC insulated 600/1000 V Cu conductor + 2.5 mm<sup>2</sup> insulated earth wire in 20 mm diameter uPVC conduit.
  - iii) air-conditioner circuits – 4 mm<sup>2</sup> PVC insulated 600/1000 V Cu conductor + 2.5 mm<sup>2</sup> insulated earth wire in 20 mm diameter uPVC conduit.
  - iv) hot water cylinder/hydro-boil/hand dryer circuits – 4 mm<sup>2</sup> PVC insulated 600/1000 V Cu conductor + 2.5 mm<sup>2</sup> insulated earth wire in 20 mm diameter uPVC conduit.
- b) Refer to the relevant single line diagrams of the distribution boards for the wiring of circuits not mentioned above. The conduit sizes shall be in accordance with the SANS – 10142-1.
- c) Where cable ends connect onto switches, luminaries etc. the end strands must be neatly and tightly twisted together and firmly secured. Cutting away of wire strands of any cable shall not be allowed.

4.4.16.22 Wall extract fan

- a) The supply and installation of the electrical extract fans and ducting work shall be the responsibility of the *Contractor*.
- b) The *Contractor* shall connect the fans including the controls for the fans as indicated on the drawing and specified in this Works Information. It must be controlled or connected via the plugged 5A switched socket out. The 5A switched socket outlets for this extract fan must be mounted 100mm below the extract fan.
- c) The circuit of extract fan within the ablutions shall be looped with the lighting circuit as indicated on the drawings. The circuit of extract fan within the rooms shall be operated and connected on its own circuit as indicated on the drawings.

- d) Wall type fans shall be fitted with automatic shutters. Fans shall be fitted with finger protection guards. Where specified, speed control shall be provided. Where remote control is specified, wiring between fan, control point and power supply point shall be flush mounted with conduit and draw boxes and shall include a temperature control.

#### 4.4.16.23 Lighting

- a) All luminaires shall be as specified in the Bill of Quantities and as indicated on the drawings. All luminaires comply with the SABS safety standard. The *Contractor* shall remove the existing lighting.
- b) The *Contractor* shall make provision for additional wiring for the controlling of the lights from the controller and digital addressable lighting interface (DALI) ballasts to meet the audio visual requirements within the board and training rooms.
- c) The *Contractor* shall make provision for additional light switch/s as per audio visual requirements.
- d) All recessed and surface mounted lighting fittings shall be the double parabolic type.
- e) All luminaries shall be operated with DALI protocol. The DALI circuits shall be used to control the lighting in each room by using the software programme.
- f) Samples of all luminaires shall be approved by the Supervisor before any order is placed. All luminaires must be complete with lamps and where necessary, control gear. All control gear shall bare the SABS mark.
- g) All luminaries shall have respective control gear/electronic ballast and cool white lamps controlled by the DALI system. All luminaries to be supplied by an approved SABS supplier and must meet all minimum requirements, SABS and SANS approved standard.
- h) The *Contractor* is given the recommended suppliers on the Bill of Quantities for the fitting. Should the *Contractor* not accept the recommended supplier, then he shall offer an equal to be approved by the Supervisor. Samples of the proposed fitting must be submitted to the Supervisor for approval.

#### 4.4.16.24 Positions

The layout of the luminaires as indicated on the drawings shall be adhered to as far as possible. The final mounting positions of luminaires shall be verified on Site. All luminaires shall be placed symmetrically with respect to ceiling panels, battens, beams, columns or other architectural features of the space. The layout as shown in the drawings shall generally be adhered to, but any discrepancies or clashes with structural or other features must be referred to the *Supervisor*, before commencing installation.

#### 4.4.16.25 Hangers and supports

- a) Where provision has not been made for the fixing of luminaires, the *Contractor* shall supply the necessary supports, hangers, conduit extensions, angle brackets or any other fixing method approved by the *Supervisor*. Fluorescent luminaires installed against concrete ceilings shall be screwed to the outlet boxes and in addition a minimum of 2 x 6 mm expansion or other approved type fixing bolts are to be provided. The bolts are to be placed 3/4 of the length of the luminaires apart.
- b) Fluorescent luminaires to be mounted on board ceilings shall be secured by means of two 40 mm x No. 10 round head screws and washers. The fixing screws are to be placed 3/4 of the length of the fitting apart.

4.4.16.26 Bulkhead luminaires

Surface-mounted bulkhead luminaires shall not be screwed directly to conduit ends. The conduit shall terminate in a round draw-box at the top or rear of the luminaire. The PVC-insulated conductors shall terminate in a porcelain terminal strip in the draw-box. Silicon-rubber insulated conductors shall be installed from the terminal strip to the luminaire lamp holder. "Screw-it" or similar connectors are not acceptable. The luminaires shall be fixed with 2 x 6 mm expansion bolts with a solid metal backing plate installed between the luminaire and the column.

4.4.16.27 Wiring to enclosed luminaires

The wiring, within enclosed, unventilated luminaires shall consist of tinned copper conductors insulated with silicone-rubber, braided with a heat resistant fibrous material (e.g. glass or terephthalate fibre). Several parallel strands of nickel-chrome or "KANTHAL" resistance wire insulated with porcelain beads may be used as an alternative.

4.4.16.28 Connection to luminaires

Connectors to the wiring or luminaires and other appliances where connectors are used, shall be affected by means of brass screw couplers shrouded in porcelain, neoprene or PVC or by means of approved spring steel locking connectors insulated in unbreakable material. Other types of connectors are not acceptable.

4.4.16.29 Knock-outs

Where knock outs are used for the wiring of luminaires and other appliances, brass bushes or gripper glands shall be used.

4.4.16.30 Type of conductor

Wiring from the lamp holder to the general wiring shall be heat resisting silicon compound insulated conductors.

4.4.16.31 Screwed lamp holders

The central terminal of Edison Screw ("ES") lamp holders shall be connected to the phase conductor (i.e. conductor with red insulation) and the screwed housing to the neutral conductor i.e. conductor with black insulation).

4.4.16.32 Earthing

Earth conductors shall be drawn in with the circuit wiring and connected to the earthing terminal of all luminaires in accordance with the SANS 10142-1.

4.4.16.33 Emergency lighting

- a) The emergency lighting shall comply with the requirements of SANS 10114-2. Individual recessed luminaires may be offered for this purpose. The units shall be of the maintained type with 1 hour battery back-up.
- b) The emergency luminaire shall contain an automatic self-test facility that both exercises the batteries and establishes the lamp condition. A weekly and full functional monthly test must be performed. The detection of a fault shall set off a continuous visual alarm (LED) and an acoustic alarm. The inverter shall meet the requirements of SANS 598-1 and SANS 1464.
- c) The nickel cadmium batteries shall be suitable for the specified for the specified performance, be compatible with the E.B.U and shall be of the high-temperature type suitable up to 40°C ambient temperature.

4.4.16.34 Stairwell lighting

Emergency back-up units shall be supplied and installed at all stairwell luminaires. The emergency back-up unit shall form part of the fitting.

4.4.16.35 Lighting pole

- a) An 8 meter pole, from Beka or any other approved supplier, in total length shall be used and shall have 7 meter height above ground level and a 1000mm of a pole shall be below ground. A hole shall be provided at 400mm below level for supplying cables. An access door shall be 1000mm above finishing floor level. Colour shall be same as Beka pole K913 Mineral grey or similar.
- b) The pole shall be manufactured from glass fibre reinforced polyester utilising the glass filament wind process. The filament winding shall be continuously applied with uniform tension onto a rotation mandrel, resulting in a minimum mass glass to resin ratio of 70:30, for optimum rigidity. The pole shall be seamless and circular in shape with a continuous taper of 16-18 mm diameter change per meter. An 80mm diameter hole shall be provided at 400mm below ground level for the cable entry.
- c) The pole surface shall be finished in a gel coat that complies with the requirements of SANS 141 and be applied to a uniform thickness of between 250 and 500 microns, achieving a smooth finish that provides a weatherproof, UV resistant, flame resistant and impact strong surface in the colour specified.
- d) The minimum mechanical strength of the pole shall be designed for a fluctuating wind pressure of 500 Pa onto a wind surface area of 0.20 m<sup>2</sup> under which a maximum deflection of 5% of its height above ground shall be permissible. The pole shall have a safety factor of 2.5 and be able to be manufactured to any other strength required.
- e) An access door opening is required; the 80 mm x 240 mm cut out shall be covered by access door cover manufactured from glass filled nylon impregnated in the same colour as that of the surface coat. It shall be fixed

securely by two M4 stainless steel captive Allen head screws that locate into M4 brass nut inserts embedded in the pole.

- f) The pole shall be supplied complete with a hot dipped galvanised base plate with a minimum size of 300 mm x 300 mm x 1.6 mm, two hot dipped galvanised steel M8 hook bolt and nuts, a hot dipped galvanised gland plate suitable for the incoming and outgoing cables complete with terminal block and mounting rail and a 5A, 5 kA single pole miniature circuit breaker. The wiring from the MCB shall consist of 2.5mm<sup>2</sup> 2c trailing cable and shall be taken up to the luminaries within pole.
- g) The supply cable to each pole shall be 6mm<sup>2</sup> 3 core PVC/SWA/PVC copper ECC cable or as per drawing in cable trenches and sleeves.
- h) A suitable brass terminal shall be provided within the pole and all earth conductors installed with the underground cables shall be connected to this terminal. The fitting shall be earthed to this terminal.
- i) The pole shall bear the SANS 1749 mark and be manufactured by an ISO 9002 accredited factory.
- j) No foundations for poles are required. The final colour shall be mineral grey.

#### 4.4.16.36 Erection of the pole

The pole shall be supplied complete with a hot dipped galvanised base plate with a minimum size of 300 mm x 300 mm x 1.6 mm, two hot dipped galvanised steel M8 hook bolt and nuts. The poles shall be positioned as shown on the drawing. The poles shall be buried to a depth of 1000mm below finished ground level. Dry Portland cement shall be mixed with the selected soil, with a 1:9 cement to soil ratio, before backfilling. The pole shall be mechanically compacted to 98% MOD AASHTO density in maximum layers of 150mm.

#### 4.4.16.37 Final colour

The final colour shall be silver suitable for exterior.

- a) Flood lighting luminaires

#### 4.4.17 Specification of flood light luminaires

4.4.17.1 The *Contractor* shall supply and install the light fittings as per the following specifications:

- a) 1174W LED floodlight;
- b) Ambient temperature environment of up to 35<sup>0</sup>c, without reducing the LED lifetime of 15 years, at a lumen depreciation slim, aesthetical design optimised for LED characteristics;
- c) Marine grade (LM6), high pressure die cast aluminium housing;
- d) Three compartment housing ensures reliable ingress protection;

- e) The floodlights shall be the vandal and theft proof version;
- f) reflector 99.85 aluminium polished and anodised to obtain the highest light yield and shall not be subject to accidental misalignment; and
- g) tempered serigraphed glass. luminaire fitted with anti-condensation device, to prevent needless mechanical stresses on the glass and seals. This version is fitted with explosion-proof capacitors, in the event of strong mains disturbances; the capacitor cuts itself off automatically.

- 4.4.17.2 The luminaire shall have an IP65 rating and shall bear the SANS 60598-2-5 safety mark and the IP ratings shall be certified by a SABS test report.
- 4.4.17.3 The luminaire shall be robustly constructed, weatherproof, hail proof, corrosion proof and vandal resistant. The front glass covering the lamp compartment shall be heat and impact resistant and held by stainless steel clamps and sealed by extruded heat resistant silicon gasket.
- 4.4.17.4 The lamp holder shall comply with VC 8011, be rated to withstand 240°C and shall prevent loosening of the lamp caused by vibrations.
- 4.4.17.5 The control gear shall be suitable for operation with the specified rating of the lamp on a 230 V, 50 Hz single-phase system. All control gear components shall be removable and bear the relevant SABS mark. All internal wiring shall be Teflon coated with protective sleeving to prevent damage by possible abrasion.
- 4.4.17.6 All screws, bolts and metals shall be stainless steel or of non-corrosive material. Main connections shall be by means of a suitable screw terminal block with a wire clamping contact. Ignitors, where applicable, shall be of the superposed pulse type. The luminaire shall be power factor corrected to a minimum of 0.85.
- 4.4.17.7 The *Contractor* shall guarantee any paint treatment on the luminaire against flaking or peeling for 15 years. The finished colour of the luminaire shall be grey.
- 4.4.17.8 The preferred supplier shall be Beka and any other supplier used by the *Contractor* shall first be approved by the Supervisor.
- 4.4.17.9 A limited number of street lights (+/-2) exist in the driveway towards the building. These fittings together with the flood lighting structures are to be connected into the new guardhouse distribution board.

#### 4.4.18 Photo cell

Specifications for the photo cell

- 4.4.18.1 The area lighting shall be switched by either a contactor mounted in the distribution board, which is controlled by a photocell or direct by the photocell. The photocell shall comply with NRS 025.
- 4.4.18.2 The photocell shall be mounted as indicated on the drawings in such a manner that the luminaires shall not affect the operation of the photocell.
- 4.4.18.3 The photocell shall be linked with the distribution board by 3 x 2,5mm<sup>2</sup> PVC conductors drawn in conduit in the roof space.
- 4.4.18.4 The photocell shall comply with the following:

- a) area lights shall be switched on when the illumination drops to 50 Lux;
- b) area lights shall be switched off when the illumination reaches 90 Lux;
- c) it shall be weather proof and be resistant to ultra violet light;
- d) the photo cell shall have a built in time delay of approximately 30 seconds;
- e) built in protection against voltage surges shall be provided;
- f) a sample of the proposed photo cell shall be submitted to the *Supervisor* for approval prior to placing the order;
- g) 20 A rating shall be provided; and
- h) the type shall be National ZA 20.
- i) 3.10 Light switches  
All light switches shall conform to SANS 163 and must bear the SABS mark.
- j) 3.11 Interior light switches  
Interior light switches in the walls shall be flush mounted in 100mm x 50mm x 50mm conduit boxes and shall be mounted 1200 mm AFFL. Light switches shall be able to operate using the DALI system. The type shall be Crabtree or equal and approved by the *Supervisor*.
- k) 3.12 Dimmer light switches  
Manual dimmer light switches in the walls shall be flush mounted in 100mmx50mmx50mm conduit boxes and shall be mounted 1200mm AFFL. Dimmer light switches shall be able to operate using the DALI system. The DALI system light dimmer software controller shall be used to control all the luminaires within the training and board rooms.
- l) 3.12 Occupancy sensors (motion detector switches)  
Room lighting installations are shown on the drawings and the *Contractor* shall carry out his work in accordance with the relevant specifications and DALI system. The lighting in most rooms shall be controlled by a surface ceiling mounted 2000w PIR occupancy/motion detector sited in a suitable place to pick up movement. The detector shall have a range of 7m at 2.5m mounting height and an adjustable time setting of 30 minutes. A by-pass switch shall be provided in the distribution board for each occupancy sensor. The occupancy / motion detector shall be able to operate using the DALI system. The type shall be crabtree or equal and shall be approved by the *Supervisor*. The occupancy sensors shall be able to switch both air-conditioning units and the lighting equipment on/off within the room.
- m) 3.13 Switch socket outlets

#### 4.4.19 Specifications for the switch socket outlets

- 4.4.19.1 Switch socket outlets shall conform to SANS 164 and shall bear the SABS mark. Switch socket outlets must be mounted at mounting heights as shown on the drawings, power-skirting, multiway box and partition boxes. All switch socket outlets shall of the combination switch type 16A, three pin. Switch socket outlets in walls shall be flush

mounted in 100 mm x 100 mm x 50 mm conduit boxes. Normal switch socket circuits must be protected by 30 mA earth leakage units and a 20A circuit breaker with a maximum of five outlets per circuit.

- 4.4.19.2 Dedicated socket outlets shall be red with shaved earth pin and shall be protected by a 15A circuit breaker with a maximum of three outlets per circuit. The new dedicated socket shall be fed by the existing UPS system.

a) 3.14 Power points

The following power points shall be supplied:

**Extract Fans outlet**

A 5A un-switched socket outlet shall be installed for every extract fan as indicated on the drawings.

**Hand Dryers**

The *Contractor* shall supply and install 20 mm conduit from the distribution board to the hand dryer positions in the ablutions as indicated on the drawings. The conduit shall be installed flush and terminated to a 100 mm x 100 mm conduit box installed at a height of 1200 mm AFFL. A 20A DP isolator with neon indication shall be installed at 2500mm AFFL.

**Hydro boil**

The supply and installation of the hydro boil and plumbing work shall be the responsibility of the *Contractor*.

The *Contractor* shall electrically connect all hydro boil as specified.

**4.4.20 Specification for the Electrical Water Heater outlets**

- 4.4.20.1 Supply and installation of outlets only, for all hot-water cylinders shall be indicated on the drawings. Each outlet shall consist of a 30A double pole isolator with indicator light mounted on surface as close as possible to the hot-water cylinder. The isolator shall be Crabtree or equal and approved by the Supervisor.

- 4.4.20.2 The isolator shall be connected to the relevant distribution board by means of 2 x 4 mm<sup>2</sup> PVC insulated conductors, and 1 x 2.5 mm<sup>2</sup> insulated copper earth wire in 20 mm diameter uPVC conduit. Flexible uPVC conduit shall be used for the connection from the isolator to the electrical water heater.

- 4.4.20.3 The circuit breaker supplying the geyser shall be combined with a single pole isolator for switching the neutral.

- 4.4.20.4 The supply and installation of the electrical water heaters and plumbing work shall be the responsibility of the *Contractor*.

- 4.4.20.5 The *Contractor* shall electrically connect all electrical water heaters as specified elsewhere.

a) 3.16 UPS

The existing single phase on-line uninterruptable power supply unit shall be maintained to supply all dedicated socket outlets.

b) 3.17 Exterior air-conditioning outlets

Double/triple pole isolators, assembled in an IP65 enclosure and mounted adjacent to the plant as shown on the drawings shall be supplied and installed by the *Contractor*. The air-conditioning plant shall be supplied and connected to the isolator by the *Contractor*. The isolators shall be Moeller or equal and approved by the *Supervisor*.

c) 3.18 Interior air-conditioning outlets

Double/triple pole flush-mounted isolators adjacent to the plant as shown on the drawings shall be supplied and installed by the *Contractor*. Air-conditioning Plant and Material shall be supplied and connected to the isolator by the *Contractor*. They shall be Crabtree or equal and approved.

d) 3.19 Earthing and bonding

**4.4.21 Specification for earthing and bonding**

4.4.21.1 The entire electrical installation shall be earthed and bonded in accordance with SANS 10142-1. The type of main earthing must be as required by the supply authority. The entire installations shall be effectively earthed in accordance with the SANS 10142-1 and to the requirements of the supply authority. All earth conductors shall be stranded copper with or without green PVC insulation.

4.4.21.2 Connection from the main earth bar on the main board shall be made to the cold water main, the incoming service earth conductor, if any and the earth mat or other local electrode by means of 70 mm<sup>2</sup> stranded (not solid) bare copper wire or such conductor as the Supervisor may direct.

4.4.21.3 The main earth bar of a minimum cross sectional area of 40 mm x 6 mm of a high conductivity tinned copper bar shall be supported on insulators. The inter-connecting earth between bars shall be 70 mm<sup>2</sup> insulated copper conductors. The trench earth conductors shall be 70 mm<sup>2</sup> bare copper wire.

4.4.21.4 The final resistance of every main distribution board, metering panel must comply with SANS 10142-1.

4.4.21.5 Main earth copper strapping where installed below 3m from ground level must be run in 20 mm diameter uPVC conduit securely fixed to the walls.

4.4.21.6 All other hot and cold water pipes shall be connected with 12 mm x 0,8 mm perforated or solid copper strapping (not conductors) to the nearest switchboard. The strapping shall be fixed to the pipework with brass nuts and bolts and against walls with brass screws at 150 mm centres. In all cases where metal water pipes, down pipes, flues, etc., are positioned within 1,6 m of switchboards an earth connection consisting of copper strapping shall be installed between the pipework and the board. In vertical building ducts accommodating both metal water pipes metal gutters and electrical cables, all the pipes shall be earthed at each distribution board.

d) 3.20 Sub-distribution boards

**4.4.22 Specification for the sub-distribution boards**

4.4.22.1 A separate earth connection shall be supplied between the earth busbar in each sub-distribution board and the earth busbar in the main switchboard.

4.4.22.2 These connections shall consist of bare or insulated stranded copper conductors installed along the same routes as the supply cables or in the same conduit as the supply conductors.

e) 3.21 Sub-circuits

The earth conductors of all sub-circuits shall be connected to the earth busbar in the supply board in accordance with SANS 10142-1.

f) 3.22 Ring mains

**4.4.23 Specification for the ring mains**

4.4.23.1 Common earth conductors may be used where various circuits are installed in the same wireway in accordance with SANS 10142-1. In such instances the sizes of earth conductors shall be equivalent to that of the largest current carrying conductor installed in the wireway, alternatively the size of the conductor shall be as directed by the Supervisor.

4.4.23.2 Earth conductors for individual circuits branching from the ring main shall be connected to the common earth conductor with T-ferrules or soldered. The common earth shall not be broken.

g) 3.23 Non-metallic conduit

Standard insulated copper earth conductors shall be installed in the conduit and fixed securely to all metal appliances and equipment, including metal switch boxes, socket-outlet boxes, switchboards, luminaires, etc. The securing of earth conductors by means of self-threading screws shall not be permitted.

h) 3.24 Flexible conduit

An earth conductor shall be installed in all non-metal flexible conduit. This earth conductor shall not be installed externally to the flexible conduit but within the conduit with the other conductors. The earth conductor shall be connected to the earth terminals at both ends of the circuit.

i) 3.25 Connection

**4.4.24 Specification for connection**

4.4.24.1 Under no circumstances shall any connection points, bolts, screws, etc., used for earthing be utilised for any other purpose.

4.4.24.2 It shall be the responsibility of the *Contractor* to supply and fit earth terminals or clamps on Plant and Material that must be earthed where these are not provided. Unless earth conductors are connected to proper terminals, the end shall be tinned and lugged.

j) 3.26 Earth electrodes

**4.4.25 Specification for earth electrodes**

4.4.25.1 Earth electrodes shall be of stainless steel or shall have a steel core with copper cladding of, at least, 0,25 mm thickness, applied by the molten welded process, to form a microscopic crystalline copper steel alloy between the two metals, as to ensure that abrasion or bending, during driving, shall not damage the outer copper skin. Earth electrodes shall be approximately 1600 mm in length with provision for screwing together to form a mechanically and electrically continuous rod.

4.4.25.2 The joint, between the extensible electrodes, shall not permit the ingress of moisture. The coupling shall be of a material that shall inhibit electrolytic action between the coupling and the copper skin on the electrode.

4.4.25.3 Electrodes shall be driven into the soil in a professional manner that shall ensure that no unnecessary vibrations are set up. The manufacturer's recommended electrode-driving practice shall be closely followed.

4.4.25.4 The top of the electrode, after installation, shall be, at least, 400 m below surface level.

k) 3.27 Lightning protection

#### 4.4.26 General

All workmanship, Plant and Material used shall be of the highest standard and shall be carried out in accordance with the best modern practice.

The entire installation shall comply in every respect with the latest amended publication of the following specifications:

SANS spec	Description
SANS 61643-21	Low voltage surge protective devices Part 21: Surge protective devices connected to telecommunications and signalling networks – Performance requirements and testing methods
SANS 61024-1	Protection of structures against lightning Part 1 : General principles
SANS 61024-1-1	Protection of structures against lightning Part 1: General principles Section 1: Guide A – Selection of protection levels for lightning protection systems
SANS 61024-1-2	Protection of structures against lightning Part 1 – 2: General principles – Guide B – Design, installation, maintenance and inspection of lightning protection systems
SANS 61312-1	Protection against lightning electromagnetic impulse Part 1: General principles
SANS 61312-2	Protection against lightning electromagnetic impulse (LEMP) Part 2: Shielding of structures, bonding inside structures and earthing
SANS 61643-1	Surge protective devices connected to low-voltage power distribution systems Part 1: Performance requirements and testing methods
SANS 10313	The protection of structures against lightning
SANS 171	Low voltage lightning arresters
SANS 1063	Earth rods, couplers and clamps
SANS 10199	The design and installation of an earth electrode

#### 4.4.27 Competent persons

The lightning arrester system as a whole is to be installed by a specialised firm primarily engaged in this type of work. Should the *Contractor* not comply with the above then he shall employ the services of such a specialised firm and the name of this firm shall be stated at the time of tendering by the *Contractor*.

l) 3.28 Notices, signs, drawings and labels in the electrical equipment rooms

All substations and rooms accommodating electrical equipment shall be equipped with the required statutory warning, safety and first aid signs and notices in accordance with the NOSA, OHS Act and SABS 0142-1.

Notwithstanding anything to the contrary, the *Contractor* shall provide the following as minimum requirements:

- a) a notice of all entrances prohibiting unauthorized persons from entering rooms containing electrical equipment and switchboards;
- b) a notice prohibiting unauthorized persons from handling or interfering with electrical equipment located in areas accessible to the general public and within each room having electrical equipment;
- c) a notice in each room containing electrical equipment providing instructions as to the restoration of persons suffering from the effects of an electrical shock;
- d) all entrance doors shall be labelled as to room function, e.g. main MV switch and control room, etc;
- e) each switch and equipment room shall be provided with:
- f) the wiring and control schematic diagrams shall be fixed to the wall framed behind glass; and
  - i) a suitable A4 size or larger hard covered and durable log book shall be fixed by a non-ferrous chain to a suitable wall-mounted timber desk top. "Equipment Operating and Switching Instructions" - these may be included on the framed diagrams or included as part of the log book or as a separately bound hard covered manual.
- m) 3.29 Vermin-proofing and sealing of ducts

4.4.28 **Specification for vermin-proofing and sealing of ducts**

4.4.28.1 All ingress positions to substations and electrical rooms shall be adequately vermin-proofed by means of non-corrodible vermin-proof mesh. Wherever possible the vermin-proofing shall be demountable to facilitate subsequent modifications and additions to the incoming and outgoing cabling.

4.4.28.2 Unless otherwise specified all cable trenches, sleeves and ducts between substation rooms shall be sealed off in a manner as to ensure a water and gas-tight seal. The method used shall be easily removed to accommodate future changes to the cabling and shall provide a 4-hour rated fire cut-off between rooms.

3.30 Electrical testing and commissioning

4.4.29 **Specification for electrical testing and commissioning**

4.4.29.1 The *Contractor* shall test the entire electrical installation in terms of Regulation 7 of the Electrical Installation Regulations 1992 of the Occupational Health and Safety Act 1993 and shall issue a Certificate of Compliance on the official form, obtainable from

the Electrical Contracting Board of South Africa. All tests shall be carried out in conjunction with and to the satisfaction of the Supply Authority and in the presence of the *Project Manager*.

- 4.4.29.2 Each length of cable shall be tested for insulation and polarity by means of a 1000 V megger designed for that purpose. In the case of underground cables this shall be done before back filling.
- 4.4.29.3 In addition, the earth-loop impedance of each main and sub-main feed shall be measured. The earth resistance at each down conductor electrode shall be measured. The earth resistance shall be tested by means of an approved instrument.
- 4.4.29.4 If there is no power on the day of the test, the *Contractor* shall supply a 3 kW 230 V generating plant for testing purposes. "Danger" notices shall be displayed at remote ends of cables under test.
- 4.4.29.5 The *Contractor* shall advise the *Project Manager* in writing of all results and furnish copies of all certificates.
- 4.4.29.6 The *Contractor* shall undertake load balancing.
- 4.4.29.7 The *Contractor* shall provide all the necessary instruments for the proper testing of the complete installation. If there is a reason to doubt the accuracy of such instruments, the *Contractor* shall take the necessary action to prove their accuracy.
- 4.4.29.8 The *Supervisor* shall provide the *Contractor* with quality control check sheets, which shall be used and completed in full. These check sheets do not relieve the *Contractor* from carrying out his own checks and tests.
- 4.4.29.9 The responsibility of the installation meeting specification and statutory requirements remain with the *Contractor*.
- 4.4.29.10 The *Contractor* shall ensure that the installation is completed in every respect and that there are no major Defects before notifying the *Supervisor* (in writing) for the first delivery inspection. The certificates of compliance shall be issued to the *Project Manager* at the first delivery inspection.
- 4.4.29.11 The *Supervisor* shall accept zero minor Defects during the final inspection. Should any Defects as listed during the first delivery inspection be found not to have been corrected then the *Supervisor* shall terminate that inspection and request that an additional final inspection be arranged by the *Contractor*. The cost of the *Supervisor's* time for the re-inspection shall be deducted from the fee in the form of a variation order.

Testing	Minimum requirements
Insulation resistance	Whole installations: better than 1 Meg Ohm
LT Installation	Each sub-distribution section: better than 5 Meg Ohms. Each un-terminated cable : better than 5 Meg Ohms
Earth leakage on socket outlets	Better than 30 milli amps
Max resistance of earth continuity conductor	As per SANS 10142-1

Earth electrode resistance	Better than 10 Ohms
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- 4.4.29.12 The *Contractor* shall be responsible for all commencement and completion forms required by statutory bodies and municipalities.

#### Guarantee

The *Contractor* shall guarantee the Plant and Material, apparatus and workmanship delivered and installed by him. The guarantee shall be valid for a period of twelve months starting on the date when the Completion certificate is issued. The complete installation shall be guaranteed against Defects as a result of patent and latent defects of the apparatus, as well as against faulty Plant, Material and workmanship. Fair wear and tear shall be excluded from the guarantee.

#### Extended guarantee

Where certain Plant and Material have supplier's standard guarantee clauses of which do not correspond with the guarantee the *Contractor* shall allow in the tender price for the extensions of guarantees and additional charges thereof, in order to comply with guarantee clause.

Transnet projects specification (latest revisions)

HE8/2/8	technical specification for testing and commissioning of electrical equipment
EEAM-Q-012	General electrical equipment (HE8/2/2)
EEAM-Q-014	Electrical motors and generators (HE8/2/3)
EEAM-Q-020	Testing and commissioning of electrical equipment (HE8/2/8)
EEAM-Q-021	Electronic equipment (HE8/2/9)
EEAM-Q-028E	Specific requirements for electrical equipment: Port of Richards Bay (HE8/2/12)
EEAM-Q-030	Specific requirements for electrical equipment to be supplied with Machinery and Plant for Ports
HE8/2/6	Lighting on equipment
HE8/2/8	Testing and commissioning of electrical equipment
EEAM-Q-008	Corrosion protection (HE9/2/8)
EEAM-Q-016	General requirements and conditions (HE9/2/9)
EEAM-Q-028M	Specific requirements for mechanical equipment: Port of Richards Bay (HE9/2/12)

#### List of Drawings

Drawings issued by the *Employer*

The following drawings shall be issued by the *Employer* at or before the Contract Date and which shall apply to this contract.

Note: Some drawings may contain both Works Information and Site information.

#### Electrical drawings

Drawing number	Rev	Title
32442.00-300-01	01	Site Plan: Electrical Layout
32442.00-300-02	01	Guard House: Electrical Layout
32442.00-300-03	01	Server Room: Electrical Layout
32442.00-301-05	01	Roof Plan Renovation: Electrical Layout
32442.00-312-01	03	Single Line Diagram 01
32442.00-312-02	03	Single Line Diagram 02
32442.00-312-03	03	Single Line Diagram 03
32442.00-312-04	03	Single Line Diagram 04
32442.00-312-05	03	Single Line Diagram 05
32442.00-312-06	03	Single Line Diagram 06
32442.00-320-01	03	Ground Floor: Electronic Layout
32442.00-320-02	01	First Floor: Electronic Layout
32442.00-320-03	01	Second Floor: Electronic Layout
32442.00-320-04	01	Third Floor: Electronic Layout
32442.00-370-01	01	Ground Floor: Power Layout
32442.00-370-02	01	First Floor: Power Layout
32442.00-370-03	01	Second Floor: Power Layout
32442.00-370-04	01	Third Floor: Power Layout
32442.00-377-01	01	Ground Floor: Containment Layout
32442.00-377-02	01	First Floor: Containment Layout
32442.00-377-03	01	Second Floor: Containment Layout
32442.00-377-04	01	Third Floor: Containment Layout
32442.00-380-01	01	Ground Floor: Lighting Layout
32442.00-380-02	01	First Floor: Lighting Layout
32442.00-380-03	01	Second Floor: Lighting Layout
32442.00-380-04	01	Third Floor: Lighting Layout

The specification and drawings generally show the character and extent of the proposed work, and shall not be held as showing every minute detail of the work to be executed. The *Contractor* shall ensure that his copy of the specification is complete and that all drawings as listed have been received.

The following drawings are provided with this contract.

The layout and extent of the electrical installation are shown on the drawings that form part of this document. These drawings are for tender purposes and construction drawings shall be issued to the *Contractor* after the contract is awarded.

Drawings to be supplied by *Contractor*

Prior to fabrication or construction, the *Contractor* shall submit to the *Project Manager*:

- a) distribution board: general arrangement and steelwork drawings; and
- b) distribution board: equipment list

## PROCESS CONTROL AND IT WORKS

### 4.5 ACCESS CONTROL

## ENGINEERING AND THE *CONTRACTOR'S* DESIGN

### 4.5.1 *Employer's* design

No design for permanent structures shall be required from the *Contractor*.

The *Employer* shall supply the following:

- Works Information;
- technical specifications;
- structural concrete drawings;
- structural steelwork general arrangement drawings (excluding shop detailing drawings); and
- architectural drawings.

Drawings for providing the *works* are listed in the Works Information of this document.

The *Employer* grants the *Contractor* a license to use the copyright in design data presented to the *Contractor* for the purpose of the *works* only.

#### **4.5.2 Parts of the *works* which the *Contractor* shall design**

The *Contractor* shall design the revised access control based on the existing design topology. The *Contractor* shall also provide detailed drawings of the revised system.

The *Contractor* shall further provide full details of the CCTV camera system with all detail design drawings indicating locations, wiring and Plant and Material utilized.

#### **4.5.3 Procedure for submission and acceptance of *Contractor's* design**

The *Contractor* shall submit to the *Project Manager* for acceptance all design drawings and relevant documentation prior to the on-Site work commencing.

All procedures shall be completed according to the *Employer's* specifications.

#### **4.5.4 Review and acceptance of *Contractor's* documentation**

The *Contractor* shall submit two sets of construction drawings to the *Project Manager*. The *Project Manager* shall either accept the drawings or reject the drawings and return for revision. Only once the design has been accepted shall the *Project Manager* provide the necessary permission to proceed.

#### **4.5.5 Plant and Material to be included in the *works***

A full list of Plant and Material shall be issued by the *Contractor* to the *Project Manager*. Currently the *Employer's* access control equipment for the various ports includes the following:

- entry and exit badging, biometric readers - Autec model XMP-TMC2801-FP-MIF;
- access controllers - Autec XMP-K32SX-000; and
- electro-magnetic door lock - Bell 600S

#### **4.5.6 As-built drawings, operating manuals and maintenance schedules**

##### **4.5.6.1 As-built drawings**

After Completion, the *Contractor* shall provide "as-built" drawings. The "as-built" drawings shall be a continuation of the *Contractor's* shop drawings as modified, augmented, and reviewed during the installation, check out and acceptance phases of the project. All drawings shall be fully dimensioned and prepared in DWG format using any CAD-based software capable of exporting the format (such as AutoCAD)

##### **4.5.6.2 As-Built / final documentation**

After Completion, the *Contractor* shall provide copies of the manuals as described herein. Each manual's contents shall be identified on the cover. The manual shall

include names, addresses, and telephone numbers of each security system integrator installing Plant and Material and systems and the nearest service representatives for each item of Plant and Material for each system. The manuals shall have a table of contents and labeled sections. The manuals shall include all modifications made during installation, checkout, and acceptance. The manuals shall contain the following:

- a) Functional design manual  
The functional design manual shall identify the operational requirements for the system and explain the theory of operation, design philosophy, and specific functions. A description of hardware and software functions, interfaces, and requirements shall be included for all system operating modes.
- b) Hardware manual  
The hardware manual shall describe all Plant and Material furnished including:
  - i) general description and specifications;
  - ii) installation and check out procedures;
  - iii) Plant and Material layout and electrical schematics to the component level;
  - iv) system layout drawings and schematics;
  - v) alignment and calibration procedures; and
  - vi) manufacturers' repair parts list indicating sources of supply.
- c) Software manual  
The software manual shall describe the functions of all software and shall include all other information necessary to enable proper loading, testing, and operation. The manual shall include:
- d) Definition of terms and functions;
  - i) use of system and applications software;
  - ii) initialization, start-up, and shut down;
  - iii) alarm reports;
  - iv) reports generation;
  - v) database format and data entry requirements; and
  - vi) directory of all disk files.
- e) Operator's manual  
The operator's manual shall fully explain all procedures and instructions for the operation of the system including:
  - i) computers and peripherals;
  - ii) system start-up and shut down procedures;
  - iii) use of system, command, and applications software;
  - iv) recovery and restart procedures;
  - v) graphic alarm presentation;
  - vi) use of report generator and generation of reports;
  - vii) data entry;

- viii) operator commands;
  - ix) alarm messages and reprinting formats; and
  - x) system access requirements.
- f) Maintenance manual  
The maintenance manual shall include descriptions of maintenance for all Plant and Material including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components.

## **PLANT AND MATERIALS STANDARDS AND WORKMANSHIP**

### **4.5.7 Scope of Work**

#### **General**

- 4.5.7.1 Where SANS 10142 and/or SANS 10198 specifications are used within the Works Information, then where the term “Equipment” (or the like) is used with the meaning of installation and items left behind in the works, then please read this term as “Plant” for ECC3 defined term compliance.
- 4.5.7.2 The existing control tower was constructed during 1976. Due to operational requirements, the current structure is too small to accommodate staff and is to be expanded.
- 4.5.7.3 An additional floor and additional rooms are to be added to the existing building and a new access control system installed to cover both building access and Site access.
- 4.5.7.4 The scope shall include for additional site and door access control to cover the modifications to the site and the building.
- 4.5.7.5 The scope shall also include a revised CCTV camera system to provide adequate coverage over the revised Site layout.

#### **Detailed scope and description of requirements**

- 4.5.7.6 Access control system (see ESS/Hatch drawings of existing system TNPA491-K-612-0001/0002)
- 4.5.7.7 There is an existing Autec security system running “Babylon” software. The existing system includes biometric/card reader access on the main entrance (for time and attendance) and the equipment room doors both in and out, and a card reader on the existing driveway gate entrance. The existing cameras are also integrated into the Autec system.
- 4.5.7.8 The system is to be expanded and card readers and magnetic door locks shall be installed in the following locations:
  - i) security office;
  - ii) door connecting the training center to the main office;
  - iii) generator room;

- iv) training door 1 (double door);
- v) training door 2 (double door);
- vi) dormitory 1;
- vii) dormitory 2;
- viii) archive room;
- ix) harbour master office;
- x) deputy harbour master office;
- xi) secretary's office; and
- xii) operations office

- 4.5.7.9 The existing Biometric readers are Autec type XMP-TMC2801-FP-MIF. New card readers shall be compatible with the existing system.
- 4.5.7.10 The door locks shall be eletro-magnetic Bell type 600S (250kg) with LED door open/closed status.
- 4.5.7.11 The scope includes the supply, installation, cabling to the equipment room, connecting into the existing network and commissioning.
- 4.5.7.12 The nominated Sub-Contractor to complete the above work is ESS (Engineering System Solutions).

**CCTV surveillance system (see ESS/Hatch drawings of the existing camera system  
TNPA-K-GA- 612-0001-01 and TNPA-K-BD-612-0001-01)**

- 4.5.7.13 There is an existing CCTV system on Site, however due to the modifications to the control tower building and additional parking the system shall require to be expanded to ensure total coverage over the entire outside area. The existing external cameras eight in total cover the perimeter fence and the parking area. Seven of these cameras have fixed positions and one is a pan/tilt/zoom unit mounted on the north east wall of the building at 2nd floor level.
- 4.5.7.14 During the course of site leveling it will be necessary to temporary remove the cameras to avoid damage. This will be done as and when necessary as dictated by the civil work. Any one camera may only be out of commission for a minimum period.
- 4.5.7.15 The cameras are connected via fibre optic cable which runs to junction boxes (containing a fibre convertor) mounted adjacent to the camera pole.
- 4.5.7.16 The fibre cable for the cameras at the existing security "hut" will require to be disconnected and pulled back to the manhole under the existing car park until these cameras can be relocated and re-connected.
- 4.5.7.17 The camera fibre cable on the eastern corner will require pulling back to the nearest manhole whilst the earth mound over the cable is removed and the area leveled. Subsequently a new sleeve shall be installed and the camera re-connected in its original position.

- 4.5.7.18 Two new external cameras shall be installed and integrated into the existing surveillance monitoring system. Their location is indicated on drawing 1101/067/3000.
- 4.5.7.19 There are four internal dome cameras two of which will require relocation after building completion. These are the cameras in the existing equipment room and in the existing control room.
- 4.5.7.20 One new pan tilt and zoom camera shall be installed on the new roof and another camera in the new Training Centre. The PTZ camera shall have high resolution and minimum 36X optical zoom capability. The Training Centre camera shall be a doom type Sony SNC-DF40P.
- 4.5.7.21 The camera electronic equipment is located in the server room. A new sever room is to be constructed and this equipment shall be moved to the new room.
- 4.5.7.22 The existing monitoring equipment (PC server) is installed in the control room and shall be moved to the location of the new control room one floor above.
- 4.5.7.23 The Contractor's scope shall also include for a survey of the existing surveillance system and the requirement, if necessary, for any additional monitoring Plant and Material to be included for the additional cameras. The *Contractor* shall advise the Project Manager in writing the results of his survey and if any additional Plant and Material is required, proceed only after approval from the Project Manager.
- 4.5.7.23 All new Plant and Material shall be compatible with the existing CCTV camera system.
- 4.5.7.23 The nominated Sub-contractor to complete the integration of the additional cameras into the existing system is ESS.

#### **Submittals**

- 4.5.7.24 Shop drawings
- Prior to assembling or installing the SMS, the *Contractor* shall provide complete shop drawings which include the following:
- a) architectural floor plans indicating all system device locations;
  - b) full schematic wiring information for all devices. Wiring information shall include cable type, cable length, conduit routings, quantities, and point-to-point termination schedules;
  - c) complete access control system one-line block diagram;
  - d) statement of the system sequence of operation;
  - e) riser diagrams showing interconnections;
  - f) detail drawings showing installation and mounting (this shall apply to the cameras also); and
  - g) fabrication drawings for console arrangements and Plant and Material layout.
- All drawings shall be fully dimensioned and prepared in DWG format using any CAD-based software capable of exporting the format (such as AutoCAD).

## 4.5.8 THE **EMPLOYER'S SPECIFICATIONS (LATEST REVISIONS)**

The following Employer's specifications shall apply:

TPD-001-EL&PSPEC	Technical specification for the supply and installation of electrical lighting and power in buildings other than dwelling houses
TPD-003-CABLESPEC	Technical specification for the installation of medium and low voltage cables

## 4.5.9 LIST OF DRAWINGS

Drawings issued by the Employer

The following drawings shall be issued by the Employer at or before the Contract Date and which shall apply to this contract.

Note: Some drawings may contain both Works Information and Site information.

Instrumentation Drawings

Drawing number	Rev	Title
32442.00-320-01	03	Ground Floor: Electronic Layout
32442.00-320-02	01	First Floor: Electronic Layout
32442.00-320-03	01	Second Floor: Electronic Layout
32442.00-320-04	01	Third Floor: Electronic Layout

## 4.6 SPECIALIST INSTRUMENTATION

### ENGINEERING AND THE **CONTRACTOR'S DESIGN**

#### 4.6.1 Employer's design

No design for permanent structures shall be done by the Contractor.

The Employer shall supply the following:

- Works Information;
- technical specifications;
- structural concrete drawings;
- structural steelwork general arrangement drawings (excluding shop detailing drawings);
- architectural drawings; and
- the drawings for providing the works are listed in the Works Information of this document.

The Employer grants the *Contractor* a license to use the copyright in design data presented to the *Contractor* for the purpose of the works only.

#### **4.6.2 Parts of the *works* which the *Contractor* shall design**

The *Contractor* shall mark-up on structural drawings provided by the *Project Manager* the following:

- a) the location of the various communications antennae on the temporary structure;
- b) the position of the various communications antennae on the final permanent structure; and
- c) all cable locations.

Any changes to termination cabinets required shall be designed by the *Contractor* and appropriate drawings completed.

#### **4.6.3 Procedure for submission and acceptance of *Contractor's* design**

The *Contractor* shall submit to the *Project Manager* for acceptance all design drawings and relevant documentation prior to the on Site work commencing.

All procedures shall be completed according to the Employer's specifications.

#### **4.6.4 Review and acceptance of *Contractor's* documentation**

The *Contractor* shall submit two sets of construction drawings to the Project Manager. The Project Manager shall either accept the drawings or reject the drawings and return for revision. Only once the design has been accepted shall the Project Manager provide the necessary permission to proceed.

#### **4.6.5 As-built drawings, operating manuals and maintenance schedules**

The *Contractor* shall provide 2 copies of the as-built marked up drawings, the wiring drawings and termination box drawings, within 14 days of completion of the final moving of the roof equipment.

#### **4.6.6 Nominated Sub-Contractors**

The items indicated in clause 3.1.45 above excluding the lattice mast N shall be re-located. The bidder *Contractor* is requested to contact:

- a) Radar Equipment, Marine Date Services 021-386 8517;
- b) Radio antenna, Neotel 035 905 3802; and
- c) Server room equipment, Transnet Ports Authority IT department.

#### **4.6.7 Detailed Scope**

The following is a list of antenna and other equipment installed on the existing roof and which requires removal. Refer to figure 1 for location drawing of antenna and other equipment.

##### **4.6.7.1 Scope of work for Antenna in positions**

4.6.7.1.1 The Contractor shall determine if these antennas are in use or have been decommissioned.

4.6.7.1.2 The estimated cable length from the antenna position on the temporary structure to the control room is 35m depending on the chosen cable route and the exact antenna location.

4.6.7.1.3 The Contractor shall remove and reinstall the antenna on the temporary structure and run a new cable to the control room equipment. Joining of cables shall only be allowed if the manufacturer's specifications allow this to be done.

4.6.7.1.4 The estimated cable length from the antenna position on the new roof level to the attached equipment in the control room is also 35m; this assumes a single cable entry point on the roof and maximum distance from cable entry point to the opposite end of the control room following a floor level route to the attached equipment. The Contractor shall reinstall the antenna on the new roof location and run new or existing cables to the control room equipment.

4.6.7.1.5 An appropriate Surge Protection Device ("SPD") shall be installed on the co-axial cable.

4.6.7.1.6 There are two antennas at location C and that the direction of antenna D is critical to its effective operation.

4.6.7.1.7 If any of the antenna are not required (decommissioned), they shall be removed with their cable and stored.

##### **4.6.7.2 Scope of work for Antenna**

- 4.6.7.2.1 The Contractor shall determine if this antenna and connected radio is in use or has been decommissioned. The existing co-axial cable runs from the connection point of the antenna to the GAR telemetry radio junction box located above the port lights control box.
- 4.6.7.2.2 The GAR radio is powered but there is no input or output signals wired to it. The radio could therefore not be in use or simply relaying the signals it receives from its antenna to another destination located off Site.
- 4.6.7.2.3 The estimated cable length from the antenna position on the temporary structure to the control room is 35m depending on the chosen cable route and exact antenna location. The Contractor shall remove and reinstall the antenna on the temporary structure and run a new cable to the control room equipment. Joining of cables shall only be allowed if the manufacturer's specifications allow this to be done.
- 4.6.7.2.4 The estimated cable length from the antenna position on the new roof level to the junction box is 20m; this assumes a shared cable entry point on the roof with the port control light cluster. The Contractor shall reinstall the antenna on the new roof location and run new or existing cables to the control room equipment
- 4.6.7.2.5 An appropriate SPD shall be installed on the co-axial cable.
- 4.6.7.2.6 If the antenna is not required (decommissioned) it shall be removed and stored with the cable.

#### **4.6.7.3 Scope of work for GPS**

- 4.6.7.3.1 The Contractor shall determine if this GPS antenna is in use or has been decommissioned and where the existing GPS receiver is located.
- 4.6.7.3.2 The estimated cable length from the antenna position on the temporary structure to either the control room or computer room is 35m depending on the chosen cable route and exact antenna location. The Contractor shall remove and reinstall the antenna on the temporary structure and run a new cable to the control room equipment. Joining of cables shall only be allowed if the manufacturer's specifications allow this to be done.
- 4.6.7.3.3 The estimated cable length from the antenna position on the new roof level to the GPS receiver located either in the control room or new computer room is 35m or 40m, this assumes a single cable entry point on the roof and maximum distance from cable entry point to the opposite end of the control room following a floor level route to the attached equipment. The route to the computer room assumes a straight vertical drop from the middle of the roof to ground floor and then to the computer room. The Contractor shall reinstall the antenna on the new roof location and run new or existing cables to the computer room equipment.
- 4.6.7.3.4 If the antenna is not required (decommissioned) it shall be removed and stored with its cable.

#### **4.6.7.4 Scope of work for GPS**

- 4.6.7.4.1 The Contractor shall determine if this GPS antenna is in use or has been decommissioned and where the existing GPS receiver is located. The description of this GPS antenna is as follows:

Model	Trimble 55238-0
Existing Cable	Part number 60155
More Information	<a href="http://www.trimble.com/timing/acutime-gold-gps-antenna.aspx">/www.trimble.com/timing/acutime-gold-gps-antenna.aspx</a>

- 4.6.7.4.2 The estimated cable length from the antenna position on the temporary structure to either the control room or computer room is 35m depending on the chosen cable route and exact antenna location. The Contractor shall remove and reinstall the antenna on the temporary structure and run a new cable to the control room equipment. Joining of cables shall only be allowed if the manufacturer's specifications allow this to be done.

- 4.6.7.4.3 The estimated cable length from the antenna position on the new roof level to the GPS receiver located either in the control room or new computer room is 35m or 40m, this assumes a single cable entry point on the roof and maximum distance from cable entry point to the opposite end of the control room following a floor level route to the attached equipment. The route to the computer room assumes a straight vertical drop from the middle of the roof to ground floor and then to the computer room. The Contractor shall reinstall the antenna on the new roof location and run new or existing cables to the computer room equipment.

- 4.6.7.4.4 If the antenna is not required (decommissioned) it shall be removed and stored together with its cable.

#### **4.6.7.5 Scope of work for Ethernet radio**

- 4.6.7.5.1 This is a Radwin 1000 ODU Ethernet radio with an external parabolic dish antenna. The radio is connected to the computer room via an outdoor rated CAT-5e Ethernet cable.

- 4.6.7.5.2 The estimated cable length from the antenna position on the temporary structure to the computer room is 35m depending on the chosen cable route and exact antenna location. The Contractor shall remove and reinstall the antenna on the temporary structure and run a new cable to the control room equipment. Joining of cables shall only be allowed if the manufacturer's specifications allow this to be done.

- 4.6.7.5.3 The estimated cable length from the antenna position on the new roof level to the new computer room is 40m. The route to the computer room assumes a straight vertical drop from the middle of the roof to ground floor and then to the computer room. The Contractor shall reinstall the antenna on the new roof location and run new or existing cables to the control room equipment.

- 4.6.7.5.4 The direction of the antenna is critical to the radios operation.

#### **4.6.7.6 Scope of work for Furuno radar**

4.6.7.6.1 This radar unit has been decommissioned and shall be removed from the roof and safely crated and stored according to the manufacturer's guidelines.

4.6.7.6.2 All existing cabling shall be removed.

4.6.7.6.3 The description of the radar is as follows: Furuno model number RSB-0071, Serial number R0758416.

#### **4.6.7.7 Scope of work for Terma radar (Model No SC 2001)**

4.6.7.7.1 The description of this radar is as follows: Terma model number SC2001. Serial numbers and other equipment details are shown in the attached photographs.

4.6.7.7.2 Four control cables connect the rotating antenna with its controlling equipment located in the computer room. The estimated cable length from the antenna position on the new roof level to the computer room is 30m per cable. The estimated cable length from the antenna position on the new roof to the new computer room is 40m depending on the chosen cable route. These antenna cables shall use their own cable tray unless advised otherwise by the manufacturer. The manufacturer's cable installation procedures shall be strictly observed.

4.6.7.7.3 Cable types

The cable types are as follows:

- i) 2 of 'LiYCY' 4 x 2 x 0.34 Type 4349-F;
- ii) clear plastic braided screened cable approximately 10mm diameter of indeterminate type;
- iii) elliptical waveguide – RFS Flexwell EP100J.

The radar unit and all control room computer equipment, is serviced and maintained by 'Marine Data Services', telephone 021-3868517, [www.marinedata.co.za](http://www.marinedata.co.za) who shall be contacted to decommission, move and commission this radar.

#### **4.6.7.8 Scope of work for Lattice mast**

4.6.7.8.1 This mast is approximately 8m tall with the following equipment secured to it:

- a) omni directional antenna located near the top of the mast;
- b) omni directional antenna located near the middle of the mast;
- c) microwave antenna located at the top of the mast. The direction of this antenna is critical to its operation;
- d) weather station sensors which are terminated locally at the top of the mast in a junction box and a screened cable of indeterminate cores runs from the junction box to a control box located at the bottom of the data cabinet in the control room; and
- e) a 'direction finder' antenna located at the very top of the mast with cabling running to the computer room. The direction of this antenna is critical to its operation.

4.6.7.8.2 The Contractor shall determine which equipment on the mast is in use and what has been decommissioned.

4.6.7.8.3 The estimated cable length from the top of the mast on the temporary structure to either the control room or computer room is 50m and 40m respectively depending on the chosen cable route and exact mast location. The Contractor shall remove and reinstall the various antennas and other equipment onto the temporary structure and run a new cable to the control room equipment. Joining of cables shall only be allowed if the manufacturer's specifications allow this to be done.

4.6.7.8.4 The estimated cable length from the top of the mast position on the new roof level to the control room or new computer room is 25m or 35m respectively depending on the chosen cable route and exact antenna location. The Contractor shall reinstall the various antennas and other equipment onto the new roof location and run new or existing cables to the control room equipment.

4.6.7.8.5 If any of the equipment is not required (decommissioned) it shall be removed complete with cable and stored.

#### **4.6.7.9 Scope of work for Port control lights**

4.6.7.9.1 This is a cluster of 32 red and green 30V 200W PAR56 lights on a steel frame connected to a control box located at the top of the stairs to the roof via 5 of SWA 600/1000V cables 6m in length each with 7 x 4mm<sup>2</sup> cores.

4.6.7.9.2 The Contractor shall dismantle, refurbish and test the light cluster re-install it to the temporary structure. The Contractor shall supply a new mounting plate for the temporary structure and new roof.

4.6.7.9.3 The existing light control panel located at the top of the existing building stairwell shall be reused and its location shall not change.

4.6.7.9.4 The estimated cable length from the light cluster position on the temporary structure to the control box is 30m depending on the chosen cable route and exact antenna location.

4.6.7.9.5 The estimated cable length from the light cluster position on the new roof level to the control box is 20m depending on the chosen cable route and exact light cluster location.

4.6.7.9.6 The direction of the light cluster is critical to its operation.

#### **4.6.8. PTZ junction box**

4.6.8.1 The junction box labelled 612-FB-PTZC-001 and its cabling and racking shall be removed and stored.

#### **4.6.9 Temporary structure**

4.6.9.1 The Contractor shall make good on the structure during the construction period. The Contractor shall identify suitable method to demolish the temporary structure after all equipment have been removed.

#### **4.6.10 Control room data cabinet**

4.6.10.1 The data cabinet in the control room has a variety of modems, radios, data collectors and a desktop computer with screen, mouse and keyboard in it. Some of the equipment is obsolete and the *Contractor* shall determine if this is the case and remove it. The following is a list of equipment in the cabinet which is functioning:

- a) Elpro radio modem. This is connected to a co-axial cable fed from the roof;
- b) 'Datawell RX-D Directional wave-rider receiver'. This is connected to one of the antenna on the roof and the transmitter is a buoy located in the harbour. The data from this unit is displayed on the computer; and
- c) Weather station control box.

#### 4.6.11 Port control room equipment

4.6.11.1 The control room is equipped with several (6-8) computers housed in multiple under counter data cabinets and 5 VHF radios all connected to antenna on the roof. There are 3 wide screen monitors mounted on the walls displaying radar and ship information and Ethernet and power is available from power skirting along all walls of the control room. Once the new floor with its control room is built the *Contractor* shall move this equipment to the new floor and place in position under the direction of the Project Manager.

#### 4.6.12. GENERAL NOTES AND REQUIREMENTS

- a) During the building modifications the existing server room will be relocated to the 1st floor and the new control room will be on the top floor. The *Contractor* shall contact the nominated Sub-Contractors with regards to the relocation of the equipment in the existing server room.
- b) All cables of a similar type or usage and which will not cause any electrical or signal interference with each other shall use the same cable entry point in to the existing building. Cables that will cause interference with each other shall be kept a minimum of 300mm from other cables.
- c) All cable entry points to the building both new and existing where cables have been removed shall be made weather and vermin proof.
- d) All cable joints shall be appropriately weather sealed using, glands with shrouds, self-amalgamating tape or other means as recommended by the Plant and Material supplier.
- e) All cabling shall be certified for use in the required (marine) application and environmental conditions and both minimum and maximum cable lengths as well as cable routing requirements as recommended by the Plant and Material supplier must be observed.
- f) Cable trays shall be 316 stainless steel welded wire mesh type without covers and minimum cable bend radii shall be observed and straight cable runs are to be maximised where possible. The reuse of cable trays is preferred when the temporary structure is decommissioned and items moved to the new roof.
- g) 'Band-it' type stainless steel fasteners and straps shall be used to secure the cables to the cable trays and the trays shall be securely fastened to the

structure using the appropriate stainless steel fasteners. The use of dissimilar metals for fasteners, washers, mounting brackets etc. where these items meet is to be avoided to prevent oxidation.

- h) All items shall be earthed in accordance with IEC 62305-4 recommended guidelines.
- i) The temporary structure shall be earthed and certified in accordance with IEC 62305-4 recommended guidelines for structures.
- j) The existing structure earthing system shall be verified, repaired and certified in accordance with IEC 62305-4 recommended guidelines for structures.
- k) All final Plant and Material locations shall be verified by the Project Manager before installation may commence.

## **4.7 FIRE SYSTEM**

### **ENGINEERING AND THE *CONTRACTOR'S* DESIGN**

#### **4.7.1 Employer's design**

The design included in this document as represented by specifications or included fire-system drawings serves as a guide only and therefore does not relieve the *Contractor* of his responsibilities regarding the design and engineering performance of the installations.

The Employer shall supply the following:

- a) Works Information;
- b) technical specifications;
- c) architectural drawings; and
- d) preliminary layout of fire-system;

The Employer grants the *Contractor* a license to use the copyright in design data presented to the *Contractor* for the purpose of the works only.

#### **4.7.2 Works which the *Contractor* shall design**

##### **4.7.2.1 The Contractor shall design the following:**

- a) complete fire-suppression and detection system for the areas of the port control tower described within this document according to relevant national standards;
- b) automatic FM200 system to the first floor server room according to relevant national standards; and
- c) all piping including pipe routes and diameters.

4.7.2.2 The *Contractor* shall furthermore select the appropriate Plant and Material sizes to satisfy the requirements for each area of the building.

#### **4.7.3 Procedure for submission and acceptance of *Contractor's* design**

##### **4.7.3.1 The *Contractor* shall:**

- a) prepare detail drawings and material lists for checking by the *Project Manager*; and
- b) complete the design adhering to national building regulations SANS 10400.

#### 4.7.4 Review and acceptance of Contractor's documentation

4.7.4.1 The *Contractor* shall submit two sets of detail drawings to the Project Manager for verification. The Project Manager shall mark up and return one set of detailed drawings within 10 working days after receiving it.

#### 4.7.5 Other requirements of the Contractor's design

4.7.5.1 The *Contractor's* design shall comply with SANS 10400-1990 and the following:

SANS 10139	Fire detection and alarm systems for buildings - System design, installation and servicing
SANS 2001-DP2	Construction Works Part DP2: Medium pressure pipelines
SANS 62-1	Steel pipes Part 1
SANS 10400-W	The application of the National Building Regulations Part W: Fire installation
SANS 1128	Fire hose couplings, connectors, branch pipe and nozzle connections
SANS 10400-T	The application of the National Building Regulations Part T: Fire Protection
SANS 988	Braided reinforced rubber for air and water
SANS 10105-1	The classification, use, and maintenance of portable fire extinguishers
SANS 543	Fire hose reels (with hose)
SANS 810	Portable rechargeable fire extinguishers - Dry powder type Extinguishers
SANS 50054-5	Fire detection and fire alarm systems Part 5: Heat Detector – Point detectors
SANS 50054-6	Components of automatic fire detection systems Part 6: Heat-sensitive detectors - Point detectors containing a static element
BS EN 12101	Basic fire principles
SANS 10142-1	Wiring regulations
National Fire Protection	Standards for clean agent extinguishing systems

Association (NFPA)	
SANS 331	Fire extinguishing aerosol systems

4.7.5.2 The *Contractor* shall also comply with the OHS Act 85 of 1993 and National Building regulations and Building Standards Act 103 of 1977.

#### 4.7.6 **As-built drawings, data books, installation, maintenance and operation manuals**

4.7.6.1 The *Contractor* shall comply with the following requirements:

- a) the *Contractor* shall provide manuals in an A4 hard covered, red, grease and waterproof binder, using 2 ring type binders. The manuals shall be well indexed and user friendly and include a summarized table of contents;
- b) drawings and charts larger than A4 shall be folded and those greater than A3 shall be enclosed in an A4 plastic pocket of adequate strength.
- c) The *Contractor* submits the draft table of contents to the Project Manager for acceptance prior to the compilation and official submittal of the manuals;
- d) the originals of all brochures shall be issued to the Project Manager. When a general brochure is applicable to a range of Plant and Material, then the specific item, catalogue number or model number shall be stated, which is best achieved by introducing a separate index page, which cross-references the specific item to a tag number;
- e) the address, phone numbers, fax numbers and reference numbers of all Subcontractors shall be provided;
- f) where manuals include drawings that still need to be revised to “as-built” status, and such manuals are required prior to “as-built” status, the manual shall not be considered to be in its final form until the “as-built” version of each such drawing has been incorporated;
- g) As-built drawings shall show actual installation details; all Plant and Material locations (manual stations, abort switches, alarms, detectors, control panels) shall be shown, as well as exact conduit and piping routing details and clean agent storage positions. All facilities modifications including door installations and modifications shall insure required soak times, and in the case of the suppression system, shall be illustrated. One copy of reproducible engineering drawings shall be provided reflecting all actual installation details;
- h) the required number of copies of the manual (s) shall be as specified by the Project Manager and submitted per type or model number of Plant and Material included in the contract, or as specified by the Project Manager; and
- i) a typical example of what the binder/file (s) shall be marked with on the spine and the front cover is as follows:
  - i) Project Name;
  - ii) Manual Title, e.g. Installation, Maintenance and Operating Manual;
  - iii) Manual Numbering (e.g. Volume 1 of 2, etc.);
  - iv) Contract Number; and

v) *Contractor Name*

j) The number of copies of as-built/final documentation: 5

## PLANT AND MATERIALS STANDARDS AND WORKMANSHIP

### 4.7.7 Investigation, Survey and Site Clearance

4.7.7.1 The *Contractor* shall carry out the following:

Maintain a record of the conditions of all existing buildings, structures and services

### 4.7.8 Mechanical Engineering Works Information

4.7.8.1 Scope of work for design, supply and installation of a fire detection and suppression system

### 4.7.9 Overview

The Employer wishes to refurbish and provide a new operations floor to the existing port control tower for the port of Richards Bay. The current structure is now too small for current and envisaged future operational requirements. The building shall consist of four stories and is of strategic importance as well as a national key point.

It is required that the completed building possess a fire-suppression and detection system that complies with all relevant regulations.

The Works Information covers the following work:

- a) a warning fire detection system – addressable type L1;
- b) an automatic FM200 fire suppression and detection system to the new server room;
- c) fire hydrant system;
- d) hose reel system complete with automatic pump and standby water tank;
- e) fire extinguishers;
- f) the Completion of the works mentioned above such that the current functions of the building is not impeded; and
- g) any other work arising out of or incidental to the above, or required of the *Contractor* for the proper completion of the works in accordance with the true meaning and intent of the contract document.

The fee shall include all labour, material, Equipment, Site establishment painting, transport, detailed drawings, final design and accommodation. The systems shall be complete.

### 4.7.10 Principal items of work include (scope inclusions)

Principal items of work shall include the following:

- a) project management of the scope of work outlined in this Works Information including planning, scheduling and reporting to the *Employer* and the *Project Manager*;

- b) implementation of an appropriate quality system and quality control;
- c) submission of all documentation, drawings and technical data as outlined in the schedule of documents and drawings included in this Works Information as well as those required for statutory regulations and project control;
- d) selection of suitable materials of construction and appropriate codes of practice, standards and specifications applicable to the works where not already specified herein;
- e) design, supply, installation, testing and commissioning of an early warning fire detection system – addressable type L1;
- f) design, supply, installation, testing and commissioning of a standalone fire detection and suppression system to the server room;
- g) design, supply, installation, testing and commissioning of a fire hydrant system;
- h) design, supply, installation, testing and commissioning of a hose reel system complete with automatic pump and standby water tank;
- i) design, supply, installation of hand held fire extinguishers;
- j) electrical work including wiring between sensors and remote panels etc.;
- k) provision of corrosion resistant measures to Plant and Material;
- l) removal of temporary structures used in the scope of this contract;
- m) maintenance during the Defects correction period; and
- n) training of the Employer's maintenance staff in the operation and maintenance of the installations during the Defect correction period.

#### 4.7.11 Scope exclusions

The following items shall be specifically excluded from the scope of supply:

- a) construction power and water;
- b) environmental impact assessments; and
- c) environmental impact management plans

#### 4.7.12 Design conditions

The following design conditions represent the project

Summer ambient	31 °C dry bulb 23°C wet bulb
Winter ambient	0 °C indoor dry bulb
Room temperature	22.5 °C dry bulb – 55 % relative humidity
Altitude	0m above sea level
Occupancy density	The design occupancy density is based on the internal furniture layouts as indicated on the drawings provided
Building dimensions	As per drawings

#### **4.7.13 Fire suppression**

- 4.7.13.1 Fire hose reels shall provide cover to all areas of the buildings and shall be mounted at 1500mm (to centre) above finished floor level. Piping feeding any single fire hose reel shall be a minimum of 25mm diameter black steel pipe in accordance with SANS 2001-DP2 and SANS 62-1 medium duty. Pipe work generally shall be hydraulically sized in accordance with SANS 10400-W: 2011
- 4.7.13.2 The reliability of the local authority water supply to meet the flow and pressure requirements of SANS 10400 Part W and shall be determined. A 9000 litre fire water reserve tank shall be provided together with a booster pump to enable all fire hose reels within a single division area (as defined by SANS 10400) to operate simultaneously for a period of 30 minutes at a running pressure of 300kPa as required by Part W.
- 4.7.13.3 A twin booster connection shall be provided at the entrance to the premises to enable the fire department to boost the system fire hydrants. The proposed development is located in relatively close proximity to a Metro Fire Department, which is equipped with fire tenders capable of delivering water to the buildings hydrants, via the Site booster connection at 20 Bar pressure which is more than adequate to comply with SANS 10400-W:2011, regulation 4.6.1(b)(2).
- 4.7.13.4 The *Contractor* shall provide a suitable number of evacuation chairs on each floor to enable the transport of disabled or injured persons during a fire condition.
- The *Contractor* shall supply the following:
- a) determine the capability of the local municipal water supply to meet the requirements of SANS 10400 Part W;
  - b) design, supply and install a hose-reel system to satisfy SANS 10400-W;
  - c) design, supply and install a 9000L fire water reserve tank and booster pump to enable operation of all hoses within a single division area to operate simultaneously for a period of 30 minutes at a running pressure of 300kPa as required by SANS 10400: W;
  - d) supply and install a twin booster connection at the entrance to the premises to allow the fire department to boost the system fire hydrants;
  - e) supply and install suitable pipe supports necessary for fixing pipes to the building structure;
  - f) supply and install all connecting pipework required for the effective operation of the systems mentioned above;
  - g) supply and install all corrosion protection methods required for underground piping;
  - h) supply and install corrosion protection in accordance with the Employer's specification HE9/2/8 for all pipework, pipe supports and fittings;
  - i) supply, delivery and installation of equipment signage as well as escape route signage; and
  - j) testing and commissioning of the works mentioned above.

#### **4.7.14 Fire detection and alarms**

- 4.7.14.1 The installed fire-detection and alarm system shall comprise of a category L1 installation throughout including conduit and A-grade loop fire retardant wiring as per SANS 10139.
- 4.7.14.2 The fire detection and alarm system shall consist of main fire alarm control panels, optical smoke-and-heat sensors, heat only sensors and optical smoke-and-heat sensors with integral sounder units, manual call points, electronic sounders, repeater panel, and interface units. All loop cabling and any other components and accessories deemed necessary for a safe, reliable and satisfactory system shall conform to this document and the requirements of SANS 10139.
- 4.7.14.3 The system shall be configured to allow on Site modifications with the minimum of disruption using controls on the front of the main control panel to facilitate future changes or alterations to the buildings.
- 4.7.14.4 The fire detection and alarm system shall be designed to facilitate accurate identification of the source of heat, smoke or fire in their early stages to minimize occurrences of false alarms due to faulty equipment, electrical transients or system faults.
- 4.7.14.5 The system shall be of safe addressable type i.e. all the devices on the loops of the main control panel shall be allocated addresses within each detector at the time of installation.
- 4.7.14.6 All devices sensors, fire alarm interface units, electronic sounders, manual call points, shall be installed on the same loop.
- 4.7.14.7 A method shall be provided at the fire alarm control panels to silence the loop powered alarm sounders but the visual indication shall remain until the system is reset.
- 4.7.14.8 It shall be possible to change the sensitivity of analogue sensors from fire alarm control panel only. The main fire alarm control panels shall be located as shown on the floor drawings
- 4.7.14.9 The *Contractor* shall train and instruct the Employer's personnel in the correct use, operation and supervision of the system, prior to the handing over of the project.

The *Contractor* shall supply the following:

- a) design, supply and install a suitable category L1 fire-detection and alarm system with wiring according to SANS 10139;
- b) supply and install an adequate quantity of the following detection equipment to be of the addressable type and suitably located within the building:
  - i) manual call points;
  - ii) main fire alarm control panels;
  - iii) optical smoke-and-heat sensors;
  - iv) heat only sensors;
  - v) optical smoke-and-heat sensors with integral sounder units;
  - vi) electronic sounders;
  - vii) repeater panel; and
  - viii) interface units.

- c) supply and install each type of detector, manual call point or sounder on its own loop;
- d) provide a method to allow the loop powered alarm sounders to be silenced at the alarm control panels while a visual indication remains until the system is reset;
- e) ensure that it shall be possible to change the sensitivity of analogue sensors from fire alarm control panel only;
- f) test and commission the works mentioned above; and
- g) train and instruct the Employer's personnel in the correct usage of systems installed.

#### **4.7.15 Automatic FM200 fire suppression system to the server room**

4.7.15.1 The server room Plant and Material is considered a high priority and therefore its fire protection shall comprise of a gas suppression system actuated by a fire detection system independent of the rest of the building. The installation shall consist of a cross-zoned detection and total flooding FM-200 fire suppression system. Modular systems shall be preferred due to the small size of the protected area and the limited storage space.

4.7.15.2 The system shall be installed by an experienced company regularly engaged in the installation of automatic FM-200 fire extinguishing systems in strict accordance with SANS standards.

4.7.15.3 The automatic fire suppression system shall be independent of the fire detection system to be used in the rest of the building. This is to allow continued operation of the server room Plant and Material when a fire condition is experienced in the elsewhere in the building.

The *Contractor* shall supply the following:

- a) design, supply and install a standalone conventional fire detection and integral gas control panel complete with batteries and power supply;
- b) design, supply and install optical smoke detectors to the room floor void and ceiling void area within the server room;
- c) design, supply and install a modular FM 200 clean agent extinguishing system;
- d) design, supply and install interlock conduit and wiring to air conditioning Plant and Material;
- e) connection of the FM-200 gas and alarm control panel to the main building addressable fire detection system; and
- f) testing and commissioning of the above mentioned works.

#### **Technical specification for design, supply and installation of a new fire system**

##### **4.7.17 General requirements**

4.7.17.1 In the event of a fire being reported from the detectors or activation of manual call points then the evacuation alarm tone shall be produced by the electronic sounders in the same zone.

4.7.17.2 Activation of the fire alarm system shall directly initiate some or all of the following:

- a) signal to all lift machine rooms indicating fire status (to control lifts);
- b) release doors normally locked by magnetic devices;
- c) release doors normally held open by magnetic devices;
- d) shutdown mechanical equipment ventilation plant;
- e) start-up smoke extract fans; and
- f) automatically operate fire dampers.

#### **4.7.18 Fire suppression system**

4.7.18.1 Fire hydrants

Fire hydrants shall comply with SANS Specification 1128 and must be supplied to the approval of the local Fire Brigade and in accordance with SANS Code of Practice 10400 T Section as specified. The centre of fire hydrant outlet shall be approximately 1.2m above floor level.

4.7.18.2 Fire hose reels

The following requirements shall apply:

- a) the hose reels shall be 30m long and 20mm diameter fire hoses that comply with SANS Specifications 988, 10105-1 and SANS 10400-W AND SANS 543 with reels (non-swivel type) that comply with SANS Specification 543, including all valves, nozzles, etc., all to the approval of the local Fire Brigade and in accordance with SANS Code of Practice 10400 T Section as specified, must be provided;
- b) the *Contractor* shall fix fire hose reels against walls with 10mm diameter anchor bolts, not less than 150mm long fire hose reels shall be deemed to include same;
- c) the centre of the fire hose reel shall be approximately 1.5 m above floor level; and
- d) the hose reel system shall be fed via an automatic pump and standby water storage tank.

4.7.18.3 Automatic hose-reel pump

The following requirements shall apply:

- a) the pump shall be an end suction centrifugal pump in 304 stainless steel with a pump control unit mounted and wired on the pump for automatic start and stop in the event of use of the hose reel system; and
- b) the pump's duty shall be 360Lt/min @ 500kPa.

4.7.18.4 Stand-by water tank

The following requirements shall apply:

- a) a sectional steel tank with 1.22m by 1.22m square sections shall be provided. The capacity of the tank shall be a minimum of 9000 liters; and

- b) the water supply tank and pump arrangement shall be as per the tender drawings.

#### 4.7.18.5 Piping

The piping for the system shall be as follows:

- a) inside: black mild steel SANS 62 or copper.
- b) outside: galvanized mild steel SANS 62.

#### 4.7.18.6 Corrosion protection

All exposed steelwork shall be adequately protected against rust. The installation is adjacent to the beach and Richards Bay port; as such corrosion will occur. Piping, brackets and structures shall be hot dipped galvanized or stainless steel when used outside.

#### 4.7.18.7 Fire extinguishers

The following requirements shall apply:

- a) supply of the number and type of fire extinguishers as specified, all in accordance with SANS Code of Practice 10400 T Section and to the approval of the local Fire Brigade;
- b) the extinguishers shall be hung on the appropriate approved wall mounted back boards and hangers at heights as directed. No fixings to partition walls shall be allowed;
- c) all extinguishers shall be of the refillable handheld portable types according to the capacities indicated;
- d) dry powder ("DCP") extinguishers in accordance with SANS Specification 810 the size and capacity shall be as per the tender drawing i.e. 4,5KG;
- e) CO2 extinguishers approved by the Project Manager. The size and capacity shall be as per the tender drawing i.e. 5KG;
- f) the fire extinguisher shall hang inside approved watertight, ultra-high impact resistant, housing; and
- g) in outside positions, an UV-stabilized, corrosion resistant cupboard with a similar clear acrylic hinged door shall be supplied. The cupboard shall be fixed at an appropriate height against a permanent support and supplied with a numbered twist-action closer seal. The fire extinguisher cupboard should be sized according to size and requirements of specified extinguisher.

#### 4.7.18.8 Signage

All fire appliances installed in the building shall be clearly sign posted.

#### 4.7.18 Fire-detection and alarm system

##### 4.7.18.1 Main fire alarm

- a) The panel shall be microprocessor controlled using analogue techniques to detect smoke / heat / fire conditions. The control panel shall comply with the requirements of EN54 or the latest equivalent thereof and shall include, but not be limited to, the following elements:
  - i) visual display unit capable of displaying LCD alphanumeric backlit display;
  - ii) built-in thermal printer;
  - iii) built-in keyboard for system control and on Site programming and maintenance;
  - iv) integral rechargeable sealed lead acid battery and charger, with 24 hour back up in the event of supply mains failure;
  - v) essential controls - sound alarms, silence alarms and reset fire. These shall be enabled by a key switch;
  - vi) cancel fault buzzer; and
  - vii) fire, fault, warning and power on lamps.
- b) Simple menu driven function keys with password protection shall allow users to an extensive range of software based features:
  - i) all control buttons and keyboard shall be enclosed behind a lockable cover;
  - ii) up to 128-device capacity per loop;
  - iii) RS 232/ RS 485 computer communication option; and
  - iv) it shall have minimum of 2 master alarm circuits.
- c) In addition to the above, all other necessary controls, elements and accessories shall be included to provide a complete and efficient panel conforming to the requirements of SANS 10139.

#### 4.7.19 Sensors

The following requirements shall apply:

- a) all analogue sensors and bases shall be provided by the manufacturer of the control Plant and Material;
- b) the following types of analogue sensors shall be implemented as standard:
  - i) heat sensor;
  - ii) heat sensor with integral sounder and/or strobe;
  - iii) optical heat sensor; and
  - iv) optical heat sensor with integral sounder.
- c) all of the above shall be compatible with the aforementioned base providing inter-changeability between sensor heads without the requirement for switch settings;
- d) the sensitivity of all sensors shall be adjustable from the control panel. This may be carried out manually to manage false activation issues or automatically using the system clock (day/night settings) for specific risks;
- e) install the sensors as shown in the drawings. These shall comply with the requirements of SANS 50054 parts 5 and 7 or BS 5445: Parts 5 and 7. They shall be complete with the other elements described for smoke sensors above, for an analogue safe addressable sensing device; and

- f) sensors mounted in the false ceilings shall be provided with a semi flush mounting kits and it shall have inbuilt short circuit isolators.

#### 4.7.20 Manual call points ("MCP")

The following requirements shall apply:

- a) 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 as required within standard. 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; and
- b) the MCP shall 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 shall also be used to reset the MCP when fitted with a resettable plastic element. The option to retrofit a clip-on transparent plastic cover to prevent accidental or malicious activation should be available as standard and give the unit an IP55 ingress rating when fitted to the plastic back box.

#### 4.7.21 Alarm sounders

These shall comply with the requirements of the standard. Alarm sounders are all electronic sounders addressable and loop powered from the control panel.

#### 4.7.22 Interface modules

Fire detection interface units shall 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 shall incorporate a short circuit isolator as standard to maintain system integrity in the event of an equipment failure or wiring fault. As standard several variants shall be available.

#### 4.7.23 Repeater panel

The repeat panel shall be situated at the indicated locations. It shall provide system repeat facilities to repeat all of the LCD displayed messages as well as the common indications. It shall have essential alarm controls, menu facilities and an optional printer allowing it to take the role of the main system indicator for the day to day running of the system. The repeat panel shall be complete with built-in battery and charger to comply with the standard.

The repeater shall be located as shown in the floor layout drawings.

#### 4.7.24 Installation of detection Plant and Material

The following requirements shall apply:

- a) the fire alarm components shall be installed directly to conduit outlet boxes at the following mounting heights above finished floor level, measured to the center of box unless stated otherwise:
  - i) fix manual call station semi-recessed at 1.5m above floor level;
  - ii) automatic smoke and heat sensors shall be ceiling mounted; and
  - iii) alarm sounders shall be 2.0m above floor level.

#### 4.7.25 Wiring and wiring facilities

The following requirements shall apply:

- a) the *Contractor* shall supply and install the necessary conduit, and where necessary, trucking to route the fire cable, and accessories and wiring for the fire alarm system;
- b) all cables associated with the fire alarm installation shall be of fire resistant 2 core, 1.5 mm<sup>2</sup> and shall be installed in accordance with SANS 10139;
- c) all cables shall be run as Class A loop wiring systems;
- d) multi core cables having more than 2 cores shall not be allowed for loop wiring due to inadequate separation and possible interference problems; and
- e) the fire alarm/detection system wiring shall be completely independent from the other system wiring in all respects in accordance with the Wiring Regulations.

#### 4.7.25 Automatic FM200 fire suppression system to the server room

##### 4.7.25.1 System description and operation

The following requirements shall apply:

- a) The installation shall be a total flooding FM 200 extinguishing system designed to provide a 7% minimum uniform concentration of FM 200 at normal average ambient temperature.
- b) The amount of FM 200 to be provided shall be the amount required to obtain and hold the minimum uniform concentration for ten minutes. The *Contractor* shall take into consideration such factors as, run-down time of HVAC Plant and Material and any other feature of the facility that could affect concentration.
- c) The system shall be actuated by optical smoke detectors. Automatic operation in each separate protected area shall be as follows:  
Actuation of one (1) detector in either loop shall:
  - i) illuminate the respective zone (circuit) lamp on the control panel;
  - ii) energize a pre-alarm audible or audible/visual signal associated with that area in which the detector was operated; and
  - iii) transmit a signal to the building's fire alarm system

Actuation of a second detector in the same area, but on the second detection loop, shall:

- i) illuminate the respective zone (circuit) lamp on the control panel;

- ii) energize an evacuation audible and visual signal associated with the area in which the detector was operated;
- iii) start time-delay sequence;
- iv) shut down ventilation system; and
- v) discharge of the FM-200 shall occur at the end of time-delay period.

The system shall be capable of being actuated by manual discharge stations located at each fire exit.

#### 4.7.26 Operation of a manual discharge station

The following requirements shall apply:

The manual activation of the system shall duplicate the cross-zones sequence description of the automatic operation, except that time-delay shall be bypassed. The manual discharge station shall be of the electrical actuation type and be supervised at the control panel.

#### 4.7.29 Materials and equipment

The following requirements shall apply:

- a) Plant and Materials shall be standard products of the manufacturer's latest design and suitable to perform the functions intended. When one or more pieces of Plant and Materials must perform the same functions, this Plant and Material shall be produced by the same manufacturer. The name of the manufacturer and the serial numbers shall appear on all major components.
- b) All devices and Plant and Material shall be UL listed and/or FM approved or other internationally accepted standard.
- c) All Plant and Material under this section shall preferably be products of the same manufacturer.
- d) The control unit shall operate on 220 volts AC, 50/60 Hz. and shall contain the following features:
  - i) visual and audible indicators that shall be activated in the event of a loss of main power;
  - ii) a twin cross zoned gas discharge system including a coincidence unit and gas system status control i.e. automatic and manual controls and a manual discharge station; and
  - iii) a self-contained, 24V DC emergency power supply. This shall consist of rechargeable standby batteries to provide emergency power for a minimum of 24-hours. A fault signal shall be initiated if the battery leads are disconnected or the battery is in an abnormally low state of charge.
- e) Manual discharge stations shall be of the dual-action type, which shall require that an outer door be lifted to expose the actuation door. The front shall be suitably labelled. Push button type manual discharge stations shall not be permitted.

#### 4.7.30 Operations and maintenance manuals

Prior to final acceptance, the *Contractor* shall provide complete operation and maintenance instruction manuals to the Project Manager. All aspects of system

operation and maintenance shall be detailed, including electrical schematics of all circuits, a written description of the system design, drawing illustrating control logic and equipment used in the system. Checklists and procedures for emergency situations, troubleshooting techniques, and maintenance operations shall be included.

#### 4.7.31 AS-Built drawings

As-built drawings shall show actual installation details; all Plant and Material locations (manual stations, abort switches, alarms, detectors, control panels) shall be shown, as well as exact conduit and piping routing details and clean agent storage positions. All facilities modifications including door installations and modifications to insure required soak times, in the case of the suppression system, shall be illustrated. One copy of reproducible engineering drawings shall be provided reflecting all actual installation details.

#### 4.7.32 Submittals

The following shall be submitted for approval prior to the start of installation:

- a) manufacturer's certificate of acceptance of the qualifications of the installing contractor to install, test, maintain, and recharge the manufacturer's Plant and Material;
- b) shop drawing indicating locations, installation details, and operation details of all Plant and Material associated with the FM 200 system. Floor plans showing equipment locations, piping, conduit runs and other details shall be provided;
- c) elevations, cross section, and other details shall be shown on drawings;
- d) sequences of operation, electrical schematics, and connection diagrams shall be provided to completely describe the operation of the FM 200 system controls;
- e) the *Contractor* shall illustrate the agent distribution system, and provide calculations to demonstrate the volumetric concentrations; and
- f) results from a room integrity test made prior to the commencement of any design work. A room pressurization test shall be conducted in each room to determine the presence of openings which could affect the FM 200 system.

#### 4.7.33 Testing and commissioning

After the installation is complete, the *Contractor* shall conduct operating and commissioning tests. The Plant and Material shall be demonstrated to operate in accordance with the requirements of the Works Information. The system installation, testing and commissioning shall be as per local approvals and requirements.

The fire alarm system shall be completely programmed in accordance with fire department requirement and a specialist from the manufacturer shall attend and demonstrate the complete system. A company trained representative shall personally supervise the complete installation and final testing of the system.

All tests shall be carried out in the presence of the Employer or persons authorized by the Project Manager or Employer. Upon the completion of the acceptance tests, the representatives shall instruct operatives in the proper operation, maintenance

programming, configuration, and testing of the system. The *Contractor* shall provide equipment and /or software which is necessary to allow field modification of the programming and configuration. The completed installation shall be inspected and accepted by the Fire Systems Inspection Bureau and a successful test certificate shall be a part of the system completion process.

#### **4.7.34 Guarantee**

##### **4.7.34.1 General**

The *Contractor* shall guarantee the Plant and Material and workmanship delivered and installed by him. The guarantee shall be valid for a period of twelve months starting on the date when the Completion certificate is issued. The complete installation shall be guaranteed against Defects as a result of patent and latent defects of the Plant and Material, as well as against faulty workmanship. Fair wear and tear is excluded from the guarantee.

The guarantee shall provide all parts, spares and appurtenances which become defective during the Defects correction period, to be replaced free of charge to the Employer. All costs of labour, out-of-town town allowances, Material and transportation required to replace such part of a defective installation shall be borne by the *Contractor* and shall be included in his guarantee.

##### **4.7.34.2 Extended Guarantee**

Where certain Plant and Material have supplier's standard guarantee clauses of which do not correspond with the guarantee the *Contractor* shall allow in the tender price for the extensions of guarantees and additional charges thereof, in order to comply with guarantee clause.

Mechanical drawings

#### **Fire drawings**

32442.00.720.01	02	Ground Floor Fire Layout
32442.00.720.02	02	First Floor Fire Layout
32442.00.720.03	02	Second Floor Fire Layout
32442.00.720.04	02	Third Floor Fire Layout
32442.00.720.05	02	Roof Fire Layout

## 4.8 ELEVATOR WORKS

### ENGINEERING AND THE CONTRACTOR'S DESIGN

#### 4.8.1 Employer's design

The design included in this document as represented by specifications or drawings serves as a guide only and therefore does not relieve the *Contractor* of his responsibilities regarding the design and engineering performance of the Plant and Material.

The Employer shall supply the following:

- a) Works Information;
- b) technical specifications;
- c) architectural drawings; and

The Employer grants the *Contractor* a license to use the copyright in design data presented to the *Contractor* for the purpose of the works only.

#### 4.8.2 Works which the *Contractor* shall design

The *Contractor* shall design the new passenger elevator for the port control tower described within this document according to relevant national standards.

#### 4.8.3 Procedure for submission and acceptance of Contractor's design

- a) The *Contractor* shall be responsible for preparing detail drawings and material lists for checking by the *Project Manager*; and
- b) The *Contractor* shall be responsible for the complete design adhering to national building regulations.

#### 4.8.4 Review and acceptance of *Contractor's* documentation

The *Contractor* shall submit two sets of detail drawings to the *Project Manager* for verification. The *Project Manager* shall mark up and return one set of detailed drawings within 10 working days after receiving it.

#### 4.8.5 *Contractor's* Design

The *Contractor's* design shall comply with the following:

The latest editions and/or amendments of the following Standards and Codes shall be considered a minimum requirement. In the event of differing requirements, the most stringent Code or Standard shall apply:

- a) All requirements of SANS 10400-1990;
- b) Occupational health and Safety (OHS) Act No. 85 of 1993;
- c) SANS 10142 - The standard regulations for the wiring of premises;
- d) Local fire office regulations;

- e) SANS 50081 - Safety rules for the construction and installation of lifts;
- f) SANS 1545: Lifts and Service Lifts;
- g) EN 81: Lifts and Service Lifts;
- h) BS EN 12101 – Basic fire principles; and
- i) SANS 10142–1 Wiring regulations.

#### **4.8.6 As - built drawings, data books, installation, maintenance and operation manuals**

The following requirements shall apply:

- a) The *Contractor* shall provide manuals in an A4 hard covered, red, grease and waterproof binder, using 2 ring type binders. The manuals shall be well indexed and user friendly and include a summarized table of contents;
- b) Drawings and charts larger than A4 shall be folded and those greater than A3 shall be enclosed in an A4 plastic pocket of adequate strength;
- c) The *Contractor* shall submit the draft table of contents to the Project Manager for acceptance prior to the compilation and official submittal of the manuals;
- d) The originals of all brochures shall be issued to the Project Manager. When a general brochure is applicable to a range of Plant and Material, then the specific item, catalogue number or model number shall be stated, which is best achieved by introducing a separate index page, which cross-references the specific item to a tag number;
- e) The address, phone numbers, fax numbers and reference numbers of all Subcontractors shall be provided;
- f) Where manuals include drawings that still need to be revised to “as-built” status, and such manuals are required prior to “as-built” status, the manual shall not be considered to be in its final form until the “as-built” version of each such drawing has been incorporated;
- g) The required number of copies of the manual (s) shall be as specified by the Project Manager and submitted per type or model number of Plant and Material included in the contract, or as specified by the Project Manager; and
- h) A typical example of what the binder/file (s) shall be marked with on the spine and the front cover is as follows: -
  - i. Project name;
  - ii. Manual title, e.g. installation, maintenance and operating manual;
  - iii. Manual numbering (e.g. Volume 1 of 2, etc.);
  - iv. Contract number; and
  - v. *Contractor* name.

The number of copies of as-built/final documentation: 5

## PLANT AND MATERIALS STANDARDS AND WORKMANSHIP

### 4.8.7 Investigation, Survey and Site clearance

4.8.7.1 The *Contractor* shall carry out the following:

Maintain a record of the conditions of all existing buildings, structures and services.

## MECHANICAL ENGINEERING WORKS INFORMATION

### 4.8.8 Scope of work for design, supply and installation of a new electric passenger lift

#### 4.8.8.1 Overview

This Works Information includes the design, supply, installation, testing and commissioning of a new electric passenger lift for the Richards Bay port control tower to be installed in the existing lift shaft of the building. The *Contractor* shall install a cost effective and energy efficient drive system, preferably using regenerative drive technology:

#### 4.8.8.2 Scope inclusions

The *Contractor's* scope of work shall include the following:

- a) project management of the scope of work outlined in this Works Information;
- b) submission of all documentation, drawings and technical data as outlined in the schedule of documents and drawings included in this Works Information as well as those required for statutory regulations and project control;
- c) site visits to ensure the gathering of relevant information pertinent to the successful completion of this Works Information;
- d) selection of suitable Plant and Material of construction and appropriate codes of practice, standards and specifications applicable to the works where not already specified herein;
- e) site establishment and disestablishment;
- f) removal of scrap and recoverable material to a location (s) designated by the *Employer*;
- g) design, supply, installation and commissioning of one new electric passenger lift to suit the upgraded lift shaft of the port control tower building to contain the following:
  - i) provision of lighting within the shaft;
  - ii) emergency fire operation;
  - iii) independent operation;
  - iv) intercom;
  - v) automatic rescue device;

- vi) lift ceiling – with black rubber transit tiles;
- vii) buttons, inside the lift and on each landing, which shall have raised numerical with braille; and
- viii) a combination unit of hall button(s) and direction arrows for each landing.
- h) the design, supply and installation of any necessary structural steel work and brackets required in the existing lift shafts;
- i) planning, scheduling, controlling and reporting all aspects of the Works Information;
- j) quality assurance and control in accordance with ISO 9001;
- k) all safety equipment, guards and notices;
- l) assisting the Employer with hot commissioning after Completion;
- m) attend all necessary progress meetings on Site;
- n) compilation of all relevant documentation containing relevant certification witnessed and signed by the Project Manager.
- o) removal of temporary structures used in the scope of this Works Information; and
- p) maintenance and a guarantee for twelve months after Completion.

#### 4.8.9 Scope exclusions

The following items shall be specifically excluded from the scope of supply:

- a) overall project management of the project;
- b) environmental impact assessments;
- c) environmental impact management plans;
- d) civil works – foundations, grouting, concrete floors, brick work, trenching, backfill and earth works;
- e) temporary electric power of permanent characteristics for installing, testing and adjusting the lift Plant and Material;
- f) permanent power mains supply with a suitably rated isolator with earth and neutral situated in the lift motor room;
- g) emergency generator set(s) supplied, sized and installed to run the lift;
- h) normal/standby power indicating circuitry. A delayed normally closed potential free contact rated at 220-Volt / 5 Amps from the emergency power change over switch gear wired to the lift machine room/s and terminated in a suitably sized junction box;
- i) wiring and conduit between the lift shaft to the reception room for the lift intercom system, and/or remote monitoring station;
- j) lift shaft ventilation Plant and Material;
- k) grouting around doorframes and under the sills after installation of the entrances;
- l) counter sloping of floors away from lift entrances to prevent water ingress to the shaft; and
- m) proximity readers/access control system.

#### 4.8.10 General requirements

The requirements of the elevator are as follows:

No. of lifts	1
Car capacity	Max 630kg
Shaft size	1800mm wide x 1800mm deep
Car internal size (nominal)	1100mm wide and 1400mm deep and 2142mm high
Speed of car	Min 1,0m/s
No. of floors served	4 stops (Ground floor, 1st, 2nd, 3rd )  Ground floor (0) FFL 0,000  First floor (1) FFL 2.856 (+2,856)  Second floor (2) FFL 5.883 (+5,833)  Third floor (3) FFL 11.283 (+11,283)
Total travel distance	11.3m
Type of doors	The basic shell construction is of 1.5mm minimum welded and braced pressed metal panels. Automatic two panels opening – brushed/hairline stainless steel
Finish of landings	Stainless steel frames
Type of drive	Variable voltage variable frequency regenerative
Ventilation	Fan
Ceiling/lighting	Ceiling with emergency exit facility and recessed LED lighting including emergency lighting
Safety rail	Safety balustrade above car for service man.
Power and lighting	3 Phase, 400V and 230V at 50Hz
Operation	Simplex selective-collective automatic operation
Overall finish of car	Stainless steel.
Front wall	Brushed/hairline stainless steel
Side walls	Brushed/hairline stainless steel
Back wall	Brushed/hairline stainless steel with half mirror above

Hand rail	Tubular +/- 38mm diameter brushed/hairline stainless steel (on 3 wall)
Skirting	Brushed/hairline stainless steel
Flooring	Rubber / grey transit tiles (3 mm thick)

4.8.11 Further details of the lift are provided in the attached lift data sheet which shall be completed in full by the Contractor, and submitted with their offer.

4.8.11.1 The following Plant and Material components offered in terms of this Works Information shall be clearly detailed in the Contractor's supplementary documentation and shall be the most modern, technically advanced and most reliable Plant and Material available:

- i) car and landing signals,
- ii) car and landing call button units,
- iii) door drive equipment,
- iv) door protection devices,
- v) control equipment,
- vi) drive equipment,
- vii) intercom and security system equipment; and
- viii) safety features.

4.8.11.2 The *Contractor* shall supply all necessary labour, supervision, Plant and Material, consumables, Equipment, services and testing devices for all aspects of this Works Information.

4.8.11.3 The information supplied in this Works Information in the form of data, drawings and descriptions is intended to serve as a guide to the requirements of the Employer with respect to the design and operation of the installation. Acceptance of this guide shall in no way relieve the *Contractor* of their responsibility for the design and engineering performance of the installation. This shall also not restrict nor limit the Contractor's technical input and advice, nor the ability to offer substitute Plant and Material better suited to the installation as a whole for the Employer's consideration.

4.8.12 Lift shaft

4.8.12.1 The elevator shaft comprises of concrete pit and over travel cavities, the overall dimensions of the lift shaft are 1800mm wide x 1800mm deep. The *Contractor* shall be responsible for measuring all lift shafts, steel work and other dimensions necessary for the complete lift installations.

4.8.12.2 The power mains distribution board ("DB") shall be provided by the Contractor. A 3-phase power point shall be provided at the top of the lift shaft for the lift motor (fed from DB above).

4.8.12.3 Suitably rated single phase plug socket outlets shall be provided at the top and bottom of the shaft respectively, and shall be protected by a separate earth leakage device.

- 4.8.12.4 Shaft lights shall be operable by means of two-way switching, one switch mounted at the bottom, and the other at the top of the shaft.
- 4.8.13 Car landing doors and door frames
- 4.8.13.1 The landing doors and the car doors shall be of natural coloured brushed or hairline stainless steel with a suitable fire rating.
- 4.8.13.2 All panels of the landing and car doors shall comply with SANS 1545, and certification of proof shall be furnished by the Contractor.
- 4.8.13.3 Landing architrave frames shall be natural coloured brushed/hairline stainless steel with a fire rating complying with SANS 1545 part 9. The *Contractor* shall furnish a test report as required in terms of EN 1363-1.
- 4.8.13.4 Detailed drawings of the proposed frames shall be submitted to the Project Manager for approval before manufacturing commences.
- 4.8.14 Landing details
- 4.8.14.1 An infra-red curtain door protection system shall be provided at each landing door such that an invisible safety net of beams is produced across the lift entrance. At the lift entrances on each landing, a flush mounted alpha-numeric digital car position display unit shall be provided in an operating panel comprising of natural coloured brushed stainless steel finish with micro-touch buttons. The design of the panel shall cater for visually impaired users.
- 4.8.14.2 Each button shall be clearly marked with its corresponding direction of travel. The demarcation shall either comprise a raised or recessed approved symbol, with Braille markings, that shall not fade over time.
- 4.8.14.3 The location of the center-line of each landing's micro push button fixture shall be located at 1050mm above the floor to suit operation from a wheelchair.
- 4.8.15 Landing operating panels
- Landing operating panels shall have the following:
- a) hairline finish stainless steel panel with touch-sensitive buttons;
  - b) call acceptance (visual);
  - c) up and down buttons on each floor (one button only for basement and top floor);
  - d) braille;
  - e) car position indicator on each floor;
  - f) car full indicator, pre-announcing arrows on each floor; and
  - g) key switch on ground floor landing.
- 4.8.16 Lift car
- 4.8.16.1 Emergency lighting shall be fitted in the car either in self-contained luminaries or a centrally supplied luminaire. The duration of operation of the emergency lighting shall be at least 3 hours.

- 4.8.16.2 A ventilation fan and a safety balustrade shall be fitted around the top of the lift car. Appropriate safety control shall be provided for servicemen working on the top of the lift car. Hangers and canvas shall be provided to protect the car wall from damage during office furniture transport.
- 4.8.17 Door protection devices
- 4.8.17.1 A non-retractable electronic infra-red/ultra-sonic 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. If this device is activated while the car doors are closing, the car and shaft doors shall return to their open positions.
- 4.8.17.2 Without exception the *Contractor* shall demonstrate on the day of Completion that the door closing pressures comply in full with the SANS 1545 Part 1 and Part 2 under normal and forced closing conditions. The door protection device shall have the capabilities of detecting metal or plastic trolleys.
- 4.8.18 Nameplates
- The nameplate shall accommodate names and other information as well as floor assignments. Name plate for the elevator shall indicate that the elevator is on the stand-by emergency generator set in case of power failure.
- 4.8.19 Lift drive
- 4.8.19.1 The lift machine shall be of the variable voltage variable frequency gearless traction drive type, with regeneration technology. Where regenerative technology is not provided, the *Contractor* shall prove the lift drive system has a similar energy saving and efficiency to that of a regenerative drive system and that the total harmonic distortion is equal to or below 5%.
- 4.8.19.2 Where hoist belts are provided in lieu of ropes or cables these shall be monitored by a resistance monitor with lift cut-out protection.
- 4.8.20 Lift operation
- 4.8.20.1 The lift operation shall be duplex full collective with microprocessor control with backup as per the manufacturer's standard, which shall be submitted to the Project Manager for approval before manufacturing commences.
- 4.8.20.2 A full length, flush mounted operating panel shall be provided in the side wall of the car, and shall be furnished with a digital floor position and direction of travel indicators.
- 4.8.20.3 The panel shall be paraplegic friendly and shall be located so that all operating and emergency buttons that incorporate Braille markings are located between 900 and 1500mm 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.

4.8.20.4 The alarm button shall operate a bell on top of the car and a buzzer with flashing LED unit at the reception room on the ground floor, which serves as an emergency signal. The alarm shall, however, be combined with the intercom system. Once it is activated the unit at the reception room on the ground floor shall remain active until it is manually reset.

4.8.21 Car operating panels

The car operating panel shall have or meet following minimum requirements:

- a) stainless steel – telephone style with touch sensitive glass, button keypad (built to standard EN 81-70);
- b) door open / close and alarm buttons;
- c) Braille;
- d) visual and audible confirmation of call;
- e) position indicator and number of current level;
- f) direction arrows for memory push button control;
- g) pre-announcing arrows for collective controls;
- h) destination floor display for collective selective control;
- i) additional, horizontal car operating panel for handicapped;
- j) second, vertical car operating panel in car opposite to main car operating panel;
- k) voice floor announcement (English and Zulu languages); and
- l) intercom facility.

4.8.22 Elevator on stand-by supply

The lift shall be connected to the stand-by generator set.

4.8.23 Fire detection control

A fire detection system shall be provided by the Contractor. Once this is activated, the fire detection control panel shall provide an output signal to the lift controller and the lift shall function as detailed under Fireman's switch control.

4.8.24 Fireman's switch control

4.8.24.1 A "Fireman's Service" switch shall be provided on the ground floor. The switch shall be housed behind a glass panel, in a separate box, mounted adjacent to the top of the landing frame on Level 0.

4.8.24.2 Upon operation of the "Fireman's Service" switch or the fire detection signal, all calls for the lift shall be cancelled and car and landing call buttons shall be inoperative. The lifts shall immediately stop at the nearest floor in the direction of travel and, without opening their doors, shall immediately return to Level 0.

4.8.24.3 At Level 0 the lifts shall stop, the doors shall open and the lifts shall be taken out of service.

4.8.24.4 After the events described above have been cleared, the lifts operation shall be revert to normal, viz on car calls. In addition, an override feature shall be provided in the event

of emergency requirements such as the evacuation of stretcher/s during fire drills or false alarms.

4.8.25 Lift intercom system and security system

4.8.25.1 An intercommunication system, complete with talk-back speakers with all required auxiliary Plant and Material, wiring and a (two) hour minimum back-up power supply, shall be provided.

4.8.25.2 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, one at the lift controller and the other at the reception room on the ground floor shall include a visual and audible indicator system/panel to indicate the lift car initiating the emergency call. Once activated the warning system shall remain active until manually set.

4.8.25.3 Wiring from the lift master station to the ground floor reception room shall be undertaken by the Contractor, and, the supply of the remote intercom station forms part of this Works Information.

4.8.25.4 Lift travelling cables shall contain (two) shielded pairs of conductors for the car intercommunication system. All wires in the wiring system shall be shielded without exception.

4.8.25.5 There shall be an activated or programmable voice in English and Zulu languages notifying the passenger of the opening floor level. An announcement of lift overload shall also be provided.

4.8.25.6 There shall be a communication system between the elevator and the security access disc and proximity reader to be installed. A security specialist shall install the proximity and the basement level. The system is used to call the elevator using the access disc only. This system shall be overridden if and when necessary by the authorised person with a special key.

4.8.26 Scope of supply

The scope of supply shall comprise of the following:

- a) design, supply and install a passenger lift in compliance with general requirements listed above and best suited to the upgraded building;
- b) removal and relocation of existing lift car and associated Plant and Material from the building;
- c) supply and install lighting in the lift shaft and two way switches. One switch shall be mounted at the bottom, and the other at the top of the shaft;
- d) supply samples of all exposed materials and finishes to the Project Manager for approval;
- e) design, supply and install landing doors and door frames as per SANS 1545;
- f) design, supply and install an infra-red curtain door protection system at each landing floor;
- g) supply and install landing operating panels with suitable finishes, operating buttons and visible as well with Braille indicators;

- h) design, supply and install emergency lighting within the lift car with an operational duration of at least three hours and an alarm system activated by occupants within the lift car;
- i) supply and install ventilation fans to serve the lift car and appropriate safety measures for personnel working on top of the lift car;
- j) supply hangars and canvas to protect the inner wall of the lift car during transport of goods, furniture or equipment;
- k) supply and install nameplates to indicate floor assignments and emergency power status;
- l) design, supply, test and install a new lift drive with energy efficient operation and power regenerative capability;
- m) design, supply and install paraplegic-friendly operation of the lift car and external operating buttons;
- n) design and supply fire-detection control to integrate into the new fire-detection system and automatically transport the lift car to the ground floor then maintain the doors in the open position;
- o) design and supply an intercom system to facilitate communication from occupants within the lift during emergency situations; and
- p) testing and commissioning of the works mentioned above.

#### **4.8.27 Technical specification for design, supply and installation of a passenger lift**

4.8.27.1 Hoisting machine: traction drive

4.8.27.2 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.

4.8.27.3 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. The drive shall provide substantial energy savings of up to 70%. Total harmonic distortion shall be equal to or below 5%.

4.8.27.4 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.

4.8.27.5 The lift machinery shall operate silently and without vibration. The lift shall constantly operate and shall be maintained at noise levels not exceeding 56 dBA. The noise level shall be considered acceptable if it does not exceed 56 dBA measured on the landing and in the car enclosure.

4.8.27.6 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 remain on Site at all times.

4.8.27.7 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.

4.8.27.8 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.

4.8.28 Operation with standby power: emergency recall to main landing – level-0

4.8.28.1 The *Contractor* shall provide a standby power operation which recognises the feeder arrangement which automatically evacuates the lift by sending it to the main dispatching landing without responding to car or landing calls. If the lift fails to return to its main landing within (ninety) seconds, it shall automatically be disconnected from the automatic return feature.

4.8.28.2 The lift shall be connected to the stand-by generator set. The lift specialist shall liaise with the *Contractor* with regards to the correct supplying cable or distribution board to connect to.

4.8.28.3 In the event of a total failure of normal power, the feeder shall be transferred to the standby power source. A potential free normally closed contact shall be provided to indicate the transfer to the standby power source. The contact shall open (fail to safety) when on standby power and the lift shall commence their sequenced evacuation.

4.8.28.4 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 ten minutes without overheating.

4.8.28.5 All connections to the lift controls for standby power operation shall be provided and all the necessary interlocking interconnection wiring shall be provided under this section.

4.8.29 Overload protection

Without exception, overload protection shall be provided as per SANS1545-Part-1 1999 and 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. An announcement shall be made indicating the lift is overloaded.

4.8.30 Drive control

4.8.30.1 A fully regulated distance dependent closed loop Variable Voltage Variable Frequency (“VVVF”), regenerative drive control system shall be provided by the *Contractor* 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 “leveling in” phase i.e. a direct approach.

- 4.8.30.2 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.
- 4.8.31 Operational requirements
- 4.8.31.1 Simplex selective-collective automatic operation
- a) Passenger and goods/passenger lifts
    - i) The operation of the lift 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.
    - ii) 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.
    - iii) 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.
    - iv) 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.
    - v) 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 shall be made to have this automatic return feature disabled if required.
  - b) Automatic landing by-pass
    - i) When the car load exceeds a predetermined weight level, it shall automatically bypass all landing calls in the direction of service and shall respond only to car calls. The default setting for this predetermined level shall be 65% of rated load.

- c) Load weighing
  - ii) The lift shall be provided with a strain gauge load weighing device to ensure optimum service. This device shall be capable of constantly monitoring the load on the car platform with an accuracy of  $\pm 5.0$  kg.
- d) Anti-nuisance control
  - i) When a lift with a loading level of less than 20 kg arrives at a landing, all car calls shall be reset automatically.
- e) Motor generator set time-out
  - i) When a lift does not receive a demand dispatch at the dispatching landing for a software adjustable time period of up to ten minutes, set initially at five minutes, the motor generator set, if provided, shall stop and shut down the car lighting and ventilation automatically after it has opened the car and landing doors. If solid-state motion control is provided, timing devices shall be provided to accomplish this shutdown.

#### 4.8.31.2 Operation with independent service

- a) A two position key operated switch, with removable cylinder 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.

#### 4.8.31.3 Operation with inspection

A two position switch shall be provided on top of the car enclosure to operate the 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.

#### 4.8.31.4 Emergency operation

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.

#### 4.8.31.5 Firemen's service

- a) The fireman's operation is initiated by a switch (depending on local code regulations). Upon activation of the switch, the elevator shall travel to the designated fireman's floor non-stop. If the elevator is travelling away from

- the fireman's floor, it shall stop at the next floor and without opening its doors, return to the fireman's floor;
- b) If the doors are open, they shall close immediately. If the doors are opening, they shall fully open, and then close immediately. The elevator shall then travel to the fireman's floor non-stop;
  - c) Upon activation of the switch all hall calls and care calls shall be disabled along with any safety shoe / detector feature;
  - d) Once at the fireman's floor, the elevator doors are opened and can be switched to fireman's service inside the care. Control of the care is via the operating panel inside the care, with all hall calls disabled; and
  - e) Normal operation shall only be activated once the switch is returned to the off position.

#### 4.8.32 Layout and shop drawings

4.8.32.1 Layout drawings shall be provided for all lift work, including car enclosure and landing entrance co-ordinating drawings. Drawings shall show top clearance above cross-heads and counterweight frames, power requirements and heat release data, location of all Plant and Material on tops of cars, overhead beams and elevations, and reactions which shall be transmitted to the building structure during normal operation of the lift.

4.8.32.2 Shop drawings shall be required for car enclosure, landing entrances and signal fixture work showing construction, finish and fastening details. Furthermore, drawings shall clearly show the, 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.

4.8.32.6 All special Plant and Material and fixture faceplates shall be submitted to the Project Manager 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 Plant and Material shall be approved by the Project Manager.

#### 4.8.33 Samples

- a) All exposed Plant and Material and finishes shall be submitted to the *Project Manager* for approval in sample form.
- b) The *Contractor* shall furnish such samples as shall be called for and the Project Manager shall reject all Plant and Material 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.

#### 4.8.34 Tests certificates and inspections

- a) The *Contractor* shall carry out all the tests and checks required in terms of SANS1545-10 Annex A and/or B and issue the necessary certificate of compliance prior to final completion to the *Project Manager* who shall make a copy and send the original to the building owner. A copy of this certificate shall also be forwarded to the Department of Labour.

- b) Upon Completion of the installation of all Plant and Material and once in full operation, the *Contractor* shall completely test the lift Plant and Material to demonstrate that the Plant and Material is provided in compliance with the Works Information. The total costs for these tests shall be included in the tendered amount.
- c) The *Contractor* shall make arrangements for such tests and shall give at least 72 hours written notice to the Project Manager, before commencing the test.
- d) In the event of the Plant, Material or installation not passing the test, they shall be at liberty to deduct from the contract amount all reasonable expenses incurred by the Employer and/or the Project Manager attending the test.
- e) Whenever any installation or Plant and Material is operated for testing or adjusting as provided for above, the *Contractor* shall operate the entire system for as long a period as shall be required to prove satisfactory performance at all times in the occupied space served by that system until the system is handed over.
- f) 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.
- g) After completing the installation or system, all Plant and Material shall be tested, adjusted and readjusted until they operate to the satisfaction and approval of the *Project Manager*.
- h) The *Contractor* shall submit certificates of tests carried out to prove the efficiency of all Plant and Material, as well as certificates to be obtained from all relevant authorities, statutory bodies, etc.

#### **4.8.35 Application to Department of Labour**

The *Contractor* shall submit all the necessary drawings and information to the Regional Director of the Department of Labour and shall submit the necessary application for the erection and use of the lifts and access goods lifts only.

#### **4.8.36 Guarantee and maintenance**

- a) The *Contractor* shall be responsible for the maintenance of the lift, which shall be carried out in compliance with the requirements of the Occupational Health and Safety Act (Act 85 of 1993) as amended, during the *Defects correction period* and shall allow for the aspect in his tender price.
- b) After first delivery of the installation, there shall be a 12-month free maintenance period. The free service period shall be extended unconditionally at the rate of one month for every 3 elevator stoppages (during the initial 12 month free service period) that are directly attributable to Plant and Material or component failures as supplied by the elevator Contractor.
- c) During this period the *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 Employer.

- d) The work under this section shall be performed by competent, qualified personnel under the supervision of the *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 hours a day, seven days a week.
- e) During the guarantee period the Employer shall invite tenders for the comprehensive maintenance of the lift installation, which shall commence after the final delivery has taken place, i.e. after the twelfth month guarantee period is over and all Defects are corrected.

#### **4.8.37 Materials and workmanship**

- a) The work throughout shall be executed to the highest standards and to the entire satisfaction of the *Project Manager* who shall interpret the meaning of the Works Information and shall have the authority to reject any work and Material, which, in his judgment, are not in full accordance therewith. All condemned Material and workmanship shall be replaced or rectified as directed and approved by the *Project Manager*.
- b) All work shall be executed in a first-class manner by qualified tradesmen.
- 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 installation and its contents against damage by him, his employees or Subcontractors 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 Subcontractors, including any and all expenses, legal or otherwise, which shall be incurred by the Employer or representative/agent in the defence of any claim, action or suit.
- e) The Contractor shall warrant that the Plant, Material and workmanship shall be of the highest grade, that the Plant and Material shall be installed in a practical and first-class manner in accordance with the best practices and ready and complete for full operation.
- 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 shall be necessary for the proper installation work and shall co-operate with and co-ordinate the work of others as shall be applicable.
- g) The *Contractor* shall inspect and verify that the existing power feeder system is compatible with the Plant and Material offered and any changes or upgrading of the electrical supply shall be brought to the attention of the Project Manager.
- h) Plant and Material damaged in transit shall be replaced.

- i) All components and their respective adjustment, which do not form part of the installation work, but influence the optimum and safe operation of the Plant and Material shall form part the Works Information.
- j) All control Plant and Material and serviceable items shall be installed and positioned such that they shall 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 Employer's clients.
- l) The *Contractor* shall include all scaffolding required to complete the work required.

## EMPLOYER'S PROJECTS SPECIFICATIONS (LATEST REVISIONS)

E8/2/4	Technical specification for Air-conditioning equipment
E8/2/8	Technical specification for Testing and commissioning of electrical equipment
E9/2/3	Steel wire ropes
E9/2/4	Gearing, shafts, bearings, brakes, lubrication, vee-belts, keys and keyways
E8/2/3	Electrical motors and generators
E8/2/7	Cable reel systems

### 4.8.38 LIST OF DRAWINGS

#### 4.8.39.1 Drawings issued by the *Employer*

This is the list of drawings issued by the *Employer* at or before the Contract Date and which apply to this contract.

Note: Some drawings may contain both Works Information and Site information.

#### Architectural drawings

Architectural drawings		
32442.00.201.03	03	Ground Floor Renovations
32442.00.201.04	03	First Floor Renovations
32442.00.201.05	03	Second Floor Renovations
32442.00.201.06	03	New Third Floor
32442.00.201.07	02	New roof
32442.00.202.01	02	Section A-A

32442.00.202.02	01	Section B-B
32442.00.202.03	01	Elevations
32442.00.609.01	01	Door Schedule
32442.00.610.01	01	Window Schedule
32442.00.610.02	01	Window Schedule
32442.00.611.01	02	Finishes Schedule

## 4.9 HVAC SYSTEM

### ENGINEERING AND THE *CONTRACTOR'S* DESIGN

#### 4.9.1 *Employer's design*

The design included in this document as represented by specifications or included HVAC drawings serves as a guide only and therefore does not relieve the *Contractor* of his responsibilities regarding the design and engineering performance of the installations.

The *Employer* shall supply the following

The *Employer* shall supply the following information to the *Contractor*:

- a) Works Information;
- b) technical specifications;
- c) architectural drawings; and
- d) preliminary layout of air-conditioning and ventilation units.

The *Employer* grants the *Contractor* a license to use the copyright in design data presented to the *Contractor* for the purpose of the *works* (and the *Contractor's* obligation under paragraph 1.2 of the *Employer's* Works Information) only.

#### 4.9.2 *Works which the Contractor shall design*

The *Contractor* shall design the following:

- a) complete air-conditioning and ventilation system for the areas of the port control tower described within this document according to relevant national standards;
- b) selection of appropriate Plant and Material and sizes to satisfy the requirements for each area of the building;
- c) all ducting including routes and diameters; and
- d) all piping including pipe routes and diameters.

#### 4.9.3 *Procedure for submission and acceptance of Contractor's design*

- a) The *Contractor* shall submit detail drawings and material lists for checking by the *Project Manager*; and
- b) The *Contractor* shall be responsible for the complete design adhering to national building regulations SANS 10400.

#### **4.9.4 Review and acceptance of *Contractor's* documentation**

The *Contractor* shall submit two sets of detail drawings to the *Project Manager* for verification. The *Project Manager* shall mark up and return one set of detailed drawings within 10 working days after receiving it

#### **4.9.5 Other requirements of the *Contractor's* design**

The *Contractor's* design shall comply with the following:

- a) all requirements of SANS 10400-1990;
- b) all requirements of SANS 1424-Filters for use in air-conditioning and general ventilation;
- c) all requirements of SANS 1238 – Air conditioning ductwork;
- d) all requirements of SANS 10173 – The installation, testing and balancing of air-conditioning ductwork;
- e) BS EN 12101;
- f) SANS 10142–1 wiring regulations;
- g) OHS Act 85 of 1993;
- h) National Building regulations and Building Standards Act 103 of 1977; and
- i) all requirements of the Employer's standard specifications.

#### **4.9.6 As-built drawings, data books, installation, maintenance and operation manuals**

##### **Supply of documents**

- 4.6.6.1 The *Contractor* shall provide manuals in an A4 hard covered, red, grease and waterproof binder, using 2 ring type binders. The manuals shall be well indexed and user friendly and include a summarized table of contents.
- 4.6.6.2 Drawings and charts larger than A4 are folded and those greater than A3 shall be enclosed in an A4 plastic pocket of adequate strength.
- 4.6.6.3 The *Contractor* shall submit the draft table of contents to the *Project Manager* for acceptance prior to the compilation and official submittal of the manuals.
- 4.6.6.4 The originals of all brochures shall be issued to the *Project Manager*. When a general brochure is applicable to a range of Plant and Material, then the specific item, catalogue number or model number shall be stated, which is best achieved by introducing a separate index page, which cross-references the specific item to a tag number.
- 4.6.6.5 The address, phone numbers, fax numbers and reference numbers of all Subcontractors' shall be provided;
- 4.6.6.6 Where manuals include drawings that still need to be revised to "as-built" status, and such manuals are required prior to "as-built" status, the manual shall not be considered to be in its final form until the "as-built" version of each such drawing has been incorporated;

- 4.6.6.7 The required number of copies of the manual (s) shall be as specified by the Project Manager and submitted per type or model number of the Plant and Material included in the contract, or as specified by the Project Manager; and
- 4.6.6.8 A typical example of what the binder/file (s) shall be marked with on the spine and the front cover is as follows: -
- a) Project Name:
  - b) Manual Title, e.g. Installation, Maintenance and Operating Manual:
  - c) FBS No. and Title:
  - d) Manual Numbering (e.g. Volume 1 of 2, etc.):
  - e) Contract Number:
  - f) *Contractor* Name:

## **PLANT AND MATERIALS STANDARDS AND WORKMANSHIP**

### **4.9.7 Investigation, survey and site clearance**

The *Contractor* shall carry out the following investigations:

Maintain a record of the conditions of all existing buildings, structures and services.

### **4.9.8 Building Works**

**The *Contractor* shall:**

- a) remove of all existing heating, ventilation and air-conditioning equipment; and
- b) the removal of all waste and or rubble from Site that is created due to complying with the removal of existing HVAC systems.

### **4.9.9 Mechanical engineering Works Information**

The following is the Scope of work for the design, supply and installation of a new air conditioning and ventilation system.

#### **4.9.10 Overview**

4.9.10.1 The *Employer* wishes to refurbish and provide a new operations floor to the existing port control tower for the port of Richards Bay. The current structure was constructed during 1976, and is now too small for current and envisaged future operational requirements. The building shall be extended to accommodate training facilities, and a new operations floor is to be constructed above the existing operations floor.

4.9.10.2 The building's air-conditioning requirements are currently satisfied by several split units that shall be insufficient for the refurbished structure. It is therefore required that a holistic HVAC solution is designed, supplied, installed and commissioned to serve the new building.

4.9.10.3 The contract covers the following work:

- a) the supply, delivery to Site, storage, erection, installation, testing, commissioning and energising of the items detailed hereafter, handed over in satisfactory working condition to the complete satisfaction of the *Employer*, *Project Manager* and local authorities, including all labor, materials, workmanship, machinery, and test equipment which shall be necessary for successful completion, all in accordance with the attached specifications. The system shall be ready for immediate use once handed over and shall be inclusive of subsequent maintenance for a period of 12 months; and
- b) the removal of all existing air-conditioning and ventilation equipment in the building.

4.9.11 Principal items of work include (scope inclusions)

The following is included in the *Contractor's* scope:

- a) Project management of the scope of work outlined in this Works Information including planning, scheduling and reporting to the *Employer* and the *Project Manager*;
- b) implementation of an appropriate quality system and quality control;
- c) submission of all documentation, drawings and technical data as outlined in the schedule of documents and drawings included in this Works Information as well as those required for statutory regulations and project control;
- d) selection of suitable materials of construction and appropriate codes of practice, standards and specifications applicable to the works where not already specified herein;
- e) the supply, delivery, installation, testing and commissioning of variable refrigerant volume ("VRV") air-conditioning systems and associated ducting in the offices, dormitories, open plan areas and boardrooms as per attached drawings;
- f) the supply and installation of drain piping from the indoor VRV units and connecting thereof to the nearest floor drains;
- g) the supply, delivery, installation, testing and commissioning of the condenser unit associated with the VRV system;
- h) the supply, delivery, installation and commissioning of a close control air conditioning unit for use in the server room as per attached drawings;
- i) the supply, delivery, installation and commissioning of extraction ventilation systems for use in the toilets throughout the building;
- j) the supply, delivery and installation of fresh air systems as per the attached drawings;
- k) electrical work including wiring between switchboards, unit mounted sensors, control devices, etc. and wiring between controllers and remote sensors, remote set point adjusters, etc.;
- l) provision of corrosion resistant measures to Plant and Material;
- m) means of interlocking all air-conditioning and ventilation equipment with the new fire detection panel provided by the firesystem Contractor;

- n) maintenance and guarantee for twelve (12) months after “practical completion” date of the completed installation, or sections thereof. This is the date confirmed in writing by the Project Manager; and the Employer; and
- o) training of the Employer’s maintenance staff in the operation and maintenance of the installations during the contractual twelve (12) month maintenance and guarantee period.

#### 4.9.12 Scope exclusions

The following items shall be specifically excluded from the scope of supply:

- a) construction power and water;
- b) environmental impact assessments; and
- c) environmental impact management plans

#### 4.9.13 Design conditions

The following design conditions shall be used in designing the air-conditioning for this project.

Summer ambient:	31 °C Dry Bulb 23°C wet bulb
Winter ambient:	0 °C indoor dry bulb
Room temperature:	22.5 °C dry bulb – 55 % relative humidity
Room relative humidity:	N/A
Altitude:	0m above sea level
Toilet ventilation:	as per SANS 10400
Occupancy density:	The design occupancy density is based on the internal furniture layouts as indicated on the drawings provided
Lighting load:	The design lighting load is estimated at 15W/m <sup>2</sup>
Glazing specification:	Solar reflectance: 12
Solar absorption:	52
Direct transmission:	36
Shading coefficient:	0.57

The *Contractor* shall test, commission and adjust the air-condition installations so that they shall maintain the inside design conditions specified above, subject to the capacity limits hereinafter specified during hours of operation.

#### 4.9.14 Variable refrigerant volume air-conditioning units

- a) The port control building shall be air conditioned using a new variable refrigerant volume air conditioning system. All condenser units shall be positioned in a freely ventilated area on the roof level of the building. The

variable refrigerant volume air conditioning system differs from standard DX based air conditioning (split units) in that a single outdoor condenser unit can be connected to multiple indoor units. The VRV system shall be of the heat recovery type with one heat recovery distribution box installed per floor level. The building shall be air conditioned using combination of VRV under ceiling and midwall indoor units.

- b) The indoor units shall be provided with locally wall mounted temperature controllers. A central VRV controller shall be provided to allow for complete central control. The HVAC system can either be controlled centrally by the facilities manager or individually from any of the wall mounted controllers. All coils shall be coated to be protected from corrosion.

#### 4.9.14.1 Scope of supply

The *Contractor* shall:

- a) design, supply and install a suitable variable refrigerant volume DX based air conditioning systems as per specifications and the *Employer's* specific standards with heat recovery to serve the following areas:
  - i) offices;
  - ii) dormitories;
  - iii) open plan areas;
  - iv) boardrooms; and
  - v) kitchens.
- b) design, supply and install the condenser plant to be placed on designated plant areas on the roof of the building;
- c) supply and install the following piping including all necessary fittings, valves, safety devices, supports, brackets, flexible pipe connections:
  - i) drain piping;
  - ii) refrigerant piping; and
  - iii) any other piping not specifically mentioned but which is required for Plant and Material supplied under this contract.
- d) supply and install all required refrigeration piping to the sizes and requirement of the Employer. Pipe sizing shall ensure proper oil return to the compressors under all operating conditions;
- e) supply and install refrigerant and condensate piping to be surface mounted in powder coated trunking or chased into the walls where possible;
- f) supply and install heat recovery boxes into the main riser on the floor or in designated areas where it needs to be covered by a powder coated sheet metal enclosure;
- g) provide a means of interlocking all air-conditioning and ventilation equipment with the new fire detection panel provided by the Contractor;
- h) design, supply and install indoor units onto the internal walls of the building as indicated the drawings; and
- i) testing and commissioning of the works.

#### 4.9.15 Close control air conditioning unit

- a) The server room shall be provided with a close control air conditioning unit. The air conditioning unit shall be provided with a twin refrigerant circuit. The air conditioning unit shall be of the down blow type supplying conditioned air into

the floor void which shall be supplied to the room via floor mounted grilles complete with balancing dampers. The close control air conditioning unit shall be supplied complete with humidification and water leak detection. Return air to the close control air conditioning unit shall be via a plenum, complete with return air grille, mounted on top of the unit.

- b) The condenser units shall be positioned at roof level in a freely ventilated plant room area. All coils of the close control air conditioning unit shall be coated to be protected from corrosion.

#### 4.9.15.1 Scope of supply

The *Contractor* shall:

- a) design, supply and install a suitable new close control air conditioning system and associated Plant and Material for use in the server room of the first floor as per specifications and the *Employer's* specific standards;
- b) design, supply and install all necessary piping to be surface mounted in powder coated trunking or chased into the walls where possible;
- c) provide a means of interlocking the close control air conditioning unit with the automatic fire suppression system provided by the Contractor; and
- d) testing and commissioning of the works.

#### 4.9.16 Fresh air installation

Fresh air shall be introduced into the building as per the National Building Regulation's requirements to the air-conditioned zones and to the building as a whole. The building shall be kept under a positive pressure in order to minimise the infiltration of dust and unconditioned air. Local wall mounted supply and extraction fans, complete with internal and external weather louvers, shall provide fresh air and extraction ventilation to all areas. All fans to be provided with 7 day programmable timers within the local electrical distribution boards.

##### 4.9.16.1 Scope of supply

The *Contractor* shall:

- a) design, supply and install a suitable ventilation system as per standards specifications listed in this clause and the *Employer's* specific standards;
- b) supply with all fresh air fans a 7 day timer in the electrical boards feeding the fans;
- c) provide a means of interlocking all ventilation equipment with the new fire detection panel provided by the Contractor; and
- d) testing and commissioning of the works.

#### 4.9.17 Ablution extraction ventilation

New toilet extraction ventilation shall be installed throughout the building consisting of local wall mounted fans located within the external walls of the office areas. The ablution areas shall be mechanically ventilated as per the National Building Regulation's requirements and kept under a negative pressure. All fans shall be provided with 7 day programmable timers within the local electrical distribution boards.

##### 4.9.17.1 Scope of supply

The *Contractor* shall:

- a) design, supply and install suitable new toilet extraction ventilation throughout the building consisting of local wall mounted fans located within the external walls of the office areas as per standards and specifications and the *Employer's* specific standards;
- b) supply with all air fans a 7 day timer in the electrical boards feeding the fans;
- c) provide a means of interlocking all ventilation equipment with the new fire detection panel provided by the Contractor; and
- d) testing and commissioning of the works

**Technical specification for design, supply and installation of a new air conditioning and ventilation system**

4.9.18 Noise levels  
Maximum noise levels caused by the operation of the air-conditioning system and ventilation shall comply with the OHS Act 85 of 1993 and regulations.

4.9.19 Variable refrigerant volume air conditioning units

4.9.19.1 General requirements

The following requirements shall be applicable to the *works*:

- a) The *Contractor* shall provide a design of the VRV system for approval by the *Project Manager*. The information shall include electrical requirements, pipe sizes and run lengths, including a full schedule of Plant and Material. The design shall be in full accordance with the *Employer's* requirements and specifications.
- b) The mid-wall mounted and cassette units shall be heat pump air-conditioning systems. Included is provision of all insulated condensate drainage piping, insulated refrigerant piping, electrical wiring and conduits.
- c) All units shall be supplied complete with individual wall mounted remote controls in each room. All the remotes shall automatically turn on as soon as the backup power kicks in, in case of power failure.
- d) The range of the operation capacity of the inverter-type condenser unit shall be between 20% and 130% of the required cooling capacity.
- e) The outdoor unit heat exchanger fins shall be factory coated with anti-corrosive and hydrophilic layers to prevent heat exchanger fins from corroding prematurely. Additional 'BLUCHEM' treatment shall be administered by the *Contractor* to further extend the life of the outdoor condensing units.
- f) Heating shall be by means of reverse cycle refrigeration.
- g) The VRV system shall be of the "heat recovery type" making use of mid wall and underceiling type heat recovery units.
- h) Mitsubishi VRV systems shall only be used due to the configuration of the heat recovery boxes.
- i) The refrigerant for the VRV system shall be R410a.
- j) All refrigerant piping, including y-joints, headers and heat recovery boxes shall be according to the *Employer's* specification.
- k) All indoor units shall be supplied complete with electronic expansion valves and individual controllers with full compatibility to a central controller or building management system ("BMS") via open protocols.

- l) The design of the refrigerant reticulation shall make allowance for a spare port on each heat recovery box for future expansion.
- m) Each circuit from the heat recovery box to the indoor unit shall be fitted with isolation valves, including a valve between the Heat Recovery unit and the outdoor condenser. All valves shall be insulated as per the insulation.
- n) The indoor controller shall have a program function with a 7-day programmable time function.
- o) The indoor controller shall have at least 2 hour battery back-up in order to contain all programs and time functions during a 2-hour power failure.

#### 4.9.19.2 VRV AC manager

The following requirements shall be applicable:

- a) A central controller shall be provided with all cabling and functionality as per the *Employer's* specification. The central controller shall indicate both the VRF based units as well and the package units;
- b) The controller shall allow for the input for a minimum of 64 units with the ability to extend to 124 units;
- c) The controller shall have a graphical interface, with login/logout functionality to prevent changes to the system by un-authorized personnel;
- d) The controller shall have a program function with a 7 day, 365 day programmable time function;
- e) The controller shall have at least 2 hour battery backup in order to contain all programs and time functions during a 2 hour power failure;
- f) The controller shall provide a log of all changes in set-point to operation of the units, and shall have the capability to integrate to a notification system; and
- g) All cabling, cable trays and trunking from the VRF and package units shall be included.

#### 4.9.19.3 Refrigeration piping and fittings

The following general requirements shall apply:

- a) all refrigerant tubing shall be of seamless dehydrated de-oxidised, refrigeration class copper tubing manufactured to ASTM B280-88 and ASTM B743-88;
- b) joints or connections in tubing up to 15mm O.D may be flared or soldered;
- c) Salkop and Maksal type "RC" and "RL" refrigeration class copper tubing shall be acceptable;
- d) fittings or flared joints or connections shall be equal and approved to those manufactured by Imperial Manufacturing Company. Flare nuts shall be of the "frost free" type;
- e) the tubing shall be run in a neat, straight, plumb or parallel manner. Silver soldered or Sil-Fos welded joints shall be acceptable and such joints shall be easily accessible for inspection purposes;
- f) where tubing passes through walls or ceilings, etc, neat PVC sleeves shall be used. The inside diameter shall be such that the insulated piping can pass through the sleeves. Gaps between the insulation and PVC sleeves shall be sealed with anon-hard setting putty;
- g) pipe joints shall be silver soldered and shall be standard wrought copper or force brass sweat fitting and high melting point solder such as "sibraloy" or

- other approved type shall be used. During the soldering process, heated joints shall be purged with nitrogen at all times;
- h) during installation open ends of the piping shall be protected against the ingress of dust and moisture;
  - i) all pipe bends shall be as gentle as possible with a bending radius of 30 to 40mm or larger. Installers shall use a pipe bender for this purpose;
  - j) piping which runs between the building and outdoor units shall run in suitable UV resistant PVC trunking with removable covers and angled covers. Similarly any piping that is located inside plumbing riser ducts shall run inside PVC trunking;

Piping shall be supported as follows:

Pipe size (mm)	Max. distance between supports (metres)
10 (and smaller)	0.6
10-18	1.0
22	1.5
28-35	2.0
42	2.5
54	2.75
67	3.0

- k) piping supports saddles shall be copper with rubber inserts;
- l) piping shall be installed to allow for expansion and contraction during operation of the systems;
- m) pressure testing of completed reticulation systems shall be carried out under the direction of the Project Manager. Such tests shall be carried out before the plastered false ceiling are installed, and again after the installation of false ceilings has been completed;
- n) before the systems are charged with refrigerant, the systems shall be vacuum evacuated so that all moisture is removed from the reticulation systems. The process shall be witnessed by the Project Manager;
- o) all liquid, gas and liquid gas piping shall be thermally insulated with closed cell Armaflex with a heat transfer rate not more than 0.041- 0.052kW/mK and to thickness as required. Straight sections of piping shall have insulation applied without and longitudinal joints and taped resistant PVC trucking;
- p) all refrigerant pipe work between the air cooled condenser and the evaporator units shall be carried out in copper tubing to the recommendations of the manufacturer and using materials provided by the manufacturer. Each system shall be completed with all necessary strainers, and thermal expansion valves;
- q) all pipe work shall be specially designed for use with refrigerants;
- r) the pipe work shall be sized to ensure that oil is returned to the compressor under all operating conditions. Oil traps shall be fitted at the bottom of riser piping and riser piping shall be sized for oil entrainment;
- s) all refrigerant lines shall be insulated separately (external pipe runs to be cladded);

- t) refrigerant suction lines shall be lagged, with pre-formed flexible foamed rubber such as urea-formaldehyde, polyurethane or polystyrene. The insulation shall have a minimum density of at least 20kg/m<sup>3</sup> and shall be provided in a self-extinguishing grade. The insulation thickness shall be at least 25mm thick. All fittings shall be insulated with the same materials and thickness as the adjacent pipe work;
- u) maximum pipe lengths between evaporators and condensing units must not exceed manufacturer's specifications; and
- v) the *Contractor* shall be required to produce a pipe run schedule indicating for each unit the total pipe length, total elevation, total no. of bends as well as the approved pipe diameter as agreed by the manufacturer.

#### 4.9.19.4 Drain piping

The following general requirements shall apply:

- a) insulate all drain piping from cassette units with a minimum of 19mm thick Armaflex;
- b) mid wall type unit drain pan piping shall be Class 12 PVC, where drain piping shall be subject to sweating, it shall be insulated;
- c) drain piping which is subject to sweating shall not be run in floor screeds, brick walls or partitions;
- d) drain piping shall include rodding eyes and means of dismantling pipe sections for internal cleaning. Suitable see-through cleanable traps shall be provided where drain piping connects into waste pipes, or discharge over floor drains; and
- e) condensate drain pipes shall be in copper or galvanised mild steel and shall be led to the nearest drain point. No main drainpipe smaller than 50mm diameter and branch pipes smaller than 25mm shall be allowed. All drain pipes shall be p-trapped at the unit. All drain pipes shall be in ceiling voids as well as drainpipe droppers.

#### 4.9.19.5 Protection of piping

During construction, all piping shall be protected from ingress of foreign matter entering completed pipe sections of the installed piping not walked on. Opening in piping, drains, fitting, apparatus and equipment shall be covered up, when not worked on.

Thickness of piping insulation shall be as follows:

Normal Pipe Size (mm)	Insulation Thickness (mm)
6.35 - 9.53	19
12.7 Up	25

#### 4.9.19.6 Oil and refrigerant charge

The entire system shall be complete with the initial charge of refrigerant and lubrication oil.

4.9.19.7 Installation

- a) The *Contractor* shall coordinate the correct positioning of sleeves for refrigerant pipe work where not already provided, as well as the building in of drainage pipe work. The *Contractor* shall install the units as indicated on the drawings.

The *Contractor* shall take cognisance of positions of indoor and outdoor units and piping runs between these units and shall ensure that he has allowed for sufficient piping between the units. No extra claims for refrigerant piping shall be tolerated, except if positions of units are changed by the *Project Manager* and drawings are issued.

- b) All refrigerant pipe work shall be installed on electrical cable tray and refrigerant pipe work exposed to weather shall be installed in galvanized sheet metal trunking, primed and painted with enamel paint.

4.9.19.8 Electrical wiring

The following shall apply:

- a) the entire installation shall be wired in accordance with the latest version of SANS 10142-1;
- b) after completion of the installation and prior to the acceptance thereof the following documentation shall be submitted to the Project Manager:
- i) all original certificates as required by SANS 10142-5;
  - ii) a copy of wiring diagrams marked up with wire colours, core numbers, alterations, corrected motor loads, etc;
  - iii) a cable schedule showing cable sizes, types, cable numbers, etc;
  - iv) a schedule of all components and switch gear use.
- c) electrical components, compliance certificates shall be required by the latest revision of SANS 10142-1 and shall be produced before power is applied to the specified switchboard and installation;
- d) no wiring diagrams, switchgear selections, cable sizes, cable types, equipment positions etc shall be altered without permission from the Project Manager;
- e) the *Contractor* shall be responsible for the provision of three phase or single phase isolators.
- f) where wire unit controls are offered, conduits to a 100mm x 100mm outlet box between the ceiling space and the outlet box must be provided. Controllers of these thermostat/fan selectors shall be decided at a later stage.

4.9.19.9 Labeling

All condensing units and evaporators shall be labeled with printed labels corresponding to the installation drawings in order to identify each unit.

4.9.20 Close control air conditioning unit ("CRAC")

4.9.20.1 General requirements

The following general requirements shall be applicable:

- a) this specification relates to the DX-based computer room downdraft air conditioning units as specified below and indicated on the drawings, which form part of this Works Information;
- b) the CRAC unit shall be as manufactured by AIAC (Airedale), Stulz, Emerson or equivalent approved;
- c) the close control air conditioning unit shall be installed in the server room;
- d) the units shall be supplied complete with internal humidifier. Air shall be distributed through the floor void and supplied to the room via floor mounted grilles. Return air shall be via a return plenum at the top of the unit;
- e) the cabinet shall be powder coated and shall be constructed of durable sheet metal sections. A return air plenum, complete with access panel; constructed out of the same powder coated material as the cabinet shall be provided to link the unit with the ceiling void. This access panel shall lock securely and no short cycling shall be allowed through the access panel;
- f) the overall unit dimensions including mounting details shall not exceed those shown on the general arrangement drawing; and
- g) access to the unit shall only be via the front of the unit, no access from the sides shall be permitted. The *Contractor* shall check the proposed access and installation details and ensure that all necessary provisions are made for the installation, servicing and maintenance of the units in accordance with his service and maintenance instructions and contract.

#### 4.9.20.2 Fan selection

The following requirements shall apply:

- a) variable fan speed control shall be required. A minimum of two fans shall be installed per CRAC unit;
- b) the unit's fan shall be selected so that the air delivery does not decrease by more than 10% when the filter is dirty. The operation point shall be in a stable part of curve. Fan curves shall be submitted for approval before the units are ordered;
- c) all fans shall be fitted with electronically commutated ("EC") motors and shall be non-overloading at any operating point on the performance curve;
- d) fans shall be powered by direct drive variable speed motor, statically and dynamically balanced; and
- e) the fan shall be selected assuming a pressure drop across the filter equal to the average pressure drop caused by the filter in its clean and dirty stages.

#### 4.9.20.3 Coils

The following requirements shall apply:

- a) cooling coils shall have copper tubes mechanically expanded into aluminum fins;
- b) cooling coil connections and return bends shall be tested to 2000kPa and rated for operating at 1700kPa; and
- c) all coils shall be chemically treated to prevent the scaling, oxidation or discoloration.

#### 4.9.20.4 Electric heater

The following requirements shall apply:

- a) the heater bank shall be maintainable and removable in such a way as to not disrupt normal operation (cooling) of the CRAC units;
- b) the heater shall be complete with:
  - i) an auto reset thermal cut-out device set at 65°C;
  - ii) a manual reset thermal cut-out device set between 80 – 100°C with reset button, labelled and operable without removing any terminal box cover; and
  - iii) airflow interlock by means of either supply air pressure switch, or air flow switch.
- c) elements shall have an adequate resistance to earth, with due regard to the possible condensation of moisture during the cooling cycle;
- d) the heater element for each step shall be strung across the entire face of the coil to prevent stratification when operating at less than full capacity; and
- e) there shall be no bypass of unheated air.

#### 4.9.20.5 Unit control

- a) the CRAC unit shall control cooling and dehumidification by means of 2 averaging sensors installed in the data centre. The *Contractor* shall allow for sensors as well as cabling (25m per sensor) per unit;
- b) the humidifiers shall not be integral to the CRAC units. Separate humidifiers in an N+1 configuration shall be installed in the server room;
- c) the control and alarm panel shall indicate the operating status of the unit and malfunction by means of readout displays (metric units only) and audible alarm of the following possible malfunctions:
  - i) dirty filter alarm;
  - ii) high room temperature alarm;
  - iii) low room temperature alarm;
  - iv) high humidity alarm;
  - v) low humidity alarm;
  - vi) chilled water flow alarm;
  - vii) air flow alarm;
  - viii) floor void water detection alarm; and
  - ix) demand valve position.
- d) any of the abovementioned alarms shall need to be displayed on the BMS system, describing the alarm type, which has occurred. The BMS shall indicate which of the units has the specified alarm condition. The unit shall be fully protected and shall be fail safe;
- e) if a unit failure occurs, the BMS system shall need to log the failure, send an alarm, and automatically increase cooling to the standby units;
- f) the close control computer room units shall have the following safety protection elements:
  - i) thermal overload for single phase motors;
  - ii) combined thermal overload and phase-failure for three phase motors; and
  - iii) an excessive drop of voltage or power interruption shall disconnect the system with automatic re-start and normal operation and control when fault condition is rectified.

- g) the *Contractor* shall be expected to be on 24 hour callout for any failure with specialist technicians staying available on the Employer's behalf, and the response time for a callout shall be no more than 2 hours. A service level agreement shall be required to be signed by the Employer before any Plant and Material shall be ordered; and
- h) the CRAC units shall auto restart after a power failure.

#### 4.9.20.6 Electrical works

The following requirements shall apply:

- a) each unit shall be supplied by two separate electrical supplies sized for the unit full load. The unit shall allow for a connection of each supply within the casing and shall be equipped to automatically transfer between supplies based on supply availability. Each unit's internal automatic transfer switch shall transfer the full load capability of the unit to the alternate supply in the event of a main supply failure. The retransfer shall be close transition after a minimum period of two minutes. The retransfer characteristics shall be within the *Employer's* Plant and Material specifications;
- b) a control/alarm panel shall be provided for each unit, internally mounted and factory wired and accessible from the front of the unit. The panel shall be able to display a history of the last 200 events and must be time and date stamped;
- c) all electrical wiring shall be brought to a numbered terminal strip within the panel;
- d) all controls shall be of the electronic type designed to provide continuity and correct operation during abnormal conditions caused by over voltages, electromagnetic induction, spiking input/output, switching of fluorescent lights, operation of computer hardware, etc;
- e) the temperature and humidity control shall measure the conditions in the entering return air. They both shall have an adjustable range, field adjustable sensitivity and calibration check system;
- f) digital readouts of following shall be displayed on the front of the unit or the control panel:
  - i) return air temperatures (to one decimal point);
  - ii) relative humidity (to 1%);
  - iii) demand valve position; and
  - iv) power source (main or alternate).
- g) the unit shall be suitable for remote stop/start (via the fire interlock only) and fault monitoring (any one fault to activate remote alarm);
- h) all necessary instrumentation inspection and testing provisions (including location) shall enable the operator to log performance and identify malfunctioning of the Plant and Material, in accordance with trouble shooting instructions, shall be installed and grouped together in such a way to facilitate logging with maximum accuracy and reduce operator's time to a minimum;
- i) each unit shall be connected to floor mounted water sensors. These sensors shall be positioned inside the data centre floor void where the supply air is introduced in the floor void as well as in the purpose built corridors where the units are housed;
- j) the alarms are to be configured to continue operation for all alarms, except for a supply fan failure; and

- k) each controller shall be fully Bacnet compatible. The *Contractor* shall ensure full functionality of the units with the BMS and shall ensure full details of data points are available.

4.9.20.7 Refrigerant pipework and fittings

The refrigeration pipework and fittings shall be as per VRV specifications

4.9.20.8 Reliability and availability

The following requirements shall apply:

- a) the maximum allowable time for routine services shall not be more than one hour per unit per month;
- b) the maximum allowable time for annual services shall not be more the four hours per unit;
- c) the minimum allowable mean time between failures of the units or sub-components thereof shall be 15 years operating 24 hours per day continuously under full and part load conditions;
- d) the *Contractor* shall submit proof of his ability to maintain the Plant and Material for a minimum of 5 years and shall maintain the Plant and Material for 9 years; and
- e) the *Contractor* shall submit service, maintenance, trouble shooting, testing, installation and normal and emergency operating start-up instructions in order to obtain acceptance approval. Documentation shall be indexed in accordance with the Plant and Material part of the operations and maintenance manual.

4.9.20.9 Mounting details

The following requirements shall apply:

- a) the units shall be mounted on an adjustable floor stand to be supplied by the *Contractor*. The CRAC unit shall be mounted 5 mm above the finished floor level, but free from the finished floor to prevent the transmission of any vibrations.
- b) The stand shall rest on vibration isolation pads. Compriband or equal shall be provided between floor stand and access floor; and
- c) the stand shall be provided with an adjustable lip to support the raised floor, as well as lip to create a shadow line underneath the CRAC unit.

4.9.20.10 Factory testing

The following requirements shall apply:

- a) the completed unit shall be leak and pressure tested at 40 bars on the coils;
- b) unit operation and all control functions shall be programmed prior to shipment; and
- c) where Plant and Material is manufactured outside of KwaZulu Natal the *Contractor* shall allow for all flights, travel, food and accommodation for the Project Manager and one of the Employer's representatives to witness the factory testing.

4.9.20.11 Shipment

The unit shall ship fully assembled and wired, charged with refrigerant and oil, and ready for commissioning after Site connection of the power supply and electric interlocks.

4.9.20.12 Delivery and rigging

The *Contractor* shall ensure delivery of the CRAC units to Site and rigging to the data centre rooms, in conjunction with the CRAC units manufacturer's representative.

4.9.20.13 Additional requirements

The units shall have all the following features:

- a) heating and controls;
- b) high efficiency filter and pre-filter;
- c) discharge plenum;
- d) ceiling duct extension;
- e) adjustable floorstands; and
- f) water detection.

4.9.20.14 Building restraints

The following requirements shall apply:

- a) access to the white space areas is limited by the doorways which are 2.0m high and 1.0m wide. The *Contractor* shall take this into account and shall allow for removable panels and filters in order to accommodate rigging of the units;
- b) the units shall be installed in accordance with manufacturer's recommendations;
- c) the units shall not drum, vibrate or leak under any operating conditions;
- d) piping shall not impose stress on the units; and
- e) noise level through the operation of the unit at any operation point shall not exceed the NC40 level measured approximately 3 meter in front of the unit in a typical hard surface type computer room.

4.9.20.15 Submittals

The *Contractor* shall submit the following:

- a) unit performance data including capacity, nominal and operating performance;
- b) shop drawings indicating overall dimensions as well as installation, operation and service clearances. This shall indicate lift points and recommendations and centre of gravity, as well as Indicate unit shipping, installation and operating weights including dimensions; and
- c) data on electrical requirements and connection points which shall include recommended wire and fuse sizes or Minimum Circuit Amps ("MCA") and safety and start-up instruction.

4.9.20.16 Warranty

The *Contractor* shall provide the following:

- a) a full parts warranty for the *Defects correction period*;

- b) a qualified technician to fully commission and log operating conditions of the CRAC on start-up. The commissioning log shall be included in the submittal package provided by the Contractor; and
- c) a five-year warranty for replacement compressors including material and labour.

4.9.20.17 Compliance with specification

The following requirements shall apply:

- a) all commissioning of Plant and Material shall be ASHRAE level 5 compliant and shall be supplied with documentation indicating such;
- b) the *Contractor* shall supply the necessary field testing instruments complete with instrument calibration certificates;
- c) the *Contractor* shall provide a method statement (detailed description) of the field-testing arrangement to prove a capacity/performance measured accuracy of  $\pm 5\%$  of rated capacity/performance for the unit acceptance testing. The method statement shall include:
  - i) a description of the system under test;
  - ii) the test procedure;
  - iii) Plant and Material to be used;
  - iv) test record detailing unit serial number, design specification, test results and deviations;
  - v) drawings where applicable;
  - vi) risk assessment; and
  - vii) health and safety assessment and mitigation.
- d) the *Contractor* shall provide a week's notice prior to a test for the Project Manager to arrange attendance. The Project Manager may decline to attend;
- e) certified test results shall be plotted on the official published and certified equipment performance graph/table to confirm that claimed performance is achieved;
- f) evidence of "inspection passed" in accordance with the specified Quality Management System (ISO 9001 or equivalent) shall be attached to the unit and shown for inspection on delivery to Site and/or claim for payment; and
- g) the *Contractor* shall compile a file with the information listed below, which must be handed to the Project Manager:
  - i) test method statements;
  - ii) test results;
  - iii) test graphs and tables;
  - iv) system / unit drawings; and
  - v) system / unit test sign-off and completion certificate.

Summary of unit specifications

Description	Units	Data
Altitude	(m)	0
Identification		CRAC1
Number of units		Please refer to BOQ
Supply fan		

Air flow rate	(l/s)	3700 (Variable 30%-100%)
Unit external static pressure	(Pa)	200 (Maximum)
Fresh air volume		
Minimum volume	(l/s)	50
Cooling coil		
Air flow rate	(l/s)	3700
Entering air condition	(°Cdb/°Cwb)	22/15.4
Leaving air condition	(°Cdb/°Cwb)	12/10.5 (To be verified)
Capacity - total	(kW)	32
Capacity - sensible	(kW)	38
Humidifier (external N+1)		
Steam output - maximum	(Kg/h)	15kg/hr
Steam output - minimum	(Kg/h)	Variable
Number of control steps		N/A
Water pressure available	(Bar)	To be confirmed on Site
Electric heater		
Air flow rate	(l/s)	3700 (to be verified)
Capacity	(kw)	15
Number of control steps		4
Filter		
Air flow rate	(l/s)	3700 (to be verified)
Maximum velocity	(m/s)	2.5
Efficiency	(%)	by Contractor (as per ASHRAE)
Arrestance	(%)	by Contractor (as per ASHRAE)
Initial resistance	(Pa)	by Contractor
Final resistance	(Pa)	250 (estimate)
Noise level		
Room	(NC)	40 @ 3m
Power supply		
Volt/phase/frequency	(V/Hz)	400/3/50
Supply fan motor	(kW)	
Humidifier	(kW)	
Heater	Amps	

#### 4.9.21 Ventilation and extraction

##### 4.9.21.1 General

The following requirements shall be applicable:

- a) mechanical ventilation shall comply with SANS 10400;
- b) the required rate of supply per person shall be in accordance with SANS 10400; and
- c) all fresh air supply fans shall be provided with 7-day timers in the electrical boards feeding the fans.

#### 4.9.21.2 Fan system

The following requirements shall be applicable:

- a) all fans shall be mounted on anti-vibration rubber mountings and fitted with a flexible collar on the fan outlet. All fans shall be fitted with sound attenuators;
- b) the fans shall be complete with 7 day timer switches;
- c) fans motors shall be selected to not exceed a power factor of 0.9; and
- d) all fan motors shall be fitted with overload safeties including phase protection.

#### 4.9.21.3 Smoke extraction systems

All smoke extraction fans and fire dampers shall be rated for operation at a 300 degrees Celsius for 3 hours.

#### 4.9.22 Ducting

##### 4.9.22.1 Sheet metal

All conditioned air ductwork, inclusive of flexible ductwork shall be externally insulated. All exposed ducting shall be externally insulated and clad.

##### 4.9.22.2 Air velocity

Air velocity in all ductwork shall not exceed 7 m/s at any point.

##### 4.9.22.3 Standards

Ducting shall be manufactured according to SANS 1238-2005 as amended.

##### 4.9.22.4 Artificial resistance

Dampers shall not be used to create artificial resistance in the system in order to reduce fan air flow capacity. Reduction of air flow shall be accomplished by reduced fan speed or by changing the fan blade angle.

##### 4.9.22.5 Passing through concrete walls

All ducts passing through concrete or brick wall shall be isolated from the walls by means of a high-density glass fibre collar of at least 20 mm thickness.

##### 4.9.22.6 Galvanised steel

Galvanised steel shall be used for ducting unless otherwise specified.

##### 4.9.22.7 Duct hangers

Dimensions of duct hangers shall be as follows:

Longest duct dimensions (mm)	Round hangers (mm)	Galv. Strap hangers (mm)	Shelf angles (mm)	Maximum spacing (mm)
Up to 760	6	25 x 1.6	25 x 25 x 3	3.0
761-1000	10	n/a	38 x 38 x 3	3.0
10001-2100	10	n/a	50 x 50 x 3	2.4

Round hangers shall not protrude below the lowest part of the shelf angles.

All hangers and supports shall be painted in accordance with the general technical specification for painting.

#### 4.9.22.8 Flexible duct connections

Flexible connections between ducting and vibrating equipment, or where otherwise specified, shall be fitted with flanges identical to those specified for ducting of the same duty and dimensions. Flexible connections shall be manufactured from heavy-duty green sterkolite or approved equivalent.

#### 4.9.22.9 Fire dampers

All riser ducts which protrude through structural slabs shall be supplied with fire dampers. Each fire damper shall be installed in such a way that the fire damper can be removed at a later stage if it needs to be repaired, and it needs to be reset from the slab soffit side.

#### 4.9.23 Diffusers, registers and grilles

##### 4.9.23.1 Colour finish

All diffusers, registers and grilles shall be finished off in a colour specified by the *Project Manager*.

##### 4.9.23.2 Grilles

Grille sizes, diffuser sizes and air quantities are as indicated on the relevant drawings.

#### 4.9.24 Painting

The following requirements shall apply:

- a) the paint colour scheme shall comply fully with:
  - i) SANS 10064 - 2005
  - ii) SANS 1274
  - iii) SANS 630 – 2004

and shall consist of:

preparation	in accordance with SANS 10064
ground coat	25 micron red lead according to SABS 312 type 11

undercoat	25 micron
finish	25 micron alkyd enamel according to SANS 29
Colour	in accordance with SANS 1091

- b) thorough descale, clean and degrease;
- c) paint all exposed metal work and Plant and Material which are not specified manufactured products:
- d) all painting shall be in accordance with colour code SANS 1091 as follows:

drainage piping	factory finish or dove grey G22
cold water pipes	natural copper or black
valves	black or natural bronze
pipehangers and supports	black

#### 4.9.24.1 Black metal work

The following requirements shall apply:

- a) one coat of PA10 primer;
- b) one universal undercoat; and
- c) two coats of high gloss enamel to ensure complete corrosion protection.

#### 4.9.24.2 Galvanised metalwork

The following requirements shall apply:

- a) degrease and prepare surfaces with a wash specially designed for pre-treatment of galvanised iron;
- b) one coat of calcium plum bates;
- c) one universal undercoat; and
- d) two coats of high gloss enamel to ensure complete corrosion protections.

#### 4.9.24.3 Factory painted Plant and Material

The following requirements shall apply:

- a) damaged and scratched paint surfaces shall be touched up with identical colour paint;
- b) all package units supporting steelwork shall be painted; and
- c) paint shall be of highest quality and shall be applied strictly in accordance with the manufacturer's specification.

### 4.9.25 Additional specifications

#### 4.9.25.1 Installation

Where nuts and bolts are used the following shall apply:

- a) for similar applications all bolts shall be of the same length;

- b) not more than 5 threads and not less than 2 threads shall extend through nuts;
- c) all bolts, nuts and washers shall be cadmium plated unless otherwise specified; and
- d) where applicable tapered washers shall be used.

#### **4.9.26 Fans**

Fans shall be fitted with overload and phase rotation safeties. Fresh air and toilet fans shall be fitted with 7 day timer at the fan or in the DB by the *Contractor*. Fans shall have indication plates fitted on the outside displaying the following information:

- a) impeller rotation;
- b) fan size;
- c) grease used; and
- d) bearing type and size.

#### **4.9.27 Ducting**

Ducting shall have flexible connections at all building expansion joints.

#### **4.9.28 Drainage**

All items with drain connections shall be provided with galvanised iron pipe work to the nearest drain point inside the plant room.

#### **4.9.29 Omissions**

Not all Plant and Material for the successful completion of the project is described in the Works Information. Where this is the case, the *Contractor* shall follow accepted practice of a reasonable standard to the satisfaction of the *Project Manager*.

##### **Testing, commissioning and balancing**

The following requirements shall apply:

- a) testing, commissioning and balancing shall be carried out by an independent firm employing competent technicians familiar with the testing, adjusting and balancing of air-conditioning systems in the presence of the *Project Manager*. The *Contractor* shall forward all test results to the *Project Manager*, for approval;
- b) commissioning of the class 100 and class 1000 units shall be carried out by the manufacturer of the units, to ensure that systems performs and designed and specified duties and functions and that all temperature and control monitoring / adjustment are in place and also functioning correctly; and
- c) testing, adjusting and balancing of the systems shall generally be in accordance with chapter 37 of 2008 ASHRAE handbook (HVAC Systems and Equipment).

##### **Operating and maintenance manuals**

The following requirements shall apply:

- a) five sets of operating and maintenance manuals shall be in the form as suggested in Chapter 38 of 2007 ASHRAE handbook (HVAC Applications);
- b) all as built drawings shall be supplied on CD with five sets of hard copies; and
- c) plant schematic and wiring diagrams shall be the latest revision and shall be framed behind glass and displayed adjacent to switchboards.

#### **Maintenance**

The following requirements shall apply:

- a) allow for the maintenance of the complete installation for a period of twelve months after the Completion certificate has been issued by the *Project Manager*. The *Contractor* shall visit the installation once a month on the basis of a proper preventive programme approved by the *Project Manager*;
- b) the *Contractor* shall report to an official nominated by the Employer on arrival and again on leaving their premises on the occasion of each visit. Such person, who has been nominated by the Employer, shall sign a service report giving details of corrected temperature and humidity readings taken, etc; and
- c) at each service visit, maintenance personnel shall, inter alia, perform the following duties in addition to any other which may be necessary:
  - i) check all fans and drives variable speed drives, lubricate moving part and tighten where applicable, belts, as required, and check all lock-out stops;
  - ii) check drip trays, drainage systems for cleanliness and correct functioning;
  - iii) check indoor units for condensation;
  - iv) check all air filters, etc., replacing filter media or filter panels as required;
  - v) check differential pressure gauges and switches, etc;
  - vi) check electric heaters for correct functioning, etc;
  - vii) check all switchboards;
  - viii) tighten connections, check switchgear for burnt contacts, check overload settings, phase failure relays, etc;
  - ix) replace defective voltmeter, ammeters, transformers, pilot lights, hour meter, timers, time switches, etc;
  - x) check all control systems and safety devices, air flow switches, manometer, etc for correct functioning and replace defective items or any other as necessary; and
  - xi) check refrigerant systems for leaks, refrigerant dryness, sufficient oil level, and all safety controls and settings, etc and correct top-up as required.

#### **Guarantee**

The following requirements shall apply:

- a) the *Contractor* shall guarantee the materials, apparatus and workmanship delivered and installed by him. The guarantee shall be valid for a period of twelve months starting on the date when the Completion certificate is issued, the complete installation shall be guaranteed against Defects as a result of patent and latent defects of the apparatus, as well as against faulty Material and workmanship. Fair wear and tear shall be excluded from the guarantee; and

- b) the guarantee shall provide all parts, spares and appurtenances which become defective during the Defects correction period, to be replaced free of charge to the Employer. All costs of labour, out-of-town town allowances, Plant and Material and transportation required to replace such part of a defective installation shall be borne by the *Contractor* and shall be included in his guarantee.

**Extended guarantee**

Where certain Plant and Material have standard guarantee clauses which do not correspond with the guarantee as specified in 4.11 above, the *Contractor* shall allow in the tender price for the extensions of guarantees and additional charges thereof, in order to comply with guarantee clause.

**4.9.30 LIST OF DRAWINGS**

**4.9.30.1 DRAWINGS ISSUED BY THE EMPLOYER**

The following drawings shall be issued by the *Employer* at or before the Contract Date and which shall apply to this contract.

Note: Some drawings may contain both Works Information and Site information.

Mechanical drawings

HVAC drawings		
32442.00.740.01	02	Ground Floor HVAC
32442.00.740.02	02	First Floor HVAC
32442.00.740.03	02	Second Floor HVAC
32442.00.740.04	02	Third Floor HVAC
32442.00.740.05	02	Roof HVAC

## 5 List of Drawings

### 5.1 Drawings issued by the *Employer*

This is the list of drawings issued by the *Employer* at or before the Contract Date and which apply to this contract.

Note: Some drawings may contain both Works Information and Site Information.

Drawing number	Revision	Title
<b>Electrical drawings</b>		
32442.00.300-01	01	Site Plan: Electrical layout
32442.00.300-02	01	Guard House: Electrical layout
32442.00.300.02	01	Server room: Electrical layout
32442.00.301.05	01	Roof Plan Renovations: Electrical layout
32442.00.312.01	01	Single line diagram No. 01
32442.00.312.02	01	Single line diagram No. 01
32442.00.312.03	01	Single line diagram No. 02
32442.00.312.06	01	Single line diagram No. 06
32442.00.320.01	01	Ground Floor Renovations: Electrical layout
32442.00.320.02	01	First Floor Renovations: Electrical layout
32442.00.320.03	01	Second Floor Renovations: Electrical layout
32442.00.320.04	01	Third Floor Renovations: Electrical layout
32442.00.370.01	00	Ground Floor Renovations: Power layout
32442.00.370.02	00	First Floor Renovations: Power layout
32442.00.370.03	00	Second Floor Renovations: Power layout
32442.00.370.04	00	Third Floor Renovations: Power layout
32442.00.377.01	00	Ground Floor Renovations: Containment layout
32442.00.377.02	00	First Floor Renovations: Containment layout
32442.00.377.03	00	Second Floor Renovations: Containment layout
32442.00.377.04	00	Third Floor Renovations: Containment layout
32442.00.380.01	01	Ground Floor Renovations: lighting layout
32442.00.380.02	01	First Floor Renovations: lighting layout
32442.00.380.03	01	Second Floor Renovations: lighting layout
32442.00.380.04	01	Third Floor Renovations: lighting layout
<b>Architectural drawings</b>		
32442.00.201.03	03	Ground Floor Renovations
32442.00.201.04	03	First Floor Renovations
32442.00.201.05	03	Second Floor Renovations
32442.00.201.06	03	New Third Floor
32442.00.201.07	02	New roof

32442.00.202.01	02	Section A-A
32442.00.202.02	01	Section B-B
32442.00.202.03	01	Elevations
32442.00.609.01	01	Door Schedule
32442.00.610.01	01	Window Schedule
32442.00.610.02	01	Window Schedule
32442.00.611.01	02	Finishes Schedule
<b>Structural drawings</b>		
32442.00.201.08	03	Ground Floor Concrete layout
32442.00.201.09	03	First Floor Concrete layout
32442.00.201.10	03	Second Floor Concrete layout
32442.00.201.11	05	New Third Floor
32442.00.201.12	03	New roof
32442.00.202.04	02	Section A-A
32442.00.202.05	02	Section B-B
32442.00.202.06	02	Section C-C
32442.00.210.01	02	Connection Details
32442.00.210.01	01	Connection Details
<b>Sewer and Water layout</b>		
32442c.130/140-01	01	Sewer and water layout
32442c.130/140-01	01	Sewer and water layout
C32442.00c.104-01	00	Sewer details
32442.110.01	01	Road and Storm water layout
32442c.130/140-01	01	Sewer and water layout
32442c.131.01	02	Layout Plan and Longitudinal section of sewer pipe
C32442c.133.01	01	Raising main and pump detail layout
<b>Fire drawings</b>		
32442.00.720.01	02	Ground Floor Fire Layout
32442.00.720.02	02	First Floor Fire Layout
32442.00.720.03	02	Second Floor Fire Layout
32442.00.720.04	02	Third Floor Fire Layout
32442.00.720.05	02	Roof Fire Layout
<b>HVAC drawings</b>		
32442.00.740.01	02	Ground Floor HVAC
32442.00.740.02	02	First Floor HVAC
32442.00.740.03	02	Second Floor HVAC
32442.00.740.04	02	Third Floor HVAC
32442.00.740.05	02	Roof HVAC

## SECTION 2

### 6 Management and start up

#### 6.1 Management meetings

Regular meetings of a general nature may be convened and chaired by the *Project Manager* as follows:

Title and purpose	Approximate time & interval	Location	Attendance by:
Overall Contract - Progress and feedback.	Monthly on a day and time mutually to be agreed.	Port of Richards Bay or MS Teams as an alternative	<i>Employer, Contractor, Supervisor, Project Manager, including relevant stakeholder's as may be deemed relevant</i>
Contract Risk register and Compensation Events	Fortnightly on a day and time mutually to be agreed.	Port of Richards Bay or MS Teams as an	<i>Employer, Contractor, Supervisor, Project Manager, including relevant stakeholder's as may be deemed relevant</i>
Site Inspections and quantity measurements	Ad hoc	Port of Richards Bay or MS Teams as an	<i>Employer, Contractor, Supervisor, Project Manager, including other stakeholder's as may be deemed relevant</i>
<i>Contractor Safety Meetings.</i>	Fortnightly with Contractors. Day and time to be agreed.	Port of Richards Bay or MS Teams as an	<i>CM (Optional), TNPA Safety Advisors and Contractor Safety Officers and Contractor Management / Supervision.</i>
<i>Safety Pre-Mobilisation Meeting</i>	<i>Once off at the kick-off meeting.</i>	Port of Richards Bay or MS Teams as an	<i>Employer, Contractor (appropriate key persons), Supervisor (as necessary and appropriate delegates), and Project Manager, including other stakeholder's as may be deemed relevant</i>
Safety, Health and Environment Induction Training.	Once off Induction programme prior to commencing any work on site and each time for a new start.	Port of Richards Bay or MS Teams as an	<i>Employer, Contractor (all personnel to work on site), Supervisor, Project Manager, including other stakeholder's as may be deemed relevant</i>

Meetings of a specialist nature may be convened as specified elsewhere in this Works Information or if not so specified by persons and at times and locations to suit the Parties, the nature and the progress of the *works*. Records of these meetings are to be submitted to the *Project Manager* by the person convening the meeting within five days of the meeting.

All meetings are to be recorded using minutes or a register prepared and circulated by the person who convened the meeting. Such minutes or register are not to be used for the purpose of confirming actions or instructions under the contract as these are to be done separately by the person identified in the *conditions of contract* to carry out such actions or instructions.

## **6.2 Documentation Control**

- 6.2.1 In undertaking the 'Works' (including all incidental services required), the *Contractor* shall conform and adhere to the requirements of the '*Contractor* Documentation as stated below. The *Contractor* is to ensure that the latest versions of the required application software and a suitable 'IT' Infrastructure are in place to support the electronic transmission of documentation.
- 6.2.2 Each supplier of documentation and data for the Project is responsible for ensuring that all documentation and data submitted conforms to the Project Standards and data Quality requirements in terms of numbering, uniqueness, quality, accuracy, format, completeness and currency of information. Data not meeting the Project Standards and data Quality requirements will be cause for rejection and returned to the *Contractor* for corrective action and re-submission.
- 6.2.3 The *Contractor* shall be responsible for the supply of all sub-supplier/sub-contractor/Manufacturer, etc. documentation and data, in the prescribed format, related to their package of work and shall ensure that these sub-suppliers have the capability to supply the necessary documentation and data in the required time frame and quality as outlined in the specified standards prior to awarding sub orders.
- 6.2.4 Electronic files submitted for the Project shall be clear of known viruses and extraneous "macros". The supplier of documentation is required to have, at all times, the latest generation of virus protection software and up to date virus definitions.
- 6.2.5 The *Contractor* must apply "wet signatures" to the original Documentation before scanning the signed original and prior to formal submission to the Project.
- 6.2.6 Final issues of all documentation shall be supplied to the Project in "wet signature" format along with the associated corresponding electronic 'native files' and PDF renditions.
- 6.2.7 The *Contractor* must ensure adequate resources are available to manage and execute the Document Control function as per the requirements of the Project.
- 6.2.8 The *Contractor* must ensure that the latest versions of the required application software and a suitable 'IT' Infrastructure are in place to support the electronic transmission of documentation.

## **6.3 Safety risk management**

- 6.3.1 The *Contractor* complies with the Occupational Health and Safety Act, 85 of 1993 and Regulations together with Health and Safety requirements contained in the Employer Health and Safety Project Specifications attached hereto as Annexure B of this Works Information:
- 6.3.2 It is a pre-requisite for the *Contractor* to develop, operate, and maintain a CHSMP which incorporates the principles outlined in the Employer Health and Safety Project Specification which is tailored for their scope of work. The *Contractor* must ensure that his Sub-Contractors comply with the requirements of the CHSMP.
- 6.3.3 The *Contractor* must perform the works having due regard to the CHSMP.

- 6.3.4 No alcohol is permitted on Site and within TNPA property. The Employer has a zero-tolerance policy in this regard and all personnel entering the Site will be required to undergo breathalyzer tests.
- 6.3.5 The *Contractor* shall provide all personnel with the required and relevant Personal Protective Equipment (PPE) as detailed in the CHSMP.
- 6.3.6 Although not limited to, the following PPE is the minimum requirement:
- Hard hat
  - Safety boots with steel toe cap
  - High visibility reflective vests
  - Safety glasses
  - Any other job specific PPE required.
- 6.3.7 The *Contractor* shall provide transport for personnel in a safe manner. Transportation in the back of a light delivery vehicle is prohibited. The *Contractor* may transport workforce by means of busses to the respective areas of work. There is no additional payment for this and shall be deemed to have been included in the tendered rates.

#### **6.4. Environmental constraints and management**

- 6.4.1 The *Contractor* complies with the following (CEMP):
- The *Contractor* performs the *works* and all construction activities within the Site and Working Areas having due regard to the environment and to environmental management practices as more particularly described within the SES and PES.
- The SES describes the minimal acceptable standard for environmental management for a range of environmental aspects commonly encountered on construction projects and sets environmental objectives and targets, which the *Contractor* observes and complies.
- The PES may require higher minimal standards than those described in the SES as may be required by the *Project Manager* or Others.
- The overarching obligations of the *Contractor* under the CEMP before construction activities commence on the Site and/or Working Areas is to provide an environmental method statement for a particular construction operation at the Site and/or Working Area by the *Contractor* and where requested by the CM and to comply with the following:
- Where relevant, method statements, as detailed in the SES and PES, shall be provided by the *Contractor*. These include, but are not limited to, the following where applicable:
- Establishment of construction lay down area
  - Hazardous and non-hazardous solid waste management
  - Storm water management
  - Contaminated water management
  - Prevention of marine pollution
  - Hydrocarbon spills
  - Diesel tanks and refuelling procedures
  - Dust control
  - Spoil dumping
  - Sourcing, excavating, transporting and dumping of fill material
  - Noise and vibration control

- Removal of rare, endemic or endangered species
  - Removal and stockpiling of topsoil
  - Rodent and pest control
  - Environmental awareness training
  - Site division
  - Emergency procedures for environmental incidents
  - Contractor's SHE Officer
  - Closure of construction laydown area
- 6.4.1.1 The *Contractor* shall ensure that his management, foremen and the general workforce, as well as all suppliers and visitors to Site have attended the Induction Programme prior to commencing any work on Site. If new personnel commence work on the Site during construction, the *Contractor* shall ensure that these personnel undergo the Induction Programme and are made aware of the environmental specifications on Site.
- 6.4.1.2 Where applicable, the *Contractor* ensures that he appoints a suitably qualified Subcontractor, to be approved by the Project Manager, to undertake the "Removal of rare, endemic or endangered species". This appointment must be completed at least three weeks before commencement of any other work on Site.
- 6.4.1.3 The Protection of the Environment Form shall be signed and submitted to the CM within 14 days after the Contract Date.
- 6.4.1.4 Where required, one of the first actions to be undertaken by the *Contractor* shall be to erect and maintain a temporary fence along the boundaries of the Site and Working Areas as applicable, and around any no-go areas identified on the layout plans, to the satisfaction of the Project Manager.
- 6.4.1.5 The plant search and rescue (if applicable) must be undertaken and completed prior to any Site clearance or any other construction activity that may damage the vegetation can commences on Site.
- 6.4.1.6 The *Contractor* must appoint a sufficient number of named assistants to the CSHEO to monitor environmental issues e.g. litter, spills, illegal activities, fence patrol, dust etc. These appointments, along with details of the individuals being appointed and job descriptions, must be sent to the Project Manager for his approval.
- 6.4.2 During the construction period, the *Contractor* complies with the following:
- 6.4.2.1 A copy of the SES, and the relevant PES shall be available on Site, and the *Contractor* shall ensure that all the personnel on Site (including Subcontractors and their staff) as well as suppliers are familiar with and understand the specifications contained in the SES (as amended by the PES).
- 6.4.2.2 Method statements that are required during construction must be submitted to the Project Manager for approval at least 20 days prior to the proposed commencement of the activity. Emergency construction activity method statements may also be required. The activities requiring method statements cannot commence if they have not been approved by the Project Manager.
- 6.4.2.3 Where applicable, the *Contractor* shall provide job-specific training on an ad hoc basis when workers are engaged in activities, which require method statements.
- 6.4.2.4 The *Contractor* must ensure that any Materials delivery drivers are informed of all procedures and restrictions (e.g. which access roads to use, no go areas, speed limits, noise, etc.) required by the CEMP before they arrive at Site and off load any Materials.

- 6.4.2.5 The *Contractor* must be responsible for rehabilitating and re-vegetating all areas to the satisfaction of the Project Manager as detailed in the SES and PES.
- 6.4.2.6 The list below is a list of some of the other issues that the *Contractor* must ensure he has planned for to meet the requirements of the environmental specifications. It is not a comprehensive list but serves as a guide:
- Cement and concrete batching
  - Workshop and maintenance of plant
  - Protection of natural fauna and flora
  - Protection of historical and archaeological artefacts
- 6.4.2.7 The *Contractor* shall clear and clean the Site and Working Areas and ensure that everything not forming part of the works is removed from the Site and Working Areas and that all rehabilitation has taken place in accordance with the PES. An Environmental Closure Certificate shall be issued by the SHEC and signed off by the Project Manager.
- 6.4.2.8 The *Contractor* complies with environmental inspections and audits as contained within CEMP.
- 6.4.2.9 The *Contractor* makes the copy of the CEMP, SES and PES available at the offices of the *Contractor* on Site. The *Contractor* ensures that all personnel on Site (including Subcontractors) are familiar with and understand the requirements of the CEMP.
- 6.4.3 The *Contractor* complies with the following SES:
- 6.4.3.1 The *Contractor* shall identify the kinds of environmental impacts that will occur as a result of his activities and then prepare separate method statements describing how each of those impacts will be prevented or managed so that the standards set out in this document are achieved. These method statements will be prepared in accordance with the requirements set out in the CEMP.

### **Site offices and facilities on site**

#### **Objective**

To ensure that environmental issues are taken into account in the establishment of the Site offices and all other facilities on Site.

#### **Scope**

The standard applies to all activities relating to the planning of the Site, Site establishment, operations and closure of the Site.

#### **Site plan**

The *Contractor* shall establish his construction camps, offices, workshops, staff accommodation and any other facilities on the Site and Working Areas in a manner that does not adversely affect the environment. However, before construction can begin, the *Contractor* shall submit to the *Project Manager* for his approval, plans of the exact location, extent and construction details of these facilities and the impact mitigation measures the *Contractor* proposes to put in place.

The plans shall detail the locality as well as the layout of the waste treatment facilities for litter, kitchen refuse, sewage and workshop-derived effluents. The Site offices should not be sited in close proximity to steep areas. It is recommended that the offices, and in particular the ablution facilities, aggregate stockpiles, spoil areas and hazardous material stockpiles are located as far away as possible from any water course as possible.

Regardless of the chosen Site, the Contractor's intended mitigation measures shall be indicated on the plan.

### **Sewage**

Particular reference in the Site establishment plan shall be given to the treatment of sewage generated at the site offices and staff accommodation and at all localities on the Site where there will be a concentration of labour. Sanitary arrangements should be to the satisfaction of the CM.

Safe and effective sewage treatment will require one of the following sewage handling methods: septic tanks and soak-ways, dry-composting toilets such as "enviro loos", or the use of chemical toilets which are supplied and maintained by a Subcontractor. The type of sewage treatment will depend on the location of the Site and the surrounding land uses, the duration of the contract and proximity (availability) of providers of chemical toilets. Should a soak-away system be used, it shall not be closer than 800 metres from any natural watercourse or water retention system. The waste material generated from these facilities shall be serviced on a regular basis.

Toilets and latrines shall be easily accessible and shall be positioned within walking distance from wherever employees are employed on the works. Use of the veld shall not, under any circumstances, be allowed.

Outside toilets shall be provided with locks and doors and shall be secured to prevent them from blowing over. The toilets shall also be placed outside areas susceptible to flooding. The Contractor shall arrange for regular emptying of toilets and shall be entirely responsible for enforcing their use and for maintaining such latrines in a clean, orderly and sanitary condition to the satisfaction of the Project Manager.

### **Effluent Management**

All effluent water from the camp / office Sites shall be disposed of in a properly designed and constructed system, situated so as not to adversely affect water sources (streams, rivers, pans dams etc.). Only domestic type wastewater shall be allowed to enter this drain.

### **Waste Management**

#### **Objective**

To ensure that all waste generated during construction and commissioning of the facilities is properly disposed of.

Examples of typical construction waste which, could be expected on the Site are indicated in the following table:

**TABLE 2: EXAMPLE OF CONSTRUCTION WASTE CLASSIFICATION**

WASTE	CLASSIFICATION	
	HAZARDOUS	NON-HAZARDOUS
Clean soil		X
Construction debris contaminated by oil or organic compounds	X	
Empty drums (depends on prior use)	X	X
Empty paint and coating containers		X
Waste paint and/or solvent	X	
Waste oil	X	
Phenolic waste	X	
Waste concrete		X

Rubble (not contaminated by oil or organic compounds)		X
Waste containing appreciable properties of fibrous asbestos	X	
Sewerage sludge	X	
Scrap metal		X
Explosive waste	X	
Waste timber		X
Waste Cable		X
PCB waste	X	
Waste plastic		X
Aerosol containers	X	
Batteries, light bulbs, circuit boards, etc.	X	X
Domestic waste		X

### Scope

The standard applies to all construction, commissioning and Site activities that may lead to the generation of waste.

### Approach

Waste is grouped into general or hazardous, depending on its characteristics. The classification determines handling methods and the ultimate disposal of the Material.

General waste to be expected during construction includes the following:

- Trash (waste paper, plastics, cardboard, etc.) and food waste from offices, warehouses and construction personnel.
- Uncontaminated construction debris such as used wood and scrap metal.
- Uncontaminated soil and non-hazardous rubble from excavation or demolition.

Hazardous waste is waste, which has the potential, even in low concentrations, to have a significant adverse effect on public health and/or the environment. This would be on account of its inherent chemical and physical characteristics, such as toxic, ignitable, corrosive, carcinogenic or other property.

### Waste avoidance and minimisation

A ladder approach to waste management is encouraged. Waste should preferably be managed in the following order:

- Prevent: by waste avoidance and minimisation during production
- Recycle: waste recycling, recovery and utilisation
- Treat: waste treatment in order to reduce toxicity and to minimise the quantities of waste
- Disposal: waste disposal, probably by incineration, destruction or landfill

### Waste Management

The *Contractor* is responsible for the removal from Site of all waste generated through the *Contractor's* activities. The *Contractor* shall ensure that all waste is removed to appropriate licensed waste management facilities.

- The classification of waste determines handling methods and the ultimate disposal of the Material. The *Contractor* shall manage hazardous wastes that are anticipated to be generated by his operations as follows:

- Characterise the waste to decide if it is general or hazardous
- Obtain and provide an acceptable container with label
- Place hazardous waste material in container
- Inspect the container on a regular basis as prescribed by the Contractor's waste environment management plan
- Track the accumulation time for the waste
- Haul the full container to the disposal Site
- Provide documentary evidence of proper disposal of the waste

The EO will work in conjunction with the *Contractor's* construction safety and industrial hygiene personnel to create a *Contractor's* Hazardous Materials Management Program. This program will establish the necessary protocol for proper handling and removal of hazardous Materials on the Site.

Information on each hazardous substance will be available to all persons on Site with the EO. Training and education about the proper use, handling, and disposal of the material will be available to all workers who will be handling the Material.

The EO must be informed of all activities that involve the use of hazardous substances to facilitate prompt response in the event of a spill or release.

The *Contractor* shall manage NON-HAZARDOUS / GENERAL WASTE that are anticipated to be generated by operations as follows:

- Determine if waste is non-hazardous and obtain containers for waste storage
- Notify waste hauler when container is full so that it can be removed and replaced with an empty
- On the Project, however, waste generating entities are directed to control the generation of non-hazardous waste by:
  - Eliminating waste generation or reducing the total volume
  - Reducing the degree of contamination of waste generated
  - Reclaiming materials otherwise considered waste

The *Contractor* shall therefore recycle NON-HAZARDOUS / GENERAL WASTE that are anticipated to be generated by its operations as follows:

Obtain and label recycling containers for:

- Office Waste
- Aluminium and steel cans
- Glass Bottles
- Scrap Metals
- Waste Timber
- And locate them within temporary office building and trailers
- Establish recycled material collection schedule
- Arrange for full bins to be hauled away

Spent batteries, circuit boards, and bulbs, while non-hazardous, require special collection and handling.

### **Vehicle and Equipment Refuelling**

### **Objective**

To eliminate / control fuel and oil spillage at refuelling facilities

### **Scope**

The standard applies to all refuelling, lubrication and oil changing requirements on all vehicles and machinery.

### **Refuelling**

Engine driven compressors, pumps, air conditioners, and arc welders can have small leaks (usually oil) that can accumulate to become spills, which require clean up. These leaks become more evident if the equipment remains in the same place for an extended period of time. Damaged fuel tanks, fuel hoses, and fuel pumps can be sources of significant fuel leaks. Hydraulic systems can blow gaskets or hoses resulting in large quantities of hydraulic fluid spilled to the ground and under lock and key arrangements.

### **Control**

No vehicles or machines shall be serviced or refuelled on Site except at designated servicing or refuelling locations, no oil or lubricant changes shall be made except at designate locations, or in case of breakdown or emergency repair.

The *Contractor* shall store fuel and oil at a secure area, which shall be bunded and designed with a liner or paved surface to prevent spillage from entering the ground.

The *Contractor* shall provide details of its proposed fuel storage and fuelling facility to the EO for approval, the design shall comply with the regulations of the *Water Act* (Act 36 of 1998), the *Hazardous Substances Act* (Act 15 of 1973), and the *Environment Conservation Act* (Act 73 of 1989).

### **Spill Response**

The *Contractor* shall comply with the regulations of the *Water Act* (Act 36 of 1998), the *Hazardous Substances Act* (Act 115 of 1973), and the *Environment Conservation Act* (Act 73 of 1989).

The *Contractor* shall provide details for approval of its spill response plan in the event of any spills of fuel, oils, solvents, paints or other hazardous Materials. The plan will show measures to be taken to remove contaminated soils from Site and demonstrate complete removal of contamination.

The *Contractor* shall instruct construction personnel on the following spill prevention and containment responsibilities:

- Repair all leaks of hydrocarbons or chemicals as soon as possible
- Take all reasonable means to prevent spills or leaks
- Do not allow sumps receiving oil or oily water to overflow
- Prevent storm water run-off from contamination by leaking or spilled drums of oil or chemicals
- Do not discharge oil or contaminants into storm sewer system
- If a spill to land occurs, the *Contractor* is responsible for:
- Immediate action to stop or reduce the spill and contain it
- Actions necessary to prevent the spill from contaminating groundwater or off Site surface water
- Disposal of contaminated Material to location designated thereto
- Any spill to water has the potential to disperse quickly; therefore, the spill must be contained immediately using appropriate containment Equipment.

- If a spill to water occurs, the Contractor is responsible for:
- Immediate action to stop or reduce the spill and contain it
- Notifying the appropriate on-Site authorities
- Actions necessary to prevent the spread of the contamination by deploying booms and/or absorbent Material
- Proper disposal of spilled Material

### **Spray Painting and Sandblasting**

#### **Objective**

To ensure that all spray painting and sandblasting on Site is done in a controlled manner where appropriate measures are taken to prevent paint contamination of the soil and to ensure that sandblasting grit/media is properly disposed of.

#### **Scope**

All spray painting and sandblasting on Site.

#### **Spray Painting and Sandblasting**

Spray painting and sandblasting should be kept to a minimum. All painting should as far as practicable be done before Equipment and Material is brought on Site. Touch up painting is to be done by hand painting or by an approved procedure. A method statement shall be submitted to the SHEC for approval.

The *Contractor* will inform the EO of when and where spray painting or sandblasting is to be carried out prior to commencement of *work*. The EO will monitor these activities to ensure that adequate measures are taken to prevent contamination of the soil.

NB: If the area is in confined or high areas then a protection plan is to be issued for approval.

### **Dust Management**

#### **Objective**

The *Contractor* (associated with activities such as earthworks, geotechnical surveys, piling, storm water drainage, construction of roads and railways, foundations, brick building, operating workshops, fencing, erecting construction camps, and batch plant activities, etc.) shall submit a dust control plan for approval by the EO.

#### **Scope**

Control of dust on the construction Site and access roads

#### **Dust Management**

Material in transit should be loaded and contained within the load bin of the vehicle in such a way as to prevent any spillage onto the roads and the creation of dust clouds. If necessary, the load bin of the vehicle shall be covered with a tarpaulin to prevent dust.

Dust to be controlled on unsurfaced access roads and Site roads using sprayed water. The *Contractor* is responsible for managing dust generated as a result of his activities. The CM will be responsible for the dust control of the Site and Working Areas.

Some dust control measures, which are normally applied during construction, are presented in this section for inclusion by the *Contractor* in the *Contractor's* dust control method statement.

These dust-mitigating procedures include the following:

- Limit vehicle speeds on unpaved roads to 20 km/h
- Wash the paved surfaces within the construction area twice a week
- Minimise haulage distances
- Apply water to gravel roads with a spraying truck when required
- Environmentally friendly soil stabilisers may be used as additional measures to control dust on gravel road and construction area
- Dust suppression measures will also apply to inactive construction areas. (An inactive construction Site is one on which construction will not occur for a month or more.)
- Construction Material being transported by trucks must be suitable moistened or covered to prevent dust generation.
- Strip and store topsoil in separate stockpiles with mounds not exceeding 2m in height to, among other things, to prevent wind-blown dust.
- Minimise disturbance of natural vegetation during right-of-way construction (e.g. transmission lines and erection of fences) to reduce potential erosion, run-off, and air-borne dust.
- Implement a system of reporting excessive dust conditions by construction personnel (as instructed through Environmental Awareness Training).
- Water for dust control shall be taken only from approved sources.

### **Storm Water and Dewatering Management**

#### **Objective**

To ensure that storm water and dewatering drainage across the Site occurs in a manner that will negate contamination by oils, fuels, litter and other waste and that will prevent erosion of the construction terrace.

#### **Scope**

All dewatering activities

#### **Storm Water and Dewatering Management**

Water is a valuable resource in the area. Both the quality and quantity of water used by the *Contractor* should be considered in making resource conservation plans.

Potential construction phase impacts on surface water and groundwater are associated with construction are run-off and percolation, dewatering activities, and miscellaneous liquid wastes associated with construction activities.

In general, construction activities may affect water quality and/or quantity of ground water and/or surface water of the area.

The *Contractor* shall be aware that, apart from run-off from overburden emplacements and stock piles, storm water can also be contaminated from batch plants, workshops, vehicle wash-down pads, etc., and that contaminants during construction can include hydrocarbons from fuels and lubricants, sewerage from Employee ablutions, even excess fertiliser from rehabilitation areas, etc.

The *Contractor* shall take cognisance of the fact that discharges to controlled waters such as the sea, rivers, or groundwater or to sewerage systems are controlled under the South African Water Legislation.

#### **Surface run-off**

Construction activities such as surface grading and excavation will disturb surface areas on Site. This will increase the potential for soil erosion and subsequent sediment

transport during periods of precipitation run-off or when excavation dewatering is required. Construction activities also have the potential to change local surface drainage and sediment transport patterns, Site floodplain delineation, and percolation rates into the soil.

### **Dewatering**

Dewatering during the groundwork produces a surface water discharge that may require collection and sedimentation. Dewatering has also the potential to effect groundwater quality and quantity.

### **Wastewater**

Liquid wastes including used solvents, used lubricating oils, chemical flushing agents, spill clean-up wastes, painting wastes, and concrete mixing drum washings, etc., have the potential to affect surface water and groundwater quality.

### **General**

- Temporary drainage must be established on Site during the construction period and until permanent drainage is in place. Contractors are responsible for maintaining the temporary drainage in their areas. The Contractors must provide secondary drainage that prevents erosion
- Contractors must effect good housekeeping in their areas to prevent contamination of drainage water
- The *Contractor* shall clear stagnant water

Specific Water Management measures (surface and groundwater) for incorporation by the *Contractor* in the CEMP include the following:

- The *Contractor* shall ensure that no contaminated surface water shall flow off Site as a result of *Contractor* operations. Silt traps shall be constructed to ensure retention of silt on site and cut-off ditches shall be constructed to ensure no run-off from the SITE except at points where silt traps are provided.
- If applicable, the *Contractor* shall be responsible for collection, management, and containment within the Site boundaries of all dewatering from all general Site preparation activities. The dewatering water shall be contained within the Site boundaries by sequentially pumping or routing water to and from sub-areas within the Site as the construction activities proceed. No discharge of dewatering water to off Site land or surface water bodies will be allowed
- On Site drainage shall be accomplished through gravity flow. The surface drainage system shall consist of mild overland slopes, ditches, and culverts. The graded areas adjacent to buildings shall be sloped away with a 5% slope. Other areas shall have a minimum slope of 0,2% or as otherwise indicated.
- Ditches shall be designed to carry a 25-years storm event with velocities in accordance to minimise erosion. Erosion protection shall consist of suitable stabilising surfaces in all ditches
- Culverts shall be designed to ensure passage of the 25-year storm peak run-off flow.
- Both structural and non-structural (vegetative) erosion control measures will be designed, implemented, and properly maintained in accordance with best management practices which will include the following:
  - Scheduling of activities to minimise the amount of disturbed area at any one time
  - Implementation of re-vegetation as early as feasible
  - Limiting construction traffic and/or avoidance thereof on access roads and areas to be graded to the extent feasible at drainage ditches.
  - Compacting loose soil as soon as possible after excavation, grading, or filling

- Using silt fences, geo-textiles, temporary rip-rap, soil stabilisation with gravel, diversionary beams or swales, small sedimentation basins, and gravelled roads to minimise transport of sediment
- Implementing the erosion and sedimentation control plan and ensuring that construction personnel are familiar with and adhere to the plan
- Managing run-off during construction
- The Contractor shall be responsible for checking and maintaining all erosion and sedimentation controls

### **Rehabilitation**

#### **Objective**

To ensure that all areas affected by the project are appropriately rehabilitated and revegetated in a manner congruent with the surrounding biophysical environment. The prevention of the spread of alien invasive species.

#### **Scope**

All areas affected by the project including laydown areas.

#### **Rehabilitation**

The *Contractor* shall rehabilitate their laydown area upon Completion of work on Site. A rehabilitation plan will be submitted to the *Project Manager* and EO for approval at least six weeks before Completion. The following are critical issues to be included in that rehabilitation plan:

- Details of soil preparation procedures including proposed fertilisers or other chemicals being considered for use.
- A list of the plant species that will be used in the rehabilitation process. Note that these should all be indigenous species, and preferably species that are endemic to the area. The assistance of an appropriately qualified botanist should be sought in developing this list.
- Procedures for watering the planted areas (frequency of watering, methodology proposed).
- An indication of the monitoring procedures that will be put in place to ensure the successful establishment of the plants (duration and frequency of monitoring, proposed criteria for declaring the rehabilitation successful).
- Procedures for the prevention of the establishment and spread of alien invasive species.

### **Noise Management**

#### **Objective**

To maintain construction noise at the Site within required limits.

#### **Scope**

Construction noise at the construction Site.

#### **Noise Management**

- Keep all Equipment in good working order
- Operate Equipment within its specification and capacity and don't overload machines
- Apply regular Maintenance, particularly with regards to lubrication

- Operate Equipment with appropriate noise abatement accessories, such as sound hoods
- Noise control measures for incorporation by the *Contractor* in its noise control plan shall include the following:
- Ensure that the potential noise source will conform to the South African Bureau of Standards recommended code of practice, SABS Code 0103:1983, so that it will not produce excessive or undesirable noise when it is released.
- All the *Contractors'* Equipment shall be fitted with effective exhaust silencers and shall comply with the South African Bureau of Standards recommended code of practice, SABS Code 0103:1983, for construction plant noise generation.
- All the *Contractors'* vehicles shall be fitted with effective exhaust silencers and shall comply with Road Traffic Act (Act 29 of 1989) when any such vehicle is operated on a public road.
- If on Site noise control is not effective, protect the victims of noise (e.g. ear-plugs) by ensuring that all noise-related occupational health provisions are met. (Occupational Health and Safety Act, Act 85 of 1993).
- Normal machine working hours will be 06:00 – 22:00 Monday to Saturday. Outside these hours machine operations will be subject to approval. This does not define shift hours

### **Protection of heritage resources**

#### **Objective**

To ensure the protection of archaeological, historical artefacts, or heritage resources discovered during construction activities.

#### **Scope**

Archaeological, historical artefacts or heritage resources discovered on or near the Site.

#### ***Archaeological Sites***

If an artefact on Site is uncovered, work in the immediate vicinity shall be stopped immediately. The *Contractor* shall take reasonable precautions to prevent any person from removing or damaging any such article and shall immediately upon discovery thereof inform the *Project Manager* of such discovery. The South African Heritage Resources Agency is to be contacted who will appoint an archaeological consultant. The work may only resume once clearance is given in writing by the archaeologist.

Discovery of an item of historical value or stopping the works would fall under compensation events 60.1(4) and/or (7), despite the manner in which the Works Information is written here.

#### **Graves and middens**

If a grave or midden is uncovered on Site, or discovered before the commencement of work, then all work in the immediate vicinity of the graves/middens shall be stopped and the *Project Manager* informed of the discovery. The National Monuments Council should be contacted and in the case of graves, arrangements made for an undertaker to carry out exhumation and reburial. The undertaker will, together with the National Monuments Council, be responsible for attempts to contact family of the deceased and for the Site where the exhumed remains can be re-interred.

### **Fire prevention**

#### **Objective**

To minimise the risk of uncontrolled fires.

#### **Scope**

All activities on or near the Site that could initiate an uncontrolled fire.

#### **Fire control**

Fires shall only be allowed in facilities or Equipment specially constructed for this purpose. A firebreak shall be cleared and maintained around the perimeter of the camp and office Sites. All conditions incorporated in the requirements of the Occupational Health and Safety Act shall also be implemented.

### **Supply of water for human use**

#### **Objective**

To ensure that there is an adequate, safe water supply for all personnel on Site.

#### **Scope**

Managing the water supply on Site and controlling the abstraction of water from natural resources in the area.

#### **Collection of water from natural resources**

No water for domestic use (drinking water or for bathing or washing) shall be abstracted from any water resource (stream, river, or dam) without the express permission of the *Project Manager*. Such permission shall only be granted once it can be shown that the water is safe for use that there is sufficient water in the resource to meet the demand, and once permission has been obtained from the Department of Water and Sanitation in accordance with the requirements of the National Water Act.

#### **Provision of drinking water**

Water for human consumption shall be available at the Site offices and at other convenient locations on site. The generally acceptable standard is that a supply of drinking water shall be available within 200m of any point on the construction Site.

### **Protection of livestock or game and the collection of firewood**

#### **Objective**

To prevent illegal activities potentially perpetrated by Site staff and to prevent the killing of any animals trapped in construction works or discovered on the construction Site or surroundings.

#### **Scope**

Managing the activities of Site staff during and after hours

#### **Poaching of livestock or game**

On no account shall any hunting or fishing activity of any kind be allowed. This includes the setting of traps, or the killing of any animal caught in construction works.

#### **Killing of animals**

On no account shall any animal, reptile or bird of any sort be killed. This specifically includes snakes or other creatures considered potentially dangerous discovered on Site. If such an animal is discovered on Site an appropriately skilled person should be summoned to remove the creature from the Site. Consideration should be given to selection and nomination of such a person prior to Site establishment. Where appropriate, training should be provided to at least two Site staff members.

#### **Collection of firewood**

The *Contractor* shall provide adequate facilities for all his staff so that they are not encouraged to supplement their comforts on Site by accessing what can be taken from the natural surroundings. The *Contractor* shall ensure that energy sources are available at all times for construction and supervision personnel for heating and cooking purposes.

#### **Environmental Awareness Training**

An Environmental Awareness Program is considered a necessary part of the Construction Environmental Management Plan for the Project. Training of the appropriate construction personnel will help ensure that all environmental regulations and requirements are followed to be defined in the relevant Method Statement to be prepared by the Contractor.

Objectives of environmental awareness training are:

- Environmental Management – protecting the environment from the effects of construction by making personnel aware of sensitive environmental resources
- Regulatory compliance – complying with requirements contained in project – specific permit conditions, also complying with requirements in regional and local regulations
- Problem recognition and communication – training personnel to recognise potential environmental problems, i.e. spills, and communicate the problem to the proper person for solution
- Liability control - non-compliance with regulatory requirements can lead to personal and corporate liability.

All individuals on the Project Construction Site will need to have a minimum awareness of environmental requirements and responsibilities. However, not all need to have the same degree of awareness. The required degree of knowledge is greatest for personnel in the Safety, Health, and Environmental Sections and the least for the manual personnel.

The *Contractor* shall keep a record of all the environmental related training of the personnel.

- 6.4.3 The lines of communication of the various personnel acting on behalf of the Project Manager who communicate to the Contractor and his key persons with respect to the CEMP will be advised on project kick-off meeting.
- 6.4.4 The CM is responsible (in the context of the CEMP only) for environmental management on the Site and Working Areas and reports to the Project Manager. The CM acts on behalf of the Project Manager.
- 6.4.5 The SHEC is responsible, inter alia, for day-to-day environmental management on the Site and Working Areas through the implementation of the CEMP. The SHEC reports directly to the CM.
- 6.4.6 The EO is responsible for conducting day-to-day tasks required to ensure the CEMP is correctly implemented at the Site and Working Areas. The EO reports to the SHEC and the ProjEM.
- 6.4.7 The EO specific tasks are:
- Ensure compliance to the CEMP and environmental legislation.
  - Report any environmental incidents to the Principal Contractor.
  - Ensure relevant documentation is readily available (Daily, weekly and monthly inspections and tool box talks)
  - Ensure environmental protection (litter control) and awareness
  - Reporting of environmental incidents to relevant stakeholders

6.4.8 The CSHEO submits daily, weekly and monthly checklists in accordance with the CEMP to the SHEC.

6.4.9 The Contractor complies with the CEMP, SES and PES. The Contractor abides by the instructions of the Project Manager regarding the implementation of the CEMP.

## **6.5 Quality assurance requirements**

6.5.1 The Contractor shall have, maintain and demonstrate its use to the Project Manager and/or the Supervisor to satisfy the requirements as appropriate) the documented Quality Management System to be used in the performance of the works. The Contractor's Quality Management System shall conform to International Standard ISO 9001 (or an equivalent standard acceptable to the Project Manager).

6.5.2 The Contractor submits his Quality Management System documents to the Project Manager as part of his programme under ECC Clause 31.2 to include details of:

- Project Quality Plan for the contract;
- ISO 9001:2015 Certification
- Quality Policy
- Index of Quality Procedures / Method statements to be used; and
- Quality Control Plans (QCP's) for each discipline (Civil & Structural, Mechanical and Electrical)

6.5.3 The Contractor develops and maintains a comprehensive register of documents that will be generated throughout the contract including all quality related documents as part of its Quality Plan.

6.5.4 The Project Manager indicates those documents required to be submitted for either information, review or acceptance and the Contractor indicates such requirements within his register of documents. The register shall indicate the dates of issue of the documents with the Project Manager responding to documents submitted by the Contractor for review or acceptance within the period for reply prior to such documents being used by the Contractor.

6.5.5 The Quality Plan means the Contractor's statement, which outlines strategy, methodology, resources allocation, QA and Quality Control co-ordination activities to ensure that the works meet the standards stated in the Works Information.

## **6.6 Programming constraints**

6.6.1 The Contractor presents his first programme and all subsequently revised programmes (see ECC Clauses 31.2 and 32.1) in hard copy format printed in full colour in A3 size and in soft copy 'Native' format with activity layout files (Note that PDF soft copy versions are not acceptable). Within seven days of award of contract, the Contractor submits his Level 4 Programme to the Project Manager for acceptance, together with the associated works method statements and a supporting Basis of Schedule document.

6.6.2 The Contractor shows on each programme he submits to the Project Manager, the requirements as outlined in the ECC (Clause 31 and associated contract specific clauses). Additionally the Contractor shows on each programme he submits all internal procurement activities conducted by himself as well as associated works and/or deliveries of materials and/or services the Contractor procured via external parties.

- 6.6.3 The Contractor complies with the Employer's programme as attached in Annexure 12 which outlines key interfaces, sequencing of works as well as tie-in (occupation/plant shut) windows when he submits his first programme. The Employer's Programme is subject to change as to allow for interfacing of multiple contractors as well as plant access and availability restrictions. It is expected that the Contractor allows sufficient Time Risk Allowances and/or plans concurrent works so as not to hinder progress should change occur. Should the Contractor not be able to comply with the Employer's Programme formal communication should be raised as per the communication methods outlined in the contract.
- 6.6.4 The Contractor uses Primavera version 6 for his programme submissions or a similar programme software package equivalent to Primavera version 6 subject to the prior written notification and acceptance by the Project Manager.
- 6.6.5 The Contractor shows on his Accepted Programme and all subsequently revised programmes schedules showing the critical path or paths and all necessary logic diagrams demonstrating sequence of operations.
- 6.6.6 The Contractor's programme shows duration of operations in working days. A normal working week comprises five working days, each of eight working hours. Alternative working hours are to be submitted to the Project Manager for approval.
- 6.6.7 The Contractor's programme shows the following levels:
- Level 1 Master Schedule – defines the major operations and interfaces between engineering design, procurement, fabrication and assembly of Plant and Materials, transportation, construction, testing and pre-commissioning, commissioning and Completion.
- Level 2 Project Schedule – summary schedules 'rolled up' from Level 3 Project Schedule described below
- Level 3 Project Schedule – detailed schedules generated to demonstrate all operations identified on the programme from the starting date to Completion. Individual operations will be assigned codes as agreed with the Project Manager, this will be agreed post Contract award. The Project Manager notifies any subsequent layouts and corresponding filters on revised programmes
- Level 4 Project Schedule – detailed discipline speciality level developed and maintained by the Contractor relating to all operations identified on the programme representing the daily activities by each discipline
- 6.6.8 The Contractor shows on each revised programme he submits to the Project Manager a resource histogram showing planned progress versus actual, deviations from the Accepted Programme and any remedial actions proposed by the Contractor.
- 6.6.9 The Contractor submits progress tracker sheet information to the Project Manager at least 1 (one) full working day prior to progress meetings at weekly intervals. Tracker reports are to have back to back relationships with Fabrication and GA Drawings with the works detailed such that all aspects of the works can be monitored and tracked through its fabrication/construction sequence. Sheets to have work steps and weight factor percentages utilized to develop the progress tracking sheets. Where necessary multiple tracking sheets may be required to track each assembly member throughout its development.
- 6.6.10 The Contractor submits programme report information to the Project Manager at least 1 (one) full working day prior to progress meetings at fortnightly intervals in addition to the intervals for submission of revised programmes stated under Contract Data Part One.

- 6.6.11 The Contractor's weekly programme narrative report includes:
- Level 4 Project Schedule – showing two separate bars for each task i.e. the primary bar must reflect the current forecast dates and the secondary bar the latest Accepted programme.
  - 3-week Look ahead Schedule - showing two separate bars for each task i.e. the primary bar must reflect the current forecast dates and the secondary bar the latest Accepted programme.
  - Manpower Histogram – reflecting actual, forecasted and planned activities
  - Progress Tracker Sheets for Fabrication, Erection, Installation, Construction & Commissioning.
  - S-curves – reflecting the actual percentage complete versus the planned percentage for the overall contract utilising the earned values as calculated by the detailed progress report.
  - Detailed narrative status and performance of operations on the Site and Working Areas.
  - Detailed narrative status and performance of operations outside the Working Areas.
  - Deviation from the Accepted Programme register with associated action plans to rectify.
  - Critical action items (Top 10)
  - Key Risks (Top 10)

6.6.12 Others (will be advised after award) will operate on site during the course of the contract

6.6.13 All time required carrying out inspections, repairs, maintenance, upgrading work, improvements, additions or any other work which could interfere with TPT operations are defined as Occupational Works and are to be done in accordance with the TPT occupation request procedure (Annexure 13). All occupations are to be defined in the Contractor's programme and allowances made for all approvals, timelines and other requirements noted in the procedure.

## **6.7 Contractor's management, supervision and key people**

6.7.1 The Contractor employs a CSHEO as a key person under ECC Clause 24.1.

6.7.2 The Contractor shall further provide an adequate, experienced and stable project team for the duration of the contract as key person as required by the Employer under Contract Data.

6.7.3 The CSHEO reports to the SHEC on the Site. The CSHEO ensures that the works are subject to a prior environmental method statement(s) accepted by the Project Manager through TNPA Environment Department and ensures that the CEMP is implemented by the Contractor in a timely and proper manner. The CSHEO provides the Project Manager with all environmental method statements.

6.7.4 It is a requirement of this contract that the Contractor will employ a full time, fully experienced Site Manager as key person who has been delegated sufficient authority to manage the contract efficiently on site during construction.

6.7.5 The Contractor shall provide an Organogram of ALL his Key people (both as required by the Employer and as independently stated by the Contractor under Contract Data Part Two) and how such Key people communicate with the Project Manager and the Supervisor and their delegates.

6.7.6 The CSHEO tasks are:

Daily, weekly and monthly inspections of the Site and Working Areas.

- Monitor compliance with the CEMP (to include the SES and PES) and the environmental method statements submitted to the *Project Manager*
- Reporting of an environmental incident to the *Project Manager*
- Attendance at all SHE meetings, toolbox talks and induction programmes.
- Litter control and ensuring the *Contractor* clears litter from the Site and Working Areas; and

- Ensuring that environmental signage and barriers are correctly placed.

6.7.7 The CSHEO submits daily, weekly and monthly checklists to the SHEC.

6.7.8 The Contractor employs a CIRP as a key person under ECC Clause 24.1.

6.7.9 The CIRP is based on the Site and ensures that all reports and IR requests are submitted accurately and in a timely manner to the Project Manager and CM.

6.7.10 The CIRP tasks are:

- Dedicated to human resources, industrial relations and any other *Contractor* employee related function;
- Resolve all human resources and industrial relations matters arising from the *Contractor's* employees;
- Represent the *Contractor* at all industrial relations meetings [state specific details within paragraph 6.1 management meetings of the Works Information];

6.7.11 The Contractor provides an Organogram of all his key people (both as required by the Employer and as independently stated by the Contractor under Contract Data Part Two) and how such key people communicate with the Project Manager and the Supervisor and their delegates all as stated at paragraph 6.5 of C3.1 Employer's Works Information.

## **6.8 Training workshops and technology transfer**

6.8.1 The Contractor facilitates the following requirements for training workshops:

- A safety pre-mobilisation workshop.
- A Contractor employee safety training programmes.

6.8.2 The Contractor arranges for the following technology transfer to the Employer:

6.8.2.1 The operation of the automated gates for Employer's personnel together with all the relevant documentation for ease of operation and maintenance.

## **6.9 Insurance provided by the Employer**

6.9.1 The Employer provide insurance as contained in the Contract Data – Part 1. The Contractor is required to provide an All Risk Insurance and this must be included on the tendered rates.

## **6.10 Contract change management**

6.10.1 No additional requirements apply to ECC Clause 60 series.

## **6.11 Provision of bonds and guarantees**

6.11.1 The form in which a bond or guarantee required by the conditions of contract (if any) is to be provided by the Contractor is given in Part 1 Agreements and Contract Data, document C1.3, Sureties.

6.11.2 The Contractor provides a bond or guarantee as required by the conditions of contract concurrently with the execution by the Parties of the form of agreement for the ECC contract.

6.11.3 The form in which a bond or guarantee required by the conditions of contract (if any) is to be provided by the Contractor is given in Part 1 Agreements and Contract Data, document C1.3, Sureties.

6.11.4 The Contractor provides a bond or guarantee as required by the conditions of contract concurrently with the execution by the Parties of the form of agreement for the ECC contract.

6.11.5 The Contractor must provide an All Risk Insurance for the works, this must be provided within 14 days after signing of the Contract with the Employer. This must be kept in force until the Completion of the project.

## **6.12 Records of Defined Cost, payments & assessments of compensation events kept by Contractor**

6.12.1 The Contractor keeps the following records available for the Project Manager to inspect:

- Records of design employee's location of work;
- Proof of payments for actual expenditure; and
- Rate breakdown for activities concerned.
- A statement of invoices;
- Escalation is calculated on a separate sheet and presented to the Project Manager for acceptance;
- The amount paid to date;
- Retention monies to be deducted from the invoice;
- Interest payable;
- Escalation formula used;
- Settlement discount;
- Proof of ownership of materials supplied;
- Copies of delivery notes of Plant and Material;
- Summary sheet of manning;
- Summary of progress covered by invoice; and
- The invoice is presented as an original.

## **6.13 The Contractor's Invoices**

6.13.1 When the Project Manager certifies payment (see ECC Clause 51.1) following an assessment date, the Contractor complies with the Employer's procedure for invoice submission.

6.13.2 The invoice must correspond to the Project Manager's assessment of the amount due to the Contractor as stated in the payment certificate.

6.13.3 The invoice states the following:

- Invoice addressed to Transnet SOC Ltd;
- Transnet SOC Limited's VAT No: 4720103177;
- Invoice number;

- The *Contractor's* VAT Number; and
- The Contract number \_\_\_\_\_.

The invoice contains the supporting detail proof of work done, materials test reports, proof of people used to perform the activity and proof of plant or machinery used to perform work.

## **6.14 People**

6.14.1 Minimum requirements of people employed on the Site

6.14.2 It is encouraged of the Contractor to consider employment of locally based labourers (i.e. reside within the boundaries of the City of uMhlathuze) where possible.

6.14.3 The Contractor performs the works having due regard and in compliance with the following Act/s:

- Basic Conditions of Employment Act.
- Labour Relations Act.
- Employee Equity Act.
- Workman's Compensation Act.
- Compensation of Occupational Injuries and Diseases Act.

6.14.4 Where under the CEMP as described under paragraph 6.4 of the Works Information, the Contractor is required to remove an animal, reptile or bird from the Site and/or Working Areas, the Contractor engages a Subcontractor who is a specialist and qualified for the removal of such animal, reptile or bird (to include the removal of rare, endemic or endangered species). The Contractor's attention is drawn to ECC Clauses 26.2 & 26.3.

6.14.5 The Contractor complies with the following PIRPMP

### **6.14.6 CONTRACTOR LIABILITY**

6.14.6.1 The Contractor warrants that it will be liable to Transnet for any loss or damage caused by strikes, riots, lockouts or any labour disputes by and/or confined to the Contractor's employees, which loss will include any indirect or consequential damages;

6.14.6.2 The Contractor warrants that no negotiations or feedback meetings by the Contractor's employees shall take place on Transnet premises, whether owned or rented by Transnet.

6.14.6.3 The Contractor shall give notice to Transnet of any industrial action by the Contractor's employees immediately upon becoming aware of any actual or contemplated action that is or may be carried out on Transnet's premises, whether owned or rented, and shall notify Transnet of all matters associated with such action that may potentially affect Transnet.

6.14.6.4 The Contractor is responsible for educating its employees on relevant provisions of the Labour Relations Act which deal with industrial action processes, and the risks of non-compliance.

6.14.6.5 The Contractor is required to develop a Contingency Strike Handling Plan, which plan the Contractor is obliged to update on a three monthly basis. The Contractor must provide Transnet with this plan and all updates to the Plan. The Contractor is responsible to communicate with its employees on site details of the plan.

#### **6.14.7 INDUSTRIAL ACTION BY CONTRACTOR EMPLOYEES**

6.14.7.1 In the event of any industrial action by the Contractor's employees, the Contractor is required to provide competent contingency resources permitted in law to carry out any of the duties that are or could potentially be interrupted by industrial action in delivering the Service.

6.14.7.2 The Contractor warrants that it will compensate Transnet for any costs Transnet incurs in providing additional security to deal with any industrial action by the Contractor's employees.

6.14.7.3 In the event of any industrial action by the Contractor's employees, the Contractor is obliged:

6.14.7.4 To prepare and deliver to Transnet, within two (2) hours of the commencement of industrial action an Industrial Action Report. If the industrial action persists the Contractor is required to deliver the report at 8h30 each day.

6.14.7.5 The Industrial Action Report must provide at least the following information:

- Industrial incident report,
- Attendance register,
- Productivity / progress to schedule reports,
- Operational contingency plan,
- Site security report,
- Industrial action intelligence gathered.

6.14.7.6 The final Industrial Action Report is to be delivered 24 hours after finalization of the industrial action.

6.14.7.7 The management of the Contractor is required to hold a daily industrial action teleconference with personnel identified by Transnet to discuss the industrial action, settlement of the industrial action, security issues and the impact on delivery under the contract.

6.14.7.8 The resolution of any disputes or industrial action by the Contractor's employees is the sole responsibility of the Contractor.

6.14.7.8 Access to Transnet premises by the Contractor and its employees is only provided for purposes of the Contractor delivering its services to Transnet. Should the Contractor and its employees not, for any reason, be capable of delivering its services Transnet is entitled to restrict or deny access onto its premises and unless otherwise authorized; such person will be deemed to be trespassing.

#### **6.15 Plant and Materials**

6.15.1 The Contractor provides Plant and Materials for inclusion in the works in accordance with SANS 1200A sub-paragraph 2.1, unless otherwise stated elsewhere in the Works Information provided by the Employer. All Plant and Materials are new, unless the use of old or refurbished goods and/or Materials are expressly permitted as stated elsewhere in this Works Information or as may be subsequently instructed by the Project Manager.

- 6.15.2 Where Plant and Materials for inclusion in the works originate from outside the Republic of South Africa, all such Plant and Materials are new and of merchantable quality, to a recognized national standard, with all proprietary products installed to manufacturers' instructions.
- 6.15.3 The Contractor replaces any Plant and Materials subject to breakages (whether in the Working Areas or not) or any Plant and Materials not conforming to standards or specifications stated and notifies the Project Manager and the Supervisor on each occasion where replacement is required.
- 6.15.4 Plant & Materials provided "free issue" by the Employer  
6.15.5 The Employer provides the following Materials for the Contractor to use in the works:
- Bricks
  - Concrete manhole rings
  - Precast Concrete kerbs
  - Toilet units
  - Internal doors
- 6.15.6 The Plant and Materials provided by the Employer are solely at the risk of the Contractor for inclusion in the works. The Contractor takes responsibility for ensuring the Plant and Materials do not contain a Defect(s) and are in compliance with the standards stated elsewhere in the Works Information.
- 6.15.7 The Contractor takes receipt of the Plant and Materials from the Employer in accordance with the following procedure:
- 6.15.8 Materials within the Client's possession will be assessed against the materials in the works information and should they be the same, then the contractor will use as the approved materials.
- 6.15.9 The Contractor provides all other Plant and Materials necessary for the works not specifically stated to be provided "free issue" by the Employer.

## **6.16 Tests and inspections before delivery**

- 6.16.1 The Contractor submits to the Supervisor details to certify that tests and inspections have been carried out on Plant and Materials by others which include:
- Fabrication of all the steel works;
  - HVAC systems;
  - Furniture including kitchen units and
  - Lift.

## **6.17 Subcontracting**

- a) The *Contractor* shall not employ or bring a subcontractor onto the Site and/or Working Areas without the prior approval of the *Project Manager*.
- b) Where the Contractor employs a subcontractor who constructs or installs part of the works or who supplies Plant and Material for incorporation into the works which involves a Subcontractor operating on the Site and/or Working Areas, then the Contractor shall ensure that any such Subcontractor

shall comply with the CHSMP (described under paragraph 2.3 of the Works Information) and the CEMP (described under paragraph 2.4 of the Works Information) as appropriate and that the subcontract documentation places back-to-back obligations on the Subcontractor which reflects the Contractor's obligations under the CHSMP, CEMP and PQP.

- c) The Contractor shall ensure that a Subcontractor complies fully with the Contractor's Quality Management System (as described under paragraph 2.5 of the Works Information). Quality system requirements shall be applied on all subcontracts to the point where the acceptability of supplies can be demonstrated solely by the conduct of inspection and/or examination of goods upon receipt at the designated point of delivery.

## SECTION 3

### C3.2 **CONTRACTOR'S WORKS INFORMATION**

The *Contractor* submits with his tender full technical drawings, details and specifications for all equipment and systems required for the works. These details shall include manufacturing, erection and application details where applicable, performance characteristics as well as any applicable warranties and guarantees.

The *Contractors* works shall include for, but not limited to:

Supply, delivery and construction of Port Control building

Electrical work

Earthworks

Reinforced concrete works

HVAC systems

Plumbing etc

## **ANNEXURE A: *EMPLOYER* HEALTH AND SAFETY PROJECT SPECIFICATIONS**

## **ANNEXURE B: *EMPLOYER* CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP) SPECIFICATION**



## **1. Description of the Site and its surroundings**

### **1.1. General Site Description**

Richards Bay is located approximately 160 km north-east of Durban in northern KwaZulu-Natal (KZN), close to the southern extremity of the Zululand Coastal Plain with the following GPS coordinates: 28°47'08.8"S 32°02'18.2"E. The climate is subtropical with warm to hot summers with a relatively low diurnal temperature range. Mean maximum and minimum temperatures during summer (December, January and February) are approximately 29°C and 21°C respectively. Winters (June, July and August) are mild with mean maximum and minimum temperatures of approximately 23°C and 12°C respectively. Although the area is a summer rainfall region significant falls may occur at any time of year. Wind directions are typically from the north-east or south-west throughout the year.

The work site are situated within the boundaries of the Port of Richards Bay, Meerensee area. The port control tower is accessed via public roads and is not located within the harbour fence line perimeter. the following GPS coordinates indicates the location of the port control tower: -28.796376355742634, 32.09893325839782.

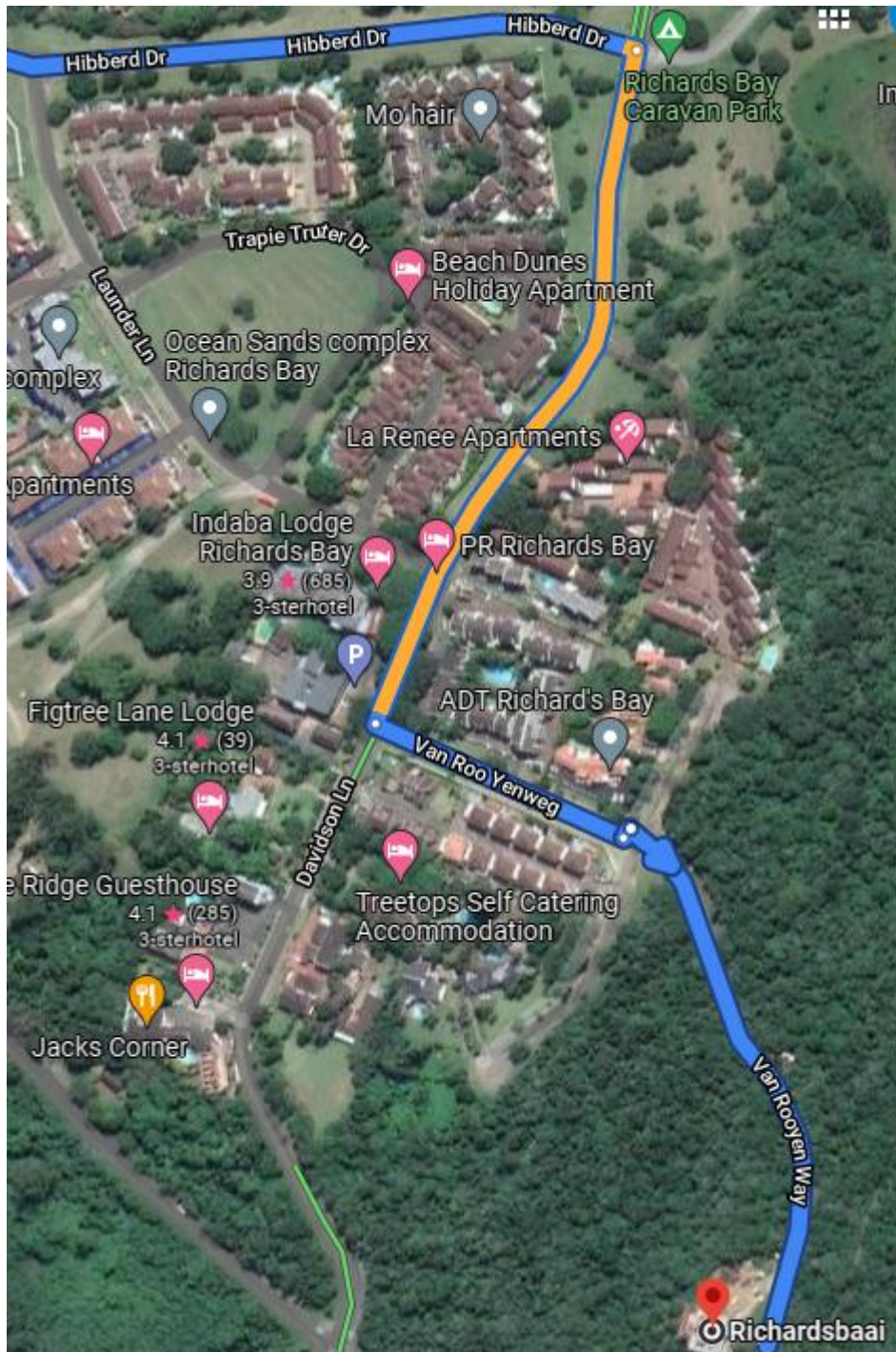
The Tenderers shall attend a site visit and acquaint himself with the nature of the Works, the conditions under which the work is to be performed, and the means of access to the site, any limitations or other authorities and in general with all matters that may influence or affect the contract.

The Contractor shall be deemed to have allowed in their tender for any additional cost to be involved due to the foregoing.

Travelling from Empangeni on the R34 on the John-Ross highway towards Meerensee. Turn right into Hibberd drive ± 1km at the next stop intersection turn right onto your Davidson Ln, ± 800m turn left into Van Rooyen weg. The road will come to a dead end at a gate. See map below.

Access shall be subject to the Employer's security requirements and regulations.

No additional access to Meerensee may be formed through the dune vegetation.



## 1.2. The Contractor complies with the following constraints in the execution of the works:

The Contractor shall comply with the following constraints and procedures of the Employer where the Project Manager arranges access for the Contractor after Completion:

- a) Safety, access control and work procedures as determined by the Employer's terminal operator.

- b) The building is to be considered as life.
- c) Work to be done by other specialist companies on their equipment related to Port Control work such and those will be
  - SANDF
  - RADAR and ANTENNAS for vessels communication
  - SERVER ROOM SPECIALIST
  - TFR NETWORKS

During the building modifications the existing server room will be relocated to the 1st floor and the new control room will be on the top floor. The Contractor shall contact the nominated Sub-Contractors with regards to the relocation of the equipment in the existing server room.

- i. Radar Equipment, Marine Data Services 021-386 8517;
  - ii. Radio antenna, Neotel 035 905 3802; and
  - iii. Server room equipment, Transnet Ports Authority IT department.
- d) The major constraints that should be factored into the project are:
- i. The estimated cable length from the antenna position on the temporary structure to either the control room or computer room is 35m. The contractor shall work in such a way not to damage the cables running from the old server room and antennas. Any damages to the cables will be the contractor's responsibility to replace.
  - ii. a small construction area, leading to Site congestion;
  - iii. close proximity to the residential suburb of Meerensee, hence noise pollution from working late and over weekends shall not be allowed;
  - iv. the health and safety of the Employer's personnel working in a live building, to which substantial alterations are being made;
  - v. limited access to deliver Plant and Material to Site; and
  - vi. the ecologically sensitive area surrounding the Site.