health
Department of
Health
North West Province
REPUBLIC OF SOUTH AFRICA

CONVERSION OF EXISTING WARD 13 TO ICU

AT JST HOSPITAL, RUSTENBURG

TENDER No. NWDOH 17/2026

Building, Electrical & Mechanical Works

NORTH WEST PROVINCE **DEPARTMENT OF HEALTH** Cnr. Sekame and First Street New Office Park Mafikeng 2745 Contact: Reboane Setena Supply Chain Management Telephone +27 (18) 391 4150 Email: rpsetena@nwpg.gov.za	

Tenderer . . . . . .

CIDB Registration No. . . . . . .

Total of the prices inclusive of value added tax: R . . . . . .

Amount in words: . . . . . .

. . . . . :. . . . . .

Preferences claimed for:

B-BBEE Status Level of Contribution: . . . . . .

Preference claimed for tendered contract participation goal is ..... **%**

health
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Health
North West Province
REPUBLIC OF SOUTH AFRICA

TENDER No. NWDOH 17/2026

CONVERSION OF EXISTING WARD 13 TO ICU

AT JST HOSPITAL, RUSTENBURG

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DEPARTMENT OF HEALTH NORTH WEST PROVINCE

CONVERSION OF EXISTING WARD 13 TO ICU

AT JST HOSPITAL, RUSTENBURG

PART T1

TENDERING PROCEDURES

CONVERSION OF EXISTING WARD 13 TO ICU

AT JST HOSPITAL, RUSTENBURG

PART C1

AGREEMENTS AND CONTRACT DATA

health
Department of
Health
North West Province
REPUBLIC OF SOUTH AFRICA

TENDER No. NWDOH 17/2026

CONVERSION OF EXISTING WARD 13 TO ICU AT JST HOSPITAL, RUSTENBURG

Part C1.1 Form of Offer and Acceptance

Offer

The employer, identified in the acceptance signature block, has solicited offers to enter into a contract for the procurement of :

CONVERSION OF EXISTING WARD 13 TO ICU AT JST HOSPITAL, RUSTENBURG

The tenderer, identified in the offer signature block, has examined the documents listed in the tender data and addenda thereto as listed in the returnable schedules, and by submitting this offer has accepted the conditions of tender.

By the representative of the tenderer, deemed to be duly authorized, signing this part of this form of offer and acceptance, the tenderer offers to perform all of the obligations and liabilities of the contractor under the contract including compliance with all its terms and conditions according to their true intent and meaning for an amount to be determined in accordance with the conditions of contract identified in the contract data.

THE OFFERED TOTAL OF THE PRICES INCLUSIVE OF VALUE ADDED TAX IS:

. ..... Rand (in words);

R..... (in figures)

This offer may be accepted by the employer by signing the acceptance part of this form of offer and acceptance and returning one copy of this document to the tenderer before the end of the period of validity stated in the tender data, whereupon the tenderer becomes the party named as the contractor in the conditions of contract identified in the contract data.

Signature(s)	…….	Date	……
Name(s)	…….		……
Capacity	…….		……
for the tenderer	……..		……

Name and signature of witness	…….	Date	……

Acceptance

By signing this part of this form of offer and acceptance, the employer identified below accepts the tenderer's offer. In consideration thereof, the employer shall pay the contractor the amount due in accordance with the conditions of contract identified in the contract data. Acceptance of the tenderer's offer shall form an agreement between the employer and the tenderer upon the terms and conditions contained in this agreement and in the contract that is the subject of this agreement.

The terms of the contract, are contained in:

Part C1:	Agreements and Contract Data, (which includes this agreement)
Part C2:	Pricing Data
Part C3:	Scope of Work
Part C4:	Site Information

and drawings and documents or parts thereof, which may be incorporated by reference into Parts C1 to C4 above.

Deviations from and amendments to the documents listed in the tender data and any addenda thereto as listed in the tender schedules as well as any changes to the terms of the offer agreed by the tenderer and the employer during this process of offer and acceptance, are contained in the schedule of deviations attached to and forming part of this agreement. No amendments to or deviations from said documents are valid unless contained in this schedule.

The tenderer shall within two weeks after receiving a completed copy of this agreement, including the schedule of deviations (if any), contact the employer's Project Manager (whose details are given in the contract data) to arrange the delivery of any bonds, guarantees, proof of insurance and any other documentation to be provided in terms of the conditions of contract identified in the contract data. Failure to fulfill any of these obligations in accordance with those terms shall constitute a repudiation of this agreement.

Notwithstanding anything contained herein, this agreement comes into effect on the date when the tenderer receives one fully completed copy of the original document, including the schedule of deviations (if any). Unless the tenderer (now Contractor) within five working days of the date of such receipt notifies the Employer in writing of any reason why he cannot accept the contents of this agreement, this agreement shall constitute a binding contract between the parties.

Signature(s) …….. Date ……

Name(s) …….. ……

Capacity …….. ……

for the Employer Department of Health - Northwest Province
Cnr Sekame and First Street
New Office park
Mafikeng
2745

Name and signature of witness ……..

…….. Date ……

Schedule of Deviations

Notes:

1 The extent of deviations from the tender documents issued by the Employer prior to the tender closing date is limited to those permitted in terms of the Conditions of Tender

2 A Tenderer's covering letter shall not be included in the final contract document. Should any matter in such letter, which constitutes a deviation as aforesaid become the subject of agreements reached during the process of Offer and acceptance, the outcome of such agreement shall be recorded here

3 Any other matter arising from the process of offer and acceptance either as a confirmation, clarification or change to the tender documents and which it is agreed by the Parties becomes an obligation of the contract,

4 Any change or addition to the tender documents arising from the above agreements and recorded here, shall also be incoporated into the final draft of the Contract.

1 Subject .....

Details .....

.....

.....

.....

2 Subject .....

Details .....

.....

.....

.....

3 Subject .....

Details .....

.....

.....

.....

4 Subject .....

Details .....

.....

.....

.....

5 Subject .....

Details .....

.....

.....

.....

By the duly authorised representatives signing this agreement, the Employer and the Tenderer agree to and accept the foregoing schedule of deviations as the only deviations from and amendments to the documents listed in the tender data and addenda thereto as listed in the tender schedules, as well as any confirmation, clarification or changes to the terms of the offer agreed by the Tenderer and the Employer during this process of offer and acceptance.

It is expressly agreed that no other matter whether in writing, oral communication or implied during the period between the issue of the tender documents and the receipt by the tenderer of a completed signed copy of this Agreement shall have any meaning or effect in the contract between the parties arising from this agreement.

DEPARTMENT OF HEALTH NORTH WEST PROVINCE

CONVERSION OF EXISTING WARD 13 TO ICU AT JST HOSPITAL,

RUSTENBURG

PRINCIPAL BUILDING AGREEMENT

The Joint Building Contracts Committee® - NPC

CONTRACT DATA

For use by ORGANS OF STATE and other PUBLIC SECTOR Bodies

Principal Building Agreement
Edition 6.2 - May 2018

JBCC®

The Joint Building Contracts Committee® NPC (JBCC®) is representative of building owners and developers, professional consultants and general and specialist contractors who contribute their knowledge and experience to the compilation of the JBCC® documents. The JBCC® documents portray the consensus view of the constituent members and are published in the interests of standardisation and good practice with an equitable distribution of contractual risk

Application of JBCC® agreements

The definitions contained in the JBCC® Principal Building Agreement apply to this document. A word or phrase in bold type in the text has the same meaning assigned to it in the definitions of such agreement. Where a word or phrase is not in bold type it has the meaning consistent with the context of its use

This contract data contains changes made to the JBCC® Principal Building Agreement to suit Organs of State and other Public Sector Bodies' requirements, as well as unique requirements applicable to the project and variables referred to in the JBCC® Principal Building Agreement and the JBCC® General Preliminaries. The information provided in this document is complete and accurate at the time of calling for tenders. Where additional information becomes available, all tenderers will be informed in writing. Reference to clause numbers in the JBCC® Principal Building Agreement are shown in [square brackets] in this contract data eg [3.2.1]. Spaces requiring information must be filled in, or marked as 'not applicable' but not left blank

Where the contractor is appointed, the contract documents comprise the completed and signed Form of Offer and Acceptance, the signed JBCC® Principal Building Agreement, this completed contract data, the priced document, drawings and other listed documents

Endorsement of JBCC® agreements

The JBCC® Edition 6.2 agreements have been endorsed by Construction Industry Development Board (CIDB) for use by Organs of State and other Public Sector Bodies

Warning!

The JBCC® Principal Building Agreement Edition 6.2 has been coordinated with the JBCC® Nominated/Selected Subcontract Agreement Edition 6.2, the JBCC® General Preliminaries and the JBCC® certificate forms and support documents. Forms from previous editions are not compatible with the JBCC® Principal Building Agreement Edition 6.2

Persons entering into or preparing contracts using the JBCC® suite of contract agreements and support documents are warned of the dangers inherent in modifying any part of it

Experience has shown that changes drafted by others, including members of the building professions, often have unintended results that may be prejudicial to either, or both, parties

Disclaimer

While the JBCC® aims to ensure that its publications represent best practice it does not accept or assume any liability or responsibility for any events or consequences which derive from the use of JBCC® documents

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A PROJECT INFORMATION

A 1.0 Works [1.1]

Project name	Conversion of Existing Ward 13 to ICU at JST Hospital, Rusteburg
Reference number	**NWDOH 17/2026**
Works description	Conversion of Existing Ward 13 to ICU at JST Hospital, Rusteburg

A 2.0 Site [1.1]

Erf / stand number	JST HOSPITAL
Township / Suburb	Rustenburg
Site address	JST Hospital, Bosch Street, GPS co-ordinates: -25.6777652, 27.2452006
Local authority	Rusteburg Local Authority

A 3.0 Employer [1.1]

Official Name of Organ of State / Public Sector Body	Department of Health North West		
Business registration number	N/A		
VAT/GST number	N/A		
Country	South Africa		
Employer's representative: Name	Mr Roelof De Jager		
E-mail	rdejager@nwpg.gov.za	Telephone number	
Mobile number	060 980 1547		
Postal address			
		Postal code	
Physical address			
	Cnr. Sekame and First Street New Office Park Mafikeng	Postal code	2745

A 4.0 Principal agent [1.1]

Name			
Legal entity of above		Contact person	
Practice number		Telephone number	

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		Mobile number	
Country		E-mail	
Postal address			
		Postal code	
Physical address			
		Postal code	

A 5.0 Agent [1.1; 6.2] Discipline

Name			
Legal entity of above		Contact person	
Practice number		Telephone number	
		Mobile number	
Country		E-mail	
Postal address			
		Postal code	
Physical address			
		Postal code	

A 6.0 Agent [1.1; 6.2] Discipline

Name			
Legal entity of above		Contact person	
Practice number		Telephone number	
		Mobile number	
Country		E-mail	
Postal address			
		Postal code	
Physical address			
		Postal code	

A 7.0 Agent [1.1; 6.2] Discipline

Name			
Legal entity of above		Contact person	
Practice number		Telephone number	
		Mobile number	
Country		E-mail	
Postal address			
		Postal code	
Physical address			
		Postal code	

A 8.0 Agent [1.1; 6.2] Discipline

Name			
Legal entity of above		Contact person	
Practice number		Telephone number	
		Mobile number	
Country		E-mail	
Postal address			
		Postal code	
Physical address			

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		Postal code	

A 9.0 Agent [1.1; 6.2]

Discipline	

Name			
Legal entity of above		Contact person	
Practice number		Telephone number	
		Mobile number	
Country		E-mail	
Postal address			
		Postal code	
Physical address			
		Postal code	

A 10.0 Agent [1.1; 6.2]

Discipline	

Name			
Legal entity of above		Contact person	
Practice number		Telephone number	
		Mobile number	
Country		E-mail	
Postal address			
		Postal code	
Physical address			
		Postal code	

A 11.0 Agent [1.1; 6.2]

Discipline	

Name			
Legal entity of above		Contact person	
Practice number		Telephone number	
		Mobile number	
Country		E-mail	
Postal address			
		Postal code	
Physical address			
		Postal code	

A 12.0 Agent [1.1; 6.2]

Discipline	

Name			
Legal entity of above		Contact person	
Practice number		Telephone number	
		Mobile number	
Country		E-mail	
Postal address			
		Postal code	
Physical address			

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		Postal code	

B CONTRACT INFORMATION

B 1.0 Definitions [1.1]

Bills of quantities: System/Method of measurement	Standard System of Measuring Building Work (as amended) published and issued by the Association of South African Quantity Surveyors (Seventh Edition (Revised) 2015),

B 2.0 Law, regulations and notices [2.0]

Law applicable to the **works**, state country [2.1]	South Africa

B 3.0 Offer and acceptance [3.0]

Currency applicable to this **agreement** [3.2]	Rand (R)

B 4.0 Documents [5.0]

The original signed **agreement** is to be held by the **principal agent** [5.2], if not, indicate by whom	**Employer**
Number of copies of **construction information** issued to the **contractor** at no cost [5.6]	**3**

Documents comprising the **agreement**	Page numbers
The **JBCC**® Principal Building Agreement, Edition 6.2 May 2018	1 to 30
The **JBCC**® Principal Building Agreement - Contract Data for Organs of State and other Public Sector Bodies, Edition 6.2 May 2018	1 to 14
The **JBCC**® General Preliminaries for use with the **JBCC**® Principal Building Agreement, Edition 6.2 May 2018	1 to 7
Performace Guarantee	11-13
Insurances	12
Construction Programme	30
Health and Safety Plan	1-83

Contract drawings – description	Number	Revision	Date
Refer to scope of work			

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B 5.0 Employer's agents [6.0]

Authority is delegated to the following **agents** to issue **contract instructions** and perform duties for specific aspects of the **works** [6.2]
Architect **Structural Engineer** **Civil Engineer** **Mechanical Engineer** **Electrical Engineer** **Fire Engineer**

Principal agent's and **agents**' interest or involvement in the **works** other than a professional interest [6.3]
No other interests

B 6.0 Insurances [10.0]

Insurances by **employer** Yes/no? **No**		Amount including **tax**	Deductible amount including **tax**
Contract works insurance:			
	New **works** [10.1.1] (**contract sum** or amount)		
or	**Works** with **practical completion** in **sections** [10.2] (**contract sum** or amount)		
or	**Works** with alterations and additions [10.3] (reinstatement value of existing structures with or including new **works)**		
	Direct contractors [10.1.1; 10.2] where applicable, to be included in the contract works insurance		
	Free issue [10.1.1; 10.2] where applicable, to be included in the contract works insurance		
	Escalation, professional fees and reinstatement costs if not included above		
Total of the above contract works insurance amount			
Supplementary insurance [10.1.2; 10.2]			

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Public liability insurance [10.1.3; 10.2]				
Removal of lateral support insurance [10.1.4; 10.2]				
Other insurances [10.1.5]				
Yes/no?	No	If yes, description 1		
Yes/no?	No	If yes, description 2		

and/or

Insurances by **contractor**			Amount including **tax**	Deductible amount including **tax**
Yes/no?	**Yes**			
	New **works** [10.1.1] (**contract sum** or amount)		**Contract Sum + 20%**	
or	**Works** with **practical completion** in **sections** [10.2] (**contract sum** or amount)			
or	**Works** with alterations and additions [10.3] (reinstatement value of existing structures with or including new **works)**			
	Direct contractors [10.1.1; 10.2] where applicable, to be included in the contract works insurance			
	Free issue [10.1.1; 10.2] where applicable, to be included in the contract works insurance			
	Escalation, professional fees and reinstatement costs if not included above			
Total of the above contract works insurance amount				
Supplementary insurance [10.1.2]				
Public liability insurance [10.1.3]			**5 000 000,00**	
Removal of lateral support insurance [10.1.4]			**N/A**	
Other insurances [10.1.5]: Refer B17.0				
Yes/no?	Yes	If yes, description 1		
Hi Risk Insurance [10.1.5.1]				
Yes/no?	Yes	If yes, description 2		
SASRIA – Coupon Policy				

B 7.0 Obligations of the employer [12.1]

Existing premises will be in use and occupied [12.1.2]		Yes/no?	Yes
If yes, description	**The hospital will still be functional during construction**		
Restriction of working hours [12.1.2]		Yes/no?	No
If yes, description			

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Natural features and known services to be preserved by the **contractor** [12.1.3]		Yes/no?	No
If yes, description			
Restrictions to the **site** or areas that the **contractor** may not occupy [12.1.4]		Yes/no?	Yes
If yes, description	**The contractor to hoard around each building that he will be working on**		
Supply of **free issue** [12.1.10]		Yes/no?	No
If yes, description			

B 8.0 Nominated subcontractors [14.0]

Yes/no?	No	If yes, description of specialisation

Specialisation 1	
Specialisation 2	
Specialisation 3	
Specialisation 4	
Specialisation 5	

B 9.0 Selected subcontractors [15.0]

Yes/no?	No	If yes, description of specialisation

Specialisation 1	
Specialisation 2	
Specialisation 3	
Specialisation 4	
Specialisation 5	

B 10.0 Direct contractors [16.0]

Yes/no?	No	If yes, description of extent of work

Extent of work [12.1.11]	
Extent of work [12.1.11]	
Extent of work [12.1.11]	
Extent of work [12.1.11]	
Extent of work [12.1.11]	

B 11.0 Description of sections [20.1]

Section 1	**Theatre Building**
Section 2	

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Section 3		
Section 4		
Section 5		
Section 6		
Section		Remainder of the **works**

B 12.0 **Possession of site** [12.1.5], **practical completion** [19.0; 20.0] **and penalty** [24.0]

Practical completion for the **works** as a whole	Intended date of possession of the **site** Refer B17.0 [12.1.5; 12.2.22]	Period for inspection by the **principal agent** [19.3]	The date for **practical completion** shall be the period as indicated below from the date of possession of the **site** by the **contractor** [12.2.7; 24.1]	**Penalty** for late completion [24.1]
		working days	Period in months	Penalty amount per **calendar day**
			18	Refer to schedule

or where **sections** are applicable

Practical completion of a **section** of the **works**	Intended date of possession of a **section** Refer B17.0 [12.1.5; 12.2.22]	Period for inspection by the **principal agent** [19.3]	The date for **practical completion** shall be the period as indicated below from the date of possession of the **site** by the **contractor** [12.2.7; 24.1]	**Penalty** for late completion [24.1]
		working days	Period in months	Penalty amount per **calendar day**
Section 1			**10**	**Refer to schedule**
Section 2				
Section 3				
Section 4				
Section 5				
Section 6				
Section 7				
Section 8				
Remainder of the **works**			**18**	**Refer to schedule**

Criteria to achieve **practical completion** not covered in the definition of **practical completion**

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B 13.0 Defects liability period [21.0]

Extended defects liability period: Refer B17.0 [21.13]		Yes/no?	Yes
If yes, description of applicable elements	eg: Electrical reticulation / Air conditioning system / Landscaping 13.1 Electrical and Electronic Installation 13.2 Mechanical Installation 13.3 Landscaping 13.4 13.5 13.6		

B 14.0 Payment [25.0]

Date of month for issue of regular **payment certificates** [25.2]	25th of each month		
Contract price adjustment / Cost fluctuations [25.3.4; 26.9.5]	Yes/no?	Yes	
If yes, method to calculate	JBCC Contract Price Adjustment Provisions CPAP Indices		
Employer shall pay the **contractor** within: [25.10]	Thirty (30) **calendar days**		

B 15.0 Dispute resolution [30.0]

Adjudication [30.6.1; 30.10] Name of nominating body	Association of Arbitration (Southern Africa)	
Applicable rules for adjudication [30.6.2]		
Arbitration [30.7.4; 30.10] If Yes, name of nominating body * If No, then dispute will be referred to litigation	Yes/no? *	Yes Association of Arbitration (Southern Africa)
Applicable rules for arbitration [30.7.5]		

B 16.0 JBCC® General Preliminaries - selections

Provisional bills of quantities [P2.2]	Yes/no?	Yes	
Availability of construction information [P2.3]	Yes/no?	Yes	
Previous work - dimensional accuracy - details of previous contract(s) [P3.1]			
Previous work - **defects** - details of previous contract(s) [P3.2]			
Inspection of adjoining properties - details [P3.3]			
Handover of **site** in stages - specific requirements [P4.1]			
Enclosure of the **works** - specific requirements [P4.2]			
Geotechnical and other investigations - specific requirements [P4.3]			
Existing premises occupied - details [P4.5]	The hospital will be in operation during construction		

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Services - known - specific requirements [P4.6]				
Water [P8.1]	By **contractor**	Yes/no?	Yes	
	By **employer**	Yes/no?	No	
	By **employer** – metered	Yes/no?	No	
Electricity [P8.2]	By **contractor**	Yes/no?	No	
	By **employer**	Yes/no?	No	
	By **employer** – metered	Yes/no?	Yes	
Ablution and welfare facilities [P8.3]	By **contractor**	Yes/no?	Yes	
	By **employer**	Yes/no?		
Communication facilities - specific requirements [P8.4]				
Protection of the **works - s**pecific requirements [P11.1]				
Protection / isolation of existing **works** and **works** occupied in **sections -** specific requirements [P11.2]		Hoarding required where necessary		
Disturbance - specific requirements [P11.5]				
Environmental disturbance - specific requirements [P11.6]				

B 17.0 Changes made to JBCC® documentation

Reference may be made to other documents forming part of this **agreement**

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1.1 Definitions

AGREEMENT: The completed Form of Offer and Acceptance, the completed **JBCC®** Principal Building Agreement and **JBCC® contract data for organs of state and other public sector bodies**, the **contract drawings**, the **priced document** and any other documents reduced to writing and signed by the authorised representatives of the **parties**

CONSTRUCTION PERIOD: The period commencing on the date of possession of the **site** by the **contractor** and ending on the date of **practical completion**

CONTRACT DATA FOR ORGANS OF STATE AND OTHER PUBLIC SECTOR BODIES: The document listing the Organs of State and other Public Sector Bodies' requirements and the project specific information

INTEREST: The interest rates applicable on this contract, whether specifically indicated in the relevant clauses or not, will be the rate as determined by the Minister of Finance from time to time, in terms of section 80(1)(b) of the Public Finance Management Act, 1999 (Act No 1 of 1999), calculated as simple interest, in respect of debts owing to the State, and will be the rate as determined by the Minister of Justice and Constitutional Development from time to time, in terms of section 1(2) of the Prescribed Rate of Interest Act, 1975 (Act No 55 of 1975), calculated as simple interest, in respect of debts owing by the State

PRINCIPAL AGENT: The person or entity appointed by the **employer** and named in the **contract data for organs of state and other public sector bodies.** In the event of a **principal agent** not being appointed, then all the duties and obligations of a **principal agent** as detailed in the **agreement** shall be fulfilled by the employer's representative as named in the **contract data for organs of state and other public sector bodies.**

3.0 Offer and Acceptance

Amend 3.3 to read as follows:

This **agreement** shall come into force on the date as stated on the Form of Offer and Acceptance and continue to be of force and effect until the end of the **latent defects** liability period [22.0] notwithstanding termination [29.0] or the certification of **final completion** [21.0] and final payment [25.0]

6.0 Employer's Agents

Add the following as 6.7:

In terms of the clauses listed hereunder, the **employer** has retained its authority and has not given a mandate to the **principal agent**. The **employer** shall sign all documents in relation to clauses 4.2, 14.1.2, 14.1.4, 14.4.1, 14.6, 23.1, 23.2, 23.3, 23.7, 23.8, 26.1, 26.7, 26.12 and 28.4

9.0 Indemnities

9.2.7: Add the following to the end of the first sentence: "…. due to no fault of the **contractor**"

10.0 Insurances

Add the following as 10.1.5.1:

Hi Risk Insurance

In the event of the project being executed in a geological area classified as a "High Risk Area", that is an area which is subject to highly unstable sub-surface conditions that might result in catastrophic ground movement evident by sinkhole or doline formation the following will apply:

10.1.5.1.1 Damage **to the works**

The contractor shall, from the date of possession of the **site** until the date of the **certificate of practical completion**, bear the full risk of and hereby indemnifies and holds harmless the **employer** against any

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damage to and/or destruction of the **works** consequent upon a catastrophic ground movement as mentioned above. The **contractor** shall take such precautions and security measures and other steps for the protection of the **works** as he may deem necessary

When so instructed to do so by the **principal agent**, the **contractor** shall proceed immediately to remove and/or dispose of any debris arising from damage to or destruction of the **works** and to rebuild, restore, replace and/or repair the **works**, at the **contractor's** own costs

10.1.5.1.2 Injury **to persons or loss of or damage to property**

The **contractor** shall be liable for and hereby indemnifies and holds harmless the **employer** against any liability, loss, claim or proceeding arising at any time during the period of the contract whether arising in common law or by statute, consequent upon personal injuries to or the death of any person whomsoever resulting from, arising out of or caused by a catastrophic ground movement as mentioned above

The **contractor** shall be liable for and hereby indemnifies the **employer** against any and all liability, loss, claim or proceeding consequent upon loss of or damage to any moveable, or immovable property, or personal property, or property contiguous to the **site,** whether belonging to or under the control of the **employer** or any other body or person whomsoever arising out of or caused by a catastrophic ground movement, as mentioned above, which occurred during the period of the contract

10.1.5.1.3
It is the responsibility of the **contractor** to ensure that he has adequate insurance to cover his risk and liability as mentioned in 10.1.5.1.1 and 10.1.5.1.2. Without limiting the **contractor's** obligations in terms of the contract, the **contractor** shall, within twenty-one (21) **calendar days** of the date of possession of the site, but before commencement of the **works**, submit to the **employer** proof of such insurance policy, if requested to do so

10.1.5.1.4
The **employer** shall be entitled to recover any and all losses and/or damages of whatever nature suffered or incurred consequent upon the **contractor's** default of his obligations as set out in 10.1.5.1.1; 10.1.5.1.2 and 10.1.5.1.3. Such losses or damages may be recovered from the **contractor** or by deducting the same from any amounts still due under this contract or under any other contract presently or hereafter existing between the **employer** and the **contractor** and for this purpose all these contracts shall be considered one indivisible whole

11.0 Securities

Amend 11.10 to read as follows:

There shall be no lien or right of retention held by any **contractor** in respect of the **works** executed on **site**

12.0 Obligations of the Parties

Amend 12.1.5 to read as follows:

Give possession of the **site** to the **contractor** within ten (10) **working days** of the **contractor** complying with the terms of 12.2.22

12.2.2: Not applicable

Add the following as 12.2.22:

Within fifteen (15) **working days** of the date of the **agreement** submit to the **principal agent** an acceptable health and safety plan, required in terms of the Occupational Health and Safety Act, 1993 (Act No 85 of 1993)

19.0 Practical Completion

19.5: Delete the words "subject to the **contractor**'s lien or right of continuing possession of the **works** where this has not been waived"

21.0 Defects Liability Period and Final Completion

Add the following as 21.13:

The ninety (90) **calendar days** defects liability period for the **works** [21.1] is replaced with a period of three hundred and sixty-five (365) **calendar days** in respect of the listed applicable elements

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25.0 Payment

25.7.5: Not applicable

25.10: Delete the words "and/or **compensatory interest**"

25.14.2: Not applicable

27.0 Recovery of Expense and/or Loss

27.1.5: Not applicable

29.0 Termination

Add the following after 29.1.3:

or where …

29.1.4: The **contractor**'s estate has been sequestrated, liquidated or surrendered in terms of the insolvency laws in force within the Republic of South Africa

29.1.5: The **contractor** has engaged in corrupt or fraudulent practices in competing for or in executing the contract

C TENDERER'S SELECTIONS

C 1.0 Securities [11.0]

Guarantee for construction: Select Option A or B ☐

Option A	**Guarantee for construction** (variable) by **contractor** [11.1.1]

Option B	**Guarantee for construction** (fixed) by **contractor** [11.1.2]

Guarantee for payment by **employer** [11.5.1; 11.10]	Not applicable

Advance payment, subject to a **guarantee for advance payment** [11.2.2; 11.3]	Not applicable

C 2.0 Contractor's annual holiday periods during the construction period

Year 1 **contractor**'s annual holiday period	start date		end date	
Year 2 **contractor**'s annual holiday period	start date		end date	
Year 3 **contractor**'s annual holiday period	start date		end date	

C 3.0 Payment of preliminaries [25.0]

Contractor's selection

Select Option A or B ☐

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Where the **contractor** does not select an option, Option A shall apply

Payment methods

Option A	The **preliminaries** shall be paid in accordance with an amount prorated to the value of the **works** executed in the same ratio as the amount of the **preliminaries** to the **contract sum**, which **contract sum** shall exclude the amount of **preliminaries**. Contingency sum(s) and any provision for cost fluctuations shall be excluded for the calculation of the aforesaid ratio

Option B	The **preliminaries** shall be paid in accordance with an amount agreed by the **principal agent** and the **contractor** in terms of the **priced document** to identify an initial establishment charge, a time-related charge and a final dis-establishment charge. Payment of the time-related charge shall be assessed by the **principal agent** and adjusted from time to time as may be necessary to take into account the rate of progress of the **works**

Lump sum contract

Where the amount of **preliminaries** is not provided it shall be taken as 7.5% (seven and a half per cent) of the **contract sum**, excluding contingency sum(s) and any provision for cost fluctuations

C 4.0 Adjustment of preliminaries [26.9.4]

Contractor's selection

Select Option A or B ☐

Where the **contractor** does not select an option, Option A shall apply

Provision of particulars

The **contractor** shall provide the particulars for the purpose of the adjustment of **preliminaries** in terms of his selection. Where completion in **sections** is required, the **contractor** shall provide an apportionment of **preliminaries** per **section**

Option A	An allocation of the **preliminaries** amounts into Fixed, Value-related and Time-related amounts as defined for adjustment method Option A below, within fifteen (15) **working days** of the date of acceptance of the tender

Option B	A detailed breakdown of the **preliminaries** amounts within fifteen (15) **working days** of possession of the **site**. Such breakdown shall include, inter alia, the administrative and supervisory staff, the use of **construction equipment**, establishment and dis-establishment charges, insurances and guarantees, all in terms of the **programme**

Adjustment methods

The amount of **preliminaries** shall be adjusted to take account of the effect which changes in time and/or value have on **preliminaries**. Such adjustment shall be based on the particulars provided by the **contractor** for this purpose in terms of Options A or B, shall preclude any further adjustment of the amount of **preliminaries** and shall apply notwithstanding the actual employment of resources by the **contractor** in the execution of the **works**

Option A	The **preliminaries** shall be adjusted in accordance with the allocation of **preliminaries** amounts provided by the **contractor,** apportioned to **sections** where completion in **sections** is required Fixed - An amount which shall not be varied Value-related - An amount varied in proportion to the **contract value** as compared to the **contract sum**. Both the **contract sum** and the **contract value** shall exclude the amount of **preliminaries**, contingency sum(s) and any provision for cost fluctuations Time-related - An amount varied in proportion to the number of **calendar days** extension to the date of **practical completion** to which the **contractor** is entitled with an adjustment of the **contract value** [23.2; 23.3] as compared to the number of **calendar days** in the initial **construction period** [26.9.4]

Option B	The adjustment of **preliminaries** shall be based on the number of **calendar days** extension to the date of **practical completion** to which the **contractor** is entitled with an adjustment of the **contract value** [23.2; 23.3] as compared to the number of **calendar days** in the initial **construction period** [26.9.4]

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	The adjustment shall take into account the resources as set out in the detailed breakdown of the **preliminaries** for the period of construction during which the delay occurred

Failure to provide particulars within the period stated

Option A	Where the allocation of **preliminaries** amounts for Option A is not provided, the following allocation of **preliminaries** amounts shall apply: Fixed - Ten per cent (10%) Value-related - Fifteen per cent (15%) Time-related - Seventy-five per cent (75%) Where the apportionment of the **preliminaries** per **section** is not provided, the categorised amounts shall be prorated to the cost of each **section** within the **contract sum** as determined by the **principal agent**

Option B	Where the detailed breakdown of **preliminaries** amounts for Option B is not provided, Option A shall apply

Lump sum contract

Where the amount of **preliminaries** is not provided it shall be taken as 7.5% (seven and a half per cent) of the **contract sum**, excluding contingency sum(s) and any provision for cost fluctuations

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DEPARTMENT OF HEALTH NORTH WEST PROVINCE

CONVERSION OF EXISTING WARD 13 TO ICU AT JST HOSPITAL,

RUSTENBURG

C1.2 Contract Data for CONVERSION OF EXISTING WARD 13 TO ICU AT JST, RUSTENBURG

CONTRACT No. NWDOH 17/2026

The additions to the JBCC Principal Agreement are:

Clause	Additions
A1	**A1.0 Labour intensive component of the works** A1.1 **Payment of labour –intensive component of the works.** Payment for works identified in the Scope work as being labour-intensive shall only be made in accordance with the provision of the Contract if the works are constructed strictly in accordance with the provisions of the Scope of work. Any non-payment for such works shall not relieve the Contractor in any way from his obligation either in contract or in delict. **A1.2 Applicable labour laws** The Ministerial Determination, Special Public Works Programme, issued in terms of the Basic Conditions of Employment Act of 1997 by the Minister of Labour in Government Notice N° R63 of 25 January 2002, as reproduced below, shall apply to works described in the Scope of Work as being labour intensive and which are undertaken by unskilled or semi-skilled workers. 1 **Introduction** 1.1 This document contains the standard terms and conditions for workers employed in 1.2 elementary occupations on a Special Public Works Programme (SPWP). These terms and conditions do NOT apply to persons employed in the supervision and management of a SPWP.

1.3 In this document –

(a) "department" means any department of the State, implementing agent or contractor;

(b) "employer" means any department, implementing agency or contractor that hires workers to work in elementary occupations on SPWP
(c) "workers" means any person working in an elementary occupation on a SPWP;
(d) "elementary occupation" means any occupation involving unskilled or semi semi-skilled work;
(e) "Management" means any person employed by a department or implementing agency to administer or execute an SPWP;
(f) "task" means a fixed quantity of work;
(g) "task-based work" means work in which a worker is paid a fixed rate for performing a task;
(h) "task-rated worker" means a worker paid on the basis of the number of tasks completed.
(i) "time-rated worker" means a worker paid on the basis of the length of the worked.

2 Terms of work

2.1 Workers on a SPWP are employed on a temporary basis.

2.2 A worker may NOT be employed for longer than 24 Months in any five-year cycle on a SPWP.

2.3 Employment on a SPWP does not qualify as employment as a contributor for the purpose of the Unemployment Insurance Act 30 of 1966.

3. Normal Hours of Work

3.1 An employer may not set tasks or hours of work that require a worker to work-

(a) more than forty hours in any week;
(b) on more than five days in any week; and
(c) for more than eight hours on any day.

3.2 An employer and worker may agree that a worker will work four days per week. The worker may then work up to ten hours per day.

3.3 A task-rated worker may not work more than a total of 55 hours in any week to complete the tasks allocated (based on a 40 hour week) to that worker.

4 Meal breaks

4.1 A worker may not work for more than five hours without taking a meal break of at least thirty minutes duration.

4.2 An employment and worker may agree on longer meal breaks

4.3 A worker may not work during a meal break. However, an employer may require a worker to perform duties during a meal break if those duties cannot be left unattended and cannot be performed by another worker. An employer must take reasonable steps to ensure that a worker is relieved of his or her duties during the meal break.

5 Special Conditions for Security Guards

5.1 A security guard may work up to 55 hours per week and up to eleven hours per day.

5.2 A security guard who works more than ten hours per day must have a meal break of at least one hour or two breaks of at least 30 minutes each.

6 Daily Rest Period

Every worker is entitled to a daily rest period of at least eight consecutive hours. The daily rest period is measured from the time the worker ends work on one day until the time the worker starts work on the next day.

7 Weekly Rest Period

Every worker must have two days off every week. A worker may only work on their off to perform work which must be done without delay and cannot be performed by workers during their ordinary hours of work ('emergency work").

8 Work on Sundays and Public Holidays

8.1 A worker may only work on a Sunday or public holiday to perform emergency or security work.

8.2 Work on Sundays is paid at double the ordinary rate of pay.

8.3 A task-rated worker who works on a public holiday must be paid-

(a) the worker's daily rate of pay, if the worker works for less than four hours on the public holiday;

(b) double the worker's daily rate of pay, if the worker works for more than four hours on the public holidays

9 Sick Leave

9.1 Only workers who work four or more days per week have the right to claim sick-pay in terms of this clause.

9.2 A worker who is unable to work on account of illness or injury is entitled to claim One day's paid sick leave for every full month that the worker has worked in terms of a contract.

9.3 A worker may accumulate a maximum of twelve day's sick leave in a year.

9.4 Accumulated sick-leave may not be transferred from one contract to another contract.

9.5 An employer must pay a task-rated worker the worker's daily task rate for a day's sick leave.

9.6 An employer must pay a time-rated worker the worker's daily task rate for a day's sick leave.

9.7 An employer must pay a worker sick pay on worker's usual payday.

9.8 Before paying sick-pay, an employer may require a worker to produce a certificate stating that the worker was unable to work on account of sickness or injury if the worker is-

(a) absent from work for more than two consecutive days; or

(b) absent from work on more than two occasions in any eight-week period.

9.9 A medical certificate must be issued and signed by a medical practitioner, a qualified nurse or a clinic staff member authorized to issue medical certificate indicating the duration and reason for incapacity.

9.10 A worker is not entitled to paid sick-leave for a work-related injury or occupational disease for which the worker can claim compensation under the Compensation for Occupational injuries and Diseases Act.

10. Maternity Leave

10.1 A worker may take up to four consecutive months' unpaid maternity leave.

10.2 A worker is not entitled to any payment or employment-related benefits during maternity leave.

10.3 A worker must give her employer reasonable notice of when she will start maternity leave and when she will return to work.

10.4 A worker is not required to take the full period of maternity leave. However, a worker may not work for four weeks before the expected date of birth of her child or for six weeks after the birth of her child, unless a medical practitioner, midwife or qualified nurse certifies that she is fit to do so.

10.5 A worker may begin maternity leave –

(a) four weeks before the expected date of birth; or

(b) on an earlier date –

(i) if a medical practitioner, midwife or certified nurse certifies that it is necessary for the health of the worker or that of her unborn child; or

(ii) if agreed to between employer and worker; or

(c) on a later date, if a medical practitioner, midwife or certified nurse has certified that the worker is able to continue to work without endangering her health.

10.6 A worker who has a miscarriage during the third trimester of pregnancy or bears a stillborn child may take maternity leave for up to six weeks after the miscarriage or stillbirth.

10.7 A worker, who returns to work after maternity leave, has the right to start a new cycle of twenty-four months employment, unless the SPWP on which she was employed has ended.

11 **Family responsibility leave**

	11.1 Workers, who work for at least four days per week, are entitled to three days paid family responsibility leave each year in the following circumstances- (a) when the employee's child is born; (b) when the employee's child is sick (c) in the event of a death of (i) the employee's spouse or life partner; (ii) employee's parent, adoptive parent, grandparent, child, adopted child, grandchild or sibling. 12 **Statement of Conditions** 12.1 An employer must give a worker a statement containing the following details at the start of employment – (a) the employer's name and address and the name of the SPWP; (b) the tasks or job that the worker is to perform; and (c) the period for which the worker is hired or, if this is not certain, the expected duration of the contract; (d) the worker's rate of pay and how this is to be calculated; (e) the training that the worker will receive during the SPWP. 12.2 An employer must ensure that these terms are explained in a suitable language to any employee who is unable to read the statement. 12.3 An employer must supply each worker with a copy of these conditions of employment. **13 Keeping records** 13.1 Every employer must keep a written record of at least the following – (a) the worker's name and position (b) in the case of a task-rated worker, the number of tasks completed by the worker; (c) in the case of a time-rated worker, the time worked by the worker; (d) payments made to each worker. 13.2 The employer must keep this record for a period of at least three years after the completion of the SPWP. **14 Payment** 14.1 An employer must pay all wages at least monthly in cash or by cheque or into a bank account. 14.2 A task-rated worker will only be paid for tasks that have been completed. 14.3 An employer must pay a task-rated worker within five weeks of the work being completed and the work having been approved by the manager or the contractor having submitted an invoice to the employer. 14.4 A time-rated worker will be paid at the end of each month. 14.5 Payment must be made in cash, by cheque or by direct deposit into a bank account

designated by the worker.

14.6 Payment in cash or by cheque must take place-
(a) at the workplace or at a place agreed to by the worker;
(b) during the worker's working hours or within fifteen minutes of the start or finish of work;
(c) in a sealed envelope which becomes the property of the worker.

14.7 An employer must give a worker the following information in writing-

(a) the period for which payment is made
(b) the numbers of tasks completed or hours worked;
(c) the worker's earnings;
(d) any money deducted from the payment;
(e) the actual amount paid to the worker.

14.8 If the worker is paid in cash or by cheque, this information must be recorded on the envelope and the worker must acknowledge receipt of payment by signing for it.

14.9 If a worker's employment is terminated, the employer must be pay all monies owing to that worker within one month of the termination of employment.

15 Deductions

15.1 An employer may not deduct money from a worker's payment unless the deduction
is required in terms of a law.

15.2 An employer must deduct and pay to the SA Revenue Services any income tax that the worker is required to pay.

15.3 An employer who deduct money from a worker's pay for payment to another person must pay the money to that person within the time period and other requirement specified in the agreement law, court order or arbitration award concerned.

15.4 An employer may not require or allow a worker to –

(a) repay any payment except an overpayment previously made by the employer by mistake;
(b) state that the worker received a greater amount of money than the employer actually paid to the worker; or
(c) pay the employer or any other person for having been employed.

16 Health and Safety

16.1 Employers must take all reasonable steps to ensure that the working environment is health and safe.

16.2 A worker must –

(a) work in a way that does not endanger his/her health and safety or that of any other person;

(b) obey any health and safety instruction ;

(c) obey all health and safety rules of the SPWP;

(d) use any personal protective equipment or clothing issued by the employer;

(e) report any accident, near-miss incident or dangerous behavior by another person to their employer or manager.

17 Compensation for Injuries and Diseases

17.1 It is the responsibility of the employers (other than a contract) to arrange for all persons employed on a SPWP to be covered in terms of the Compensation Injuries and Diseases Act, 130 of 1993.

17.2 A worker must report any work-related injury or occupational disease to their employer or manager.

17.3 The employer must report the accident or disease to the Compensation Commissioner.

17.4 An employer must pay a worker who is unable to work because of an injury caused by an accident at work 75% of their earnings for up to three months. The employer will be refunded this amount by the Compensation Commissioner. This does NOT apply to injuries caused by accidents outside the workplace such as road accidents or accidents at home.

18 Termination

18.1 The employer may terminate the employment of a worker for good cause after following a fair procedure.

18.2 A worker will not receive severance pay on termination.

18.3 A worker is not required to give notice to terminate employment. However, a worker who wishes to resign should advise the employer in advance to allow the employer to find a replacement.

18.4 A worker who is absent for more than three consecutive days without informing the employer of an intention tok return to work will have terminated the contract. However, the worker may be re-engaged if a position becomes available for the balance of the 24-month period.

A worker who does not attend required training ebents, without good reason, will have terminated the contract. However, the worker may be re-engaged if a position becomes available of the 24-month period.

19 Certificate of Service

(a) the worker's full name;
(b) the name and address of the employer
(c) the SPWP on which the worker worked;
(d) the work performed by the worker;
(e) any training received by the worker as part of the SPWP;

	(f) the period for which the worker worked on the SPWP; (g) any other information agreed on by the employer and worker.
A2	**A2.0 Expanded Public Works Programme** **A2.1** The Contractor will be required to employ staff which satisfy the EPWP requirements as per the Guidelines for the implementation of labour-intensive infrastructure projects under the EPWP and as Stipulated in this Contract.
A3	**A3.0 Mandatory Training** **A3.1** The Contractor will be required to provide training to sub-contractors. An allowance for this has been made in the final summary of the bills of quantities, which will be treated as a budgetary allowance which the Contractor can use for training and which may be deducted in part or in whole from the project should it not be used.

1.1 The Employer is the **Department of Health, North West Provincial Government**

Telephone: 018-391 4550

Facsimile : 086 241 5156

Address (physical): Cnr Sekame & First Street, New Office Park, Mafikeng; 2745

Address (postal): Private Bag x2068, Mmabatho, 2735

5.1 The Principal Agent is:

Telephone:

Facsimile :

Address (physical):

Address (postal):

Email:

1.1.1 The **works** (Refer to document C3 – Scope of Works)

1.1.1 The **site** (Refer to document C4 – Site Information)

1.1.1 The **Works** or installation to be undertaken by **direct contractors** comprises.
2.2 NONE

41.0 The Employer is an organ of **State**
31.11.2
11.2 The Interest rate as determined by the Minister of Finance, from time to time, in terms of section 80 (1)(b) of the Public Finance Management Act, 1999 (Act No 1 of 1999) will apply.
31.4.2 Lateral support insurance is to be effected by the **contractor**
26.1.2 Payment will be made for materials and goods
Extended **defects** liability period will apply to the following elements:
Electrical Installation

Mechanical Installation
Landscaping

15.2.1 Possession of the **site** is to be given within ten (10) **working days** of the **contractor** complying with the terms of 15.1

15.3 The period for the commencement of the **works** after the **contractor** takes possession of the site is ten (10) **working days.**

For the **works** as a whole

The date for **practical completion** is **[36 months]** after contractual commencement date
The **penalty** per **calendar day** is as per attached penalty schedule
Or

The date for practical completion **and the penalty per** calendar day is **as follows:**

Section	**Duration**	**Penalty Amount**
Section 1 MOU Building	24 Months	As per Schedule
Section 2 Remainder of the works	12 Months	As per Schedule
Section 3 n/a		

1.2 The law applicable to the agreement shall be that of the Republic of South Africa

10.1; 10.2 And 12.1 Contract insurance is to be effected by the **contractor.**

10.1 10.2 Contract works insurance is to be effected by the **contractor** for sum not less than the **contract sum** plus 20% with a deductible in an amount that the **contractor** deems appropriate.

12.1

11.1 , 12.1 Public liability insurance to be effected by the **contractor for an amount of R5, 000, 000.00** with a deductible in an amount as determined by the contractor's insurance company.

11.2 , 12.1 Support insurance to be effected by the **contractor** for the sum of NOT APPLICABLE with a deductible in an amount that the contractor deems appropriate.

3.3 , 15.1.3, 31.16.2 A waiver of the contractor's lien or right of continuing possession is not required.

3.7 Three copies of the construction document are to be supplied to the **contractor** free of charge.

3.4 JBCC Engineering General Conditions are not to be included in the contract document.

31.5.3 The contract value is to be adjusted using CPAP indices. The base month for the application of CPAP is the month of the closing of the tender. The listing of additional items for exclusion by Contractors, as contained in clause 3.4.3 of the CPAP Indices Application Manual, will only be permitted where the Schedule for Imported Material and Equipment form provided has been fully completed

31.3	The is no latest day of the month for the issue of an interim payment certificate.
14.5	The employer will not provide advanced payments against an advanced payment guarantee.
14.2 and 14.4	The **construction guarantee** is to be a fixed guarantee in an amount of 7.5% of the contract sum and payment reduction, not more than 10%
40.0	Dispute resolution shall be by Arbitration

Part 2: Contract Data completed by the Contractor

Clause	**Item and data**
1.2	The name of the Contractor is …….. The address of the contractor is: Telephone: …… Facsimile : …….. Address (physical): …… …….. …….. Address (postal): …… …….. ……..

DEPARTMENT OF HEALTH NORTH WEST PROVINCE

CONVERSION OF EXISTING WARD 13 TO ICU AT JST HOSPITAL,

RUSTENBURG

C1.2 Construction Guarantee

GUARANTOR DETAILS AND DEFINITIONS

Guarantor means . . . . . .

Physical address . . . . . .

Guarantor's signatory 1 . . . . . Capacity . . . . . .
. . . . . .
Guarantor's signatory 1 . . . . . Capacity . . . . . .

Employer means **DEPARTMENT OF HEALTH NORTH WEST PROVINCE**
New Office park
Cnr Sekame& First Street
Mafikeng
2754

Contractor means . . . . . .

Agent means . . . . . .

Works means . .
CONSTRUCTION OF NEW MATERNITY UNIT AND GENERAL REFURBISHMENT OF EXISTING BUILDINGS INCLUDING EXTERNAL SERVICES

Site means . .**JST HOSPITAL** . . . . . .

Agreement means the JBCC Series 2000 Principal Building Agreement

Contract Sum i.e. the total of prices in the Form of Offer and Acceptance inclusive of VAT

Amount in figures **R** . . . . . .

Amount in words.....(Rand)

Guaranteed Sum means the maximum aggregate amount of **R** . . . . . .

Amount in words.....(Rand)

1 The Guarantor's liability shall be limited to the amount of the Guaranteed Sum as follows:

GUARANTOR'S LIABILITY	**PERIOD OF LIABILITY**
Maximum Guaranteed Sum (not exceeding 10 % of the contract sum) in the amount of: . . . . (Rands) (R.....)	From and including the date of issue of this Construction Guarantee and up to and including the date of the only practical completion certificate or the last practical completion certificate where there are sections, upon which this Construction Guarantee shall expire.

2 The Guarantor hereby acknowledges that:

2.1 Any reference in this Guarantee to the Agreement is made for the purpose of convenience and shall not be construed as any intention whatsoever to create an accessory obligation or any intention whatsoever to create a suretyship.

2.2 Its obligation under this Guarantee is restricted to the payment of money.

3 Subject to the Guarantor's maximum liability referred to in clauses 1, the Guarantor hereby undertakes to pay the Employer the sum certified upon receipt of the documents identified in subclauses 3.1 to 3.3:

3.1 A copy of a first written demand issued by the Employer to the Contractor stating that payment of a sum certified by the Principal Agent in an interim or final payment certificate has not been made in terms of the Agreement and failing such payment within seven (7) calendar days, the Employer intends to call upon the Guarantor to make payment in terms of subclause 2.2

3.2 A first written demand issued by the Employer to the Guarantor at the Guarantor's physical address with a copy to the Contractor stating that a period of seven (7) calendar days has elapsed since the first written demand in terms of sub-clause 4.1 and that the sum certified has still not been paid therefore the Employer calls up this Guarantee and demands payment of the sum certified from the Guarantor.

3.3 A copy of the said payment certificate which, entitles the Employer to receive payment in terms of the Agreement of the sum certified in clause 3.
Subject to the Guarantor's maximum liability referred to in clause 1, the Guarantor undertakes to pay the Employer the Guaranteed Sum or the full outstanding balance upon receipt of a first written demand from the Employer to the Guarantor at the Guarantor's physical address calling up this Guarantee stating that:

4.1 The Agreement has been cancelled due to the Contractor's default and that the Guarantee is called up in terms of clause 4. The demand shall enclose a copy of the notice of cancellation; or

4.2 A provisional sequestration or liquidation court order has been granted against the Contractor and that the Guarantee is called up in terms of clause 4. The demand shall enclose a copy of the court order.

5 It is recorded that the aggregate amount of payments required to be made by the Guarantor in terms of clauses 3 and 4 shall not exceed the Guarantor's maximum liability in terms of clause 1.

6 Where the Guarantor is a registered insurer and has made payment in terms of clause 4, the Employer shall upon the date of issue of the final payment certificate submit an expense account to the Guarantor showing how all monies received in terms of the Guarantee have been expended and shall refund to the Guarantor any resulting surplus. All monies refunded to the Guarantor in terms of this Guarantee shall bear interest at the prime overdraft rate of the Employer's bank compounded monthly and calculated from the date payment was made by the Guarantor to the Employer until the date of refund.

7 Payment by the Guarantor in terms of clause 3 or 4 shall be made within seven (7) calendar days upon receipt of the first written demand to the Guarantor.

8 The Employer shall have the absolute right to arrange his affairs with the Contractor in any manner which, the Employer deems fit and the Guarantor shall not have the right to claim his release from this Guarantee on account of any conduct alleged to be prejudicial to the Guarantor

9 The Guarantor chooses the physical address as stated above for all purposes in connection herewith.

10 This Guarantee is neither negotiable nor transferable and shall expire in terms of clause 1, or payment in full of the Guaranteed Sum or on the Guarantee expiry date, whichever is the earlier, where after no claims will be considered by the Guarantor. The original of this Guarantee shall be returned to the Guarantor after it has expired

11 This Guarantee, with the required demand notices in terms of clauses 3 or 4, shall be regarded as a liquid document for the purpose of obtaining a court order.

12 Where this Guarantee is issued in the Republic of South Africa the Guarantor hereby consents in terms of Section 45 of the Magistrate's Courts Act No 32 of 1944, as amended, to the jurisdiction of the Magistrate's Court of any district having jurisdiction in terms of Section 28 of the said Act, notwithstanding that the amount of the claim may exceed the jurisdiction of the Magistrate's Court.

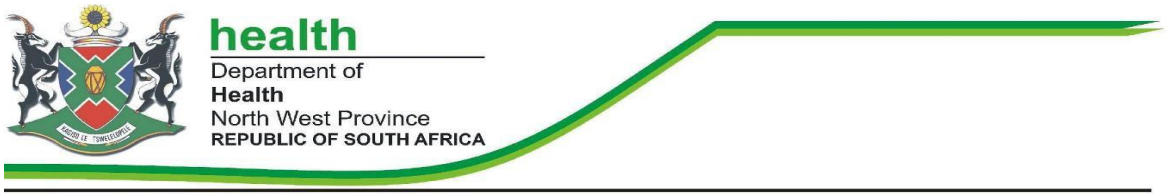
Signed at . . . . . Date . . . . . .

Guarantor's

Signatory 1 . . . . . Signatory 2 . . . . . .

.
Witness 1 . . . . . Witness 2 . . . . . .

Guarantor's seal or stamp



DEPARTMENT OF HEALTH NORTH WEST PROVINCE

CONVERSION OF EXISTING WARD 13 TO ICU AT JST HOSPITAL, RUSTENBURG

C1.3

ADJUDICATOR'S CONTRACT

This agreement is made on the . . . . . day of.....between:
.....(name of company / organisation)
of. . . . . .
.....(address) and
.....(name of company / organisation)
of . . . . . .
.....address)
the Parties) and
.....(name)
of. . . . . .
..... (address)
(the Adjudicator).

Disputes or differences may arise/have arisen* between the Parties under a Contract dated . . . . . and known as. . . . . .

and these disputes or differences shall be/have been* referred to adjudication in accordance with the JBCC Series 2000 Adjudication Rules, (hereinafter called "the Procedure") and the Adjudicator maybe or has been requested to act.
* Delete as necessary

IT IS NOW AGREED as follows:

1 The rights and obligations of the Adjudicator and the Parties shall be as set out in the JBCC Series 2000 Adjudication Rules.

2. The Adjudicator hereby accepts the appointment and agrees to conduct the adjudication in accordance with the JBCC Series 2000 Adjudication Rules.

3. The Parties bind themselves jointly and severally to pay the Adjudicator's fees and expenses as set out in the Contract Data.

4. The Parties and the Adjudicator shall at all times maintain the confidentiality of the adjudication and shall endeavor to ensure that anyone acting on their behalf or through them will do likewise, save with the consent of the other Parties which consent shall not be unreasonably refused.
5. The Adjudicator shall inform the Parties if he intends to destroy the documents which been sent to him in relation to the adjudication and he shall retain documents for a further period at the request of either Party.

SIGNED by: _____ SIGNED by: _____ SIGNED by: _____

Name: who warrants that he / she is duly authorised to sign for and on behalf of the first Party in the presence of	Name: who warrants that he / she is duly authorised to sign for and on behalf of the first Party in the presence of	Name: who warrants that he / she is duly authorised to sign for and on behalf of the first Party in the presence of
Witness……	Witness:……	Witness:……
Name: ……	Name ……	Name:……
Address:	Address:	Address:
Date: ……	Date:……	Date:……

Contract Data

1	The Adjudicator shall be paid at the hourly rate of R..... in respect of all time spent upon, or in connection with, the adjudication including time spent travelling.
2	The Adjudicator shall be reimbursed in respect of all disbursements properly made including, but not restricted to: (a) Printing, reproduction and purchase of documents, drawings, maps, records and photographs. (b) Telegrams, telex, faxes, and telephone calls. (c) Postage and similar delivery charges. (d) Travelling, hotel expenses and other similar disbursements. (e) Room charges. (f) Charges for legal or technical advice obtained in accordance with the Procedure.
3	The Adjudicator shall be paid an appointment fee of R.....This fee shall become payable in equal amounts by each Party within 14 days of the appointment of the Adjudicator, subject to an Invoice being provided. This fee will be deducted from the final statement of any sums which shall become payable under item 1 and/or item 2 of the Contract Data. If the final statement is less than the appointment fee the balance shall be refunded to the Parties.
4	The Adjudicator is/is not* currently registered for VAT
5	Where the Adjudicator is registered for VAT it shall be charged additionally in accordance

	with the rates current at the date of invoice .

DEPARTMENT OF HEALTH NORTH WEST PROVINCE

CONVERSION OF EXISTING WARD 13 TO ICU AT JST HOSPITAL,

RUSTENBURG

C2.1 Pricing Instructions

1. The Bills of Quantities have been drawn up in accordance with the Standard System of Measuring Building Work (as amended) published and issued by the Association of South African Quantity Surveyors (Sevenh Edition (Revised)), 2015. Where applicable the:

a) civil engineering work has been drawn up in accordance with the provisions of the latest edition of SABS 1200 Standardised Specifications for Civil Engineering Works.
b) mechanical work has been drawn up in accordance with the provisions of the Model Bills of Quantities for Mechanical Work, published by the South African Association of Quantity Surveyors, July 2005).
c) electrical work has been drawn up in accordance with the provisions of the Model Bills of Quantities for Electrical Work, published by the South African Association of Quantity Surveyors, (July, 2005).

2 The agreement is based on the JBCC Series 2000 Principal Building Agreement, prepared by the Joint Building Contracts Committee, Edition 6,2, July 2018. The additions, deletions and alterations to the JBCC Principal Building Agreement as well as the contract specific variables are as stated in the Contract Data or Preliminaries. Only the headings and clause numbers for which allowance must be made in the Bills of Quantities are recited.

3 Preliminary and general requirements are based on the various parts of SANS 1921, Construction and management requirements for works contracts. The additions, deletions and alterations to the various parts of SANS 1921 as well as the contract specific variables are as stated in the Specification Data in the Scope of Work. Only the headings and clause numbers for which allowance must be made in the Bills of Quantities are recited.

4 It will be assumed that prices included in the Bills of Quantities are based on Acts, Ordinances, Regulations, By-laws, International Standards and National Standards that were published 28 days before the closing date for tenders. (Refer to www.stanza.org.za or www.iso.org for information on standards).

5 The drawings listed in the Scope of Works used for the setting up of these Bills of Quantities are kept by the Principal Agent or Engineer and can be viewed at any time during office hours up until the completion of the works.

6 Reference to any particular trademark, name, patent, design, type, specific origin or producer is

purely to establish a standard for requirements. Products or articles of an equivalent standard may be substituted by approval of the Employer's representative

7 Where any item is not relevant to this specific contract, such item is marked N/A (signifying “not applicable”)

8 The Contract Data and the standard form of contract referenced therein must be studied for the full extent and meaning of each and every clause set out in Section 1 (Preliminaries) of the Bills of Quantities

9 The Bills of Quantities is not intended for the ordering of materials. Any ordering of materials, based on the Bills of Quantities, is at the Contractor’s risk.

10 The value related amount of the Preliminaries to be included in each monthly payment certificate shall be
assessed as an amount prorated to the value of the work duly executed in the same ratio as the preliminaries bear to the total of prices excluding any contingency sum, the amount for the Preliminaries and any amount in respect of contract price adjustment provided for in the contract.

11 Where the initial contract period is extended, the monthly charge shall be calculated on the basis as set out in 10 but taking into account the revised period for completing the works.

12 The amount or items of the Preliminaries shall be adjusted to take account of the theoretical financial effect which changes in time or value (or both) have on this section. Such adjustments shall be based on adjustments in the following categories as recorded in the Bills of Quantities:
a) an amount which is not to be varied, namely Fixed (F)
b) an amount which is to be varied in proportion to the contract value, namely Value Related (V); and
c) an amount which is to be varied in proportion to the contract period as compared to the initial construction period excluding revisions to the construction period for which no adjustment to the contractor is not entitled to in terms of the contract, namely Time Related (T).

13 Where no provision is made in the Bills of Quantities to indicate which of the three categories in 12 apply or where no selection is made, the adjustments shall be based on the following breakdown:
a) 10 percent is Fixed;
b) 15 percent is Value Related
c) 75 percent is Time Related.

14 The adjustment of the Preliminaries shall apply notwithstanding the actual employment of resources in the execution of the works. The contract value used for the adjustment of the Preliminaries shall exclude any contingency sum, the amount for the Preliminaries and any amount in respect of contract price adjustment provided for in the contract. Adjustments in respect of any staged or sectional completion shall be prorated to the value of each section.

15 The prices and rates in these bills of quantities are fully inclusive of prices for the work described under the item. Such rates and prices cover all costs and expenses that may be required in and for the execution of the work described in accordance with the provisions of the Scope of Works, and shall cover the cost of all general risks, liabilities, and obligation set forth and implied in the Contract Data, as well as overhead and charges and profit. These prices will be used as a basis for assessment of total payment and payment for additional work that may have to be carried out.

16 An item against which no price is entered will be considered to be covered by the other prices or rates in the Bills of Quantities. However, this is to be avoided and all items in the bill of quantities / schedule of rates must be priced. A single lump sum will apply should a number of items be grouped together for pricing purposes.

CALCULATION OF PENALTIES

CALCULATION OF PENALTY PER DAY (EXCLUDING VAT)

CONTRACT PERIOD	RATE PER R100 OF ESTIMATE
1 month	27,5 cents
1,5 months	22 cents
2 months	16,5 cents
2,5 months	13,5 cents
3 months	11 cents
3,5 months	9,5 cents
4 months	8,5 cents
4,5 months	7,5 cents
5 months	6,25 cents
6 months	5,75 cents
7 months	4,75 cents
8 months	4 cents
9 months	3,75 cents
10 months	3,5 cents
11 months	3 cents
12 months	2,75 cents
14 months	2,5 cents
15 months	2,25 cents
16 months	2 cents
18 months	1,75 cents
20 months	1,5 cents
21 months	1,5 cents
24 months	1,25 cents
30 months	1 cent
36 months	1 cent
42 months	1 cent

PENALTY PER DAY ROUNDED OFF AS FOLLOWS:

R0	-	R500	nearest	R5
R501	-	R1 000	nearest	R10
R1 001	-	R5 000	nearest	R50
R5 001	-	and above	nearest	R100

EXAMPLE

Estimated contract value = R2 500 000 (excluding VAT)
Contract period = 12 months

$$\text{R2 500 000} \times \frac{0{,}0275}{100}$$

= R687,50/day

Therefore rounded off to the nearest R10.00

= R690,00/day

PENALTIES ON CONTRACTS IN PHASES

Penalties must be calculated proportionally on the estimated contract value of each phase

DEPARTMENT OF HEALTH NORTH WEST PROVINCE

CONVERSION OF EXISTING WARD 13 TO ICU AT JST HOSPITAL,

RUSTENBURG

PART C2

PRICING DATA

SECTION No. 1

PRELININARIES AND GENERAL

PRELIMINARIES

The attached pro-forma Preliminaries are to be dealt with as follows:

Section A

Section A lists the clauses of and refers directly to the JBCC Principal Building Agreement (Edition 6.2 - May 2018), as well as those clauses that have been changed in Clause B18.0 of the Contract Data for Organs of State and other Public Sector Bodies

Section B

Section B lists the clauses of and refers directly to the JBCC General Preliminaries (May 2018)

Section C

Section C contains specific preliminary items. All items must be scrutinised and any item which is not appropriate must be marked N/A (Not Applicable)

Any new items which may be necessary for a particular service must be inserted at the end of Section C

SECTION 1

PRELIMINARIES

MEANING OF TERMS “TENDER / TENDERER”

Any reference to the words “Tender" or "Tenderer" herein and/or in any other documentation shall be construed to have the same meaning as the words "Bid" or "Bidder"

BUILDING AGREEMENT AND PRELIMINARIES

The **JBCC** Principal Building Agreement (Edition 6.2 - May 2018) prepared by the Joint Building Contracts Committee shall be the applicable building agreement, amended as hereinafter described to be read in conjunction with the **Contract Data for use by organs of state and other public sector bodies** issued with the tender.

The **JBCC** General Preliminaries (May 2018) published by the Joint Building Contracts Committee for use with the **JBCC** Principal Building Agreement (Edition 6.2 - May 2018) shall be deemed to be incorporated in these **bills of quantities /** lump sum document, amended as hereinafter described

The **contractor** is deemed to have referred to the abovementioned documents for the full intent and meaning of each clause

The clauses in the abovementioned documents are hereinafter referred to by clause number and heading only

Where any item is not relevant to this **agreement** such item is marked N/A signifying "not applicable"

Where standard clauses or alternatives are not entirely applicable to this **agreement** such amendments, modifications, corrections or supplements as will apply are given under each relevant clause heading and such amendments, modifications, corrections or supplements shall take precedence notwithstanding anything to the contrary contained in the abovementioned documents

TENDERER’S SELECTIONS

Before submission of his tender the **contractor** is to complete the tenderer's selections in the **contract data for organs of state and other public sector bodies**

STRUCTURE OF THIS PRELIMINARIES BILL

Section A : A recital of the headings of the individual clauses in the aforementioned **JBCC** Principal Building Agreement

Section B : A recital of the headings of the individual clauses in the aforementioned **JBCC** General Preliminaries

Section C : Any special clauses to meet the particular circumstances of the project

PRICING OF PRELIMINARIES

Should the **contractor** select Option A in the **contract data for organs of state and other public sector bodies** for the adjustment of **preliminaries**, the amounts entered against the relevant items in these **preliminaries** are to be divided into one or more of the three categories provided namely fixed (F), value related (V) and time related (T)

PRICING OF BILLS OF QUANTITIES

The **contractor** is to allow opposite each item for all costs in connection therewith. All prices to include, unless otherwise stated, for all materials, fabrication, conveyance and delivery, unloading, storing, unpacking, hoisting, labour, setting, fitting and fixing in position, cutting and waste (except where to be measured in accordance with the standard system of measurement), patterns, models and templates, plant, temporary works, returning of packaging, duties, taxes (other than Value Added Tax), imposts, establishment charges, overheads, profit and all other obligations arising out of this **agreement**.

Items left unpriced will be deemed to be covered in prices against other items throughout these **bills of quantities** and no claim for any extras arising out of the **contractor's** omission to price any item will be entertained

Prices for all **construction equipment**, temporary works, services and other items shall include for the supply, maintenance, operating cost and subsequent removal and making good as necessary

VALUE ADDED TAX

Provision is made in the summary page of these **bills of quantities** / lump sum document for the inclusion of Value Added Tax (VAT)

SECTION A: PRINCIPAL BUILDING AGREEMENT

INTERPRETATION

A1.0 **DEFINITIONS AND INTERPRETATION**

Clause 1.0

The following definitions replace corresponding definitions or are added to the definitions in the JBCC PRINCIPAL BUILDING AGREEMENT (Edition 6.2 of May 2018), whatever the case may be

ADVERSE WEATHER CONDITIONS: Adverse weather and inclement weather has the same meaning and used interchangeably and means any weather conditions i.e.: Rain, wind, snow, frost, temperature (cold or heat) that are not in the norm for the area where the construction takes place and during which no work is possible on site

AGREEMENT: The completed Form of Offer and Acceptance, the completed JBCC® Principal Building Agreement and contract data for organs of state and other public sector bodies, the contract drawings, the priced document and any other documents reduced to writing and signed by the authorised representative or representatives of the parties

CONSTRUCTION PERIOD: The period commencing on the date of possession of the **site** by the **contractor** and ending on the date of **practical completion**

CONTRACT PERIOD: The period commencing on the date of the letter of acceptance and ending on the date of final completion

COST FLUCTUATION shall mean contract price adjustment provision (CPAP) for the adjustment of fluctuation in the cost of labour, plant, material and goods as stated in the schedule

DEFAULT INTEREST: No Clause

GUARANTEE FOR CONSTRUCTION: A security in terms of the DPWI's Guarantee for Construction form/s, obtained by the contractor from an institution approved by the employer [CD]

INTEREST: The interest rates applicable on this contract, whether specifically indicated in the relevant clauses or not, will be the rate as determined by the Minister of Finance from time to time, in terms of section 80(1)(b) of the Public Finance Management Act, 1999 (Act No 1 of 1999) as amended, calculated as simple interest, in respect of debts owing to the State, and will be the rate as published by the Minister of Justice and Correctional Services from time to time, in terms of section 1(2) of the Prescribed Rate of Interest Act, 1975 (Act No 55 of 1975) as amended, calculated as simple interest, in respect of debts owing by the State

LETTER OF ACCEPTANCE: The letter of formal acceptance of the Contractor's or Service Provider's Tender / Bid, issued and signed by the Employer

PAYMENT CERTIFICATE: A certificate issued at regular agreed intervals [CD] by the principal agent to the parties certifying the amount due and payable in terms of Clause 25.3

PRINCIPAL AGENT: The person or entity appointed by the **employer** and named in the **contract data for organs of state and other public sector bodies.** In the event of a **principal agent** not being appointed, then all the duties and obligations of a **principal agent** as detailed in the **agreement** shall be fulfilled by the employer's representative as named in the **contract data for organs of state and other public sector bodies**

TARGETED SUBCONTRACTORS: Subcontractors that must be appointed to a total of 30% or more of the contract sum, by the contractor, projects with a contract sum of the amount determined by the Minister in terms of the latest Preferential Procurement regulations, as may be amended from time to time.

F:..... V:..... T:.....
Item

A2.0 **LAW, REGULATIONS AND NOTICES**

Clause 2.0
F:..... V:..... T:.....
Item

A3.0 **OFFER AND ACCEPTANCE**

Replace Clause 3.3 with the following:
This **agreement** shall come into force on the date of **letter of acceptance** and continue to be of force and effect until the end of the **latent defects** liability period [22.0] notwithstanding termination [29.0] or the certification of **final completion** [21.0] and final payment [25.0]

F:..... V:..... T:.....
Item

A4.0 **CESSION AND ASSIGNMENT**

Clause 4.0

Ref Clause 6.7 [CD] - Clause 4.2

Replace Clause 4.3 with the following:
Where a **contractor** cedes any right or any monies due to or to become due under this **agreement** as security in favour of a financial institution, the prior written consent of the **employer,** which consent shall not be unreasonably withheld, must be obtained

F:..... V:..... T:.....
Item

A5.0 **DOCUMENTS**

Clause 5.0

Replace last sentence of Clause 5.2 with the following:
The original signed **agreement** shall be held by the **Employer**

Replace Clause 5.4 with the following:
The Bills of Quantities shall not be used as a specification of material and goods or methods unless so instructed by the Principal Agent. The contractor may not use the Bills of Quantities for purpose of ordering material. All dimensions and quantities must be determined on site before ordering. In the event of discrepancy between the drawings and Bills of Quantity, the drawings shall take preference

Replace Clause 5.5 with the following:
The parties may publish or disclose on any platform only the contract scope and contract amount

F:..... V:..... T:.....
Item

A6.0 **EMPLOYER'S AGENTS**

Clause 6.0

Replace Clause 6.5 with the following:
Where the principal agent and/or an agent fails to act or is unable to act or ceases to be the principal agent or an agent in terms of this agreement, the employer shall appoint another principal agent and/or an agent

Add the following as Clause 6.7:
In terms of the clauses listed hereunder, the employer has retained its authority and has not given a mandate to the principal agent, notwithstanding other provisions in the contract. The employer shall sign all documents in relation to clauses 4.2, 14.1.4, 14.4.1, 14.6, 15.1.4, , 15.4.1, 23.1, 23.2, 23.3, 23.7, 23.8, 26.1, 26.7, 26.12

F:..... V:..... T:.....
Item

A7.0 **DESIGN RESPONSIBILITY**

Clause 7.0

Replace first sentence of Clause 7.2 with the following:
Any design responsibility undertaken by a subcontractor shall not devolve on the contractor except for items that require specific component design and or compatibility design and or shop drawings and or the assembly thereof
F:..... V:..... T:.....
Item

INSURANCES AND SECURITIES

A8.0 **WORKS RISK**

Clause 8.0

Replace Clause 8.4 with the following:
The **contractor** shall bear the full risk of damage to and/or destruction of the **works** by whatever cause during construction of the **works** and hereby indemnifies and holds harmless the **employer** against any such damage. The **contractor** shall take such precautions and

security measures and other steps for the protection and security of the **works** as the **contractor** may deem necessary

F:..... V:..... T:.....
Item

A9.0 **INDEMNITIES**

Clause 9.0

Add the following to the end of the first sentence of Clause 9.2.7:
"…. due to no fault of the **contractor**

9.2.9 No Clause

9.2.10 No Clause

Add the following as clause 9.3:
The employer's rights to claim damages for the contractor's omissions and actions will not be affected.

F:..... V:..... T:.....
Item

A10.0 **INSURANCES**

Clause 10.0

Replace Clause 10.1 with the following:
The party responsible shall effect and keep the respective insurances [CD] in force, in favour of the employer as beneficiary , from the date of possession of the site until the issue of the certificate of practical completion and with an extension to cover the contractors obligations after the date of practical completion [8.2.2]

Add the following as Clause 10.1.5.1:
Hi Risk Insurance
In the event of the project being executed in a geological area classified as a "High Risk Area", that is an area which is subject to highly unstable sub-surface conditions that might result in catastrophic ground movement evident by sinkhole or doline formation the following will apply

Add the following as Clause 10.1.5.1.1 Damage to the works
The contractor shall, from the date of possession of the **site** until the date of the **certificate of practical completion**, bear the full risk of and hereby indemnifies and holds harmless the **employer** against any damage to and/or destruction of the **works** consequent upon a catastrophic ground movement as mentioned above. The **contractor** shall take such precautions and security measures and other steps for the protection of the **works** as he may deem necessary

When so instructed to do so by the **principal agent**, the **contractor** shall proceed immediately to remove and/or dispose of any debris arising from damage to or destruction of the **works** and to rebuild, restore, replace and/or repair the **works**, at the **contractor's** own costs

10.1.5.1.2 Injury to persons or loss of or damage to property
The **contractor** shall be liable for and hereby indemnifies and holds harmless the **employer** against any liability, loss, claim or proceeding arising at any time during the period of the contract whether arising in common law or by statute, consequent upon personal injuries to or the death of any person whomsoever resulting from, arising out of or caused by a catastrophic ground movement as mentioned above

The **contractor** shall be liable for and hereby indemnifies the **employer** against any and all liability, loss, claim or proceeding consequent upon loss of or damage to any moveable, or immovable property, or personal property, or property contiguous to the **site,** whether

belonging to or under the control of the **employer** or any other body or person whomsoever arising out of or caused by a catastrophic ground movement, as mentioned above, which occurred during the period of the contract

10.1.5.1.3 Replace Clause with the following:
It is the responsibility of the **contractor** to ensure that he has adequate insurance to cover his risk and liability as mentioned in 10.1.5.1.1 and 10.1.5.1.2. Without limiting the **contractor's** obligations in terms of the contract, the **contractor** shall, within twenty-one (21) **calendar days of the date of letter of acceptance**, but before commencement of the **works**, submit to the **employer** proof of such insurance policy.

10.1.5.1.4 Replace Clause with the following:
The **employer** shall be entitled to recover any and all losses and/or damages of whatever nature suffered or incurred consequent upon the **contractor's** default of his obligations as set out in 10.1.5.1.1; 10.1.5.1.2 and 10.1.5.1.3. Such losses or damages may be recovered from the **contractor** or by deducting the same from any amounts still due under this contract or under any other contract presently or hereafter existing between the **employer** and the **contractor** and for this purpose all these contracts shall be considered one indivisible whole

10.2 Replace Clause with the following:
Where practical completion in sections is required [20.0), or where the works is for alterations and additions, the contractor shall effect and keep in force contract works insurance [10.1.1], supplementary insurance [10.1.2], public liability insurance [10.1.3] and where applicable, removal of lateral support insurance [10.1.4] and other insurances [10.1.5) in favour of the employer as beneficiary

10.6 No Clause

Add the following as Clause 10.11
In the event that an insurer dispute the amount of the claim to be paid to the employer, the contractor shall be liable to the employer for the difference between the claim (as determined by the employers QS appointed on the project) made by the employer and the amount that the insurer is willing to pay

F:..... V:..... T:.....
Item

A11.0 **SECURITIES**

Add the following as to the relevant related Clauses as follows:
Add the following to Clause 11.1:

In respect of contracts with a contract sum up to R1 million, the security to be provided by the contractor to the employer will be a payment reduction of five per cent (5%) of the value certified in the payment certificate (excluding VAT).

In respect of contracts with a contract sum above R1 million, the contractor shall have the right to select the security to be provided in terms of C 1.0 Securities, as stated in the schedule. Such security shall be provided to the employer within fifteen (15) working days from commencement date. Should the contractor fail to select the security to be provided or should the contractor fail to provide the employer with the selected security within fifteen (15) working days from commencement date, the security in terms of C 1.0 Option C shall be deemed to have been selected.

The payment reduction of the value certified in a payment certificate shall be mutatis mutandis in terms of 25.12.1 - 25.12.5

11.1.1 No Clause

11.1.2 No Clause

11.2.2 No Clause

11.3 No Clause

Replace Clause 11.4.1 with the following:
Hand over the site to the contractor and withhold an amount equal to ten per cent (10%) of each interim payment certificate until practical completion is achieved. The value certified shall be subject to the adjustments in terms of 25.12.6 to 25.12.10.

11.5 No Clause

11.6 No Clause

11.7 No Clause

11.8 No Clause

11.9 No Clause

11.10 No Clause

Add the following as Clause 11.11:
Where the security as a cash deposit of ten per cent (10%) of the contract sum (excluding VAT) has been selected:

Add the following as Clause 11.11.1:
The contractor shall furnish the employer with a cash deposit equal in value to ten percent (10%) of the contract sum (excluding VAT) within fifteen (15) working days from commencement date. Failure to furnish the employer with a cash deposit within fifteen (15) working days Clause 11.4 will apply mutatis mutandis.

Add the following as Clause 11.11.2:
The employer shall be entitled to recover expense and loss from the cash deposit in terms of Clause 27.0 provided that the employer notifies the Contractor in which event the employer's entitlement shall take precedence over his obligations to refund the cash deposit security or portions thereof to the contractor.

Add the following as Clause 11.11.3:
Within fifteen (15) working days of the date of practical completion of the works the employer shall reduce the cash deposit to an amount equal to three per cent (3%) of the contract value (excluding VAT) and refund the balance to the contractor

Add the following as Clause 11.11.4:
Within fifteen (15) working days of the date of final completion of the works the employer shall reduce the cash deposit to an amount equal to one per cent (1%) of the contract value (excluding VAT) and refund the balance to the contractor.

Add the following as Clause 11.11.5:
On the date of payment of the amount in the final payment certificate, the employer shall refund the remainder of the cash deposit to the contractor.

Add the following as Clause 11.11.6:
The parties expressly agree that neither the employer nor the contractor shall be entitled to cede the rights to the deposit to any third party.

Add the following as Clause 11.12:
Where security as a variable construction guarantee of ten percent (10%) of the contract sum (excluding VAT) has been selected:

Add the following as Clause 11.12.1:
The contractor shall furnish the employer with an acceptable variable construction guarantee equal in value to ten per cent (10%) of the contract sum (excluding VAT) within fifteen (15) working days after issuance of the letter of acceptance. Failure to submit an acceptable

variable construction guarantee within fifteen (15) working days Clause 11.4 will apply mutatis mutandis.

Add the following as Clause 11.12.2:
The variable construction guarantee shall reduce and expire in terms of the Variable Construction Guarantee form included in the invitation to tender.

Add the following as Clause 11.12.3:
The employer shall return the variable construction guarantee to the contractor within fourteen (14) calendar days of it expiring.

Add the following as Clause 11.12.4:
Where the employer has a right of recovery against the contractor in terms of 27.0, the employer shall issue a written demand in terms of the variable construction guarantee.

Add the following as Clause 11.13:
Where security as a fixed construction guarantee of five per cent (5%) of the contract sum (excluding VAT) and a five per cent (5%) payment reduction of the value certified in the payment certificate (excluding VAT) has been selected:

Add the following as Clause 11.13.1:
The contractor shall furnish a fixed construction guarantee to the employer equal in value to five per cent (5%) of the contract sum (excluding VAT).

Add the following as Clause 11.13.2:
The fixed construction guarantee shall come into force on the date of issue and shall expire on the date of the last certificate of practical completion.

Add the following as Clause 11.13.3:
The employer shall return the fixed construction guarantee to the contractor within fourteen (14) calendar days of it expiring.

Add the following as Clause 11.13.4:
The payment reduction of the value certified in a payment certificate shall be mutatis mutandis in terms of 25.12.1 - 25.12.5.

Add the following as Clause 11.13.5:
Where the employer has a right of recovery against the contractor in terms of 27.0, the employer shall be entitled to issue a written demand in terms of the fixed construction guarantee or may recover from the payment reduction or from both.

Add the following as Clause 11.14.1:
Where security as a cash deposit of five per cent (5%) of the contract sum (excluding VAT) and a payment reduction of five per cent (5%) of the value certified in the payment certificate (excluding VAT) has been selected:

Add the following as Clause 11.14.2:
The contractor shall furnish the employer with a cash deposit equal in value to five per cent (5%) of the contract sum (excluding VAT) within fifteen (15) working days from commencement date. Failure to submit a cash deposit within fifteen (15) working days Clause 11.4 will apply mutatis mutandis.

Add the following as Clause 11.14.3:
Within fifteen (15) working days of the date of practical completion of the works the employer shall refund the cash deposit in total to the contractor.

Add the following as Clause 11.14.4:
The payment reduction of the value certified in a payment certificate shall be mutatis mutandis in terms of 25.12.1 - 25.12.5.

Add the following as Clause 11.14.5:

Where the employer has a right of recovery against the contractor in terms of 27, the employer may recover from the payment reduction or cash deposit or from both.

Add the following as Clause 11.15:
Where security as a payment reduction of ten per cent (10%) of the value certified in the payment certificate (excluding VAT) has been selected.

Add the following as Clause 11.15.1:
The payment reduction of the value certified in a payment certificate shall be mutatis mutandis in terms of 25.12.6 to 25.12.10.

Add the following as Clause 11.15.2:
The employer shall be entitled to recover expense and loss from the cash deposit in terms of 27.0 provided that the employer notifies the Contractor in which event the employer's entitlement shall take precedence over his obligations to refund the cash deposit security or portions thereof to the contractor.

Add the following as Clause 11.16:
Payments made by the guarantor to the employer in terms of the fixed or variable construction guarantee shall not prejudice the rights of the employer or contractor in terms of this agreement.

Add the following as Clause 11.17:
Should the contractor fail to furnish the security in terms of 11.2 the employer, in his sole discretion, and without notification to the contractor, is entitled to change the contractor's selected form of security to that of a ten per cent (10%) payment reduction of the value certified in the payment certificate (excluding VAT).

F:..... V:..... T:.....
Item

EXECUTION

A12.0 **OBLIGATIONS OF THE PARTIES**

Clause 12.0

12.1.1 No Clause

Replace Clause 12.1.5 with the following:
Give possession of the site to the contractor within ten (10) working days after approval of the Health and Safety Plan or the issue of a construction permit by the Department of Labour, if applicable, after the contractor complied with the terms of 12.2.22

12.1.6 No Clause

12.1.8 No Clause

Replace Clause 12.2.2 with the following:
The priced Bills must be submitted to the Employer within fourteen (14) calendar days from date of request. Where the priced document contains errors or discrepancies and/or prices considered by the employer or principal agent to be imbalanced or unreasonable the employer or principal agent and the contractor shall adjust such prices without any change to the contract sum

Replace Clause 12.2.5 with the following :
Effect and keep in force insurances in favour of the employer as beneficiary where the contractor is responsible for providing insurances [10.0) [CD]

Replace Clause 12.2.13 with the following:
Designate a competent person full time on site to continuously administer and control the

works on site and to receive and implement notices and contract instructions on behalf of the contractor

Add the following as Clause 12.2.22:
Within fourteen (14) working days of the date of the letter of acceptance submit to the principal agent an acceptable health and safety plan, required in terms of the Occupational Health and Safety Act, 1993 (Act No 85 of 1993)

Add the following as Clause 12.2.23:
The contractor shall within reasonable time inform the agents regarding inspection of the works before covering / closing [B 12.0]

Offices

The **contractor** shall provide, maintain and remove on completion of the **works** an office for the exclusive use of the **principal agent**, minimum size 4 x 3 x 3m high internally, suitably insulated and ventilated, provided with electric lighting and fitted with boarded floor, desk, chair, drawing stool, drawing board and lock-up drawers for drawings. The office shall be kept clean and fit for use at all times [12.2.18]

F:..... V:..... T:.....
Item

Main notice board

The **contractor** shall provide, erect where directed, maintain and remove on completion of the **works** a notice board size 3 x 3m as type Drawing GEN 063, constructed of suitable boarding with flat smooth surface and with edging bead 19mm thick round outer edges and projecting 12mm from face of boarding and rounded on front edge. The board shall be securely fixed to hoarding, where hoarding is provided, or fixed to and including a suitable supporting structure of timber or tubular posts and braces. The board is to be painted ivory white and the bead and 12mm wide dividing lines dark green. All wording shall be inscribed in dark green as per the coat of arms for SA. All wording shall be inscribed in dark green painted sans serif lettering [12.2.18]

F:..... V:..... T:.....
Item

A13.0 **SETTING OUT**

Clause 13.0

F:..... V:..... T:.....
Item

A14.0 **NOMINATED SUBCONTRACTORS**

Clause 14.0

Ref Clause 6.7 [CD] - Clause 14.1.4

14.1.5 No Clause

Replace “principal agent ” with “employer” [6.7 [CD]] in Clause 14.4.1

Ref Clause 6.7 [CD] - Clause 14.6

F:..... V:..... T:.....
Item

A15.0 **SELECTED SUBCONTRACTORS**

Clause 15.0

Ref Clause 6.7 [CD] - Clause 15.1.4 & Clause 15.5

15.1.5 No Clause

Replace Clause 15.1.2 with the following:
The principal agent shall call for tenders from a list of tenderers agreed between the contractor and the employer

Replace “principal agent ” with “employer” [6.7 [CD]] in Clause 15.4.1

F:..... V:..... T:.....
Item

A16.0 **DIRECT CONTRACTORS**

Clause 16.0

F:..... V:..... T:.....
Item

A17.0 **CONTRACT INSTRUCTIONS**

Clause 17.0

Replace Clause 17.4 with the following:
The contractor shall comply with and duly execute all contract instructions except any contract instruction for additional work issued after the date of practical completion other than making good physical loss and repairing damage to the works in terms of 8.0 and 21

Add the following clause as Clause 17.6:
Minutes of meetings shall not constitute a site instruction unless reduced to a written contract instruction issued by the principal agent in terms of this contract / agreement.

F:..... V:..... T:.....
Item

COMPLETION

A18.0 **INTERIM COMPLETION**

Clause 18.0

F:..... V:..... T:..... - -
N/A

A19.0 **PRACTICAL COMPLETION**

Clause 19.0

Replace Clause 19.5 with the following:
On issue of the only or last certificate of practical completion the employer shall be entitled to possession of the works and the site. On issue of the certificate of practical completion for a section, the employer shall be entitled to possession of such section

Add the following as Clause 19.8:
WORKS COMPLETION
(1) Within seven (7) calendar days of the date of practical completion the principal agent

shall issue to the contractor a works completion list defining the outstanding work and defects apparent at the date of practical completion to be completed or rectified to achieve works completion.

(2) Where, in the opinion of the contractor, the works completion list has been completed the contractor shall notify the principal agent who shall inspect within seven (7) calendar days of receipt of such a notice. Where, in the opinion of the principal agent, the Works Completion list:

(2)(a) Has been satisfactorily completed, the principal agent shall forthwith issue a certificate of Works Completion to the contractor with a copy to the employer

(2)(b) Has not been satisfactorily completed, the principal agent shall forthwith identify the works completion list items that are not yet complete and inform the contractor thereof. The contractor shall repeat the procedure in terms of 19.8(2)

(3) Should the principal agent not issue a works completion list, in terms of 19.8 (1) or 19.8 (2)(b), within seven (7) calendar days from the end of the inspection period, the contractor shall notify the employer and principal agent. Should the principal agent not issue such Works Completion list within seven (7) calendar days of receipt of such notice, the employer may within seven (7) calendar days issue to the contractor a Works Completion list. Should the employer:

(3)(a) Not issue such works completion list within seven (7) calendar days, then the certificate of Works Completion shall be deemed to have been issued on the date of expiry of the initial notice period and works completion shall be deemed to have been achieved on such date

(3b) Issue a works completion list and the work on Works Completion list not have been completed or where further defects have become apparent, the employer shall forthwith identify such items on the updated works completion list and notify the contractor. The contractor shall repeat the procedure in terms of 19.8(2)(b) until such items have been completed to the satisfaction of the employer

(4) Should the works completion list not be completed to the satisfaction of the employer within a period of twenty one (21) working days of the issue first works completion list the contractor shall be liable to a daily penalty as described in B12.0

(5) The defects liability period in terms of 21.1 shall commence with the issue or deemed issue of the certificate of Works Completion in terms of 19.8(2)(a) or 19.8(3).

F:..... V:..... T:.....
Item

A20.0 **COMPLETION IN SECTIONS**

Clause 20.0

Add the following as Clause 20.2.1.A
A certificate of Works Completion [19.8]

F:..... V:..... T:.....
Item

A21.0 **DEFECTS LIABILITY PERIOD AND FINAL COMPLETION**

Clause 21.0

Replace Clause 21.1 with the following:
The defects liability period for the works shall commence on the calendar day following the date of works completion and end at midnight (00:00) ninety (90) calendar days from the date of works completion [CD] or when work on the list for completion has been satisfactorily

attended to [21.6), whichever is the later (if we use works completion)

Replace Clause 21.6 with the following:
On the expiry of the ninety (90) calendar days defects liability period [21.1] for items not indicated as items with an extended liability as indicated in B14 and on receipt of the contractor's notice to the principal agent

And/or

On the expiry of the defects liability period as indicated in B14, for items indicated in B14 and on receipt of the contractor's notice to the principal agent, the principal agent shall:

(1) inspect the works And within ten (10) working days either issue a list for final completion detailing all outstanding work or defects that must be attended to, or rectified to achieve final completion or
(2) issue the certificate of final completion to the contractor with a copy to the employer for that part of the works where defects liability period has expired

21.6.1 Omit Clause

21.6.2 Omit Clause

Add the following as Clause 21.13:
The ninety (90) calendar days defects liability period for the works [21.1] is replaced with an extended defects liability period of three hundred and sixty-five (365) calendar days in respect of the listed applicable elements in B14

Add the following as Clause 21.14:
Penalties will be applied if the items on the completion list have not been attended to within a period of ninety (90) calendar days [21.1]. If additional defect items have being added to the list during this period, then the Principal Agent and Contractor will agree on a revised completion date. Failing in achieving the revised date will result in penalties being applied.[B12.0]
F:..... V:..... T:.....
Item

A22.0 **LATENT DEFECTS LIABILITY PERIOD**

Clause 22.0

22.3.2 No Clause

F:..... V:..... T:.....
Item

A23.0 **REVISION OF THE DATE FOR PRACTICAL COMPLETION**

Clause 23.0

Ref Clause 6.7 [CD] – Clause 23.1
Ref Clause 6.7 [CD] – Clause 23.2
23.2.13 No Clause

Replace Clause 23.3 with the following:
Further circumstances that delays practical completion due to any other cause beyond the contractor's reasonable control that could not have reasonably been anticipated and provided for which the contractor may be entitled to a revision of the date for practical completion, with or without an adjustment of the contract value as determined by the Employer [6.7 CD]

Ref Clause 6.7 [CD] - Clause 23.7

Ref Clause 6.7 [CD] - Clause 23.8

F:..... V:..... T:.....
Item

A24.0 **PENALTY FOR LATE OR NON-COMPLETION**

Clause 24.0

Replace Clause 24.1 with the following:
Where the contractor fails to bring the works, or a section thereof, to practical-, works-, or final-completion by the applicable completion date [CD], or the revised applicable completion date, the contractor shall be liable to the employer for the penalty [CD]

Replace Clause 24.2 with the following:
Where the employer elects to levy such penalty the employer, or the principal agent on instruction from the employer, shall give notice thereof to the contractor. The principal agent shall determine the penalty due from the later of the date for practical- works-, or final-completion [CD], or the revised date for practical- works-, or final- completion, up to and including the earlier of:

Replace Clause 24.2.1 with the following:
The actual or deemed date of practical- works-, or final- completion, of the works, or a section thereof [23.7.1]

F:..... V:..... T:.....
Item

PAYMENT

A25.0 **PAYMENT**

Clause 25.0

Replace Clause 25.2 with the following:
The principal agent shall issue at regular agreed intervals [CD] payment certificates, to the contractor with a copy to the employer, up to and including practical completion. Interim Payment certificates may be issued to the contractor between practical completion and the final payment certificate. A payment certificate may be for a nil or negative amount

Add the following to Clause 25.3:

25.3.12 Monthly Local content report,

25.3.13 EPWP / NYS payment register, labour reports and certified ID document of EPWP/ NYS beneficiaries, Contract between Contractor and EPWP/ NYS beneficiaries, attendance register. (if applicable)

25.3.14 Tax Invoice

25.3.15 Labour intensive report

25.3.16 Contract participation goal reports

25.5 No Clause

Replace Clause 25.6 with the following:
Materials and goods will only be certified and paid for upon providing proof of full payment to the supplier and proof of transfer of ownership from the supplier to the contractor by the contractor. Once paid, material and goods shall become the property of the employer and shall not be removed from site without the written authority of the Employer.

25.7.5 No clause.

Replace Clause 25.10 with the following:
The employer shall pay the contractor the amount stipulated in an issued payment certificate, correct in all material respects, within thirty (30) calendar days from the date of receiving the payment certificate, invoice and all other substantiating documentation for items certified in the payment certificate

Replace Clauses 25.12 to 25.12.3 with the following:
The value certified shall be subject to the following percentage adjustments :

(Clauses 25.12.1 to 25.12.5 shall be applicable to a contract sum up to R1 million. In the event of a contract sum more than R1 million for Options D & E (C 1.0 Securities [11.0]) Clauses 25.12.1 to 25.12.5 shall be applicable)

25.12.1 Where a security is selected in terms of C 1.0 Securities [11.0], the value of the works in terms of 25.1 and of the materials and goods in terms of 25.4 shall be certified in full. The value certified shall be subject to the following percentage adjustments:

25.12.2 Ninety-five per cent (95%) of such value in interim payment certificates issued up to the date of practical completion

25.12.3 Ninety-seven per cent (97%) of such value in interim payment certificates issued on the date of practical completion and up to but excluding the date of final completion

25.12.4 Ninety-nine per cent (99%) of such value in interim payment certificates issued on the date of final completion and up to but excluding the final payment certificate in terms of 26

25.12.5 One hundred per cent (100%) of such value in the final payment certificate in terms of 26 except where the amount certified is in favour of the employer. In such an event the payment reduction shall remain at the adjustment level applicable to the final payment certificate.

(Clauses 25.12.6 to 25.12.10 shall be applicable to a contract sum more than R1 million for Option C (C 1.0 Securities [11.0])

25.12.6 Where security is a payment reduction in term of C 1.0 Option C, value of the works in terms of 25.1 and materials and goods in terms of 25.4 shall be certified in full. The value certified shall be subject to the following percentage adjustments:

25.12.7 Ninety per cent (90%) of such value in interim payment certificates issued up to the date of practical completion

25.12.8 Ninety-seven per cent (97%) of such value in interim payment certificates issued on the date of practical completion and up to but excluding the date of final completion

25.12.9 Ninety-nine per cent (99%) of such value in interim payment certificates issued on the date of final completion and up to but excluding the final payment certificate in terms of 26

25.12.10 One hundred per cent (100%) of such value in the final payment certificate in terms of 26 except were the amount certified is in favour of the employer. In such an event the payment reduction shall remain at the adjustment level applicable to the final payment certificate

F:..... V:..... T:.....
Item

A26.0 **ADJUSTMENT OF THE CONTRACT VALUE AND FINAL ACCOUNT**

Clause 26.0

Ref Clause 6.7 [CD] – Clause 26.1

Omit Clause 26.4.3

Ref Clause 6.7 [CD] – Clause 26.7

Replace Clause 26.10 with the following:
The principal agent shall prepare the final account in consultation with the employer and issue the final account, to the contractor within sixty (60) working days of the date of practical completion

Ref Clause 6.7 [CD] – Clause 26.12

F:..... V:..... T:.....
Item

A27.0 **RECOVERY OF EXPENSE AND/OR LOSS**

Clause 27.0

Replace Clause 27.1.2 with the following:
Interest due to late payment only

Replace Clause 27.1.4 with the following:
Interest due to late payment only

27.1.5 No Clause

Replace Clause 27.5 with the following:
Where the employer decides to recover an amount due in terms of 27.2 from a construction guarantee, cash deposit or retention money held as security, the employer shall issue a written demand to the contractor before recovering the amount. Should such amount not be paid to the employer within fourteen (14) calendar days of the date-of notice by the employer, the employer may recover such an amount from the security

Add the following as Clause 27.6:
Where a provisional sequestration or provisional liquidation order has been granted or where an order has been granted which commences sequestration, liquidation, bankruptcy, receivership, winding-up or any similar effect, against the contractor or this agreement is cancelled in terms of 29, the employer may issue a demand to the guarantor in terms of the construction guarantee or advance payment guarantee held as security

F:..... V:..... T:.....
Item

SUSPENSION AND TERMINATION

A28.0 **SUSPENSION BY THE CONTRACTOR**

Clause 28.0

28 No Clause
28.1 No Clause
28.1.1 No Clause
28.1.2 No Clause
28.1.3 No Clause
28.1.4 No Clause
28.1.5 No Clause
28.2 No Clause

28.3 No Clause
28.4 No Clause

F:..... V:..... T:.....
Item

A29.0 **TERMINATION**

Clause 29.0

Add the following as Clause 29.1.4:
The contractor's estate has been sequestrated, liquidated or surrendered in terms of the insolvency laws in force within the Republic of South Africa

Add the following as Clause 29.1.5:
The contractor has engaged in corrupt or fraudulent practices in competing for or in executing the contract

Add the following as Clause 29.1.6:
Honour his obligations in terms of Clauses 10.1.5.1.3, 11.4.1 and 12.2. sub Clauses 5, 6, 8, 9, 10, 11, 12, 13, 15, 16, 19, 20, 22.

Replace Clause 29.7 with the following:
The employer, on notice to the contractor, may recover damages from the contractor from the date of termination including, but not limited to, additional costs incurred in the completion, consultant cost, rental of alternative accommodation, invitation of completion tenders, salaries of officials and safeguarding the site, of the remaining work [25.3.7; 27.1.3]

Replace Clause 29.9 with the following:
The employer has the right of recovery against the contractor, where applicable, [CD] from:

The guarantee for construction (variable) until the final payment has been made;

or

The guarantee for construction (fixed) until the date of practical completion;

or

The payment reduction until the final payment is made;

or

The cash deposit made as security until the final payment is made

29.14.1 No Clause

29.14.3 No Clause

29.14.4 No Clause

29.14.5 No Clause

29.14.6 No Clause

29.14.7 No Clause

29.15 No Clause

29.16 No Clause

29.17.3 No Clause

29.17.6 No Clause

29.21.5 No Clause

29.22 No Clause

29.23 No Clause

29.25.3 No Clause

29.25.4 No Clause

29.27 No Clause

F:..... V:..... T:.....
Item

DISPUTE RESOLUTION

A30.0 **DISPUTE RESOLUTION**

Clause 30.0

Replace Clause 30.2 with the following:
Where such disagreement is not resolved within ten (10) working days of receipt of such notice it shall be deemed to be a dispute and shall be submitted to Mediation as a first method of dispute resolution failing which the parties will resort to Litigation

30.3 to 30.7.7 No Clauses

Replace Clause 30.8 with the following:
The parties may, by agreement and at any time before Litigation, refer a dispute to mediation, in which event:

30.8.1 No Clause

Replace Clause 30.8.2 with the following:
The appointment of a mediator, the procedure, and the status of the outcome shall be agreed between the parties

Replace Clause 30.8.3 with the following:
Regardless of the outcome of a mediation the parties shall bear their own costs concerning the Mediation and equally share the costs of the mediator and related expenses

Replace Clause 30.9 with the following:
Institution of Litigation shall be commenced and process served within three (3) year from the date of existence of the dispute, failing which the dispute shall lapse

30.10 No Clause

30.12 No Clause

F:..... V:..... T:.....
Item

SECTION B: GENERAL PRELIMINARIES

B1.0 DEFINITIONS AND INTERPRETATION

B1.1 Definitions

F:..... V:..... T:.....
Item

B1.2 Interpretation

F:..... V:..... T:.....
Item

B2.0 DOCUMENTS

B2.1 Checking of documents

F:..... V:..... T:.....
Item

B2.2 Provisional bills of quantities

F:..... V:..... T:.....
Item

B2.3 Availability of construction information

F:..... V:..... T:.....
Item

B2.4 Ordering of materials and goods

F:..... V:..... T:.....
Item

B3.0 PREVIOUS WORK AND ADJOINING PROPERTIES

B3.1 Previous work - dimensional accuracy

F:..... V:..... T:.....
Item

B3.2 Previous work - defects

F:..... V:..... T:.....
Item

B3.3 Inspection of adjoining properties

F:..... V:..... T:.....
Item

B4.0 THE SITE

B4.1 Handover of site in stages

F:..... V:..... T:.....
Item

B4.2 Enclosure of the works

F:..... V:..... T:.....

	Item					
B4.3	**Geotechnical and other investigations**					
	F:.....	V:.....	T:.....			
	Item					
B4.4	**Encroachments**					
	F:.....	V:.....	T:.....			
	Item					
B4.5	**Existing premises occupied**					
	F:.....	V:.....	T:.....			
	Item					
B4.6	**Services - known**					
	F:.....	V:.....	T:.....			
	Item					
B5.0	**MANAGEMENT OF CONTRACT**					
B5.1	**Management of the works**					
	F:.....	V:.....	T:.....			
	Item					
B5.2	**Progress meetings**					
	F:.....	V:.....	T:.....			
	Item					
B5.3	**Technical meetings**					
	F:.....	V:.....	T:.....			
	Item					
B6.0	**SAMPLES, SHOP DRAWINGS AND MANUFACTURER'S INSTRUCTIONS**					
B6.1	**Samples of materials**					
	F:.....	V:.....	T:.....			
	Item					
B6.2	**Workmanship samples**					
	F:.....	V:.....	T:.....			
	Item					
B6.3	**Shop drawings**					
	F:.....	V:.....	T:.....			
	Item					
B6.4	**Compliance with manufacturer's instructions**					
	F:.....	V:.....	T:.....			
	Item					
B7.0	**DEPOSITS AND FEES**					

B7.1 **Deposits and fees**

F:..... V:..... T:.....
Item

B8.0 **TEMPORARY SERVICES**

B8.1 **Water**

F:..... V:..... T:.....
Item

B8.2 **Electricity**

F:..... V:..... T:.....
Item

B8.3 **Ablution and welfare facilities**

F:..... V:..... T:.....
Item

B8.4 **Communication facilities**

F:..... V:..... T:.....
Item

B9.0 **PRIME COST AMOUNTS**

B9.1 **Responsibility for prime cost amounts**

F:..... V:..... T:.....
Item

B10.0 **ATTENDANCE ON SUBCONTRACTORS**

B10.1 **General attendance**

The **contractor** shall at his own expense provide the following general attendance on the **subcontractors**:

Access to the **site** and places where the subcontract work is to be carried out, including the reasonable use of any temporary personnel hoists erected by the **contractor**

The provision of water and lighting and single phase electric power to a position within 50 metres of the place where the subcontract work is to be carried out but excluding water, fuel and power for commissioning of any installation

The provision of an area for the **subcontractor** to establish temporary office accommodation and workshops and for the storage of plant and materials

The use of erected scaffolding belonging to the **contractor**, in common with others having the like right, while it remains erected on the **site**

The use, at reasonable times by arrangement of the **contractor's** erected hoisting equipment

F:..... V:..... T:.....
Item

B10.2 **Special attendance**

F:..... V:..... T:.....
Item

B11.0 **GENERAL**

B11.1 **Protection of the works**

F:..... V:..... T:.....
Item

B11.2 **Protection/isolation of existing works and works occupied in sections**

F:..... V:..... T:.....
Item

B11.3 **Security of the works**

F:..... V:..... T:.....
Item

B11.4 **Notice before covering work**

F:..... V:..... T:.....
Item

B11.5 **Disturbance**

The **contractor** shall keep the **site**, structures, etc well watered during operations to prevent dust and shall provide and erect and remove on completion of the **works** all necessary temporary dust screens all to the satisfaction of the **principal agent**

F:..... V:.....T:.....
Item

B11.6 **Environmental disturbance**

F:..... V:..... T:.....
Item

B11.7 **Works cleaning and clearing**

F:..... V:..... T:.....
Item

B11.8 **Vermin**

F:..... V:..... T:.....
Item

B11.9 **Overhand work**

F:..... V:..... T:.....
Item

B11.10	**Tenant installations**					
	F:..... Item		V:.....		T:.....	
B11.11	**Advertising**					
	F:..... Item		V:.....		T:.....	

SECTION C: SPECIFIC PRELIMINARIES

Section C contains specific preliminary items which apply to this contract except where N/A (Not Applicable) appears against an item

C1.0 **CONTRACT DRAWINGS**

* Select relevant paragraph and delete whichever is not applicable depending on whether the contract is based on a **bills of quantities** or lump sum document

* The drawings issued with the tender documents do not comprise the complete set but serve as a guide only for tendering purposes and for indicating the scope of the work to enable the tenderer to acquaint himself with the nature and extent of the **works** and the manner in which they are to be executed

* A full set of drawings is issued with the tender documents indicating the full scope of the work to enable the tenderer to acquaint himself with the nature and extent of the **works** and the manner in which they are to be executed

Should any part of the drawings not be clearly understood by the tenderer he shall, before submitting his tender, obtain clarification in writing from the **principal agent**

F:..... V:..... T:.....
Item

C2.0 **PREAMBLES**

The document “Construction Works: Specifications: General Specification (PW371-A) Edition 2.1” is obtainable on the Department’s website (http://www.publicworks.gov.za/ under “Consultants Guidelines”), and shall be read in conjunction with the **bills of quantities** / lump sum document and be referred to for the full descriptions of work to be done and materials to be used

The document “Construction Works: Specifications: Particular Specification (PW371-B) Edition 2.2” is issued together with the drawings and shall be read in conjunction with the drawings and the **bills of quantities** / lump sum document

F:..... V:..... T:.....
Item

C3.0 **TRADE NAMES**

Wherever a trade name for any product has been described in the **bills of quantities** / lump sum document, the tenderer’s attention is drawn to the fact that any other product of equal quality may be used subject to the written approval of the **principal agent** being obtained prior to the closing date for submission of tenders

If prior written approval for an alternative product is not obtained, the product described shall be deemed to have been tendered for

F:..... V:..... T:.....
Item

C4.0 **IMPORTED MATERIALS AND EQUIPMENT**

Where imported items are listed in the tender documents, the tenderer shall provide all the information called for, failing which the price of any such item, materials or equipment shall be excluded from currency fluctuations. (refer to Schedule of Imported Materials and Equipment DPW-23(EC) to be completed by tenderer)

Notwithstanding any provisions elsewhere regarding the adjustment of contract prices, the

price of any item, material or equipment listed in terms of this clause shall be excluded from the Contract Price Adjustment Provisions (if applicable)

F:..... V:..... T:.....
Item

C5.0 **VIEWING THE SITE IN SECURITY AREAS**

The **site** is situated in a security area and the tenderer must arrange with the unit commander or other responsible officer to obtain permission to enter the **site** for tendering purposes

F:..... V:..... T:.....
Item

C6.0 **COMMENCEMENT OF WORKS IN SECURITY AREAS**

As the **works** falls within a security area the **contractor** must give the unit commander or other responsible officer notice before commencement of the **works**. Should the **contractor** fail to make such arrangements, admission to the **site** may be refused and any additional costs will be for the **contractor's** account

F:..... V:..... T:.....
Item

C7.0 **ENTRANCE PERMITS TO SECURITY AREAS**

As the **works** falls within a security area the **contractor** shall obtain entrance permits for his personnel and workmen entering the area and shall comply with all regulations and instructions which may be issued from time to time regarding the protection of persons and property under the control of the Defence Force, Police or chief security officer

F:..... V:..... T:.....
Item

C8.0 **SECURITY CHECK OF PERSONNEL**

The **principal agent** may require the **contractor** to have his personnel and workmen, or a certain number of them, security classified

In the event of the **principal agent** requesting the removal of a person or persons from the **works** for security reasons, the **contractor** shall do so forthwith and shall thereafter ensure that such person or persons are denied access to the **works** and the **site** and/or to any document or information relating to the **works**

F:..... V:..... T:.....
Item

C9.0 **PROHIBITION ON TAKING OF PHOTOGRAPHS**

In terms of article 119 of the Defence Act, 44 of 1957, it is prohibited to sketch or to take photographs of any military site or installation or any building or civil works thereon or to be in possession of a camera or other apparatus used for taking of photographs except when authorized thereto by or on behalf of the Minister

The same prohibition is also applicable to all correctional institutions in terms of article 44.1(e) of the Correctional Services Act 8 of 1959

F:..... V:..... T:.....
Item

C10.0 **HIV/AIDS AWARENESS**

It is required of the **contractor** to thoroughly study the HIV/AIDS Specification (PW 1544) of the Department that must be read together with and is deemed to be incorporated under this Section of the **bills of quantities** / lump sum document. Provision for pricing of HIV/AIDS awareness is made under items C10.1 to C10.5 hereafter and it is explicitly pointed out that all requirements of the aforementioned specification are deemed to be priced hereunder, as the said items represent the only method of measurement and no additional items or extras to the contract in this regard shall be entertained

The **contractor** must take note that compliance with the HIV/AIDS Specification is compulsory. In the event of partial or total non-compliance, the **principal agent**, notwithstanding the provisions of Clause A 25.0 of Section A or any other clause to the contrary, reserves the right to delay issuing any progress **payment certificate** until the **contractor** provides satisfactory proof of compliance. The **contractor** shall not be entitled to any compensation of whatsoever nature, including **interest**, due to such delay of payment

C10.1 **AWARENESS CHAMPION**

Selection, appointment, briefing and making available of an Awareness Champion including provision of all relevant services, all in accordance with the HIV/AIDS Specification

F:..... V:..... T:.....
Item

C10.2 **AWARENESS WORKSHOPS**

Selection and appointment of a competent Service Provider approved by the **principal agent**, provision of a Service Provider Workshop Plan and a suitable venue, conducting of awareness workshops by means of traditional and/or modern multi-media techniques, including follow-up courses, making available all tuition material and performing assessment procedures, all in accordance with the HIV/AIDS Specification

F:..... V:..... T:.....
Item

C10.3 **POSTERS, BOOKLETS, VIDEOS, ETC.**

Provision, displaying, maintaining and replacing when necessary of four plastic laminated posters, booklets and educational videos, etc. for the duration of the **construction period**, all in accordance with the HIV/AIDS Specification

F:..... V:..... T:.....
Item

C10.4 **ACCESS TO CONDOMS**

Provision and maintenance of condom dispensers fixed in position, including male and female condoms, replenishing male and female condoms on a daily basis as required for the duration of the **construction period**, all in accordance with the HIV/AIDS Specification

F:..... V:..... T:.....
Item

C10.5 **MONITORING**

Monitoring HIV/AIDS awareness of workers, providing the **principal agent** with access to information including making available all reports, thoroughly completed and reflecting the correct information, for the duration of the **construction period** and close out, all in accordance with the HIV/AIDS Specification

F:..... V:..... T:.....

	Item	
C11.0	**OCCUPATIONAL HEALTH AND SAFETY ACT** The **contractor** shall comply with all the requirements as set out in the Construction Regulations, 2014 issued under the Occupational Health and Safety Act, 1993 (Act No 85 of 1993) It is required of the **contractor** to thoroughly study the Health and Safety Specification that must be read together with and is deemed to be incorporated under this Section of the **bills of quantities** / lump sum document The **contractor** must take note that compliance with the Occupational Health and Safety Act, Construction Regulations and Health and Safety Specification is compulsory. In the event of partial or total non-compliance, the **principal agent**, notwithstanding the provisions of Clause A25.0 of Section A or any other clause to the contrary, reserves the right to delay issuing any progress **payment certificate** until the **contractor** provides satisfactory proof of compliance. The **contractor** shall not be entitled to any compensation of whatsoever nature, including **interest**, due to such delay of payment Provision for pricing of the Occupational Health and Safety Act, Construction Regulations and Health and Safety Specification is made under this clause and it is explicitly pointed out that all requirements of the aforementioned are deemed to be priced hereunder and no additional claims in this regard shall be entertained F:..... V:..... T:..... Item	
C12.0	**EMPLOYMENT AND TRAINING OF YOUTH WORKERS ON THE EXPANDED PUBLIC WORKS PROGRAMME (EPWP) INFRASTRUCTURE PROJECTS: NATIONAL YOUTH SERVICE (NYS)** The **contractor** shall comply with all the requirements as set out in the "Additional Specification SL: Employment and Training of Youth Workers on the Expanded Public Works Programme (EPWP) Infrastructure Projects: National Youth Service (NYS)" as attached to these **bills of quantities /** lump sum document The **contractor** shall identify a minimum number of youth workers from a priority list, and shall employ them at the statutory labour rates for a minimum period and train them, all as per the aforementioned specification and as elsewhere measured in these **bills of quantities /** lump sum document The **contractor** shall liaise and co-ordinate with the **employer** and the EPWP Training Service Provider with regard to the priority list, the selection of youth workers, and the employment and training of the identified youth workers The **contractor** shall avail the services of an adequately qualified foreman specifically for the EPWP-NYS youth workers, to act as their construction supervisor. The foreman will be responsible for continually monitoring the progress of the youth workers and for addressing questions and issues that may arise from the youth workers Separate items which will be subject to remeasurement have been included elsewhere in these **bills of quantities /** lump sum document to cover the direct costs associated with the employment and training of the youth workers. Any additional requirements in respect of the aforementioned specification are deemed to be priced hereunder and no additional claims in this regard shall be entertained F:..... V:..... T:..... Item	
C13.0	**IMPLEMENTATION OF LABOUR-INTENSIVE INFRASTRUCTURE PROJECTS UNDER THE**	

EXPANDED PUBLIC WORKS PROGRAMME (EPWP)

The **contractor** shall comply with all the requirements of the "Code of Good Practice for Employment and Conditions of Work for Special Public Works Programmes" issued in terms of the "Basic Conditions of Employment Act, 1997 (Act No 75 of 1997)" and the related "Ministerial Determination", for the employment of locally employed temporary workers on a labour-intensive infrastructure project under the Expanded Public Works Programme (EPWP)

The **contractor** shall maintain daily records with regard to the workers employed and shall, on a monthly basis, submit a report to the **principal agent** in the prescribed format. Compulsory indicators such as the project budget, actual project expenditure, number of job opportunities created, demographic characteristics of workers employed, minimum daily wage rate, number of person-days of employment created and number of training person-days, shall be included in said report, all as defined in the "Guidelines for the Implementation of Labour-Intensive Infrastructure Projects under the Expanded Public Works Programme (EPWP)"

Provision for pricing of compliance with the aforementioned is made under this clause and it is explicitly pointed out that all requirements in respect of the aforementioned are deemed to be priced hereunder and no additional claims in this regard shall be entertained

F:..... V:..... T:.....
Item

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SECTION No. 2

BILLS OF QUANTITIES

Item No		Quantity	Rate	Amount

PART C2:

SECTION 2

BILL 1

ALTERATIONS

PREAMBLES

NOTE : Tenderers are advised to study the "MODEL PREAMBLES FOR TRADES" (2008 Edition) as recommended and published by the Association of South African Quantity Surveyors before pricing this bill.

SUPPLEMENTARY PREAMBLES

Tenderers are advised that this Bill or any items within this Bill or any combination of the other Bills or items may be omitted from the contract should their tender be successful. Rates should therefore allow for the possibility that the contract might only consist of this Bill or any combination of some of these Bills or items. No claim whatsoever will be entertained for change of scope resulting from adjudicating the Bills individually

Old materials to be become the property of the contractor

Old materials from alterations, except where described to be re-used or handed over, become the property of the contractor, who must allow credit for same against the appropriate item

Old materials to be carted away

Old materials from the alterations, except where described to be re-used or handed over, as well as rubbish etc, must be regularly carted from the site and not be allowed to accumulate on or around the site.

Carried to Collection R

Section No. 1
Builder's Work
Bill No. 1
Alterations (Provisional)

Old materials not to be re-used

None of the old materials are to be used for new work except where specifically described as being set aside for re-use.

Handing over of materials

Where certain materials or articles from demolitions or where articles are described as to be handed over by the contractor to the Regional Representative or Representative/Agent, such materials or articles shall be properly stored by the contractor until handing over thereof.

The contractor must obtain an official receipt listing the materials or articles and dates of handing over. If the contractor fails to submit the receipt when requested, it shall be deemed that the materials or articles are still in his possession and he will be held liable to the Department for the full replacement value thereof, which amount will be deducted from any monies due to the contractor.

DEFINITIONS

Removal from site where "remove from" or spoil occurs in terms it shall include for all loading and carting away from the site to a suitable dumping site found by the Contractor and the Contractor shall pay all fees, etc., in this regard

GENERAL NOTES TO TENDERERS

Tenderers are to inspect the drawings issued with these Bills of Quantities and to satisfy themselves as to the nature and the requirements of the Contract works. Failure to do so will be the complete responsibility of the Tenderer and no claims whatsoever will be entertained in this regard

Carried to Collection R

Section No. 1
Builder's Work
Bill No. 1
Alterations (Provisional)

Tenderers are to read the descriptions, which are intended as a means of identifying various facets of the work, in conjunction with the drawings. Tenderers shall allow for all costs in connection with the various items taking full cognisance of both the drawings and the Bills of Quantities.

Tenderers shall notify the Quantity Surveyor in writing of any discrepancies encountered upon which clarification will be given by the Quantity Surveyor in writing to the Tenderer. Failure to do so will be the complete responsibility of the Tenderer and no claims whatsoever will be entertained in this regard

Tenderers are to note that setting out of the works will be the complete responsibility of the Tenderer and they should therefore acquaint themselves with the site boundaries, site co-ordinates, datum levels etc. Failure to do so will be the complete responsibility of the Tenderer and no claims whatsoever will be entertained in this regard

All sizes and dimension stated herein are approximate and deemed only sufficient to identify the item of work concerned

No allowance for overbreak has been made to any of the adjoining structures, wall finishes, etc. where removals or pockets occur (the nett opening size, etc. has been made good in later items of these bills of quantities where such making good has not been included with the item) and the tenderer is therefore to allow, in his rates, for making good any overbreak that may occur

All necessary propping etc. required to ensure the safety and stability of the structure during the contract period and the removal thereof at completion shall be deemed to be included in the descriptions of the relevant items

The contractor has to provide all necessary additional barricades, screens, overhead protections, etc. required to ensure the safety of persons, property, etc. and to remove on completion

The contractor has to allow for watering the works sufficiently to prevent nuisance from dust

Carried to Collection R

Section No. 1
Builder's Work
Bill No. 1
Alterations (Provisional)

	REMOVAL OF EXISTING WORK				
	Breaking up and removing reinforced concrete including cutting off and removing reinforcement				
1	170mm Thick slabs	m2	3		
	Breaking down and removing brickwork etc				
2	Half brick wall	m2	94		
3	One brick wall	m2	185		
	Taking out and removing doors, windows, etc including thresholds, sills, etc (building up openings elsewhere)				
4	Timber single door and frame not exceeding 2,5m2 (Credit R.....)	No	19		
5	Timber double door and frame exceeding 2,5m2 (Credit R.....)	No	4		
	Taking down and removing roofs, floors, panelling, ceilings, partitions, etc				
6	Acoustic tile suspended ceilings including suspension grid, hangers, etc. (Credit R.....)	m2	577		
	Taking out and removing joinery fittings etc				
7	Timber shelving with steel frame, five shelves x 600mm wide (Credit R.....)	m	15		
8	Timber wall and floor cupboards, 600mm wide x 900mm high (Credit R.....)	m	9		
9	Timber nurse station counter, 2,750 x 2,300 x 900mm high (Credit R.....)	No	1		
	Taking up and removing vinyl floor coverings, carpeting, etc				
10	Vinyl sheet floor covering with welded joints including preparing screed for new vinyl floor covering	m2	577		
	Carried to Collection			R	

Section No. 1
Builder's Work
Bill No. 1
Alterations (Provisional)

	Taking out and removing ironmongery				
11	Bumper rail including fixing bracket etc. (Credit R.....)	m	93		
12	Chromium plated towel rail not exceeding 3000mm long (Credit R.....)	No	34		
13	Chromium plated toilet paper holder (Credit R.....)	No	9		
14	Chromium plated hat and coat hook (Credit R.....)	No	9		
	Taking out/off and removing sundry metalwork				
15	Steel trellis double gate and framwork exceeding 2,5m2 and not exceeding 5m2 (Credit R.....)	No	2		
16	Steel wire mesh burglar proofing with framing 1,500 x 1,000mm high bolted to brickwork and making good brickwork (Credit R.....)	No	9		
	Hacking up/off and removing granolithic, screeds, plaster, etc from concrete or brickwork and preparing surfaces for new screeds, plaster, etc				
17	40mm Screed from floors	m2	577		
18	Internal plaster from walls and columns	m2	1 116		
	Hacking up/off and removing ceramic tile floor and wall finishes including removing mortar bed or backing and preparing concrete or brick surfaces for new screed, plaster or tile finishes				
19	200 x 200mm Tiles to walls	m2	178		
	Taking out and removing piping, sanitary fittings, etc including disconnecting piping from fittings and making good floor and wall finishes (making good tiling and paintwork elsewhere)				
20	Vitreous china wash hand basin (Credit R.....)	No	19		
	Carried to Collection			R	

Section No. 1
Builder's Work
Bill No. 1
Alterations (Provisional)

21	Vitreous china WC pan with cistern (Credit R.....)	No	9		
22	Bath including trap, taps, brick wall, filling, etc. (Credit R.....)	No	2		
23	Shower cubicle including trap, taps, overhead arm, rose and shower door (Credit R.....)	No	2		
24	Stainless steel WC pan with flushmaster (Credit R.....)	No	9		
25	Stainless steel double bowl sink, mixer, etc. (Credit R.....)	No	2		
26	Stainless steel bedpan and washup sink, mixers, etc. (Credit R.....)	No	1		
27	Slop hopper etc. (Credit R.....)	No	1		
	Taking out and removing glass and mirrors				
28	Glass from steel windows including cleaning out rebates and preparing for new glass (Credit R.....)	m2	20		
29	Mirror 450 x 600mm high from wall (Credit R.....)	No	10		
	BUILDING UP OPENINGS				
	Brickwork in NFP bricks in class II mortar in building up openings				
30	Half brick walls	m2	16		
31	One brick walls	m2	9		
	Sundries				
	OPENINGS THROUGH EXISTING WALLS ETC				
	Carried to Collection			R	

Section No. 1
Builder's Work
Bill No. 1
Alterations (Provisional)

	Breaking out for and forming openings through brick walls for new doors and frames including necessary precast concrete lintels and making good plaster on both sides and into reveals and with 230mm concrete thresholds with steel trowelled finish (new doors and frames and making good paintwork elsewhere)				
32	Opening for door with steel frame approximately 900 x 2,100mm high overall through 230mm brick wall	No	1		
33	Opening for door with steel frame approximately 1,800 x 2,125mm high overall through 230mm brick wall	No	4		
	Breaking out for and forming openings through brick walls for new windows including necessary precast concrete lintels and making good plaster on both sides and into reveals and with sloping 120mm brick-on-edge plastered sill on outside and flat 110mm flat plastered sill on inside (new windows and making good paintwork elsewhere)				
34	Opening for window (NE1) 533 x 654mm high through 230mm brick wall	No			
35	Opening for window (NE4) 1,511 x 654mm high through 230mm brick wall	No	1		
	Carried to Collection			R	

Section No. 1
Builder's Work
Bill No. 1
Alterations (Provisional)

Section No. 1

Builder's Work

Bill No. 1

Alterations (Provisional)

COLLECTION

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Section No. 1
Builder's Work
Bill No. 1
Alterations (Provisional)

Item No		Quantity	Rate	Amount

PART C2:

SECTION 2

BILL 2

MASONRY

PREAMBLES

NOTE : Tenderers are advised to study the "MODEL PREAMBLES FOR TRADES" (2008 Edition) as recommended and published by the Association of South African Quantity Surveyors before pricing this bill.

SUPPLEMENTARY PREAMBLES

Supplementary preamble items as described in Bill No. 1, shall equally apply to this Bill.

GENERAL NOTES TO TENDERERS

General notes, described in Bill No. 1, shall equally apply to this Bill.

BRICKWORK

Sizes in descriptions

Where sizes in descriptions are given in brick units, "one brick" shall represent the length and "half brick" the width of a brick

Hollow walls etc

Descriptions of hollow walls shall be deemed to include leaving every fifth perpend of the bottom course of the external skin open as a weep hole.

Face bricks

Bricks shall be ordered timeously to obtain uniformity in size and colour

Carried to Collection R

Section No. 1
Builder's Work
Bill No. 2
Masonry

	Pointing				
	Descriptions of recessed pointing to fair face brickwork and face brickwork shall be deemed to include square recessed, hollow recessed, weathered pointing, etc				
	SAMPLES				
	Samples of all masonry building units, except those for walls described as "load bearing", shall consist of a minimum of 6 units. Samples of building units to be used in walls described as "load bearing" shall consist of 30 units from every 30 000 units delivered to site				
	BRICKWORK				
	Brickwork of NFP bricks in class II mortar				
1	Half brick walls	m2	64		
2	One brick walls	m2	127		
	Brickwork of NFX bricks (14 MPa nominal compressive strength) in class I mortar				
	BRICKWORK SUNDRIES				
	Brickwork reinforcement				
3	75mm Wide reinforcement built in horizontally	m	278		
4	150mm Wide reinforcement built in horizontally	m	302		
	Prestressed fabricated lintels				
5	110 x 75mm Lintels in lengths not exceeding 3m	m	83		
	Turning pieces				
6	115mm Wide turning piece to lintels etc	m	7		
7	230mm Wide turning piece to lintels etc	m	2		
	FACE BRICKWORK				
	Carried to Collection			R	

	"Corobrick - Agate Satin FBX" or other approved clay FBX face brick pointed with recessed horizontal and vertical joints to comply with SABS 227				
8	Brick-on-edge header course lintel	m	6		
	Brick-on-edge header course copings, sills, etc of "Corobrick - Agate Satin FBX" or similar approved face bricks pointed with recessed joints on all exposed faces				
9	120mm Wide sill set sloping and slightly projecting and with bullnose edge	m	5		
	Carried to Collection			R	

Section No. 1
Builder's Work
Bill No. 2
Masonry

Section No. 1

Builder's Work

Bill No. 2

Masonry

COLLECTION

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Section No. 1
Builder's Work
Bill No. 2
Masonry

Item No			Quantity	Rate	Amount
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	WATERPROOFING				
	PREAMBLES				
	NOTE : Tenderers are advised to study the "MODEL PREAMBLES FOR TRADES" (2008 Edition) as recommended and published by the Association of South African Quantity Surveyors before pricing this bill.				
	SUPPLEMENTARY PREAMBLES				
	Supplementary preamble items as described in Bill No. 1, shall equally apply to this Bill.				
	Penetron				
	The tenderer is to allow for a Penetron approved applicator for all Penetron related works to ensure that Penetron provides their 20 year guarantee, as this guarantee will be required from contractor upon completion of the works				
	GENERAL NOTES TO TENDERERS				
	General notes, described in Bill No. 1, shall equally apply to this Bill.				
	DAMP PROOFING OF WALLS AND FLOORS				
	One layer of 375 micron "Consol Plastics Brikgrip DPC" embossed damp proof course				
1	In walls	m2	5		
	Carried Forward to Summary of Section No. 1			R	

Section No. 1
Builder's Work
Bill No. 3
Waterproofing

Item No		Quantity	Rate	Amount
	NOTE - DEDUCT Joinery here (see PS amount too)			
	PART C2:			
	SECTION 2			
	BILL 4			
	CARPENTRY AND JOINERY			
	PREAMBLES			
	NOTE : Tenderers are advised to study the "MODEL PREAMBLES FOR TRADES" (2008 Edition) as recommended and published by the Association of South African Quantity Surveyors before pricing this bill.			
	SUPPLEMENTARY PREAMBLES			
	Supplementary preamble items as described in Bill No. 1, shall equally apply to this Bill.			
	Particle board:			
	Particle board shall comply with the following specifications:			
	a) SABS 1300 Particle board: exterior and flooring type			
	b) SABS 1301 Particle board: interior type			
	Joinery:			
	Descriptions of frames shall be deemed to include frames, transomes, mullions, rails, etc			
	Descriptions of hardwood joinery shall be deemed to include pelleting of bolt holes			
	Carried to Collection		R	

	Fixing					
	Items described as "nailed" shall be deemed to be fixed with hardened steel nails or shot pins to brickwork or concrete					
	Decorative laminate finish:					
	Laminate finish shall be glued under pressure. Edge strips shall be butt jointed at junctions with adjacent similar finish					
	GENERAL NOTES TO TENDERERS					
	General notes, described in Bill No. 1, shall equally apply to this Bill.					
	DOORS, ETC					
	Wrought meranti solid doors					
1	40mm Thick door with 15 horizontal slats, 813 x 2,032mm high	No	1			
	Heavy duty interior quality solid flush timber door with 3mm thick maple veneer on both sides with 2 consolidated edges, all suitable for varnish and hung to steel frames					
2	40mm Thick door, 700 x 2,032mm high with 300 x 600mm high opening with matching timber glazing beads both sides	No	1			
3	40mm Thick door, 813 x 2,032mm high	No	2			
4	40mm Thick door, 813 x 2,032mm high with 200 x 600mm high opening with matching timber glazing beads both sides	No	9			
5	40mm Thick door, 813 x 2,032mm high with 200 x 1,700mm high opening with matching timber glazing beads both sides	No	2			
6	40mm Thick door, 1,000 x 2,032mm high	No	8			
7	40mm Thick unequal double door, 1,500 x 2,032mm high with rebated meeting edges	No	1			
	Carried to Collection				R	

Section No. 1
Builder's Work
Bill No. 4
Carpentry and Joinery

8	40mm Thick unequal double door, 1,500 x 2,032mm high with rebated meeting edges and with 200 x 900mm high opening with matching timber glazing beads both sides	No	10		
9	40mm Thick unequal double door, 1,500 x 2,032mm high with rebated meeting edges and with 600 x 600mm high opening with matching timber glazing beads both sides	No	2		
10	40mm Thick unequal double door, 1,500 x 2,032mm high with rebated meeting edges and with 200 x 1,700mm high opening with matching timber glazing beads both sides	No	1		
11	40mm Thick equal double door, 1,800 x 2,032mm high with rebated meeting edges and with two 250 x 600mm high openings with matching timber glazing beads both sides	No	1		

FITTINGS

General

The following cupboard fittings have been measured as complete units i.e. the components of the units have not been separately measured. The descriptions, therefore, of such units shall be deemed to include all components, assembling, housing, notching, glueing, blocking, planting on and screwing with countersunk screws, edge strips, decorative plastic finish, glass, ironmongery, metalwork, paint or varnish finishes, etc

The references given in the descriptions are to the respective types of fittings detailed on the architect's drawings as numbered below and accompanying these bills of quantities for tender purposes

The additional worktops measured separately in the corners, where there are no cupboards below, are not to be cut separately from the cupboard tops, but are to be integral with the worktops over the adjacent cupboards.

Carried to Collection R

Nurse station counters etc.

Nurse station counters construction is bases around modular component design (unless otherwise specified) utilizing components fittings, fastening, fitments and connectors for the purpose of prefabrication and ready for site assembly
(see architect's drawings accompanying these bills of quantities)

The general construction material of the carcass shall be bison particle board in accordance with SANS EN 312-3:1996 supawood medium density fibreboard (MDF) in accordance with SANS 540-1:1991, melamine surfaced to both faces with Bisonlam MFB (Melamine faced board) in accordance with SANS 1763:1998 and finished in minimum 1mm thickness PVC edging

The service tops shall be of "Corian Glacier Ice" solid surface material incorporating seamless joints, size 830 x 44mm thick

The outer counter decorative face shall be of 32mm Supawood MDF (medium density fibreboard) in accordance with SANS 540-1:1991, the surface to outer face in Mahogany formica HPL (high pressure laminate with woodtex finish) in accordance with SANS ISO 4586:1995 HG/P horizontal general purpose /postform 0,8mm thick (minimum) and formica HPL in accordance with SANS ISOO 4586:1995 BK 0,8mm brown backer to reverse face

Doors are to be pre drilled for hinges, drawers of 12mm particle board sides, back and front with 3,2mm hardboard bottom edged and foiled on all sides in white melamine PVC foil

Kickplates of 16 x 62mm particle board foiled in renolit PVC foil continous along floor plinth

Carcass of 16mm particle board foiled and edged on all faces with 3,2mm hardboard back foiled melamine on exposed face in white renolit PVC foil with sides predrilled and grooved for assembly

Concealed type 95 degree hinges and piano hinges to adjoining doors

Carried to Collection R

Section No. 1
Builder's Work
Bill No. 4
Carpentry and Joinery

	Tpe "D" handles in selected colours and finishes and epoxy coated steel two part telescopic drawer slides on nylon runner					
12	Nurse station U-shaped counter, size 4,440 x 1,780 x 980mm high overall with laminated bench, -tops, -front, "Surino Glacier White" solid top, stainless steel formica strips and -kick plate, drawers, etc. complete to architect's details (see architect's drawings no. 103/23A&B-Detail 1, 105/17)	No	1			
	Kitchens, Skills room, etc.					
	Kitchen cupboards etc. with worktops of 30 x 600mm ice white granite with a 20mm overhang and silicone sealant applied at back edges, doors of 16mm particle board post formed on both vertical sides and foiled wrapped in colour in renolit PVC with back of door foiled in white PVC renolit, doors are to be pre drilled for hinges, drawers of 12mm particle board sides, back and front with 3,2mm hardboard bottom edged and foiled on all sides in white melamine PVC foil with runners of epoxy coated steel two part telescopic slides running on nylon runners and fronts the same as doors, kickplates of 16 x 62mm particle board foiled in renolit PVC foil continous along floor plinth, carcass of 16mm particle board foiled and edged on all faces with 3,2mm hardboard back foiled melamine on exposed face in white renolit PVC foil with sides predrilled and grooved for assembly, concealed type 95 degree hinges and piano hinges to adjoining doors, type "D" handles in selected colours and finishes and epoxy coated steel two part telescopic drawer slides on nylon runner (see architect's drawing/s accompanying these bills of quantities)					
13	Additional worktop with support framework in corner, 600 x 600mm (no cupboard below)	No	1			
14	Wall cupboard, 3,000 x 300 x 800mm high with top, sides, bottom, division, shelf, back, one single hinged door and two pairs double hinged doors	No	1			
	Carried to Collection				R	

Section No. 1
Builder's Work
Bill No. 4
Carpentry and Joinery

15	Floor corner cupboard, 3,000mm long against one wall and 1,200mm long against other wall x 600mm wide x 900mm high with top, sides, bottom, division/s, shelf, back, one single hinged door and two pairs double hinged doors, dividing framework	No	1			
16	Sink cupboard, 3,600 x 600 x 900mm high with top, sides, bottom, division, shelf, back, one single hinged door and two pairs double hinged doors, dividing framework and one set of five drawers (including sink cut-out, but sink elsewhere) complete to architect's details (see architect's drawings no. 105/16+101/59) (JD17)	No	1			
	<u>Shelving and storage systems</u> Shelving and storage systems shall be design and supply of soild timber with maple colour finish. Contractor to furnish shop drawings, pictures and/or sample for approval (see architect's drawings no. 105/08) Doors: Type 1 - Doors are to be 16mm particle board post formed on both vertical sides and foiled wrapped in colour in renolit PVC foil, back of doors foiled in same colour as front, door pre drilled for hinges Type 2 - Sliding door made from durable plastic polymer on an aluminium sliding rail with a locking mechanism Drawers of 12mm particle board sides, back and front with 3,2mm hardboard bottom edged and foiled on all sides in black melamine PVC foil, drawer runners shall be epoxy coated steel two part telescopic slides running on nylon runners, front's colour to be the same as the doors Kickplates of 16 x 62mm particle board foiled in renolit PVC foil continous along floor plinth Carcass of 16mm particle board foiled and edged on all faces with 3,2mm hardboard back foiled melamine on exposed face in white renolit PVC foil with sides predrilled and grooved for assembly Concealed type 95 degree hinges and piano hinges to adjoining doors					
	Carried to Collection			R		

Section No. 1
Builder's Work
Bill No. 4
Carpentry and Joinery

	Tpe "D" handles in selected colours and finishes and epoxy coated steel two part telescopic drawer slides on nylon runner					
17	Shelving cabinet type SH2, 1,350 x 450 x 1,600mm high with top, sides, bottom, division, shelves, back, drawers and ironmongery complete	No	3			
	Reception / Security counters etc.					
	Reception / Security counters construction is bases around modular component design (unless otherwise specified) utilizing components fittings, fastening, fitments and connectors for the purpose of prefabrication and ready for site assembly (see architect's drawing/s accompanying theses bills of quantities)					
	The general construction material of the carcass shall be bison particle board in accordance with SANS EN 312-3:1996 supawood medium density fibreboard (MDF) in accordance with SANS 540-1:1991, melamine surfaced to both faces with Bisonlam MFB (Melamine faced board) in accordance with SANS 1763:1998 and finished in minimum 1mm thickness PVC edging					
	The service tops shall be of Surino "Glacier White" solid surface material incorporating seamless joints, size 800 x 44mm thick					
	The outer counter decorative face shall be of 32mm Supawood MDF (medium density fibreboard) in accordance with SANS 540-1:1991, the veneer surface to outer face in formica HPL (high pressure laminate with Mahogany finish) in accordance with SANS ISO 4586:1995 HG/P horizontal general purpose /postform 0,8mm thick (minimum) and formica HPL in accordance with SANS ISOO 4586:1995 BK 0,8mm brown backer to reverse face					
	Doors are to be pre drilled for hinges, drawers of 12mm particle board sides, back and front with 3,2mm hardboard bottom edged and foiled on all sides in white melamine PVC foil					
	Kickplates of 16 x 62mm particle board foiled in renolit PVC foil continous along floor plinth					
	Carried to Collection				R	

Section No. 1
Builder's Work
Bill No. 4
Carpentry and Joinery

	Carcass of 16mm particle board foiled and edged on all faces with 3,2mm hardboard back foiled melamine on exposed face in white renolit PVC foil with sides predrilled and grooved for assembly Concealed type 95 degree hinges and piano hinges to adjoining doors Tpe "D" handles in selected colours and finishes and epoxy coated steel two part telescopic drawer slides on nylon runner **Staff rest room** Staff rest room cupboards etc. with worktops of 30 x 600mm ice white granite with 20mm overhang and silicone sealant applied at back edges, doors of 16mm particle board post formed on both vertical sides and foiled wrapped in colour in renolit PVC with back of door foiled in white PVC renolit, doors are to be pre drilled for hinges, drawers of 12mm particle board sides, back and front with 3,2mm hardboard bottom edged and foiled on all sides in white melamine PVC foil, kickplates of 16 x 62mm particle board foiled in renolit PVC foil continuous along floor plinth, carcass of 16mm particle board foiled and edged on all faces with 3,2mm hardboard back foiled melamine on exposed face in white renolit PVC foil with sides predrilled and grooved for assembly, concealed type 95 degree hinges and piano hinges to adjoining doors, type "D" handles in selected colours and finishes and epoxy coated steel two part telescopic drawer slides on nylon runner (see architect's drawings no. 101/43 etc.)				
18	Sink cupboard, 3,564 x 600 x 900mm high with top, sides, bottom, division, shelf, back, three single hinged doors, one pair double hinged doors, dividing framework and one set of five drawers (including sink cut-out, but sink elsewhere) complete to architect's details (see drawings no. 105/15)	No	1		
	Sluice rooms Wrought softwood with belled edges and three coats clear varnish				
	Carried to Collection			R	
	Section No. 1 **Builder's Work** **Bill No. 4** **Carpentry and Joinery**				

19	1,500mm long x 100mm wide x 25mm thick Softwood broom hook holder with and including 5 mild steel broom hooks plugged	No	1		
	Sluice room cupboards etc. with worktops of 30 x 600mm polished ice white granite top with 20mm overhang and silicone sealant applied at back edges, doors of 16mm particle board post formed on both vertical sides and foiled wrapped in colour in renolit PVC with back of door foiled in white PVC renolit, doors are to be pre drilled for hinges, drawers of 12mm particle board sides, back and front with 3,2mm hardboard bottom edged and foiled on all sides in white melamine PVC foil, kickplates of 16 x 62mm particle board foiled in renolit PVC foil continous along floor plinth, carcass of 16mm particle board foiled and edged on all faces with 3,2mm hardboard back foiled melamine on exposed face in white renolit PVC foil with sides predrilled and grooved for assembly, concealed type 95 degree hinges and piano hinges to adjoining doors, type "D" handles in selected colours and finishes and epoxy coated steel two part telescopic drawer slides on nylon runner (see architect's drawing/s no. 103/19)				
20	Floor cupboard, 1,200 x 600 x 900mm high with top, sides, bottom, division, shelves, back and one pair double hinged doors (including sink cut-out, but sink elsewhere) complete to architect's details (see drawings no. 105/18)	No	1		
21	Floor cupboard, 3,983 x 600 x 900mm high with top, sides, bottom, division, shelves, back, three pairs of double hinged doors and one set of four drawers (including sink cut-out, but sink elsewhere) complete to architect's details (see drawings no. 105/18)	No	1		
	<u>Slatted benches</u>				
	Bench with slatted hadrwood seating and powdercoated mild steel frame bolted to floor including three coats timber sealer to timber slats all to architect's specifications (see architect's drawing/s)				
22	1,700mm Long x 431mm wide x 400mm high timber slatted bench with steel base (to architects details)	No	2		
	Carried to Collection			R	

Section No. 1
Builder's Work
Bill No. 4
Carpentry and Joinery

Section No. 1

Builder's Work

Bill No. 4

Carpentry and Joinery

COLLECTION

	Page No		Amount
Total Brought Forward from Page No.	14		
	15		
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	19		
	20		
	21		
	22		
Carried Forward to Summary of Section No. 1		R	

Item No		Quantity	Rate	Amount

PART C2:

SECTION 2

BILL 5

CEILINGS, PARTITIONS AND ACCESS FLOORING

PREAMBLES

NOTE : Tenderers are advised to study the "MODEL PREAMBLES FOR TRADES" (2008 Edition) as recommended and published by the Association of South African Quantity Surveyors before pricing this bill.

SUPPLEMENTARY PREAMBLES

Supplementary preamble items as described in Bill No. 1, shall equally apply to this Bill.

Descriptions:

Items described as "nailed" shall be deemed to be fixed with hardened steel nails or pins or 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 600mm centres, and where described as "bolted" the bolts have been given elsewhere

GENERAL NOTES TO TENDERERS

General notes, described in Bill No. 1, shall equally apply to this Bill.

CEILINGS ETC.

Carried to Collection R

	Insulation in compliance with category ofOccupancy A3 for climatic zone 1					
1	120mm Thick insulation closely fitted and laid on top of brandering between roof timbers etc.	m2	577			
	NAILED UP CEILINGS					
	9mm Gypsum plasterboard with 63mm wide strips of mesh scrim nailed over joints and the whole finished with gypsum skim plaster trowelled to a smooth polished surface to the thickness recommended by the manufacturer					
2	Extra over ceiling for 600 x 600mm trap door including frame	No	3			
	SUSPENDED CEILINGS					
	Proprietary suspended ceilings					
	Note:					
	Electrical light fittings, diffusers, panels, etc generally are "lay in" units of the same dimensions as the suspension grid described and allowance must be made accordingly for their support inclusive of any flexibility insetting out that may be required (ceiling panels have not been deducted and pricing is to take cognisance thereof)					
	Hangers, suspension grids, "lay-in" panels, etc are to be in accordance with the manufacturers' recommendations					
	Electrical light fittings, diffusers, panels etc are generally "lay-in" units of the same dimensions as the suspension grid described and allowance must be made in the rates accordingly for their support inclusive of any flexibility in setting out that may be required (ceiling panels have not been deducted and pricing is to take cognisance thereof)					
	The grid shall be suspended by means of galvanised steel L-section hangers at suitable centres, securely shot-pinned or screwed to concrete, steel or wood					
	Carried to Collection				R	

	9mm Gypsum plasterboard with 63mm wide strips of mesh scrim nailed over joints and the whole finished with gypsum skim plaster trowelled to a smooth polished surface to the thickness recommended by the manufacturer Ceilings shall comprise 9mm gypsum plasterboard boards screwed to and including screw-up suspension grid consisting of main tees at 1 200mm centres and galvanised steel capped cross tees at 400mm centres and with tape fixed over joints and the whole finished with gypsum plaster trowelled to a smooth polished surface				
3	Ceilings suspended not exceeding 1m below concrete soffits (C4)	m2	2		
	Pre-painted 600 x 1,200 x 15mm thick mineral fibre acoustic panels on 24mm pre-painted exposed tee suspension system including main and cross tees, necessary hangers, grids, etc. (C1)				
4	Ceilings suspended not exceeding 1m below concrete soffits (C1)	m2	577		
	"Donn" or similar approved cornices, transition strips, etc. to suspended ceilings				
5	"LSM 25" shadowline pre-painted white cornices plugged to walls (C1 & C4)	m	504		
	Carried to Collection			R	

Section No. 1
Builder's Work
Bill No. 5
Ceilings, Partitions and Access Flooring

Section No. 1

Builder's Work

Bill No. 5

Ceilings, Partitions and Access Flooring

COLLECTION

	Page No		Amount
Total Brought Forward from Page No.	24		
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Carried Forward to Summary of Section No. 1		R	

Item No		Quantity	Rate	Amount
	PART C2:			
	SECTION 2			
	BILL 6			
	FLOOR COVERINGS, PLASTIC LININGS, ETC			
	PREAMBLES			
	NOTE : Tenderers are advised to study the "MODEL PREAMBLES FOR TRADES" (2008 Edition) as recommended and published by the Association of South African Quantity Surveyors before pricing this bill.			
	SUPPLEMENTARY PREAMBLES			
	Supplementary preamble items as described in Bill No. 1, shall equally apply to this Bill.			
	GENERAL NOTES TO TENDERERS			
	General notes, described in Bill No. 1, shall equally apply to this Bill.			
	Samples and colours of all products are to be submitted to the architect for approval prior to placing of orders			
	FLOOR COVERINGS			
	2,0mm Thick "Floorworx Elite" or other approved fully flexible, non-directional heavy duty vinyl sheeting manufactured to specification EN 649 laid in approved adhesive and joints hot seam welded withapproved welding rods in compliance to SABS 070, spread with a notched trowel and stripped and sealed to manufacturer's specifications, colour and pattern to architects approval (F1)			
1	On floors (F1)	m2 577		
	Carried to Collection		R	

	2,0mm Thick "Floorworx- Surestep" or other approved slip-resistant polyurethane reinforced (PUR) non-directional heavy duty vinyl sheeting impregnated with carborundum particles laid with approved acrylic adhesive, joints butted/grooved and hot seam welded with approved welding rods and stripped and sealed to manufacturer's specifications, colour and pattern to architects approval (F3)					
2	On floors (F3)	m2	69			
	SKIRTING, NOSING, ETC					
	2.0mm Thick "Floorworx Surestep" or other approved vinyl floor sheeting to match floor finish turned-up wall as skirting, with cove fillet and capping strip including preparation, adhesive, stripping and sealing, etc. to manufacturer's specifications (S1)					
3	150mm High skirting (S1)	m	362			
	"Genesis" or other approved capping strips, coved fillets, etc. to vinyl floor sheeting extended as skirting					
4	40mm "KCS01" capping strip	m	362			
5	20 x 20mm "KCOV2" cove former	m	362			
	HANDRAILS					
	"Intrad" or other approved wall protection system of high impact resistant uPVC extruded lip channel profile complete with uPVC brackets, -joining blocks, -stop ends and -external corners to manufacturer's specfications					
6	29 x 200mm TR200 rounded filleted vinyl crush guard	m	55			
	POLISH, SEALERS, ETC					
7	Two coats wax polish on vinyl flooring	m2	511			
	Carried to Collection				R	

Section No. 1
Builder's Work
Bill No. 6
Floor Coverings, Plastic Linings, etc

Section No. 1

Builder's Work

Bill No. 6

Floor Coverings, Plastic Linings, etc

COLLECTION

	Page No		Amount
Total Brought Forward from Page No.	28		
	29		
Carried Forward to Summary of Section No. 1		R	

Item No		Quantity	Rate	Amount

PART C2:

SECTION 2

BILL 7

IRONMONGERY

PREAMBLES

NOTE : Tenderers are advised to study the "MODEL PREAMBLES FOR TRADES" (2008 Edition) as recommended and published by the Association of South African Quantity Surveyors before pricing this bill.

SUPPLEMENTARY PREAMBLES

Supplementary preamble items as described in Bill No. 1, shall equally apply to this Bill.

Finishes to ironmongery

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
AS Anodised silver
AB Anodised bronze
AG Anodised gold
ABL Anodised black
PB Polished brass
PL Polished and lacquered
PT Epoxy coated
SD Sanded
NP Nickel plated

GENERAL NOTES TO TENDERERS

General notes, described in Bill No. 1, shall equally apply to this Bill.

Carried to Collection R

Section No. 1
Builder's Work
Bill No. 7
Ironmongery

	HINGES, BOLTS, ETC				
	"GEZE" or other approved				
1	150 x 20mm "120/150" SC flush bolt	No	13		
2	300 x 20mm "120/300" SC flush bolt	No	13		
3	""HZ3110SR - Pullman" Silver Exidor single panic bolt comp.	Sets	1.0		
	LOCKS				
	"GEZE" or other approved				
4	"625/35" S/S profile cylinder sashlock D/back latch	No	1		
5	76mm "730/68" S/S profile arch sash lock	No	13		
6	76mm "742/68" S/S profile cylinder deadlock	No	4		
7	43mm "IG950933108M" NP half cylinder master key	No	3		
8	60mm "IG955930308M" NP knob cylinder master key with "963/03" 40-55mm x 5,4mm NP patent fixing screws	No	1		
9	60mm "IG950930308M" NP double cylinder master key with "963/03" 40-55mm x 5,4mm NP patent fixing screws	No	12		
10	66mm "IG950933338M" NP double cylinder master key	No	1		
11	"194/01 - TT001SS" Thumb turn and lock	Sets	11.0		
12	"195/01" Mortice W/C indicator (disabled) lock	Sets	2.0		
13	"ED910C" S/S cylinder escutheon	Pairs	3		
14	"131/69" Rebate for 700 series lock	Sets	13.0		
	HANDLES				
	Carried to Collection			R	

Section No. 1
Builder's Work
Bill No. 7
Ironmongery

	"GEZE" or other approved				
15	65 x 50mm "056/76" BR/SC flush pull ring	No	5		
16	"DB171BNC01" Hoppe Tokyo lever on N/style backplate cyclinder	Pairs	1		
17	130 x 111 x 19mm "JD213/111 BT" S/S b. thr. pull handle	No	9		
18	300 x 285mm "JHB216/300 BTB" S/S back-to-back square pull handle	Pairs	7.0		
19	330 x 305 x 25mm "JD213/305 BTB" S/S back-to-back pull handle	Pairs	2.0		
20	450 x 435mm "JHB216/450 BTB"S/S square pull handle	Pairs	2		
21	600 x 575mm "JHB216/600 BTB" S/S back-to-back squre pull handle	Pairs	2		
22	19mm / 165 x 165 x 1,5mm "Daytona - EDE/101C" plate cylinder handle	Pairs	13.0		
	PUSH PLATES AND KICKING PLATES				
	1,6mm "GEZE" or other approved stainless steel grade 304 push and kick plates				
23	160 x 1,232mm "079/160x1232x1.6" Push plate	No	46		
24	160 x 1,872mm "079/160x1872x1.6" Push plate	No	51		
25	160 x 600mm "080/160x600x1.6" Kick plate	No	4		
26	160 x 700mm "080/160x700x1.6" Kick plate	No	1		
27	160 x 813mm "080/160x813x1.6" Kick plate	No	26		
28	160 x 900mm "080/160x900x1.6" Kick plate	No	4		
29	160 x 1,000mm "080/160x1,000x1.6" Kick plate	No	16		
30	800 x 600mm "080/800x600x1.6" Kick plate	No	22		
31	800 x 900mm "080/800x900x1.6" Kick plate	No	26		
	Carried to Collection			R	

Section No. 1
Builder's Work
Bill No. 7
Ironmongery

	DOOR CLOSERS				
	"GEZE" or other approved				
32	"AZ3034SR" TS3000 door closer C/W ISM guide rail	Sets	1		
33	"AZ3035SR" TS3000E-ISM door closer INT SEL ELE MECH H/O SR	Sets	1		
34	"AZ2003SR" TS2000G DCL with g/rail and arm SR with three "ND0501" M5 patent fixing screws	Sets	6		
35	"AZ4001DA" TS4000P DA DCL C/W standard arm and pull arm and three "ND0501" M5 patent fixing screws	Sets	2.0		
36	"BZ501NVSS" TS500 NV double action floor spring NSO SS	Sets	2.0		
37	"AC3001SR" Silver lintel bracket	No	1		
	LETTERS, NAMEPLATES, ETC				
	"GEZE" or other approved				
38	160 x 160 x 0,9mm "079/160E/M" S/S E/Male push plate	No	1		
39	160 x 160 x 0,9mm "079/160E/F" S/S E/Female push plate	No	4		
40	160 x 160 x 0,9mm "079/160E/P" S/S E/Paraplegic push plate	No	2		
41	160 x 160 x 0,9mm "079/160E/FHR" S/S E/FHR push plate	No	1		
42	160 x 160 x 0,9mm "079/160E/FE" S/S E/F.EXT push plate	No	1		
43	160 x 160 x 0,9mm "079/160E/E" S/S E/ELE push plate	No	3		
	PELMETS AND CURTAIN TRACKS				
	Carried to Collection			R	

Section No. 1
Builder's Work
Bill No. 7
Ironmongery

	"Hospi-Showline" or other approved suspended cubical bedscreen curtain rails (see architect's detail drawing no. 101/07B)				
44	"Code SK/S21" Natural anodised (10 micron) extruded profile H/S 43353 hospital cubicle curtain track complete with 12 runners per linear meter, end stops, spacers and wall mountings fixed to suspended ceiling main and cross tees with ceiling hanger tubes to manufacturer's specifications	m	125		
45	Ditto, circular on plan	m	34		
46	Extra for end plugged	No	60		
47	Extra for bend	No	29		
48	Extra for cubicle number system	No	29		
	"Hospi-Track" or other approved bedscreen curtains				
49	"Code H/T/BS1900" curtain manufactured from poly-cotton/nylon, non-iron, non-stain, fully washable material @ a ratio of 1:25 to the length of the bedscreen rail (colour to clients request) (rail length measured)	m	159		
	"Hospi-Slick" or other approved drip rails				
50	"Code: H/S/DRI-3" Natural anodised (10 micron) extruded profile H/S/2897 1,500mm long, including stop ends and 50x50x38- softwood supports	No	31		
	"Hospi-Telescopic" or other approved intravenous drip hangers				
51	"CODE: H/T/D" Polished 304 Stainless Steel system-comprising of teflon handle and release button on shaft complete with "Code D/H/T4" 4 hooks for Trauma/ICU ward	No	31		
	50mm Wide slats wooden venetian blinds with aluminium head box with dust cover, ladder of knitted chords, flutterproof cross-straps and installed flush with window opening to comply with SANS 947:2007 (colour: Maple or Beech)				
	Carried to Collection			R	

Section No. 1
Builder's Work
Bill No. 7
Ironmongery

	To existing windows				
52	To window opening, 800 x 1,000mm high (existing window)	No	1		
53	To window opening, 1,300 x 1,000mm high (existing window)	No	2		
54	To window opening, 1,700 x 1,000mm high (existing window)	No	5		
55	To window opening, 2,300 x 1,500mm high (existing window)	No	12		
56	To window opening, 2,700 x 1,000mm high (existing window)	No	1		
	BATHROOM FITTINGS				
	"Franke" or other approved stainless steel				
57	145 x 25 x 130mm Toilet roll holder manufactured from 0,9mm 18/10 stainless steel with satin finish plugged (ZF18)	No	4		
58	156 x 141 x 303mm Two toilet roll holder with spindle system manufactured from 18/10 1,5mm stainless steel, satin finish with surface treatment - InoxPlus (anti-fingerprint), cylinder lock with standard key and including wall mounting kit (ZF14)	No	5		
59	100 x 134 x 304mm Surface mounted soap dispenser manufactured from 18/10 1,2/1,5mm stainless steel with satin finish with surface treatment - InoxPlus (anti-fingerprint), soap dispenser incorporating a replaceable and refillable 1 litre container suitable for liquid and antiseptic soaps and lotions, cylinder lock with standard key and including mounting kit (ZF12)	No	6		
60	900mm long x 32mm diameter hollow satin finish aluminium shower curtain rail with minimum 10 nylon wheeled runners per metre, fixed with wall brackets etc. to manufacturer's specifications (ZF40)	No	4		
	Carried to Collection			R	

61	1,800mm long x 32mm diameter hollow satin finish aluminium shower curtain rail with minimum 10 nylon wheeled runners per metre, fixed with wall brackets etc. to manufacturer's specifications (ZF40)	No	2			
62	1,800 x 1,800mm L-shaped x 32mm diameter custom hollow satin finish aluminium shower curtain rail with 15 nylon wheeled runners per metre, track pre-bent at a radius of approximately 900mm, fixed with wall bracket and 32mm diameter ceiling hanger tube etc. to manufacturer's specifications (ZF38)	No	2			
63	362 x 175 x 460mm Waste container for wall mounting manufactured from 18/10 0,9mm stainless steel with satin finish with seamed welded upper and lower edges with a 26 litre capacity and screws and dowels (ZF22)	No	6			
64	32mm Diameter x 750 x 260mm straight grab rail manufactured from 18/10 stainless steel with satin non-slip finish and screws and dowels to manufacturer's specifications (ZF33)	No	2			
65	32mm Diameter x 415 x 95 x 415mm 90 degree wall grab rail with FFG (Franke Fine Grip)-surface, 18/10 stainless steel covers, applicated mounting plates and screws and dowels to manufacturer's specifications (ZF31)	No	2			
66	484 x 526mm Fold down shower seat manufactured from 304 stainless steel with white polyethylene batterns with rounded corners and plugged (ZF27)	No	4			
	SUNDRIES					
	"GEZE" or other approved					
67	"140/69" S/S floor mounted doorstop	No	41			
68	"154/69" S/S hat and coat hook rubber buffer	No	9			
	SHELVES ETC					
	Carried to Collection				R	

Section No. 1
Builder's Work
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Ironmongery

	Medium duty slotted angle free standing steel shelving units with five (5) shelf levels, standard epoxy powder coated finish including assembling together with corner gussets and complete with standard bracing, end-frame angle uprights and all necessary accessories in accordance with manufacturer's specifications, size 914mm wide x 457mm deep x 2,438mm high units (see architect's drawing/s no. 101/70A)				
69	Single shelving of 914mm wide x 457mm deep x 2,438mm high units	m	31		
	STEEL LOCKERS				
	"Symo" or other approved steel lockers with standard baked enamel finish				
70	300 x 450 x 1,800mm High locker unit with two 900mm high stack lockers each with a single compartment complete with lock and bolted in position	No	8		
	PINNING BOARDS, WRITING BOARDS, PROJECTION SCREENS, ETC				
	Laminated softboard pinning board				
71	1,500mm Wide x 1,000mm high pinningboard of laminated softboard core with anodised aluminium channel surround mitred at the corners and plugged (PB1)	No	3		
72	3,000mm Wide x 1,200mm high pinningboard of laminated softboard core with anodised aluminium channel surround mitred at the corners and plugged (PB5)	No	3		
	Carried to Collection			R	

Section No. 1
Builder's Work
Bill No. 7
Ironmongery

Section No. 1

Builder's Work

Bill No. 7

Ironmongery

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Section No. 1
Builder's Work
Bill No. 7
Ironmongery

Item No		Quantity	Rate	Amount

PART C2:

SECTION 2

BILL 8

METALWORK

PREAMBLES

NOTE : Tenderers are advised to study the "MODEL PREAMBLES FOR TRADES" (2008 Edition) as recommended and published by the Association of South African Quantity Surveyors before pricing this bill.

SUPPLEMENTARY PREAMBLES

Supplementary preamble items as described in Bill No. 1, shall equally apply to this Bill.

GENERAL NOTES TO TENDERERS

General notes, described in Bill No. 1, shall equally apply to this Bill.

GENERAL NOTES TO ALUMINIUM FRAMED SHOPFRONTS

Shop Drawings

The successful tenderer shall provide shop drawings of all shopfronts, windows, etc. for approval by the Architect prior to putting any work in hand. The successful tenderer must also provide samples of the section that he intends using for approval prior to his appointment.

Glazing Specifications

Glazing shall be executed in strict accordance with the National Building Regulations, Part N, SABS 10137, SABS 10400, SABS 1263 and AAAMSA selection guide for safety glazing materials

Carried to Collection R

Section No. 1
Builder's Work
Bill No. 8
Metalwork

Aluminium Finish

Aluminium must comply with SABS and AAAMSA specifications

The colour finish to aluminium frames as specified in these Bills of Quantities is as follows: **Powder coated Matt Black**.

The successful tenderer will be required to submit samples to the Architect for approval.

Sliding tracks, etc.

Bottom sliding tracks are to be set flush with the finished floors

Ironmongery

All rates for windows, shopfronts, doors, etc. must include for taking delivery of and installation of the ironmongery to be specified and approved by the Architect.

Sub-frames

Descriptions of aluminium windows, doors, shopfronts, etc. shall be deemed to include for hardwood timber or aluminium sub-frames to the approval of the Architect and according to manufacturer's shop drawings, screwed and plugged to wall and top and sides only at approximately 250mm centres, with openings between wall and aluminium sealed with silicon sealer to match frame colour both internal and external

Protection

The Tenderer will be required to protect his work during construction, which shall be adequate and to the approval of the Architect. Such protection shall only be removed upon written instruction from the Architect.

Rates

Rates for shopfronts, doors, windows, etc. must include for all timber subframes, silicone sealant, installation of door handles, floorspring, ironmongery, etc. to ensure that the installation is waterproof, etc.

Carried to Collection R

Section No. 1
Builder's Work
Bill No. 8
Metalwork

	Descriptions Descriptions are referred to in these Bills of Quantities are intended for REFERENCE PURPOSES ONLY and where discrepancies between the Bill items and the drawings occur, the drawings shall take preference. Such discrepancies shall be qualified by the tenderers and failure to do so shall indemnify the Employer and/or his agents against any additional costs, etc. resulting from such discrepancies.					
	SUNDRY STEELWORK					
	"Kirk M-Trim" or other approved stainelss steel corner protectors					
1	50 x 50 x 3mm "SCP500" angle section corner protectors, 2,500mm in length with crimped wing edges, countersunk drilled holes and plugged	No	8			
	PRESSED STEEL DOOR FRAMES					
	1,6mm Double rebated pressed mild steel door frames complete with one-and-a-half pairs 100mm heavy duty butt hinges, adjustable striking plate, rubber buffers to lock and jamb and fixing lugs, suitable for half brick walls					
2	Frame for door, 700 x 2,032mm high	No	1			
3	Frame for door, 813 x 2,032mm high	No	10			
4	Frame for door, 1,000 x 2,032mm high	No	3			
5	Frame for double door, 1,800 x 2,032mm high	No	3			
	1,6mm Double rebated pressed mild steel door frames complete with one-and-a-half pairs 100mm heavy duty butt hinges to SWING both ways, adjustable striking plate, rubber buffers to lock and jamb and fixing lugs, suitable for one brick walls					
6	Frame for double door, 1,500 x 2,032mm high	No	1			
	STEEL WINDOWS, DOORS, ETC					
	Carried to Collection				R	

	Standard residential windows with standard burglar bars				
7	Window type NE4, 1,511 x 654mm high	No	1		
	NATURAL ANODISED ALUMINIUM LOUVRE UNITS				
	Fixed louvre units screwed into wooden frames				
8	Louvre unit for 300 x 600mm high opening	No	1		
9	Louvre unit for 600 x 200mm high opening	No	9		
10	Louvre unit for 600 x 600mm high opening	No	2		
	ALUMINIUM WINDOWS, DOORS, ETC.				
	Note:				
	Tenderers are referred to architect's drawings accompanying these bills of quantities for tender purposes				
	Purpose made fully glazed aluminium window 340 series as per drawings provided to meet minimum requirements of the Association of Architectural Aluminium of South Africa (AAAMSA), a performace certificate-, a ASFA certificate of conformance in respect of product finishes and a 10 year guarantee against peeling and discolouration are to be provided on completion, all safety glass is to be marked as per AAAMSA requirements, gaskets and weather strip are to be black in colour and all windows are to be class A2				
	Black powder coated aluminium shopfronts including doors etc. glazed with minimum 6,76mm HPR (high penetration resistance) laminated safety glass with bronze obscure tint laminate and plugged to brickwork or concrete				
11	Shopfront type DA08, 1,500mm wide x 2,400mm high	No	2		
	Carried to Collection			R	

Section No. 1
Builder's Work
Bill No. 8
Metalwork

Section No. 1

Builder's Work

Bill No. 8

Metalwork

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Section No. 1
Builder's Work
Bill No. 8
Metalwork

Item No		Quantity	Rate	Amount
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	SECTION 2			
	BILL 9			
	PLASTERING			
	PREAMBLES			
	NOTE : Tenderers are advised to study the "MODEL PREAMBLES FOR TRADES" (2008 Edition) as recommended and published by the Association of South African Quantity Surveyors before pricing this bill.			
	SUPPLEMENTARY PREAMBLES			
	Supplementary preamble items as described in Bill No. 1, shall equally apply to this Bill.			
	GENERAL NOTES TO TENDERERS			
	General notes, described in Bill No. 1, shall equally apply to this Bill.			
	SCREEDS			
	Screeds on concrete			
1	40mm Thick on floors and landings m2	577		
	Self levelling screed			
	Gloss finish self-levelling screed laid to manufacturer's specifications			
2	2mm Thick on floors and landings (F5) m2	577		
	INTERNAL PLASTER			
	Carried to Collection		R	

Section No. 1
Builder's Work
Bill No. 9
Plastering

	One coat cement plaster wood floated on brickwork				
3	On brick walls	m2	284		
4	On narrow widths	m2	5		
	One coat cement plaster with one coat gypsum skim plaster finishing coat				
5	On brick walls	m2	1 218		
6	On narrow widths	m2	10		
	EXTERNAL PLASTER				
	Cement plaster on brickwork				
7	On walls	m2	115		
	SPECIALIST PLASTER WALL COVERINGS				
	1mm Thick "Marmoran Permaspray - Rhine Castle colour" or other approved spray wall coating incorporating marble aggregate and acrylic resin, applied with a hooper gun on and including primer etc. by specialist applicator to manufacturer's specifications on plaster				
8	On walls (E2)	m2	115		
	Carried to Collection			R	

Section No. 1
Builder's Work
Bill No. 9
Plastering

Section No. 1

Builder's Work

Bill No. 9

Plastering

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Item No		Quantity	Rate	Amount
	PART C2:			
	SECTION 2			
	BILL 10			
	TILING			
	PREAMBLES			
	NOTE : Tenderers are advised to study the "MODEL PREAMBLES FOR TRADES" (2008 Edition) as recommended and published by the Association of South African Quantity Surveyors before pricing this bill.			
	SUPPLEMENTARY PREAMBLES			
	Supplementary preamble items as described in Bill No. 1, shall equally apply to this Bill.			
	GENERAL NOTES TO TENDERERS			
	General notes, described in Bill No. 1, shall equally apply to this Bill.			
	TILING NOTE			
	All PC amounts include for delivery to site, handling, storing, etc.			
	WALL TILING			
	300 x 600 x 9mmmm Porcelain tiles fixed to plastered walls with approved adhesives and grout to manufacturer's specifications and in compliance with the SABS approved standards, pattern and colour to architects approval (allow R300/m² prime cost for tiles supplied to site (excluding VAT)) (architect type: R7)			
1	On walls	284 m2		
	Carried to Collection		R	

Section No. 1
Builder's Work
Bill No. 10
Tiling

2	On narrow widths	m2	5		
	FLOOR TILING				
	600 x 600 x 9mm Thick non-slip porcelain tiles with matt finish, laid in approved pattern with approved adhesive and grout, (allow R300/m² prime cost for tiles supplied to site (excluding VAT)), laid to SABS approved standards with colour and pattern to architects approval (architect type: F7)				
3	On floors and landings (F7)	m2	8		
	CORNER PROTECTORS, DIVIDING STRIPS, ETC.				
	Corner protectors, trims, etc.				
4	12mm Stainless steel corner protector (S7)	m	150		
	Carried to Collection			R	

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Builder's Work
Bill No. 10
Tiling

Section No. 1

Builder's Work

Bill No. 10

Tiling

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PART C2:

SECTION 2

BILL 11

PLUMBING AND DRAINAGE

PREAMBLES

NOTE : Tenderers are advised to study the "MODEL PREAMBLES FOR TRADES" (2008 Edition) as recommended and published by the Association of South African Quantity Surveyors before pricing this bill.

SUPPLEMENTARY PREAMBLES

Supplementary preamble items as described in Bill No. 1, shall equally apply to this Bill.

Concrete pipes:

Pipes shall be jointed with ogee joints with rubber collars or socket and spigot joints with rubber rings

uPVC pipes and fittings:

Soil, waste and vent pipes and fittings shall be solvent weld jointed

uPVC pressure pipes and fittings:

Pipes for water supply shall be of the class stated

Pipes of 40mm diameter and smaller shall be plain ended with solvent welded uPVC loose sockets and fittings

Pipes of 50mm diameter and greater shall have sockets and spigots with push in type integral rubber ring joints. Bends shall be uPVC and all other fittings shall be cast iron, all with similar push-in type joints

Carried to Collection R

Section No. 1
Builder's Work
Bill No. 11
Plumbing and Drainage (Provisional)

Copper pipes:

Pipes shall be hard drawn and half-hard pipes of the class stated. Class 0 (thin walled hard drawn) pipes shall not be bent. Class 1 (thin walled half-hard), class 2 (half-hard) and class 3 (heavy walled half-hard) pipes shall only be bent with benders with inner and outer formers. Fittings to copper waste, vent and anti-syphon pipes, capillary solder fittings and compression fittings shall be "Cobra Watertech" type. Capillary solder fittings shall comply with ISO 2016. Only compression fittings shall be used in walls or in ground

Fixing of pipes

Unless specifically otherwise stated, descriptions of pipes shall be deemed to include fixing to walls etc, casting in, building in or suspending not exceeding 1m below suspension level

Reducing fittings

Where fittings have reducing ends or branches they are described as "reducing". In the case of pipes with diameters not exceeding 60mm only the largest end or branch size is given. Should the contractor wish to use other fittings and bushes or reducers he may do so on the understanding that no claim in this regard will be entertained. In the case of pipes with diameters exceeding 60mm all sizes are given and no claim for extra bushes, reducers, etc will be entertained

Wire gratings

Descriptions of gutter outlets etc shall be deemed to include wire balloon gratings

Exposed concrete surfaces

Exposed surfaces of concrete stormwater channels, cover slabs, inspection eye marker slabs, gulley tops, cleaning eye tops, catchpits, inspection chambers, etc shall be finished smooth with plaster

Carried to Collection R

Section No. 1
Builder's Work
Bill No. 11
Plumbing and Drainage (Provisional)

Excavations

No claim for rock excavation will be entertained unless the contractor has timeously notified the quantity surveyor thereof prior to backfilling

"Soft rock" and "hard rock" shall be as defined in "Earthworks"

Laying, backfilling, bedding, etc. of pipes

Pipes shall be laid and bedded and trenches shall be carefully backfilled in accordance with manufacturers' instructions

Where no manufacturers' instructions exist pipes shall be laid in accordance with clauses 5.1 and 5.2 of each of the following: SABS 1200 L : Medium-pressure pipelines LD : Sewers LE : Stormwater drainage Pipe trenches etc shall be backfilled in accordance with clauses 3, 5.5, 5.6, 5.7 and 7 of SABS 1200 DB : Earthworks (Pipe trenches) Pipes shall be bedded in accordance with clauses 3.1 to 3.4.1, 5.1 to 5.3 and 7 of SABS 1200 LB : Bedding (Pipes). Unless otherwise described bedding of rigid pipes shall be class B bedding

Flush pans

Flush pans shall have straight or side outlets and "P" or "S" traps as necessary

Stainless steelbasins, sinks, wash troughs, urinals, etc.

Units shall have standard aprons on all exposed edges and tiling keys against walls where applicable

Waste unions

Descriptions of waste unions shall be deemed to include rubber or vulcanite plugs and chains fixed to fittings

Steel sectional water tanks

Tanks shall comply with SABS CKS 114

Carried to Collection R

Section No. 1
Builder's Work
Bill No. 11
Plumbing and Drainage (Provisional)

	"Densyl" petrolatum anti-corrosion tape as manufactured by Denso SA (Pty) Ltd. Pipes to be taped shall be coated with the appropriate primer and the tape shall be applied with minimum 15mm lap per spiral unless otherwise described Couplings and fittings to pipes shall be taped in strict accordance with the manufacturer's instructions including all mastic, tape, "Layflat" sheeting, securing of same, etc					
	GENERAL NOTES TO TENDERERS General notes, described in Bill No. 1, shall equally apply to this Bill.					
	SANITARY FITTINGS					
	Stainless steel					
1	900 x 500 x 260mm Stainless steel inset single bowl wash trough manufactured from grade 304(18/10) stainless steel, fitted to sluice cupboard (cupboard elsewhere measured)	No	2			
2	1,000 x 510mm "GOX651" stainless steel inset double end bowl sink with recessed drainage ledge and folded edges, bowl to be fitted to kitchen cupboard (cupboard elsewhere measured), grade 304(18/10) stainless steel sink to comply with SABS 906 (ZA17)	No	1			
3	Model SSF Floor mounted Surgeon's Scub-up unit, length 1,200mm manufactured from grade 304 (18/10) 1.6mm stainless steel 150mm high integral splashback to back with radiused internal corners and provision for 40mm waste outlet, front and sides of unit to be double walled construction with inner wall sprayed with vermin proof bitumastic sound deadening, with 300 x 300mm removable inspection panels in the front skirting for access to fit the waste outlets in the trough, fixed to wall and floor with and including anchor bolts to manufacturer's specifications (ZB01)	No	1			
	Carried to Collection			R		

4	1,830 x 685mm "Model EC6 (350056)" combination bed pan and wash up sink manufactured from grade 304 (18/10) stainless steel - 1,6mm draining boards and 1,2mm bowls, unit to have a 150mm high integral splash back to rear and 15mm deep hospital bead 100mm apron to front and sides, fitted with two pressed seamless bowls with sluice bowl having an integral flusing rim and a 38mm inlet pipe for the flush valve, 110mm outlet on the sluice bowl, 610 x 460 x 230mm deep rince bowl with a 40mm waste discharging into a sluice bowl, underside sprayed with vermin proof bitumastic sound deadening and has a galvanised mild steel backing sheet, complete with 11 litre stainless steel high level cistern fitted with supa flush valve and pull chain, 41mm diameter stainless steel flush pipe and 41mm chrome plated coupling which is reduced on one end to fit 38mm diameter connection unit, code C-FM8.20 compression pan connector to suit and 110mm diameter waste outlet (ZB09)	No	1		
5	540 x 540mm "Model CH" slop hopper manufactured from grade 304 (18/10) 1,2mm stainless steel with a 100mm high integral splashback to the rear and both sides, the cone has an integral flushing rim and a 110mm waste outlet for pan connector, the inlet fitted with a 38 x 250mm long vertical flush pipe for a standard flush valve, fitted with a hinged bucket grid manufactured from 10mm diameter grade 304 (18/10) stainless steel round bar complete with 40 x 40mm square stainless steel wall mounting gallow brackets and four anchor bolts, installed together with approved 11 litre stainless steel high level cistern fitted with supa flush valve and pull chain, 41mm diameter stainless steel flush pipe and 41mm chrome plated coupling which is reduced on one end to fit 38mm diameter connection unit, code C-FM8.20 compression pan connector to suit and 110mm diameter waste outlet (ZB06)	No	1		
	<u>Vitreous china etc.</u>				
6	"Tuscany" or other approved vitreous china 90 degree outlet close rim washdown pan with matching 7 litre pushbutton top dual flush cistern complete with lid and fitments, with quality approved heavy duty wooden toilet seat (ZE05)	No	9		
	Carried to Collection			R	

Section No. 1
Builder's Work
Bill No. 11
Plumbing and Drainage (Provisional)

7	560 x 415mm "Tuscany" or other approved vitreous china rounded basin with three semi-punched tapholes with integrated overflow, 15mm "NM-502-21R" CP elbow action pillar taps with dry spout design, pop-up waste assembly, mounting kit, 400mm long flexible connector pipes with angle valves, basin bolted to wall with two 10mm bolts in strict accordance to manufacturer's specification (ZC06)+(ZG02)	No	6		
8	560 x 415mm "Tuscany" or other approved vitreous china rounded basin with three semi-punched tapholes with integrated overflow, 15mm "NM-851" CP elbow action basin mixer with progressive cartridge, pop-up waste assembly, mounting kit, 400mm long flexible connector pipes with angle valves, basin bolted to wall with two 10mm bolts in strict accordance to manufacturer's specification (ZC06)+(ZG06)	No	10		
9	565 x 275 x 310mm "Sweetpea" vitreous china wall hung urinal with top inlet, inlet fittings, 38mm CP domical grating, spreader with 20mm diameter htread and to hanger brackets (flushing valve elsewhere) (ZD05)	No	4		
	WASTE UNIONS ETC				
10	32mm Basin waste union	No	18		
11	38mm Bath or sink waste union	No	4		
	TRAPS ETC				
	Traps, etc including joints to steel pipe and/or fittings unless otherwise described				
	uPVC etc.				
12	32 - 40mm Butyl rubber deep seal "P" or "S" trap	No	2		
13	40 x 300mm Sink combination for double bowl with deepseal "P" trap	No	1		
	Brass				
14	40mm Shower trap including stainless steel grating	No	7		
	Carried to Collection			R	

Section No. 1
Builder's Work
Bill No. 11
Plumbing and Drainage (Provisional)

	"Cobra Watertech" or other approved CP				
15	32mm 340 CP bottle trap	No	17		
16	40mm 345/40 CP bottle trap with tail pipe	No	1		
	TAPS, VALVES, ETC				
	"Franke, Cobra" or other approved				
17	15mm CP angle regulating valve	No	55		
18	15mm "515-21" CP elbow action pillar type sink mixer with aerated swan neck swivel outlet (ZH77)	No	3		
19	FJ6000CP "Flushmaster Junior" urinal flush valve with flush pipe	No	1		
	"Franke" or other approved				
20	15mm "073-Liana-SQ" 200 x 200 x 2mm square CP polymer shower head (ZJ16)	No	4		
21	400mm "023TU-400" tubular shower arm (ZJ61)	No	4		
22	600mm "002/5SQ" square minimalist type hand shower rail with sliding hand shower holder (ZJ66)	No	4		
23	15mm "Dura DU-961" single lever undertile bath/shower diverter mixer (ZH45)	No	4		
24	15mm "Dura DU-970" CP single lever sink mixer with aerated swivel outlet and angle valves (ZH47 & ZH54)	No	1		
25	15mm "NM-519-21" elbow action hose bib tap with trigger spray (ZG05)	No	2		
26	15mm "NM-859SET1" single lever elbow action wall type diverter mixer with a hand shower, hose and holder (ZG10)	No	3		
	SANITARY PLUMBING				
	uPVC pipes				
27	50mm Pipes	m	140		
	Carried to Collection			R	

Section No. 1
Builder's Work
Bill No. 11
Plumbing and Drainage (Provisional)

28	110mm Pipes	m	50		
	Extra over uPVC pipes for fittings				
29	50mm Bend	No	73		
30	50mm Access bend	No	21		
31	50mm Access junction	No	3		
32	110mm Bend	No	20		
33	110mm Pan connector	No	10		
34	110mm Access bend	No	18		
	Sundries				
35	Testing waste pipe system		Item		
	WATER SUPPLIES				
	Class 1 copper pipes				
36	15mm Pipes	m	270		
37	22mm Pipes	m	55		
	Extra over class 1 copper pipes for capillary fittings				
38	15mm Fittings	No	270		
39	22mm Fittings	No	55		
	Copper overflow and service pipes				
40	15mm Service pipe 350mm girth	No	55		
	TESTING				
41	Testing water pipe system		Item		
	SLEEVES				
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Section No. 1

Builder's Work

Bill No. 11

Plumbing and Drainage (Provisional)

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Section No. 1
Builder's Work
Bill No. 11
Plumbing and Drainage (Provisional)

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	BILL 12				
	GLAZING				
	PREAMBLES				
	NOTE : Tenderers are advised to study the "MODEL PREAMBLES FOR TRADES" (2008 Edition) as recommended and published by the Association of South African Quantity Surveyors before pricing this bill.				
	SUPPLEMENTARY PREAMBLES				
	Supplementary preamble items as described in Bill No. 1, shall equally apply to this Bill.				
	GENERAL NOTES TO TENDERERS				
	General notes, described in Bill No. 1, shall equally apply to this Bill.				
	GLAZING TO STEEL WITH PUTTY				
	4mm Clear float glass				
1	Panes exceeding 0,1m2 and not exceeding 0,5m2	m2	22		
2	Panes exceeding 0,5m2 and not exceeding 2m2	m2	42		
	4mm Obscure glass				
3	Panes exceeding 0,1m2 and not exceeding 0,5m2	m2	10		
	GLAZING TO WOOD WITH PINNED ON BEADS (BEADS ELSEWHERE)				
	6,38mm Clear toughened safety glass				
4	Panes exceeding 0,1m2 and not exceeding 0,5m2	m2	3		
	Carried to Collection			R	

TOPS, SHELVES, DOORS, MIRRORS, ETC

6mm Silvered float glass copper backed mirrors with 10mm bevelled and polished edges holed for and fixed with chromium plated dome capped mirror screws with rubber buffers to plugs in brickwork or concrete

5	Mirror 600 x 900mm high with four dome-head mirror screws (ZF32)	No	12		

Carried to Collection R

Section No. 1
Builder's Work
Bill No. 12
Glazing

Section No. 1

Builder's Work

Bill No. 12

Glazing

COLLECTION

	Page No		Amount
Total Brought Forward from Page No.	60		
	61		
Carried Forward to Summary of Section No. 1		R	

Item No			Quantity	Rate	Amount
	PART C2:				
	SECTION 2				
	BILL 13				
	PAINTWORK				
	PREAMBLES				
	NOTE : Tenderers are advised to study the "MODEL PREAMBLES FOR TRADES" (2008 Edition) as recommended and published by the Association of South African Quantity Surveyors before pricing this bill.				
	SUPPLEMENTARY PREAMBLES				
	Supplementary preamble items as described in Bill No. 1, shall equally apply to this Bill.				
	GENERAL NOTES TO TENDERERS				
	General notes, described in Bill No. 1, shall equally apply to this Bill.				
	PAINT TO NEW WORK				
	ON FLOATED PLASTER				
	One coat primer and two coats of (matt) PVA emulsion paint to SABS 1586 (R3)				
1	On walls	m2	1 464		
	One coat alkali resistant plaster primer to SABS 1416, one coat undercoat to SABS 681 grade 1 and two coats matt (egg shell) enamel paint to SABS 630 (R2)				
2	On walls	m2	128		
	ON PLASTER BOARD				
	Carried to Collection			R	
	Section No. 1 **Builder's Work** **Bill No. 13** **Paintwork**				

	Three coats of super PVA external quality paint with colour to architect's approval (C4)				
3	On ceilings and cornices (C4)	m2	109		
	ON METAL				
	Rust inhibitive prime paint base coat complying with ANSI A250.10 and other relevant SABS and internationalstandards, undercoat complying to SABS 681 and twocoats enamel paint complying to SABS 630 type 2 for finish coat				
4	On door frames	m2	63		
5	On windows with burglar bars	m2	146		
6	On rails, bars, pipes, etc not exceeding 300 mm girth	m	16		
	ON WOOD				
	Three coats clear wood preservative				
7	On doors	m2	139		
8	On open slatted shelves, seats, etc of 50 x 30mm slats at 75mm centres (both sides measured over the full flat area)	m2	3		
	Carried to Collection			R	

Section No. 1
Builder's Work
Bill No. 13
Paintwork

Section No. 1

Builder's Work

Bill No. 13

Paintwork

COLLECTION

	Page No		Amount
Total Brought Forward from Page No.	63		
	64		
Carried Forward to Summary of Section No. 1		R	

Section No. 1

Builder's Work

SECTION SUMMARY - Builder's Work

Bill No		Page No		Amount
1	Alterations (Provisional)	8		
2	Masonry	12		
3	Waterproofing	13		
4	Carpentry and Joinery	23		
5	Ceilings, Partitions and Access Flooring	27		
6	Floor Coverings, Plastic Linings, etc	30		
7	Ironmongery	39		
8	Metalwork	44		
9	Plastering	47		
10	Tiling	50		
11	Plumbing and Drainage (Provisional)	59		
12	Glazing	62		
13	Paintwork	65		

Carried to Final Summary (Bills of Quantities) R

Section No. 1
Builder's Work

Item No		Quantity	Rate	Amount
	PART C2:			
	SECTION 3			
	BILL 1			
	PROVISIONAL SUMS			
	PREAMBLES			
	NOTE : Tenderers are advised to study the "MODEL PREAMBLES FOR TRADES" (2008 Edition) as recommended and published by the Association of South African Quantity Surveyors before pricing this bill.			
	SUPPLEMENTARY PREAMBLES			
	Supplementary preamble items as described in Section No. 1, Bill No. 1, shall equally apply to this Bill.			
	GENERAL NOTES TO TENDERERS			
	General notes, described in Section No. 1, Bill No. 1, shall equally apply to this Bill.			
	ATTENDANCE			
	The amounts allowed for "attendance" must provide for all services rendered, attendance of making good of all trades after "specialists", also for the use of any scaffolding and equipment.			
	JOINERY			
1	Provide the amount as indicated for supply and installation of joinery by a firm of specialists	Item		250 000.00
2	Allow for profit and attendance		%	
	SIGNAGE			
3	Provide the amount as indicated for signage by a firm of specialists	Item		50 000.00
	Carried to Collection		R	

4	Allow for profit and attendance		%	
	BUDGETARY ALLOWANCES			
	The following budgetary allowances are for work to be executed by the Contractor			
	Note: Work for which budgetary allowances are provided will be measured and valued in accordance with clause 32 of the Principal Building Agreement and deducted in whole or in part, if not required, without any compensation for loss of profit			
	Note: Budgetary allowances listed below are for work to be executed by the Main Contractor and will be measured and valued in terms of rates submitted against similar items in these bills.			
	Note: These items are to be taken into account in the pricing of Preliminaries and General as they will not attract separate Preliminaries of their own.			
5	Provide the amount as indicated for builders work related services	Item		50 000.00
	Carried to Collection		R	

Section No. 2
Provisional Sums
Bill No. 1
Provisional Sums

Section No. 2

Provisional Sums

Bill No. 1

Provisional Sums

COLLECTION

	Page No		Amount
Total Brought Forward from Page No.	67		
	68		
Carried to Final Summary (Bills of Quantities)		R	

Section No. 2
Provisional Sums
Bill No. 1
Provisional Sums

FINAL SUMMARY (BILL OF QUANTITIES)

Section No			Page No		Amount
	Preliminaries		Item		
1	Builder's Work		66		
2	Provisional Sums		69		
	SUB-TOTAL			R	
	ELECTRICAL & ELECTRONICS	m			
	MECHANICAL	m			
	Allow the sum for Contingencies		Item		500 500.00
	Allow the sum for (CPAP) Contract Price Adjustment Provision		Item		539 000.00
	SUB-TOTAL including Contingencies, but excluding Value Added Tax (VAT)			R	
	ADD: Value Added Tax (VAT) calculated at the rate of 15%			R	
	SUB-TOTAL			R	
	LESS: Credit for old materials		Item		
	TOTAL CARRIED TO FORM OF TENDER			R	

PROPOSED CONVERSION OF WARD 13 TO AN INTENSIVE CARE UNIT (ICU)

JOB SHIMANKANA TABANE (JST) HOSPITAL, RUSTENBURG

BILL NO 1: ELECTRICAL INSTALLATION

Item	Description	Unit	Qty	Rate	Amount
1	**Preliminaries & Generals**				
	General Items				
1.1	Compliance to Occupational Health and Safety (OHS) Act requirements	Item	1		
1.2	Site Establishment	Item	1		
1.3	Isolation, stripping of existing electrical distribution board(s), removal of existing socket outlets, lights, switches, isolators, cables and conductors etc. and making safe of the entire existing installation.	Item	1		
1.4	Comprehensive maintenance, with guarantees, of all sections of the works for a period of 12 months from the date of approved practical completion of the project.	Item	1		
	Commissioning and Testing				
1.5	Inspection, commissioning and applicable testing of the entire installation including certificates of completion	Item	1		
	Manuals				
1.6	Provision of operational and maintenance manuals in hard copies and PDF's on CD/DVD	Sets	3		
	Drawings				
1.7	As-built drawings of entire installation (DWG & PDF drawings for electronic submission on CD/DVD in addition to hard copies)	Sets	3		
	SUB-TOTAL : CARRIED FORWARD TO SUMMARY PAGE				R -

PROPOSED CONVERSION OF WARD 13 TO AN INTENSIVE CARE UNIT (ICU)

JOB SHIMANKANA TABANE (JST) HOSPITAL, RUSTENBURG

BILL NO 1: ELECTRICAL INSTALLATION

Item	Description	Unit	Qty	Rate	Amount
2	Low Voltage Cables:				
	Supply and install 600/1000V PVC/PVC/SWA/PVC copper cable laid in trenches or fixed to cable trays (cable trays measured elsewhere)				
2.1	70mm² 4-core cable	m	450		
2.2	35mm² 4-core cable	m	250		
2.3	16mm² 4-core cable	m	250		
	Cable Terminations:				
	Supply and install cable terminations for 600/1000V PVC/PVC/SWA/PVC copper cables				
2.4	70mm² 4-core cable	No.	2		
2.5	35mm² 4-core cable	No.	4		
2.6	16mm² 4-core cable	No.	4		
3	Earthing:				
	Bare copper earth conductor installed and strapped to cable (cable measured elsewhere) and building earthing				
3.1	50mm² BCEW	m	450		
3.2	25mm² BCEW	m	250		
3.3	10mm² BCEW	m	250		
	Earth Conductor Termination:				
	Termination for bare insulated copper conductors including lugs and connections				
3.4	50mm² BCEW	No.	2		
3.5	25mm² BCEW	No.	4		
3.6	10mm² BCEW	No.	4		
4	Sleeves:				
	Sleeve piping including short lengths and jointing, laid in trench (trench filling measured elsewhere)				
4.1	50mm diameter sleeve	m	300		
4.2	110mm diameter sleeve	m	300		
5	Distribution Boards:				
	Supply and install distribution boards complete with sheet metal tray, frames, sub-frames, bus-bars, provision for 30% future circuit breakers and legend card as per line diagram				
5.1	DB - ICU **(refer to drawing: G42-JST-ICU-E-300)**	Item	1		
5.2	DB - HVAC 1 **(refer to drawing: G42-JST-ICU-E-300)**	Item	1		
	Alteration of Main Panel in Substation Building for the feed to the proposed ICU				
5.3	Temporary isolation works of Main Panel in Substation	Item	1		
5.4	Supply, install and energise a new 150A 3P circuit breaker	No.	1		
	SUB-TOTAL : CARRIED FORWARD TO SUMMARY PAGE				R -

PROPOSED CONVERSION OF WARD 13 TO AN INTENSIVE CARE UNIT (ICU)

JOB SHIMANKANA TABANE (JST) HOSPITAL, RUSTENBURG

BILL NO 1: ELECTRICAL INSTALLATION

Item	Description	Unit	Qty	Rate	Amount
6	**Conduits and Accessories:**				
	Conduits chased into walls or fixed in ceiling voids				
6.1	20mm diameter PVC conduit	m	2,850		
6.2	25mm diameter PVC conduit	m	1,450		
6.3	20mm diameter galvanised conduit	m	250		
6.4	25mm diameter galvanised conduit	m	250		
	Conduit boxes and fittings chased into walls or fixed in ceiling voids				
6.5	100mm x 50mm x 50mm deep galvanised box	No.	50		
6.6	100mm x 100mm x 50mm deep galvanised box	No.	150		
7	**Conductors:**				
	Bare stranded copper earth conductor drawn into wireways				
7.1	2,5mm²	m	4,850		
7.2	4mm²	m	2,150		
	PVC Insulated stranded copper conductor drawn into wireways				
7.3	2,5mm²	m	4,650		
7.4	4mm²	m	3,350		
7.5	6mm²	m	1,650		
8	**Cable Trays:**				
	Wired mesh cable tray GS50 complete with accessories, short lengths, fixed to purlines or in ceiling voids				
8.1	300mm wide cable tray with mounting accessories	m	300		
9	**Wiring Channel:**				
	Galvanized steel channel complete with accessories, cover plates suspended from steel trusses or concrete slab including hangers or steel cables				
9.1	OL8000 channel complete with mounting accessories	m	300		
10	**Power-Skirting:**				
10.1	Supply and install 2-compartment power-skirting complete with accessories and covers	m	150		
10.2	16A 3-pin shaved earth socket outlet on power-skirting	No.	50		
10.3	16A 3-pin normal socket outlet on power-skirting	No.	50		
	SUB-TOTAL : CARRIED FORWARD TO SUMMARY PAGE				**R -**

PROPOSED CONVERSION OF WARD 13 TO AN INTENSIVE CARE UNIT (ICU)

JOB SHIMANKANA TABANE (JST) HOSPITAL, RUSTENBURG

BILL NO 1: ELECTRICAL INSTALLATION

Item	Description	Unit	Qty	Rate	Amount
11	**Bedhead Trunking Service System:**				
	Bedhead trunking system fixed to wall and as described below:				
11.1	**Type A:** 3.5m horizontal bedhead trunking unit complete with 3x 16A dedicated earth socket outlets and 3x 16A normal socket outlets switched via a 15A double-pole MCB with red LED indicator light (power switched on), 3x punchings for gas outlets, 1x punching for nurse call outlet, 1x reading light, 1x RJ-45 data point and 1x medical rail complete with mounting brackets; Supplier: Hutz Medical	No.	1		
11.2	**Type B:** 3.5m horizontal bedhead trunking unit complete with 6x 16A dedicated earth socket outlets and 6x 16A normal socket outlets switched via a 15A double-pole MCB with red LED indicator light (power switched on), 6x punchings for gas outlets, 2x punching for nurse call outlet, 2x reading light, 2x RJ-45 data point and 2x medical rail complete with mounting brackets; Supplier: Hutz Medical	No.	1		
11.3	**Type C:** 6m horizontal bedhead trunking unit complete with 9x 16A dedicated earth socket outlets and 9x 16A normal socket outlets switched via a 15A double-pole MCB with red LED indicator light (power switched on), 9x punchings for gas outlets, 3x punching for nurse call outlet, 3x reading light, 3x RJ-45 data point and 3x medical rail complete with mounting brackets; Supplier: Hutz Medical	No.	5		
11.4	**Type D:** 9m horizontal bedhead trunking unit complete with 9x 16A dedicated earth socket outlets and 9x 16A normal socket outlets switched via a 15A double-pole MCB with red LED indicator light (power switched on), 9x punchings for gas outlets, 3x punching for nurse call outlet, 3x reading light, 3x RJ-45 data point and 3x medical rail complete with mounting brackets; Supplier: Hutz Medical	No.	1		
12	**Light Switches:**				
	Flush switch with white cover plate and chrome screws in a box measured elsewhere;				
12.1	16A 1-lever 1-way switch	No.	20		
12.2	16A 1-lever 2-way switch	No.	6		
	SUB-TOTAL : CARRIED FORWARD TO SUMMARY PAGE				**R 0.00**

PROPOSED CONVERSION OF WARD 13 TO AN INTENSIVE CARE UNIT (ICU)

JOB SHIMANKANA TABANE (JST) HOSPITAL, RUSTENBURG

BILL NO 1: ELECTRICAL INSTALLATION

Item	Description	Unit	Qty	Rate	Amount
13	**Switched Socket Outlet:**				
	Flush switched socket outlets with white cover plate and chrome screws, mounted in a box measured elsewhere;				
13.1	16A normal single switched socket outlet white in colour suitable to accommodate SANS 164-1 and SANS 164-2 socket outlets	No.	10		
13.2	16A normal double switched socket outlet white in colour suitable to accommodate SANS 164-1 and SANS 164-2 socket outlets	No.	35		
14	**Power Isolators**				
	Power outlets with white cover plates and chrome screws, mounted in a box, measured elsewhere:				
14.1	30A double-pole isolator in 100mm x 100mm box	No.	10		
14.2	60A double-pole isolator in 100mm x 100mm box	No.	10		
14.3	60A double-pole UPS isolator mounted in 100mm x 100mm box	No.	1		
	Power outlets in outdoor utility box for external installations				
14.4	60A double pole isolator mounted in outdoor utility box for air-conditioning units	No.	10		
14.5	60A triple pole isolator mounted in outdoor utility box for air-conditioning units	No.	10		
15	**Luminaires and Equipment:**				
	Supply and install luminaries complete with lamps, connectors, electronic gear, drivers, etc. as described in the Lighting Schedule				
15.1	**Type D1** - 15W recessed LED downlight with COB antiglare <19; white die cast aluminium body and driver; overall diameter: 110*54; cut-out diameter: 90 – 95; 60° beam angle; lumen output: 1,300 lumens; CRI > 80; CCT: 4,000K; IP rating – IP54; flicker free driver;	No.	15		
15.2	**Type D2** - 15W recessed LED downlight with COB antiglare <19; white die cast aluminium body and driver; overall diameter: 110*54; cut-out diameter: 90 – 95; 60° beam angle; lumen output: 1,300 lumens; CRI > 80; CCT: 4,000K; IP rating – IP65; flicker free driver;	No.	5		
15.3	**Type D3** - 10W recessed LED downlight with COB antiglare <19; white die cast aluminium body and driver; overall diameter: 90*40; cut-out diameter: 75 – 80; 60° beam angle; Tiltable: 30°; Lumen output: 1,300 lumens; CRI > 80; CCT: 4,000K; IP rating – IP54; flicker free driver.	No.	5		
	SUB-TOTAL PAGE: CARRIED FORWARD TO SUMMARY PAGE				**R -**

PROPOSED CONVERSION OF WARD 13 TO AN INTENSIVE CARE UNIT (ICU)

JOB SHIMANKANA TABANE (JST) HOSPITAL, RUSTENBURG

BILL NO 1: ELECTRICAL INSTALLATION

Item	Description	Unit	Qty	Rate	Amount
15.4	**Type D4** - 18W recessed LED downlight with COB antiglare <19; white die cast aluminium body and driver; overall diameter: 110*54; cut-out diameter: 90 – 95; 60° beam angle; lumen output: 1,300 lumens; CRI > 80; CCT: 4,000K; IP rating – IP54; flicker free driver;	No.	40		
15.5	**Type F1** - Recessed 1200 x 600mm 60W side lit LED panel luminaire complete with aluminium frame; honeycomb diffuser and driver; control gear and 3m cab-tyre lead with 5A plug top. Life hours – 65,000 L70B10; UGR<19; Flicker free driver; CRI>80; CCT – 4,000K; IP42; Lumen output – 5,880 lumens;	No.	55		
15.6	**Type F2 -** Recessed 600 x 600mm 40W side lit LED panel luminaire complete with aluminium frame; honeycomb diffuser and driver; control gear and 3m cab-tyre lead with 5A plug top. Life hours – 65,000 L70B10; UGR<19; Flicker free driver; CRI>80; CCT – 4,000K; IP42;	No.	60		
15.7	20kVA 3-phase in / 3-phase out UPS unit to be installed in the DB room as per specifications and information schedule	No.	1		
16	**Supply and install galvanised draw-wire in all conduits and sleeve pipes**				
16.1	1,6mm diameter steel draw wire	m	500		
	SUB-TOTAL: CARRIED FORWARD TO SUMMARY PAGE				**R -**

PROPOSED CONVERSION OF WARD 13 TO AN INTENSIVE CARE UNIT (ICU)

JOB SHIMANKANA TABANE (JST) HOSPITAL, RUSTENBURG

BILL NO 1: ELECTRICAL INSTALLATION

Item	Description	Unit	Qty	Rate	Amount
BILLS OF QUANTITIES - ELECTRICAL INSTALLATION: SUMMARY PAGE					
1	SUB-TOTAL : PAGE 1				R -
2	SUB-TOTAL : PAGE 2				R -
3	SUB-TOTAL : PAGE 3				R -
4	SUB-TOTAL : PAGE 4				R -
5	SUB-TOTAL : PAGE 5				R -
6	SUB-TOTAL : PAGE 6				R -
	TOTAL: ELECTRICAL INSTALLATION - CARRIED FORWARD TO SUMMARY PAGE				R -

PROPOSED CONVERSION OF WARD 13 TO AN INTENSIVE CARE UNIT (ICU)

JOB SHIMANKANA TABANE (JST) HOSPITAL, RUSTENBURG

BILL NO 2: ELECTRONICS INSTALLATION

Item	Description	Unit	Qty	Rate	Amount
1	**Preliminaries & Generals**				
	General Items				
1.1	Compliance to Occupational Health and Safety (OHS) Act requirements	Item	1		
1.2	Comprehensive maintenance, with guarantees, of all sections of the works for a period of 12 months from the date of approved practical completion of the project.	Item	1		
	Commissioning and Testing				
1.3	Inspection, commissioning and applicable testing of the entire installation including certificates of completion	Item	1		
	Manuals				
1.4	Provision of operational and maintenance manuals in hard copies and PDF's on CD/DVD	Sets	3		
	Drawings				
1.5	As-built drawings of entire installation (DWG & PDF drawings for electronic submission on CD/DVD in addition to hard copies)	Sets	3		
	SUB-TOTAL : CARRIED FORWARD TO SUMMARY PAGE				**R -**

PROPOSED CONVERSION OF WARD 13 TO AN INTENSIVE CARE UNIT (ICU)

JOB SHIMANKANA TABANE (JST) HOSPITAL, RUSTENBURG

BILL NO 2: ELECTRONICS INSTALLATION

Item	Description	Unit	Qty	Rate	Amount
2	**Nurse Call System Installation**				
	Supply, deliver, install and commission the following:				
2.1	Nurse Call System Main Control Panel for system complete with LED indicator panels and complete with power supply unit, back-up battery and necessary accessories etc.	No.	1		
2.2	Bedhead Trunking Nurse Call Unit with inline socket for handheld unit and reset button	No.	16		
2.3	Patient Handheld Unit with nurse call functions	No.	16		
2.4	Bathroom Push Call Unit	No.	2		
2.5	Bathroom Pull Call Unit with nylon string	No.	4		
2.6	Overdoor ceiling mounted indication lights	No.	17		
2.7	Nurse Call System Cabling	m	1,650		
3	**Access Control & CCTV Installations**				
	This contract shall involve the supply, delivery, installation and configuration of all softwares including licensing and commissioning of the Access Control equipment as specified to the full satisfaction of the Consulting Engineer and Client's Technical and End-User's personnel. Rates shall include all WIRING & accessories required to make the system functional.				
3.1	Supply and install Intelligent Field Controller including all wiring	No.	1		
3.2	Supply and install 8-H Card Reader Module	No.	3		
3.3	Supply and install Dual Cabinet with power supply (8A)	No.	1		
3.4	Supply and install 8in 2out Door module - including all wiring back to controller	No.	5		
3.5	Supply and install Universal Reader Interphase Wiagand including all wiring	No.	1		
3.6	Supply and install a 12V DC 3.2A power supply unit including a 12V DC 7A/H battery-up	No.	5		
3.7	Exit Button Steel - Surface Mount, No Touch	No.	2		
3.8	Manual Call Point, Green - resettable element with hinged clear cover	No.	5		
3.9	Supply and install T10 Reader - Mifare, Black, including all wiring back to controller	No.	10		
3.10	Ethernet Cat-6A cabling complete with terminations	m	1,500		
3.11	8-core (4-pair) flexible communication cable	Lot	1		
3.12	RJ-45 plug and boots	Lot	1		
	SUB-TOTAL : CARRIED FORWARD TO SUMMARY PAGE				**R -**

PROPOSED CONVERSION OF WARD 13 TO AN INTENSIVE CARE UNIT (ICU)

JOB SHIMANKANA TABANE (JST) HOSPITAL, RUSTENBURG

BILL NO 2: ELECTRONICS INSTALLATION

Item	Description	Unit	Qty	Rate	Amount
	Central Equipment				
3.13	Supply and install rack mounted Access Control Server complete with Software Suite to support a minimum 300 doors, 1,000 tags		1		
3.14	Access Control PC Host and Management Workstation - supply, install and commission including appropriate operating system license, all surge protection and other accessories to make the installation complete. Workstation to enable full integration between CCTV, Access Control and Fire Detection Systems		1		
3.15	Supply and install Mifare Card Encoder		1		
3.16	Supply and install Card Printer		1		
3.17	Supply Mifare Classic Access Card		50		
	CCTV Installation				
	Supply and install the following CCTV cameras and equipment:				
3.18	Supply and install 5MP 360degrees high resolution dome type camera IP66 enclosure		10		
3.19	Enterprise Recording and Storage (50TB; Storage HD 90days)		1		
	Operator Workstation / Viewing Station				
3.20	High performance evaluation, analysis and processing unit for networking systems with pre-installed client software and operating system		1		
3.21	42" LED Monitor - 16:9 HD, 409.8 x 230mm, 1366 x 768, VGA, including brackets 50'000:1,5ms, 16.7 mil colours		1		
4	**Provisional Sum - ICT Installation**				
4.1	Allow the Provisional Sum of R 750,000.00 (Seven Hundred and Fifty Thousand Rand) for the ICT Installation to the ICU	Item	1		
4.2	Profit	%	5%		
4.3	Attendance	%	5%		
	SUB-TOTAL : CARRIED FORWARD TO SUMMARY PAGE				**R -**

PROPOSED CONVERSION OF WARD 13 TO AN INTENSIVE CARE UNIT (ICU)

JOB SHIMANKANA TABANE (JST) HOSPITAL, RUSTENBURG

BILL NO 2: ELECTRONICS INSTALLATION

Item	Description	Unit	Qty	Rate	Amount
BILLS OF QUANTITIES - ELECTRONICS INSTALLATION: SUMMARY PAGE					
1	SUB-TOTAL : PAGE 1				R -
2	SUB-TOTAL : PAGE 2				R -
3	SUB-TOTAL : PAGE 3				R -

PROPOSED CONVERSION OF WARD 13 TO AN INTENSIVE CARE UNIT (ICU)

JOB SHIMANKANA TABANE (JST) HOSPITAL, RUSTENBURG

SUMMARY PAGE: ELECTRICAL & ELECTRONICS INSTALLATION

Item	Description	Amount
1	Electrical Installlation	
2	Electronics Installation	
	TOTAL: ELECTRICAL AND ELECTRONICS INSTALLATION - CARRIED FORWARD TO FINAL SUMMARY	

NORTH WEST DEPARTMENT OF HEALTH
JST HOSPITAL ICU UNIT (WARD 13)
SECTION 1M - ICU (MEDICAL GASES INSTALLATIONS)

SCHEDULE 1 - ADDITIONAL P&G

Item	Description	Unit	Amount	
	Additional P & G in accordance with the Standard and Detailed specification			
1	**Site Establishment and site security and storage**			
01	Fixed	Item		
02	Value related	Item		
03	Time related	Item		
2	**Preparation of O & M manuals and re-commissioning reports**	Sum		
3	**Preparation of shop drawings samples etc.**	Sum		
4	**Provision of As Built Drawings As specified**	Sum		
7	**Location and protection of existing services**			
	Water and sewer pipes	Psum	R	5 000.00
	Electrical and other cables	Psum	R	5 000.00
8	**Engineering, Submissions & Approvals**	Sum		
9	**Additional tests required by the engineer**	PC Sum	R	6 500.00
10	**Occupational Health and Safety**			
PSA	**Compliance with OHS Act and Construction Regulation 153**	Sum		
11	**Decommissioning of Existing equipments and making the area safe.**	PC Sum	R	30 000.00
12	**Comissioning of the following in the presence of Engineer, client and user client**			
01	Medical gas installation	Sum		
13	**Training of user client**			
01	Training Of end users	Item		
18	Rigging and Crainage Provision of crain equipment for rigging of equipment to roof plant room as well as all the necessary rigging of equipment on the project.	Sum		
	Total carried to Summary Page			

JST HOSPITAL ICU UNIT (WARD 13)
SECTION 2.2 - PART 3 (MEDICAL GAS INSTALLATION)
BILL 1 -ICU -WARD 13

Item	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	Supply, deliver, install, test and commission complete medical piped gases installation in the hospital as detailed below.				
1.0	Vacuum Moisture Traps				
01	Vacuum moisture trap set consisting of moisture trap, brackets etc.	No.	2		
2.0	**Pipework**				
2.1	**Medical grade copper tubes with brazed joints in accordance with BS EN 737-1 and BS EN 13348, complete with all necessary clamping and support**				
01	42 mm NB	m	200		
02	35 mm NB	m	80		
03	28 mm NB	m	65		
04	22 mm NB	m	90		
05	15 mm NB	m	325		
06	12 mm NB	m	90		
07	10 mm NB	m	30		
2.2	**Pipework fittings – elbows**				
	Medical grade copper brazed joints in accordance with BS EN 737-1 and BS EN 13348				
01	OD 42mm	No.	15		
02	OD 35mm	No.	15		
03	OD 28mm	No.	10		
04	OD 22mm	No.	20		
05	OD 15mm	No.	30		
06	OD 12mm	No.	20		
07	OD 10mm	No.	15		
2.3	**Pipework fittings – tees**				
	Medical grade copper brazed joints in accordance with BS EN 737-1 and BS EN 13348				
01	OD 42mm	No.	45		
02	OD 35mm	No.	15		
03	OD 28mm	No.	10		
04	OD 22mm	No.	15		
05	OD 15mm	No.	15		
06	OD 12mm	No.	10		
07	OD 10mm	No.	10		
2.4	**Pipework fittings – couplings**				
	Medical grade copper brazed joints in accordance with BS EN 737-1 and BS EN 13348				
01	OD 42mm	No.	10		
02	OD 35mm	No.	10		
03	OD 28mm	No.	10		
04	OD 22mm	No.	20		
05	OD 15mm	No.	90		
06	OD 12mm	No.	20		
	Total carried forward				

JST HOSPITAL ICU UNIT (WARD 13)
SECTION 2.2 - PART 3 (MEDICAL GAS INSTALLATION)
BILL 1 -ICU -WARD 13

Item	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	Total Brought forward				
2.5	**Pipework fittings – reducers**				
	Medical grade copper brazed joints in accordance with BS EN 737-1 and BS EN 13348				
	Medical grade copper brazed joints in accordance with BS EN 737-1 and BS EN 13348				
01	42x35mm	No.	5		
02	35x28mm	No.	5		
03	28x22mm	No.	5		
04	22x15mm	No.	15		
05	15x12mm	No.	10		
06	12x10mm	No.	35		
3.0	**Bedhead Units, Pendants & Panels**				
3.1	**ICU Ward**				
01	**1 x Fixed Pendant Unit complete with 1 x pillar assembly - 600mm (service column & 4 x grabtube** complete with 8 x 16A SW/SO D/pole (blue - UPS Supply); 4 x 16A SW/SO D/Pole (Red) (Essential Supply); 1 x 50W reading light (relay switched); 1 x 5W LED night light (switch at door); 8 off medical gas installed; 1 x medical rail @ 600mm; 1 x nurse call (only provision); 1 x emergency call (only provision); 1 x RJ45 Data point/monitor point installed	No.	15		
3.2	**Cath Lab**				
01	**1 x Fixed Pendant Unit complete with 1 x pillar assembly - 600mm (service column & 4 x grabtube** complete with 8 x 16A SW/SO D/pole (blue - UPS Supply); 4 x 16A SW/SO D/Pole (Red) (Essential Supply); 1 x 50W reading light (relay switched); 1 x 5W LED night light (switch at door); 8 off medical gas installed; 1 x medical rail @ 600mm; 1 x nurse call (only provision); 1 x emergency call (only provision); 1 x RJ45 Data point/monitor point installed	No.	1		
	Total carried forward				

JST HOSPITAL ICU UNIT (WARD 13)
SECTION 2.2 - PART 3 (MEDICAL GAS INSTALLATION)
BILL 1 -ICU -WARD 13

Item	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	Total Brought forward				
	Threater Panel				
1.7.6	**Panel as follows**				
a	**recessed HU12 RS stainless steel theatre panel (LxW = 2mx1,6mx2m)** complete with first fix plate; 1 x pillar assembly - 600mm (servicecolumn & 4 grabtubes); 6 x 16A SW/SO D/Pole (Blue) (Ups Supply); 1 x RJ45 - data point/monitor point installed; 1 x emergency call provision; 4 x 16A D/Pole switches; 6 x 15A socket switched via D/Pole MCB; 1 x analogue clock; 1 x buzzer + mute; 1 x CD/Radio player with USB port; 1 x digital elapsed timer with remote (small); 3 isoloc indicator lights - (green/red/amber); 1 x power supply 12Vregulated; 1 x two 80W speakers; 1 x Xray viewing screen; 1 x monitor provision only plus mounting brackets (42"/32"/20"); 1 x gas alarm panel only; 1 x air conditioning control - provision only; 1 x 3A three pin euro socket switched via 15A D/pole MCB; 3 patient earth (banana plug); 13 x engraving/labels (per item); Medical Gases - 2 off oxygen; 2 off vaccum; 1 off LPA; 2 off HPA ; 1 off Nitrous Oxide; 1 off AGS; 1 x emergency call (provision only) and 1 x theatre panel	No.	1		
3.3	**Isolation rooms**				
01	**1 x Fixed Pendant Unit complete with 1 x pillar assebly - 600mm (service column & 4 x grabtube** complete with 4 x 16A SW/SO D/pole (blue - UPS Supply); 1 x 50W reading light (relay switched); 1 x 5W LED night light (switch at door); 7 off medical gas installed; 1 x medical rail @ 600mm; 1 x nurse call (only provision); 1 x emergency call (only provision); 1 x RJ45 Data point/monitor point installed	No.	1		
4.0	**Valves and valve boxes**				
4.1	**Valve Box**				
01	Flush-mounted 3 gas valve type complete with valves	No.	2		
02	Flush-mounted 4gas valve type complete with valves	No.	1		
03	Flush-mounted 1 gas valve type complete with valves	No.	0		Rate only
4.2	**Isolation valves proprietary for the gas line pressure at entrance to each building, for:**				
01	Oxygen on pipe size 28mm NB(set)	No.	3		
02	Vacuum on pipe size 42mm NB (set)	No.	3		
03	Medical air (400 kPa) on pipe size 28mm NB(set)	No.	3		
04	Nitrous oxide (400 kPa) on pipe size 15mm NB(set)	No.	3		
	Total carried forward				

JST HOSPITAL ICU UNIT (WARD 13)
SECTION 2.2 - PART 3 (MEDICAL GAS INSTALLATION)
BILL 1 -ICU -WARD 13

Item	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	Total Brought forward				
5.0	**Terminal units**				
	Medical gas specific terminal units to Eminence, labelled, including guide end piece valve filter, fixed on to the provided bed head trunking and final termination of pipes to the terminal units				
01	Oxygen	No.	0		Rate only
02	Vacuum	No.	0		Rate only
03	Medical air	No.	0		Rate only
6.0	**Alarms**				
01	Slave alarm panel installed complete with line pressure sensors and & vacuum stats.	No.	1		
02	Alarm cabling	m	20		
03	20mm Diameter Galvanised steel conduit for control wiring.	m	20		
6.0	**PIPEWORK**				
	Supply and install all interconnecting pipework including requisite valves to the plant room main supply pipes				
	Oxygen	Sum	1		
	Vacuum	Sum	1		
	Medical air	Sum	1		
	N2O	Sum	1		
10.0	Colour coding of Installation	Sum	1		
11.0	**TEST & COMMISSION**				
11.1	**Pressure testing**				
01	Pressure Testing of the entire pipework to the satisfaction of the Consulting Engineer.	Item	1		
11.2	**System Validation**				
01	Validation of installation as necessary	item	2		
02	Commission the entire System to the satisfaction of the Consulting Engineer.	Item	1		
	Total to Summary page				

NORTH WEST DEPARTMENT OF HEALTH
JST HOSPITAL ICU UNIT (WARD 13)
SECTION 1M - ICU (MEDICAL GASES INSTALLATIONS)

SUMMARY

Bill No.	Description	Amount
1.0	Preliminary and General	
2.0	Medical gas installation	
	CARRIED FORWARD TO MAIN CONTRACT SUMMARY	R -

NORTH WEST DEPARTMENT OF HEALTH
JST HOSPITAL ICU UNIT (WARD 13)
SECTION 1M - ICU (MECHANICAL INSTALLATIONS)
SCHEDULE 1 - ADDITIONAL P&G

Item	Description	Unit	Amount	
	Additional P & G in accordance with the Standard and Detailed specification			
1	**Site Establishment and site security and storage**			
01	Fixed	Item		
02	Value related	Item		
03	Time related	Item		
2	**Preparation of O & M manuals and re-commissioning reports**	Sum		
3	**Preparation of shop drawings samples etc.**	Sum		
4	**Provision of As Built Drawings As specified**	Sum		
7	**Location and protection of existing services**			
	Water and sewer pipes	Psum	R	15 000.00
	Electrical and other cables	Psum	R	15 000.00
8	**Engineering, Submissions & Approvals**	Sum		
9	**Additional tests required by the engineer**	PC Sum	R	10 000.00
10	**Occupational Health and Safety**			
PSA	**Compliance with OHS Act and Construction Regulation 153**	Sum		
11	**Decommissioning of Existing equipments and making the area safe.**	PC Sum	R	60 000.00
12	**Comissioning of the following in the presence of Engineer, client and user client**			
01	HVAC installation	Sum		
02	Plumbing , Drainage & Hotwater Installation	Sum		
03	Fire Installation	Sum		
04	Medical gas installation	Sum		
13	**Training of user client**			
01	Training Of end users	Item		
18	Rigging and Crainage Provision of crain equipment for rigging of equipment to roof plant room as well as all the necessary rigging of equipment on the project.	Sum		
	Total carried to Summary Page			

NORTH WEST DEPARTMENT OF HEALTH
SECTION 1.2 - PART 1 (HVAC)
BILL 1 - ICU (WARD 13)

Item	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
1.0	**EXTRACTION SYSTEM**				
	Supply, installation and setting of the following.				
1.1	**Extraction Fan Unit**				
01	EFU1 (through shaft 1), centrifugal exhaust dual fans for 5500L/s @ 300 Pa static pressure, installed complete with 2 off 1.5D Melanex lined attenuator, 3m riser, vibration isolation, square to round transformation, supports, bird screens, weather skirts, electric controls,3 stage filters and safeties and all appurtenances related.	No	1		
02	EFU2 (through shaft 2), centrifugal exhaust dual fans for 1500L/s @ 300 Pa static pressure, installed complete with 2 off 1.5D Melanex lined attenuator, 3m riser, vibration isolation, square to round transformation, supports, bird screens, weather skirts, electric controls ,3 stage filters and safetiesand safeties and all appurtenances related.	No	1		
1.2	**EFU 1 System Ducting(Beds 5-14)**				
1.2.1	**Un-insulated ductwork installed complete with fixing arrangements and hangers.**				
02	500X450	m	12		
01	400X400	m	15		
	300X300	m	18		
03	400 Dia	m	3		
04	350 Dia	m	5		
05	300dia	m	70		
06	200dia	m	4		
07	200 Dia Flexible duct	m	5		
08	300 Dia Flexible duct	m	5		
1.2.2	**Un- insulated ductwork . Fittings**				
	Transformations				
05	500X450 to 400X400	No	2		
06	500x400 to 400 Dia	No	2		
01	500x400 to 300 Dia	No	2		
02	500x400 to 350 Dia	No	4		
03	500x400 to 300x300	No	3		
04	500x400 to 300 Dia	No	3		
1.2.3	**Bends 90°**	m			
03	500X450	No	5		
04	400X400	No	5		
05	400 Dia	No	15		
	350 Dia	No	15		
	300dia	No	15		
	200dia				
1.2.5	**Shoes**				
01	500x400	No	0		Rate only
1.2.6	**Spigots**				
01	200dia	No	2		
02	300dia	No	18		
05	100dia	No	0		Rate only
1.2.7	**Stop Ends**				
02	300x300	No.	2		
03	400x400	No.	2		
	Total carried forward				

NORTH WEST DEPARTMENT OF HEALTH SECTION 1.2 - PART 1 (HVAC) BILL 1 - ICU (WARD 13)					
Item	**DESCRIPTION**	**UNIT**	**QTY**	**RATE**	**AMOUNT**
	Total Brought forward				
05	300 Dia	No	1		
06	400dia	No.	5		
1.2.8	**Velocity Control Dampers**				
02	350x350	No	1		
03	350x300	No	1		
04	200 Dia	No.	1		
05	300Dia	No	1		
1.2.9	**Curved blade extraction grille complete with OBD**				
01	400x350	No	7		
02	600x600	No	8		
1.2.10	**White polypropylene disc valve complete with OBD and flexible ducting.**				
04	Ø 200	No	10		
1.2.11	**Fire Dampers with fusible links**				
01	300x300	No	1		
02	300 Dia	No	1		
	Cath Lab				
	Supply and install Packaged unit as follows. Supply, deliver to site, and installation of following fully automatically controlled Package unit suitable for outdoor use complete with 3 stage (primary-G3, secondary-F8 and HEPA-H13) filters, Cooling capacity;22Kw Air Supply 3 stage Filteration: 2 stage, Primary, secondary & Hepa	No	1		
2.2	**SUPPLY AIR SYSTEM**				
	Supply and installation of Externally insulated ductwork installed complete with fixing arrangements and hangers complete with all necessary appurtenances As Follows:				
2.2.1	**PAU 01 System Ducting**				
03	700x400	m	5		
04	600x400	m	4		
04	500x400	m	5		
05	Ø 300	m	12		
2.2.1.2	**Insulated Flexible ducting**				
01	Ø 300	m	5		
2.2.1.3	**Transformations**				
01	700x400 to 600x400	No	2		
02	600x400 to 500x400	No	4		
03	800x550 to 350x350	No	4		
2.2.1.4	**Bends 90°**				
03	700x400	No	2		
05	Ø 300	No	2		
2.2.1.5	**Shoes**				
03	500x400	No	0		Rate only
05	Ø 300	No	0		Rate only
	Total carried forward				

NORTH WEST DEPARTMENT OF HEALTH
SECTION 1.2 - PART 1 (HVAC)
BILL 1 - ICU (WARD 13)

Item	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	Total Brought forward				
2.2.1.6	**Spigots**				
01	Ø 300	No	5		
	Externally insulated ductwork . Fittings				
2.2.1.7	**Stop Ends**				
01	500x400	No	1		
2.2.1.8	**Velocity Control Dampers**				
03	300 Dia	No	5		
2.2.1.9	**Fire Dampers with fusible links**				
01	700x400	No	1		
2.2.1.10	**White epoxy powder coated Supply Air 600x600 constant volume diffuser complete with flexible, plenum box, butterfly damper and mounted controllers and all appurtenances related. With neck size**				
01	Ø 300	No	5		
6	**Air Handling Units (AHU)**				
6.1	Supply, deliver to site, and installation of following fully automatically controlled air handling unit suitable for outdoor use complete with 3 stage (primary-G3, secondary-F8 and HEPA-H13) filters,Hepa Partitions are sealed to the internal side of the exterior wall, roof and floor panels to ensure zero air by-pass. 50 mm thickness of insulation •The AHU must be the heat recovery type with a Heat recovery wheel, it must come complete with pressure switches for filters and fans, fan motors and inverters. •Electrical control panel complete with Direct Digital Control (DDC) controller › Internal fitting of all sensors and pressure measurement devices › Built-in temperature, humidity and CO2 sensors › Internal electrical wiring for all components. Mixing box with damper and factory-mounted actuators. Supports and fixings, Magnehelic gauges across filter bank, 1.5D Eurolon infill, Return air fans, vibration isolation, supports, , variable speed drive, Plenum lights in each chamber with light switch per light, Damper motors on mixing box dampers and bypass dampers, Intake Weather louvres on plenum boxes or fresh air units, pressure gauges and thermometers and all appurtenances necessary for the safe and efficient operation of the system. Installed				
01	AHU1 (1st Floor beds 6 to15) Supply Air Quantity : 5825L/sec Percentage Fresh Air : 100% Cooling Capacity : 70 kW Type : horizontal	No	1		
	Total carried forward				

NORTH WEST DEPARTMENT OF HEALTH SECTION 1.2 - PART 1 (HVAC) BILL 1 - ICU (WARD 13)					
Item	**DESCRIPTION**	**UNIT**	**QTY**	**RATE**	**AMOUNT**
	Total Brought forward				
2.2	**SUPPLY AIR SYSTEM**				
	Supply and installation of Externally insulated ductwork installed complete with fixing arrangements and hangers complete with all necessary appurtenances As Follows:				
2.2.1	**AHU 01 Ducting**				
03	900x400	m	15		
04	700x400	m	6		
04	600x400	m	5		
04	400x400	m	4		
05	Ø 300	m	30		
2.2.1.2	**Insulated Flexible ducting**				
01	Ø 300	m	16		
2.2.1.3	**Transformations**				
01	900x400 to 700x400	No	2		
02	700x400 to 600x400	No	2		
03	600x400 to 500x400	No	4		
04	800x550 to 350x350	No	4		
2.2.1.4	**Bends 90°**				
03	900x400	No	2		
05	Ø 300	No	2		
2.2.1.5	**Shoes**				
03	500x400	No	0		Rate only
05	Ø 300	No	0		Rate only
2.2.1.6	**Spigots**				
01	Ø 300	No	16		
	Externally insulated ductwork . Fittings				
2.2.1.7	**Stop Ends**				
01	400x400	No	3		
2.2.1.8	**Velocity Control Dampers**				
03	300 Dia	No	16		
2.2.1.9	**Fire Dampers with fusible links**				
01	900x400	No	2		
2.2.1.10	**White epoxy powder coated Supply Air 600x600 constant volume diffuser complete with flexible, plenum box, butterfly damper and mounted controllers and all appurtenances related. With neck size**				
01	Ø 300	No	16		
	Total carried forward				

NORTH WEST DEPARTMENT OF HEALTH
SECTION 1.2 - PART 1 (HVAC)
BILL 1 - ICU (WARD 13)

Item	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	Total Brought forward				
3.0	**Fan Coil Units**				
	4 Way Blow Cassette Type Fan Coil Units (4 pipe system) installed complete with, low sound level centrifugal condensate pump (max 650mm pump head), 2 or 3 way valve kits provided with stop/balancing valves, hot and cold water pipes with terminating valves and unions. These units should be installed on galvanised steel cantilever brackets and on vibration padding. The LCD wired remote controller should be in a suitable position to be specified by the engineer. An auxillary drain pan should be included in this installation and condensate pipes are to be routed to the nearest drain, sloped and fitted with a 'p' trap.				
01	3.5Kw	No	5		
02	5,2Kw	No	1		
03	7,2Kw	No	2		
4	**Supply and installation of following: Complete with fittings and ancillaries for a complete installation**				
4.1	**Copper piping**				
01	1 5/8"	m	40		
02	5/8"	m	25		
03	1/2"	m	30		
04	3/8"	m	30		
05	1/4"	m	50		
4.2	**Refnet Joints**	No	8		
4.3	**BS boxes**				
01	4 port	No	2		
02	2 port	No	1		
03	1 Port	No	1		
5	**Split Air condition Unit**				
5	Midwall Type split Units installed complete with, low sound level centrifugal condensate pump (max 650mm pump head), The units should be installed on galvanised steel cantilever brackets and on vibration padding. The LCD wired remote controller should be in a suitable position as per drawing. Condensate pipes are to be routed to the nearest drain, sloped and fitted with a 'p' trap.				
01	18000Btu	No	1		
5	**Supply and installation of following: Complete with fittings and ancillaries for a complete installation**				
	Copper piping				
01	5/8"	m	5		
02	1/2"	m	5		
03	3/8"	m	5		
5.3	**Supply and installation of following complete with couplings and accessories for a complete installation:**				
	PVC piping for drainage				
01	50mm	m	15		
02	22mm	m	20		
	Total carried forward				

NORTH WEST DEPARTMENT OF HEALTH
SECTION 1.2 - PART 1 (HVAC)
BILL 1 - ICU (WARD 13)

Item	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	Total Brought forward				
8	**VRV CONDENSING UNIT**				
	Supply, Deliver to site Installation and commission of heat recovery VRV Outdoor Condensing unit of capacity as indicated below complete with plinth, vibration isolation pads and all necesary appurtenances for a complete installation.				
01	80Kw	No	1		
5	**Split Air condition Unit**				
5.1	Midwall Type split Units installed complete with, low sound level centrifugal condensate pump (max 650mm pump head), The units should be installed on galvanised steel cantilever brackets and on vibration padding. The LCD wired remote controller should be in a suitable position as per drawing. Condensate pipes are to be routed to the nearest drain, sloped and fitted with a 'p' trap.				
	18000Btu	No	1		
5.2	**Supply and installation of following: Complete with fittings and ancillaries for a complete installation**				
	Copper piping				
01	5/8"	m	3		
02	1/2"	m	3		
03	3/8"	m	3		
9.0	**Electrical works for above installation**				
01	Electrical Material and labour work to provide power from units to isolator point which will be supplied by Electrical contractor	Sum	1		
02	All control cabling associated with the above units,	sum	1		
03	Wired remote controller Wall mounted control unit in a suitable position to be specified by the engineer	No	7		
7	**Testing and balancing of system**	Item	1		
	HVAC installation				
	Total carried to Summary Page				

JST HOSPITAL ICU UNIT (WARD 13)
MECHANICAL INSTALLATION
Bill No.1 - Plumbing ICU
Hot and Cold water reticulation

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
1.0	Supply, Deliver to site install the following steam heated hotwater calorifier				
1.1	Capacity Range: 2500L Connect to the existing steam and condensate line including re-lagging, gladding and isolation valves	ITEM	1		
1.2	Schedule 40 stream pipe line including lagging and gladding				
01	40mm dia	m	10		
02	32mm dia	m	5		
03	25mm dia	m	5		
04	15mm dia	m	10		
1.3	Supply and installation of lagging and cladding of the steam piping.				
01	40mm dia	m	10		
02	32mm dia	m	5		
03	25mm dia	m	5		
04	15mm dia	m	10		
1.4	Supply and install steam PRV set arrangement consisting of the following:Pressure reducing valve, 2x Isolating Valves, 1x Steam separator, 2x Pressure gauges, 1x strainer, 1x Steam trap arrangement and 1x safety valve	Item	1		
1.5	Supply and installation of steam trap arrangement consisting of steam trap, strainers, non-return valves, sight glasses, steam & condensate isolating valves	Item	3		
2.0	**Hot water circulating Pumps** Supply, deliver, off-load and store on site and install hot water circulation pumps as specified				
	Flow: 4.32 m^3/h ; Head : 5m	No	2		
2.1	**CONTROL PANEL** Supply deliver, off-load , store on sit and install control panel including accessories as specified	No	1		
2.2	**ELECTRICAL WORK** Supply and install electrical work including power and control cabling and connections as specified for above installation	Item	1		
3.0	**HOT WATER PIPEWORK** Supply, deliver, off-load, store on site copper pipes class 2 SANS 460 including all fittings and other accessories for the plumbing work as specified and shown on the drawings sizes as follows including hangers, supports, anchors and fittings; Class 0 copper pipes : 15mm - 28mm Pipes chased into brick walls where possible and all other pipes fixed to walls in ducts with M10 rubber lined hanger brackets including M10 threaded rod not exceeding 500mm long and M10 drop-in				
01	Ø65mm	m	55		
02	Ø54mm	m	55		
03	Ø42mm	m	20		
04	Ø35mm	m	20		
05	Ø28mm	m	10		
06	Ø22mm	m	80		
07	Ø15mm	m	140		
	Total carried forward				

JST HOSPITAL ICU UNIT (WARD 13)
MECHANICAL INSTALLATION
Bill No.1 - Plumbing ICU
Hot and Cold water reticulation

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	Total Brought forward				
2.2	**INSULATION AND CLADDING**				
	Supply, deliver, off-load, store on site and install close cell polythene insulation complete with galvanized metal cladding for hot water pipes as specified and shown on the drawings sizes as follows:				
01	Ø65mm (50mm thick)	m	55		
02	Ø54mm (50mm thick)	m	55		
03	Ø42mm (25mm thick)	m	20		
04	Ø35mm (20mm thick)	m	20		
05	Ø28mm (15mm thick)	m	10		
06	Ø22mm (15mm thick)	m	20		
07	Ø15mm (10mm thick)	m	5		
2.3	Extra over class 0 copper pipes for capillary fittings				
01	15mm Fittings	No	85		
02	22mm Fittings	No	55		
03	28mm Fittings	No	20		
04	Ø35mm	No	15		
05	Ø42mm	No	15		
06	Ø54mm	No	20		
07	Ø65mm	No	20		
2.4	**ISOLATION VALVES**				
	Supply, delivery and installation of isolation valves on hot water pipes including all fitting and accessories				
01	Ø65mm	no.	5.0		
02	Ø54mm	no.	5.0		
03	Ø42mm	no.	5		
04	Ø35mm	no.	5		
05	Ø28mm	no.	5		
06	Ø22mm	no.	15		
07	Ø15mm	no.	35		
2.5	**PRESSURE REDUCING VALVES**				
	Supply deliver, off-load , store on sit and install pressure reducing valves on the cold water supply pipes to the hot water storage cylinders including all fittings and accessories	Item	1		
2.6	**EXPANSION RELIEF VALVES**				
	Supply deliver, off-load , store on sit and install expansion relief valves on the hot water storage cylinders including all fittings and accessories	Item	1		
	Total carried forward				

JST HOSPITAL ICU UNIT (WARD 13)
MECHANICAL INSTALLATION
Bill No.1 - Plumbing ICU
Hot and Cold water reticulation

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	Total Brought forward				
2.7	**VACUUM BREAKERS/ AIR RELEASE VALVES**				
	Supply deliver, off-load , store on sit and install vacuum breakers/air release valves on hot water storage cylinders including all fittings and accessories	Item	2		
2.8	**VACUUM BREAKERS/ AIR RELEASE VALVES**				
	Supply deliver, off-load , store on sit and install vacuum breakers/air release valves on hot water storage cylinders including all fittings and accessories				
2.9	**BALANCING VALVES**				
	Supply deliver, off-load , store on sit and install balancing valves on primary circuit including all fittings and accessories	Item	1		
2.10	**Pressure Testing of the installation**				
	Test and commission all the water heating systems including pressure test of all system components and performance test of the systems.	Item	1		
	Ditto but in the presence of and to the entire satisfaction of the consulting engineer	Item	1		
3.0	**WATER SUPPLIES**				
3.1	Sterilizing all water pipes prior to installation in strict accordance to the methods and specifications in SANS10252-	Sum	1		
3.2	**Copper Piping**				
	Class 0 copper pipes : 15mm - 28mm Pipes chased into brick walls where possible and all other pipes fixed to walls in ducts with M10 rubber lined hanger brackets including M10 threaded rod not exceeding 500mm long and M10 drop-in anchor				
01	15mm Pipes	m	150		
02	22mm Pipes	m	55		
03	28mm Pipes	m	10		
04	35mm Pipes	m	20		
05	42mm Pipes	m	20		
06	48mm Pipes	m	20		
07	50mm Pipes	m	80		
08	65mm Pipes	m	60		
09	80mm Pipes	m	-		
3.3	Extra over class 0 copper pipes for capillary fittings				
	15mm Fittings	No	115		
	22mm Fittings	No	85		
	28mm Fittings	No	90		
04	35mm Fittings	No	20		
05	42mm Fittings	No	15		
06	48mm Fittings	No	20		
07	50mm Fittings	No	80		
08	65mm Fittings	No	50		
09	80mm Fittings	No	60		
3.4	Testing : Pressure testing water pipe system	Item	1		
	Total carried summury				

MECHANICAL INSTALLATION
Bill No.3 - Plumbing
Drainage Installation

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	Total Brought down				
3.5	**PIPE PROTECTION**				
	Thermal cross-linked polyethylene foam pipe insulation minimum 20mm thick				
01	Insulation to 15mm pipe and couplings	m	150		
02	Extra for wrapping around 15mm fittings	m	150		
03	Insulation to 22mm pipe and couplings	m	55		
04	Extra for wrapping around 22mm fittings	m	55		
05	Insulation to 28mm pipe and couplings	m	10		
06	Extra for wrapping around 28mm fittings	m	10		
07	Extra for wrapping around 15mm valve	m	150		
08	Extra for wrapping around 28mm valve	m	10		
4.0	**DRAINAGE PLUMBING**				
4.1	uPVC pipes				
01	50mm pipes	m	350		
02	110mm pipes	m	185		
4.2	**Extra over uPVC pipes for fittings**				
01	50mm Bend	No	85		
02	50mm Access bend	No	65		
03	50mm access junction	No	20		
04	110mm Pan connector	No	55		
05	110mm Bend	No	65		
06	110mm Access bend	No	45		
07	110mm Access junction	No	35		
08	50mm Vent valve	No	10		
09	110mm Vent valve	No	10		
4.3	**WASTE UNIONS, ETC.**				
01	Sink waste code to Franke kitchen system refer to sink code	No	25		
02	303 Basin waste, without chain and stay, slotted and supplied with flanged , washer, plug with stirrup, without chain and stay 62mm diameter flange, 80mm long shrank G11/2" MI inlet, chrome plated	No	35		
03	323CP Shower waste, rough brass and chrome plated, with 75mm diameter shower grating and RB body G1/2" MI inlet, RB/CP shower "P" trap, rough brass, with shallow seal and chrome plated grating G1/2" FI outlet, RB	No	12		
4.4	**TRAPS, ETC.**				
01	38 x 38mm bottle-trap	No	24		
02	50mm Shower "P" trap	No	5		
4.5	**Testing**				
01	Pressure testing drainage pipe system	Item	1		
	Total carried to Summary Page				

JST HOSPITAL ICU UNIT (WARD 13)
SECTION 1M - ICU (MECHANICAL INSTALLATIONS)
Bill No: Fire Protection

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	Supply, installation and setting of the following.				
1	**FIRE PROTECTION**				
1.1	**FIRE HOSE REELS**				
	Supply and install 30m fire hose reels complete as specified	No.	3		
1.2	**PIPEWORK**				
	Supply and install medium grade, seamless galvanized mild steel pipework c/w pipe supports and accessories as specified and shown on the drawings				
01	100mm dia	m	0		Rate only
02	80mm dia	m	0		Rate only
03	65mm dia	m	50		
04	50mm dia	m	5		
05	32mm dia	m	30		
06	25mm dia	m	0		Rate only
1.3	**Extra over pipework as follows**				
1.3.1	Bends				
01	65mm. Dia	No	10		
02	32mm. Dia	No	15		
03	25mm. Dia	No	0		Rate only
1.3.2	Tees and reducing tees				
01	100 x 80 x 100mm	No	0		Rate only
02	80 x 65 x 80mm	No	0		Rate only
03	65 x 65 x 65mm	No	4		
04	50 x 32 x 50mm	No	0		Rate only
05	50 x 25 x 50mm	No	0		Rate only
06	32 x 32 x 32mm	No	6		
07	32 x 25 x 32mm	No	0		Rate only
08	25 x 25 x 25mm	No	0		Rate only
1.4	**PORTABLE FIRE EXTINQUISHERS**				
	Supply and install fire extinguishers complete as specified				
01	4.5 kg DCP Dry Powder	No	6		
02	4.5 kg CO2	No	2		
03	9 kg DCP Dry Powder	No	0		Rate only
04	9 kg CO2	No	1		
	Total carried forward				

JST HOSPITAL ICU UNIT (WARD 13)
SECTION 1M - ICU (MECHANICAL INSTALLATIONS)
Bill No: Fire Protection

Item	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	Total Brought forward				
1.5	**Evacuation Chairs**				
	Supply and installation of Mobile Evacuation Stair Chair, the Chair must be Foldable,Portable Stair Chair Lift with 4 Wheels, it must meet the need for Firefighter Evacuation for Transferring Patients Or People with Limited Mobility Up&Down Stairs.	No	4		
2.0	**SIGNAGE**				
	Supply, deliver, off-load and install signs as specified on the drawings				
01	E1	No	12		
02	E2	No	6		
03	E3	No	4		
04	F16	No	6		
05	F45	No	6		
06	F4	No	6		
07	F5/F6	No	6		
08	EE3	No	5		
3.0	**Emergency and Evacuation plan**				
01	Provide detailed emergency and evacuation plan	Sum	1		
4	**Fire Sealing**				
01	Fire sealing by specialist of Entire ICU unit	PSum	1	R 45 250.00	R 45 250.00
4.0	**TEST & COMMISSION**				
01	Pressure tesing of Piping as specified	Sum	1		
02	Commission the Entire Fire Protection Services Installation	Item	1		
03	Ditto but in the presence of and to the entire satisfaction of the Consulting Engineer.	Item	1		
	Total Carried to summary				

NORTH WEST DEPARTMENT OF HEALTH

BILL NO 7: FIRE AND SMOKE DETECION

CONTRACT: SECTION 1M - ICU (MECHANICAL INSTALLATIONS)

AREA: ALL LEVELS

ITEM No	Description	Unit	Qty	Rate	Total
	Fire and Smoke Detection				
	Supply,installation,test and commissioning of the complete fire detection & Gas suppression system equipment as shown on the drawings. All equipment to comply with the relevant SABS and EN Standards. The sytem shall be complete with an Evacuation system. Equipment to be **Ziton** or similar and equal approved.				
1.0	**Fire Detection**				
01	4 Loop Addressable Fire Control Panel (AFCP). • Up to 127 devices per loop.• All loop devices must incorporate switch settings enabling them to be assigned a unique address, the location of which is pinpointed & polled by the panel every two seconds. • Monitoring: Open and short circuit fault, earth leakage, sensor removed & wrong device type. • Wiring 2 core screened • User Interface • all sw and licences • Expandable system with distributed intelligence..• Programmable zones >500, event log • 4 Fire output changeover relays and 1 Fault output relay (NC), open collector outputs for Fire, Fault and pre-alarm remote indication. • fully monitored conventional sounder outputs on main panel & each sub panel • Switched outputs (standard) • printer 24 character (built into front door) • Integral rechargeable sealed lead acid battery and charger, with 24 hour back up in the event of supply mains failure • Software Firmware & site configuration programming - Flash memory • Communications ports Z-Port 1 Planner, RS 232 Z-Port 2 Network, RS 485 / fibre optic • Selectable features Common sounders, Coincidence alarm, RMC fire, RMC fault, Zone walk test • Control output, Output delays, Alarm counter, Sounder silence delay, Alarm verification • Standby batteries 2 x 12 volt sealed lead acid - up to 28 Ah accommodated inside panel enclosure.	No.	1		
02	Mimic Panel with built-in short circuit isolation will be sited at the indicated locations. It will provide system repeat facilities to repeat all of the liquid crystal display messages as well as the common indications. It will 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 Annunciator Panel will be loop driven and provided with an inbuilt isolator. It will be complete with built-in battery, charger, 220V AC supply and will be located as shown in the floor layout drawings	No.	2		
03	TCP/IP communication interface. • Supply - 24V DC / 28 mA • Configuration – USB mini • Communication connection type – RJ45 • Input - Restart Switch • Windows 10	No.	1		
04	Addressable Triple Input and Triple Output Module. A loop powered device that permit the interfacing of third party equipment with the Fire Alarm Control panel using normally open dry contact connections. Key Features: Loop Powered, Status LEDs for each I/O and O/P, short-circuit loop isolator.	No.	2		
05	12VDC 8 Ah Battery	No.	8		
06	Addressable Optical Smoke Beam Detector	No.	35		
07	Addressable Heat Detector	No.	2		
	Total carried forward				

NORTH WEST DEPARTMENT OF HEALTH

BILL NO 7: FIRE AND SMOKE DETECION

AREA: All

ITEM No	Description	Unit	Qty	Rate (Supply & Install)	Total
	Total Brought forward				
08	Addressable, indoor, ceiling mount electronic sounder with strobe / beacon (30 to 130 flashes per minute, alarm signals should bered in colour). Minimum sound pressure leve: 65 dB(A) at a frequency between 500 Hz and 1000 Hz. Maximum sound level should not exceed 120 dB(A). For areas where people are sleeping, sounder devices should produce a minimum 75 dB(A) at the bed-head with all doors shut.	No.	2		
09	Addressable, outdoor, wall mount electronic sounder with beacon (30 to 130 flashes per minute, alarm signals should bered in colour)., IP65. Minimum sound pressure leve: 65 dB(A) at a frequency between 500 Hz and 1000 Hz. Maximum sound level should not exceed 120 dB(A).	No.	1		
10	Addressable Manual Call Point (Red). Surface mount, resettable element, LED indication	No.	6		
11	Addressable Detector Base	No.	35		
12	XP95 Blank Xpert card	No.	35		
13	Remote LED indicator, recessed	no.	21		
14	IP interface module	no.	2		
15	Fire Resistant PH120 Fire cable. Twisted 2C x 1.5 Sq.mm + E, Stranded	m	1100		
16	Fire Resistant UTP CAT6 Data Cables incl connectors	m	40		
17	GSM/GPRS Interface Module	No.	1		
2.0	Containment & wire ways				
01	25mm galvanized conduits (Bosal or similar approved)	m	485		
02	P9000 trunking	m	105		
3.0	**Integration of Other systems to fire detection for compliance**				
01	Line Relays - Interface to Smoke extraction fans / HVAC systems, Voice Evacuation System, Access Control, Elevators, Fire doors.	no.	7		
4.0	**Commissioning & Documentation**				
01	Testing, commissioning & compliance to statutory instruments	Sum	1		
02	Training of Personnel	Sum	1		
03	COCs	Sum	1		
5.0	**Provisional Amount**				
01	Provision of Voice Evacuation system linked to the fire system.	Psum	1	215 000.00	215 000.00
	Total Carried To Summary (Excluding VAT)				

JST HOSPITAL ICU UNIT (WARD 13)
SECTION 2.2 - PART 1 MEDICAL EQUIPMENT)
BILL 2 - MEDICAL EQUIMENT

Item	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	Supply, installation and setting of the following.				
1	**AUTOMATIC BEDPAN WASHERS**				
01	Supply, deliver, offload and store on site automatic bedpan washers as specified.	No.	1		
02	Installallation	No.	1		
2	**AUTOMATIC SLUICE MACHINE**				
01	Supply, deliver, offload and store on site automatic sluice machine as specified and shown on the drawings.	No.	1		
02	Installallation	No.	1		
	Total carried to Summary Page				

NORTH WEST DEPARTMENT OF HEALTH
JST HOSPITAL ICU UNIT (WARD 13)
SECTION 1M - ICU (MECHANICAL INSTALLATIONS)
SUMMARY

Bill No.	Description	Amount
1.0	Preliminary and General	
2.0	HVAC installation	
3.0	Plumbing and wet services	
4.0	Fire installation	
5.0	Fire Detection	
6.0	Medical Equipment	
	CARRIED FORWARD TO MAIN CONTRACT SUMMARY	

PART C3

SCOPE OF WORK

health
Department of
Health
North West Province
REPUBLIC OF SOUTH AFRICA

TENDER No. NWDOH 17/2026

CONVERSION OF EXISTING WARD 13 TO ICU AT JST HOSPITAL, RUSTENBURG

Part C3.1 Scope of Work

1 DESCRIPTION OF THE WORKS

1.1 Employer's objectives

Upgrade existing facilities at J S T Hospital

1.2 Overview of the works

Repurposing of an existing ward.

1.3 Extent of the works

Construction of a new maternity ward, a guard house, refurbishment of existing wards and external services including upgrading of the road network and demolition of existing redundant buildings

1.4 Location of the works

Existing J S T Hospital

GPS co-ordinates: -25.6777652, 27.2452006

1.5 Temporary works

No specific temporary works required

2 ENGINEERING

2.1 Design services

Works designed by, per design stage:

Concept, feasibility and overall process	Employer
Basic engineering and detail layouts to tender stage	Employer
Final design to approval for construction stage	Employer
Temporary works	Contractor
Preparation of as-built drawings	Contractor

2.2 Employer's design

The Employer is responsible for the design of the permanent works unless otherwise stated. The Contractor is responsible for the design of the temporary works and their compatibility with the permanent works.

2.3 Design brief

The Contractor shall supply all details necessary to assist the Architect in the compilation of the as-built drawings.

As-built drawings to indicate the following information:

- Construction breaks and the extent of individual concrete pours
- Routing of and junctions in all services
- Salient features for the operation and maintenance of services

and to be submitted to the following employer's required format and manner:

- A paper copy complete with approval signatures of the agent/agents bound into the operating instruction manuals
- Tiff format scanned versions of the approved paper copy
- Electronic version of approved drawings on CD in either Caddie.drw or Autocad.dwg formats

2.4 Drawings

The following drawings are applicable to the contract:

NOTE: These drawings are only for indication of the extent of the works. Full set of drawings are available on request.

Drawing number

ARCHITECTURAL DRAWINGS

See the attached drawings.

2.5 Design procedures

Not Applicable

3 PROCUREMENT

3.1 Preferential procurement deliverables

Where the contractor claims a preference in the Preferencing Schedule for subcontracting work to CIDB registered contractors having specified CIDB contractor grading designations, the contractor shall deliver deliverable C1, Provide business opportunities for targeted enterprise, in accordance with the requirements of the CIDB Specification for Social and Economic Deliverables in Construction Works Contracts (SSED) (see www.cidb.org.za) and the following associated specification data associated with SANS 1914-1 which shall have precedence in the interpretation of any ambiguity or inconsistency:

2.7	The employer's representative is the Project Manager identified in the Contract Data
2.17	A targeted enterprise is a CIDB registered contractor who has a contractor grading designation of 1, 2, 3 or 4.
	The targeting strategy is A.
	The contract participation goal is as tendered in the Preferencing Schedule for which a preference was granted.
	The contract participation goal may only be achieved by subcontracting work to one or more targeted enterprises to perform commercially useful functions in the performance of the contract.
	The targeted enterprise declaration and letters of undertaking are to be submitted within 3 months of the commencement of the contract.

The Employer reserves the right to subcontract up to 30% of the works where deemed necessary.

3.2 Provide employment and skills development opportunities to targeted labour

The contractor shall deliver Deliverable B1, provide employment and skills development opportunities to targeted labour, in accordance with the requirements of the CIDB Specification for Social and Economic Deliverables in Construction Works Contracts (SSED) (see www.cidb.org.za) and the following associated specification data, which shall have precedence in the interpretation of any ambiguity or inconsistency:

4.3.1.1	The following activities are to be carried out by temporarily employed local workers: ● earthworks activities which are to be performed by hand, namely. trench excavation, compaction of backfilling to trenches in areas not subject to traffic, clearing and grubbing, shaping, loading, haul, off-loading, spreading, compaction and grassing ● stone pitching and rubble masonry ● manufactured elements ● Sundry alteratioin work
4.3.2.1.2	The rate per day is as per regulated going rate in the area.
The specification data associated with SANS 1921-5 is as follows:	
	Essential data 5.1 The depth of trenches which are to be excavated by hand is **0,60** m

	Variations Compaction to filling under roads and parkings will be enhanced by machine compaction and will be as per the required density and will be tested to achive the specified results **Additional clauses** ..... State additional requirements and identify other activities to be performed by hand, as required

The Schedule which is to be attached to payment claims in terms of clause 4.3.2.2.8 of SSED is as shown in Figure 1.

3.3 Participation goals

The participation goals are to be divided into the following categories:

3.3.1 Subcontracting a minimum of 40% of the contract value to contractors having a CIDB contractor grading of 1 to 4.

3.3.2 Employ a minimum of 40% of the total labour requirement of the contract from the local community.

3.3.3 The total labour requirements of the contract should be in the following proportions:

- a minimum of 40% to women;
- a minimum of 30% to youth who are between the ages of 18 and 35 years of age; and
- a minimum of 5% to persons with disabilities

3.4 Social and economic deliverables

The contractor shall deliver the following deliverables as described in the CIDB Specification for Social and Economic Deliverables in Construction Works Contracts (SSED) and the following associated specification data:

1) Deliverable ……
2) Deliverable ……

The Specification Data shall have precedence in the interpretation of any ambiguity or inconsistency between it and these standards.

Each item of Specification Data given below is cross-referenced to the clause in the standard to which it mainly applies.

The associated Specification Data is as follows:

Deliverable ……..	
Clause	Specification data
Variations: 1)…… 2)……..	
Additional clauses: 1)…….	
Deliverable ……..	
Clause	Specification data
Variations: 1)…… 2)……..	
Additional clauses: 1)…….	

4 CONSTRUCTION

4.1 Works specification

The works specifications that are applicable to the works are marked with a cross hereunder in the relevant box(es). The specifications are obtainable on request from the Employer.

Architectural, Structural and Civil

X	General Specification for Material and Methods to be used for Building Contracts	GP/ASC

Electrical

X	Standard quality specifications for Intercom Systems	GP/E1/1
X	Standard quality specifications for Public Address Systems	GP/E1/2
X	Standard quality specifications for Silent Call Systems	GP/E1/3
X	Standard quality specifications for Access Control Systems	GP/E2/1
X	Standard quality specifications for Intruder Alarm Systems	GP/E2/2
X	Standard quality specifications for Fire Detection Systems	GP/E2/3
X	Standard quality specifications for Standby Generators	GP/E4/1
X	Standard quality specifications for UPS Systems	GP/E4/2
X	Standard quality specifications for Solar Power Systems	GP/E4/3
X	Standard quality specifications for General Installations	GP/E5/1
X	Standard quality specifications for Material and Equipment	GP/E5/2

Mechanical

X	Standard quality specifications for Heating Installations	GP/M2
	Standard quality specifications for Steam and Condensate Reticulation	GP/M4
X	Standard quality specifications for Medical Gas and Vacuum Systems	GP/M5
X	Standard quality specifications for Air Conditioning Installations	GP/M6
X	Standard quality specifications for Refrigeration Services	GP/M

4.1.1 Applicable SANS 2001 standards

The Contractor shall ensure that a master installation electrician is required to oversee and certify any electrical work to the works.

4.1.2 Applicable national and international standards
4.1.3 Particular / generic specifications
4.1.4 Certification by recognised bodies
4.1.5 Agrément certificates

4.2 Plant and materials

4.2.1 Plant and materials supplied by the employer

Not applicable

4.2.2 Materials, samples and shop drawings

Samples of materials

The contractor shall furnish samples of materials and specimens of finishes as may be called for by the supervisor for his approval

Workmanship samples

The supervisor may instruct the contractor to furnish samples of workmanship for his approval. Where the supervisor requires an assembly of various elements of the building or installation which is not incorporated in the works, the contractor shall arrange such an assembly at the employer's expense and the contract value shall be adjusted accordingly

Shop drawings

Only shop drawings and samples submitted for approval by the contractor shall be considered by the supervisor. The supervisor's approval of shop drawings or samples shall be limited to checking for general conformity with design and specification and shall not alter the design responsibilities in terms of the agreement. Where shop drawings are called for:

The contractor shall:

- Prepare, or ensure that a subcontractor, manufacturer, supplier or distributor prepares shop drawings at their own expense
- Submit sufficient copies of shop drawings to the supervisor for approval
- Allow the supervisor reasonable time to approve shop drawings
- Keep a record of all shop drawings submitted to the supervisor
- Ensure that shop drawings conform to the dimensions of built work
- Submit sufficient copies of the approved shop drawings to the supervisor for his use and for use on the works
- Ensure that work is not executed from shop drawings that have not been approved by the supervisor

The supervisor shall:

- Check the shop drawings submitted by the contractor timeously
- Advise the contractor where shop drawings are approved or are to be resubmitted

4.2.3 Instruction manuals and guarantees

The Contractor shall hand over to the project manager any operating and instruction manuals, data, product guarantees or instructions required by the project manager or provided by the manufacturers, suppliers or subcontractors

Operating and instruction manuals are to be submitted to the following employer's required format and manner:

- One master manual which contains all original certificates
- Three copies of the master manual

4.2.4 Training staff of the employer

The Contractor shall train all relevant staff of the employer in the safe operating procedures of the starting up, maintaining and shutting down of equipment supplied, all to the approval of the project manager.

4.3 Construction equipment

4.3.1 Requirements for equipment

4.3.2 Equipment provided by the employer

4.4 Existing services

4.4.1 Known services

Services are existing on site and an investigation will have to be carried out to locate them

4.4.2 Dimensional accuracy

The contractor shall within 4 weeks of the access date check the existing levels, lines, profiles and the like affecting the works and satisfy himself as to the dimensional accuracy of work previously executed. The contractor shall forthwith notify the supervisor

4.4.3 Treatment of existing services

4.4.4 Use of detection equipment for the location of underground services

4.4.5 Damage to services

The Contractor is responsible for fixing services damaged by him/her or his/her employees

4.4.6 Reinstatement of services and structures damaged during construction

4.5 Site establishment

4.5.1 Services and facilities provided by the employer

Water and Electricity

The Employer does not warrant that any water or electricity supply that may exist is adequate for the proper execution of the works. Where such supply is inadequate, the contractor shall provide an adequate supply at his own expense

Service - Water

The Contractor shall make and upon completion remove all the necessary temporary plumbing connections to the Employer's water supply at designated points and make use of water free of charge for construction purposes only.

Service - Electricity

The Contractor shall make and upon completion remove all the necessary temporary installation to the Employer's electrical supply at designated points and make use of electricity free of charge for construction purposes only.

Ablution facilities

The Employer shall permit the Contractor where applicable, usage of the existing ablution facilities. The Contractor shall maintain such facilities in a thoroughly clean and tidy condition and make good any damage thereto at his

4.5.2 Facilities provided by the contractor

The Contractor shall provide, maintain and remove on completion of the works an office for the exclusive use of the project manager and supervisor, minimum size 4 x 3 x 3m high internally, suitably insulated and ventilated, provided with electric lighting and fitted with boarded floor, table and eight chairs. The office shall be kept clean and fit for use at all times.

The Contractor shall provide, maintain and remove on completion of the works sheds for the proper storage of materials and for use by the contractor's workers.

4.5.3 Storage and laboratory facilities

4.5.4 Other facilities and services

Water and Electricity

The Employer does not warrant that any water or electricity supply that may exist is adequate for the proper execution of the works. Where such supply is inadequate, the contractor shall provide an adequate supply at his own expense

Service - Water

The Contractor is to provide and remove and make good upon completion all the necessary temporary plumbing connections and purchase water from the local authority for the works at his own cost.

The Contractor shall make and upon completion remove all the necessary temporary plumbing connections and water meters to the Employer's water supply at designated points and be responsible for costs associated with all water consumption.

Service - Electricity

The Contractor is to provide and remove and make good upon completion all the necessary temporary electrical connections and installations and purchase electricity from the local authority for the works at his own cost.

The Contractor shall make and upon completion remove all the necessary installation and meters to the Employer's electrical supply at designated points and be responsible for costs associated with all electricity consumption.

Ablution facilities

The Contractor is to provide, erect where directed, and remove on completion of the works ablution facilities and shall maintain such facilities in a thoroughly clean and tidy condition.

Telecommunication facilities

The Contractor shall provide the following telecommunication facilities and shall be entitled to recover usage costs from the users thereof:

- Telephone
- Facsimile
- E-mail

Security of the works

The Contractor shall take all appropriate measures for general security of the works.

Compliance with manufacturer's instructions

The Contractor shall take delivery of, handle, store, use, apply and fix all products in strict accordance with the manufacturer's instructions.

Protection/isolation of existing/sectionally occupied works

The Contractor shall provide all temporary measures to protect/isolate the existing and/or sections of the occupied works and remove such measures on completion.

4.5.5 Vehicles and equipment

4.5.6 Advertising rights

4.5.7 Notice boards

The Contractor shall provide, erect where directed, maintain and remove on completion of the works a notice board, size 2,44m wide and 2,89m high, according to the standard drawing available from the employer, constructed of suitable boarding with flat smooth surface and with edging bead 19mm thick round outer edges and projecting 12mm from face of boarding and rounded on front edge. The board shall be securely fixed to hoarding, where hoarding is provided, or fixed to and including a suitable supporting structure of timber or tubular posts and braces.

The lettering is to be 50mm and 100mm "sans serif" in ivory white on the blue background and in 100mm "sans serif" in navy blue on the ivory white background. The inscription, in one language only, which must bear the approval of the Project Manager. No other names or notice boards may be erected without the written approval of the Project Manager.

Sketch drawings of all proposed names or notice boards must be submitted to the Project Manager for approval, before being prepared and erected on site. These sketch drawings must not only show the full content of the proposed names or notice boards, but also the position and locality in which the boards will be erected.

4.5.8 Notice before covering work

The contractor shall give adequate notice to the project manager whenever any work or material which is subject to inspection or remeasurement is to be covered or concealed in any way. In default of such a notice being received timeously by the project manager such work shall be exposed and later made good at the contractor's expense.

4.6 Site usage

4.7 Permits and way leaves

4.8 Inspection of adjoining properties

Before commencing with the works the project manager and contractor shall arrange with the owners of adjacent buildings and properties and representatives of local authorities to inspect, among others, the buildings, structures, pavings, kerbs, channels and fences. The contractor shall record all conditions that the works could affect and copy the project manager accordingly. The contractor shall pay particular attention to cracks, defects and existing levels related to structures, pavings, kerbs, channels and fences, which later could be claimed to have been caused or disturbed by the works.

Where instructed by the project manager, levels and photographs shall be taken by the contractor and the cost thereof shall be for the employer's account. Certified copies shall be lodged with the project manager.

4.9 Water for construction purposes

4.10 Survey control and setting out of the works

5 MANAGEMENT

5.1 Management of the works

5.1.1 Applicable SANS 1921 standards

5.1.2 Particular / generic specifications

5.1.3 Planning and programming

5.1.4 Sequence of the works

5.1.5 Software application for programming

5.1.6 Methods and procedures

5.1.7 Quality plans and control

5.1.8 Environment

5.1.9 Accommodation of traffic on public roads occupied by the contractor

5.1.10 Other contractors on site

5.1.11 Testing, completion, commissioning and correction of defects

Testing of plant and equipment

The Contractor shall provide all necessary test apparatus including ladders, scaffolding, tools, lighting, etc as may be necessary for inspection, examining and testing materials, workmanship and performance of any plant or equipment intended for the works.

The Contractor shall carry out preliminary tests on plant and equipment. The results of these preliminary tests shall be forwarded to the Project Manager.

Where the Contractor fails to carry out preliminary tests the project manager may engage others to execute the tests. Any expense or loss incurred by the employer resulting from such engagement may be recovered in terms of the contract.

The Contractor shall execute maintenance for the following services from completion until the defects date. Maintenance shall include for the replacement or repair of all components and include for stationary, replacement parts, lubrication, cleaning material, etc.

Preventative Maintenance

The Contractor shall:

- Visit the installation at least once per month
- Make all necessary adjustments for the correct operation of the plant
- Maintain all lubrication levels
- Clean all relevant machinery/equipment and affected plant rooms
- Record all work performed in a logbook

Scheduled Services

The Contractor shall:

- Perform all scheduled services in accordance with the operating and maintenance manuals
- Complete all maintenance schedules

- Clean all relevant machinery/equipment and affected plant rooms
- Record all services in a logbook

Break Downs

The Contractor shall:

- Attend to all call outs with due diligence
- Make good any defects due to inferior material and/or workmanship
- Clean all relevant machinery/equipment and affected plant rooms
- Record all work performed in a logbook

Vandalism

The Contractor shall:

- Attend to all call outs with due diligence
- Prove vandalised breakages
- Submit a price for repairs to the agent
- Effect repairs on receipt of instruction
- Clean all relevant machinery/equipment and affected plant rooms
- Record all work performed in a logbook

Administration

The Contractor shall:

- Submit all relevant contact details to the maintenance site foreman including the start and end dates of the maintenance period
- Supply a triplicate record type logbook for the installation to be kept in the office of the foreman
- Report to the foreman when visiting the site
- Sign off all logbook records with the foreman or his duly appointed representative
- Not shut down any part of the plant or installation without the approval of the institution management
- Convene three quarterly site meetings for the purpose of performance tracking. This meeting is to be attended by the site foreman, the employer's maintenance inspector and the agent
- Complete a site meeting record in the logbook, which must be signed by the foreman and the agent
- Submit a monthly invoice with copies of the monthly site inspection record, any service records and all relevant schedules

5.1.12 Recording of weather

The Contractor shall erect an effective rainfall gauge on the site and record daily rainfall figures in a book. Such book shall be handed to the Project Manager at site meetings. Any rainfall which is considered to justify a compensation event is to be made known to the Project Manager within 1 week of occurrence.

5.1.13 Format of communications

5.1.14 Key personnel

5.1.15 Management meetings

Site Meetings and Procedures

The Project Manager and the Contractor shall hold meetings relating to the progress of the works at regular intervals and at other such times as may be necessary. The Contractor shall attend all site meetings and shall ensure that all persons under his jurisdiction are notified timeously of all site meetings should the Project Manager require their attendance at such meetings.

The indicative duties of the *Project Manager*, *Supervisor* and *Employer* are as indicated in Annexure A

The Contractor shall keep on site a set of minutes of all site meetings, daily records of resources (people and equipment employed), a site instruction book, a complete set of contract working drawings and a copy of the procurement document and make these available at all reasonable times to all persons concerned with the contract.

5.1.16 Forms for contract administration

5.1.17 Electronic payments

5.1.18 Daily records

5.1.19 Bonds and guarantees

5.1.20 Payment certificates

Material on site must be substentiated by invoices and only 80% of the value shall be certified

Before the employer's agent issues any certificate that includes any payment in respect of work done or goods supplied by any subcontractor, the contractor is to furnish reasonable proof of payments to subcontractors. These shall be made available at all reasonable times to all persons concerned with the contract. A monthly report on job creation should be submitted together with claims signed off by contractor, construction project manager and contractor liason officer.

5.1.21 Permits

5.1.22 Proof of compliance with the law

5.1.23 Insurance provided by the employer

5.2 Health and safety

5.2.1 Health and safety requirements

The contractor shall be responsible for compliance with the requirements of the Construction Regulations issued in terms of the Occupational Health and Safety Act, 1993, as a principal contractor and shall manage the health and safety aspects of the works in accordance with the requirements of Specification for Occupational Health and Safety in engineering and construction works contracts contained in (See Annexure).

The abovementioned standard makes several references to the Specification Data for data, provisions and variations that make these standards applicable to this contract. The Specification Data shall have precedence in the interpretation of any ambiguity or inconsistency between it and these standards.

The contractor shall within one week of the starting date and prior to commencing with the works, submit to the Project Manager for approval a suitable and sufficiently documented health and safety plan, based on this specification and the risk assessment that is conducted. No *access* to the site will be allowed to the contractor without the documented health and safety plan being submitted to and approved by the Project Manager.

Each item of Specification Data given below is cross-referenced to the clause in the standard to which it mainly applies.

Should it be found that there some materials on site contain asbestos, the contractor shall employ services of an Occupational Hygenist and his own expense to conduct a report on how the asbestos is to be removed and site. Such report shall be given to the health and safety consultant for scrutiny and approval before commencement of the works

The associated Specification Data is as follows:

Clause	Specification data
4.4.6(c)	The following needs to be taken into account in the risk assessment:

5.2.2 Protection of the public

5.2.3 Barricades and lighting

5.2.4 Traffic control on roads

5.2.5 Measures against disease and epidemics

5.2.6 Aids awareness

The Contractor as an obligation of the contract is required to promote HIV/AIDS awareness in accordance with requirements of SANS 1921-6

5.3 Annexes

Health and Safety Specification

PART C4

SITE INFORMATION

health
Department of
Health
North West Province
REPUBLIC OF SOUTH AFRICA

TENDER No. NWDOH 17/2026

CONVERSION OF EXISTING WARD 13 TO ICU AT JST HOSPITAL, RUSTENBURG

Part C4.1 Site Information

See attached site plan

C4.1 THE SITE

The site is located at J S T Hospital, GPS co-ordinates: -25.6777652, 27.2452006

C4.2 WORK AREA

The existing J S T Hospital Premises

C4.3 ACCESS

The access is through the main gate.

DEPARTMENT OF HEALTH NORTH WEST PROVINCE

CONVERSION OF EXISTING WARD 13 TO ICU AT JST HOSPITAL, RUSTENBURG

ANNEXURES

DEPARTMENT OF HEALTH NORTH WEST PROVINCE

CONVERSION OF EXISTING WARD 13 TO ICU AT JST HOSPITAL, RUSTENBURG

TECHNICAL SPECIFICATIONS

Contract
Reference No. **NWDOH 17/2026**

PROPOSED CONVERSION OF WARD 13 TO AN INTENSIVE CARE UNIT (ICU) AT THE JOB SHIMANKANE TABANE HOSPITAL, RUSTENBURG

PART B: ELECTRICAL INSTALLATION

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2	Detailed Project Specifications: Nurse Call Installations	17 - 20
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4	Bills of Quantities – Electrical & Nurse Call Installations	23
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SECTION 1: DETAILED PROJECT SPECIFICATIONS - ELECTRICAL INSTALLATIONS

1 GENERAL INFORMATION FOR THE CONTRACTOR

1.1 TENDER PRICE

The unit price in the bill of quantities shall be net and VAT exclusive.

1.2 CONTRACT WORK

The entire electrical installation shall be carried out entirely by the Electrical Contractor's own staff and shall not in any way be sub-let.

1.3 SITE VISIT

Tenderers must visit the site to ascertain the local conditions, and to allow in their tenders for all equipment, material, labour, and other costs to complete the work as specified.

The Job Shimankane Tabane (JST) Hospital is in the town of Rustenburg.

Permission must be obtained from the client representative before any tenderer visits the site.

No claims for extras will be allowed if the Tenderer overlooks site conditions and does not allow for these circumstances in their tender.

The tenderer must thoroughly familiarise themselves with the extent of the work being done and clear up all uncertainties beforehand.

1.4 SUPPLY AUTHORITY

The supply authority is the Rustenburg Local Municipality, and the electrical contractor must submit a certificate of compliance for the electrical installations.

This must be signed by an Electrician who is a permit holder in accordance with the requirements of the Occupational Health and Safety Act, Act 85 of 1993 as revised to the owner of the building.

A copy of the certificate of compliance will be handed to the supply authority and a copy to the Engineer.

1.5 INFORMATION TO BE SUBMITTED WITH THE TENDER

THE TENDERER'S ATTENTION IS DRAWN TO THE FACT THAT IF THE SCHEDULES OF THIS SPECIFICATION ARE NOT COMPLETED, HIS TENDER CANNOT BE ADJUDICATED AND MAY BE DISQUALIFIED.

1.6 SEQUENCY OF WORK

The sequence in which the work is to be carried-out must be determined in collaboration with the authorised representative of the Principal Contractor.

1.7 SUPERVISION

The works must under all circumstances be supervised by a qualified and experienced representative of the Contractor who must be registered as an accredited person.

The representative must be authorised by the Contractor and must be able to receive instructions on behalf of the Contractor.

1.8 MAKING GOOD

The Electrical Contractor shall carry-out, in all instances, any work to be made good such as damage to, or disturbance of the buildings or installations, caused by himself or his employees during the execution of this contract, at his own cost.

1.9 ELECTRICAL EQUIPMENT

All the equipment and material must comply with the attached General Specification and must have the approval of the Engineer.

1.10 SCOPE OF THE SUB-CONTRACT

This contract covers the supply, delivery, installation, testing and commissioning of the entire electrical installation associated with the proposed conversion of Ward 13 to an Intensive Care Unit (ICU) at the Job Shimankane Tabane Hospital, Rustenburg, North-West Province.

The scope of electrical installation works shall consist of the following and as indicated on the drawings and schedules:

- Stripping of all the existing electrical installations – the Electrical Contractor shall isolate the electrical supply to the existing building and remove luminaires, socket outlets, light switches, bedhead trunking, wiring and other electrical equipment as per the building plans and as directed by the Electrical Engineer.
- The supply and installation of all 600/1000V PVC/PVC/SWA/PVC cables with earth wire from the main distribution panel to the new main distribution board as indicated on the schematic diagrams and cable schedule.
- The supply, installation, and commissioning of a new circuit breaker in the main distribution board.
- Supply, installation, and commissioning of a 20kVA UPS units for uninterrupted power supply to critical circuits.
- The excavation and back-filling of all cable trenches.
- The supply and installation of all the required electrical distribution boards fitted with the equipment as per the single line schematics.
- The supply and installation PVC sleeves, conduits, and manholes with draw-wire for data, telephone, fire detection, alarm systems, sound distribution, and access control, CCTV System etc., for systems to be installed by others.
- The supply and installation of cable trays, ladders and trunking for cable management and reticulation in the ceiling voids and open areas
- The supply and installation of outlet boxes for data, telephone, fire detection, alarm systems, access control, CCTV System etc. as indicated on the drawings

- The supply and installation of all indoor and outdoor luminaires
- Supply and installation of switched and un-switched socket outlets, isolators, power outlets etc. as indicated on the electrical drawings.
- Earthing of all buildings and steel structures in compliance with the Electrical Machinery Regulations Clause 13: Earthing of the Occupational Health and Safety Act, Act 85 of 1993.
- Commissioning and testing of the new installation, issuing a Certificate of Compliance and submission of the "As-Built Drawings".

1.11 ELECTRICAL CONNECTION

There is an existing power supply to the hospital and Rustenburg Local Municipality is the supply authority.

Cables shall be in accordance with the cable's specifications in the General Specifications.

1.12 ELECTRICITY SUPPLY SYSTEM

The supply system is as follows:

High Voltage	11,000V 3-phase 3-wire 50Hz AC Supply
Low Voltage (No Load)	400 / 231V, 3-phase, 4-wire 50Hz AC Supply

1.13 TECHNICAL REQUIREMENTS OF THE INSTALLATION

Over and above the equipment specified in this Specification, the Contractor shall supply and install equipment and auxiliary equipment which he may consider necessary for the proper operation of the complete Electrical Installation to fully comply with the requirements of this Specification.

1.14 QUALITY CONTROL

The Contractor shall maintain adequate and effective quality control standards while installing the specified equipment. The Engineer shall have the prerogative of inspecting the equipment in the Contractor's factory at any reasonable time to ensure accuracy of dimensions, completeness, configuration, quality of workmanship, correct identification, proper use of and type of materials, equipment used and finishes to equipment.

If required, the Contractor shall provide the Engineer with equipment and facilities to examine the equipment and if necessary, test this equipment to preclude malfunctions of the equipment.

1.15 RELIABILITY AND MAINTAINABILITY OF EQUIPMENT

The equipment used in the installation shall be new and of good commercial quality, having good reliability and shall be selected for ease of maintenance.

The requirements must be considered in the Contractor's approach to the interpretation of the Engineers design and may be subject to approval by the Engineer, following demonstration of the equipment's capability by the Contractor.

1.16 TESTS

Acceptance Test Plan

Each Tenderer shall submit a draft of a recommended acceptance test plan for the equipment two months before the final completion of the installation.

The Engineer shall review the acceptance test plan and submit to the Contractor any alternative test procedure and/or testing methods and plans. Such a revised test plan shall be incorporated by the Contractor in the final acceptance test plan scheduling the test procedure in the factory and on the site.

The test shall demonstrate that the equipment fully complies with all functional electrical and mechanical requirements of this Specification.

Copies of test results of tests conducted in the factory and on site capable of reproduction shall be submitted to the Engineer.

Test Equipment

Properly calibrated standard test equipment shall be utilized at the factory of the Contractor and on site to complete the tests to comply with the final acceptance test plan.

The Contractor shall supply all the necessary temporary cables and interconnecting wires in the factory for completing the test plan in the factory.

Testing on site shall be conducted after the installation has been completed.

1.17 TERMINOLOGY

The function of and positions to which equipment is connected shall be indicated on the boards.

All equipment shall be fitted with identification labels like the type specified in General Technical Specification.

Terminology shall be in "ENGLISH".

1.18 AS BUILT DRAWINGS

On completion the Electrical Contractor must provide the Engineer with one complete set of "As Built" drawings. These drawings must show the exact installation as finally completed.

The Contractor must use the same List of Symbols, etc., used by the Engineer. Only drawing work conforming to the latest drawing office practice will be accepted.

2 CABLES

2.1 GENERAL

The Contractor must supply and install all the necessary medium and low voltage cables as required by this document and shown on the drawings.

Some sections of the LV cables shall be installed onto cable ladders/trays and a section in cable trenches as indicated on the drawings.

The tenderer must allow for this situation when pricing for cable installation.

All cables shall be manufactured in accordance with SANS 97 and shall come only from fresh stocks.

NB. All cables shall have the SABS mark of approval.

2.2 TRENCHING

The Contractor shall be responsible for all trenching and excavation.

The Contractor shall, before trenching commences, familiarise himself with the routes and site conditions and the procedure and order of doing work shall be planned in conjunction with the general construction programme for other services and building requirements.

The Contractor will be held responsible for damage to any existing services brought to his attention by the relevant authority and shall be responsible for the cost of repairs.

The Contractor shall take all the necessary precautions and provide the necessary warning signs and/or lights to ensure that the public and/or employees on site are not endangered.

The Contractor shall ensure that the excavations will not endanger existing structures and roads.

2.3 BLASTING

Should blasting be necessary and approved by the Client, the Contractor shall obtain the necessary authorisation from the Government Departments and Local Authorities.

The Contractor shall take full responsibility and observe all conditions and regulations set forth by the above Authorities.

2.4 ROUTES

Trenches shall connect the points shown on the drawings in a straight line. Any deviations due to obstructions or existing services shall be approved by the Electrical Engineer.

The Electrical Engineer reserves the right to alter any cable route or portion thereof in advance of cable laying. Payment in respect of any additional or wasted work involved shall be at the documented rates.

2.5 CABLE SLEEVES

Pipes shall be joined in accordance with the manufacturer's instructions

Sleeves shall cross the roads at right angles

All sleeves shall be graded 1:400 for water drainage

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

2.6 BACKFILLING

The Contractor shall not commence with backfilling of trenches without prior notification of the Electrical Engineer so that the cable installation may be inspected. Should the Contractor fail to give a timeous notification, the trenches shall be re-opened at the Contractor's cost.

For high voltage cables (1kV – 11kV), a coloured plastic marking tape shall be installed 400mm above the cable. The tape shall be yellow, marked with the words "ELECTRIC CABLE / ELEKTRISIE KABEL" in red. These markings shall not be more than 1m apart from centre to centre.

Backfilling shall be undertaken with soil suitable to ensure settling without voids. The maximum allowable diameter of stones in the backfilling material shall be 75mm.

The backfill shall be compacted in layers of 150mm and sufficient allowance shall be made for final settlement. The Contractor shall maintain the refilled trench at his expense for the duration of the contract. Surplus material shall be removed from site and suitably disposed of.

On completion, the surface shall be made good to match the surrounding area.

In-case of roadways or paved areas, the excavations shall be consolidated to the original density of the surrounding material and the surface finish reinstated.

2.7 CABLE MARKERS

This shall be for high voltage cables only, except where otherwise specified.

Cable markers shall be provided along all HV cable routes but need only be provided along LV cable routes where specified.

Cable markers shall consist of concrete blocks in the shape of truncated pyramids, approximately 300mm (high), 150 x 150mm at the top and 250 x 250mm at the bottom.

Brass plates shall be cast into the tops of the blocks in such a manner that they cannot be prised loose. The wording "ELECTRIC CABLE / ELEKTRIESE KABEL" shall be stamped on the brass plates as well as direction arrows and the cable voltage rating.

2.8 INSTALLATION OF UNDERGROUND CABLES

Cables shall be installed at the following minimum depths below final ground level:

- MV Cables: 1,000mm (depth) x 450mm (width)
- LV Cables: 600mm (depth) x 300mm (width)

The depth of cable pipes beneath roads shall not be less than 1.1m below the formation level.

Where HV and LV cables must be installed in the same trench, both shall be laid at a depth of 800mm and then covered with 200mm of soil.

The soil shall then be compacted, and backfilled layer by layer and compacted until the trench is completely backfilled.

Cables for telephone, communication systems and other low voltages (less than 50V) shall be separated from power cables by at least 1m.

2.9 LOW VOLTAGE (LV) CABLES

Specifications

The low voltage cables must be of the 600/1,000V PVC insulated armoured (PVC/PVC/SWA/PVC) type.

The cables shall conform to the General Technical Specification and the following:

Condition of Services	Normal
Armouring	SWA
Conductor Material	Stranded Copper

LV Cable Terminations

LV cable terminations shall be done with cable glands, shrouds, and suitably sized cable lugs.

LV Cable Joints

Joints in LV cables will only be allowed when specifically approved by the Engineer. If joints are made, it must be done in accordance with the General Technical Specification.

Cable Routes

The low voltage cables shall be installed as specified in the schedules of this document and in the positions shown on the drawings.

2.10 CABLE SLEEVE PIPES

Supply and install all the cable sleeves in positions indicated on the drawings.

3 DISTRIBUTION BOARDS

3.1 GENERAL

The electrical contractor shall supply and install all the distribution boards as specified in the positions shown on the drawings.

The construction and wiring of the boards must be in accordance with the General Technical Specification.

Additional space for future extensions must be allowed in all distribution boards as indicated on the schematic diagrams, but in any case, not less than 30% of the equipment space required.

The Contractor must ensure that the distribution boards' dimensions are such that they fit in the spaces provided.

The boards shall have an epoxy coating finish with white on the inside (and/or red for emergency supply from the generator and blue/violet for UPS feeds) and the colour specified on the schematic diagrams on the outside.

Outdoor distribution boards shall be manufactured from 3CR12 material.

The manufacturer shall obtain the method of labelling and marking of all the distribution boards from the Engineer.

Each distribution board shall be provided with a legend card; where a distribution board consists of a normal and emergency side, two legend cards shall be provided and the same shall apply if there is a UPS fed section.

Fascia Panels of the distribution board will be equipped with pad-lockable square key catches.

3.2 BUSBARS

All three phase distribution boards shall be provided with four copper busbars installed horizontally at the top of the board, with the broad side of the busbar fixed vertically on insulators and clearly marked red, blue, yellow for the three phases in accordance the General Technical specification.

3.3 CIRCUIT BREAKERS

All MCB's shall have minimum fault capacities as specified on the schematic diagrams. The frame sizes of the MCB's shall be adequate for the size of conductors used in the installation.

3.4 ISOLATORS

All isolators shall have minimum fault capacity as specified on the schematic diagrams with enough frame size for the specified conductors.

3.5 TIME SWITCHES

All time switches shall be of the 7-day type settable in intervals not longer than 5 minutes, from an approved manufacture with 72-hour battery reserve.

3.6 INDICATING INSTRUMENTS

The voltmeters and ammeters shall be of the P.C.I. or similar approved manufacture.

3.7 SERVICES DISTRIBUTION BOARDS/DRAWBOXES

All the services distribution boards and draw-boxes must be manufactured to the same standards and finish as specified for the metering distribution boards, complete with architrave frame and doors and shall be flush mounted.

3.8 WORKING DRAWINGS

Three sets of shop drawings, of all the electrical and telephone distribution boards shall be submitted to the Engineer for his approval prior to commencement of the manufacture of these boards.

These drawings shall be submitted to the Engineer not later than six (6) weeks after the Contractor has been notified that his tender has been accepted. The Engineer will give his approval/comment within two (2) weeks.

3.9 LABELLING

All the circuits that are not wired must be marked “SPARE” on the distribution board.

Labels indicating the supply point and size of the supply cable must be provided on each distribution board.

Where switchboards are positioned behind doors of building structures such as built-in cupboards, a suitable approved electrical danger sign and an applicable distribution board label must be supplied and fitted in a suitable position on the outside top section of one of the entrance doors at such positions.

4 EARTHING OF BUILDING & INSTALLATIONS

Installations shall be effectively earthed in accordance with the "Standard Regulations" and to the requirements of the supply authority, as well as the Eskom's Representative, who may require additional earthing to meet test standards. Earthing must comply with S.A.B.S 0142 – 1993.

All hot water, cold water and waste pipes must be effectively bonded by 12.5 x 1.6mm solid or perforated copper tape (not wire) clamped by means of brass bolts and nuts. The tape is to be fixed to walls by means of roundhead brass screws at intervals not exceeding 150 mm.

The earth connection from the main earth-bar in the mainboard must be made to the cold water main and the incoming service earth conductor by means of 16mm² stranded (not solid) bare copper earth wire. Where applicable all steel roof sheeting as well as steel walkways and stairs shall be suitably earthed.

Furthermore, an earth electrode (earth spike) of at least 1,5m long must be provided and driven into the ground at the centre of each gable-end wall of each individual block. These earth electrodes shall be installed at least 1m from the building's perimeter and shall clear all aprons and water channels. These earth spikes must be driven into the ground to at least 300 mm below ground level and only after final bonding and tests have been carried out must proper backfilling and compacting of same be executed.

In each instance these earth spikes must be interconnected by means of a 16mm² stranded bare copper earth conductor which must be installed in the inside of the ridging of the roof structure, encased in 20mm flush conduits installed in the gable walls. This earth conductor must be bonded to the roof sheeting at intervals not exceeding 5m, ensuring that roof sheeting on both sides of the ridging is properly bonded, as specified in the project specification.

The overall earth resistance at the Main Distribution Boards shall not exceed 10hm. The contractor shall assess the soil and site conditions at the time of tendering and allow for this to enable him to perform the proper earthing and bonding of all installations

5 WIRING OF CIRCUITS

5.1 GENERAL

A neutral equal in size to the phase conductors and earth wire one size smaller than the phase conductors must be installed to each three-phase outlet.

Cable lugs must be used at all terminations of conductors. The lugs must be soldered or crimped to the end of the conductor with the correct amount of insulation removed to fit the lug. Strands may not be cut from the conductor.

5.2 CONDUCTOR SIZES

Refer to schematic diagrams for conductor sizes and earth wire sizes for each individual circuit.

5.3 WIRING THROUGH LIGHT FITTINGS

Where surface mounted fluorescent light fittings are installed end to end through wiring will be allowed.

An interconnecting male bush lock nut and female bush shall be provided between fittings.

6 LIGHTING

6.1 GENERAL

Supply and install the luminaries schematically indicated on the drawings and the luminaires must comply with the requirements listed hereunder.

The required luminaire types are specified in the light schedule and tie up with the types indicated on the lighting layouts.

Samples of all luminaires must be approved by the engineer before any order is placed.

All light fittings shall be supplied complete with SABS approved control gear and lamps.

The installation of luminaires must be done in accordance with the relevant clauses in the general project specification.

All luminaires must be complete with lamps and where necessary, control gear. Starters of fluorescent luminaire for starters must be covered to the approval of the client representatives.

Lamp holders for GLs lamps must be porcelain or heavy-duty brass.

All luminaires installed in the roof slab are to be accessed and serviced from the roof space.

6.2 SCHEDULE OF LIGHT FITTINGS

These prices shall include the supply, installation and connection of the following luminaries complete with control gear, drivers, mounting brackets and tubes where applicable and is as specified in the bills of quantities.

6.3 OUTSIDE LIGHTING

All wall-mounted external lights shall be installed on the outside walls - at the heights specified on the drawings.

7 CONDUITS AND WIRING OUTLETS

7.1 GENERAL

Supply and install all the outlet points in the positions shown on the drawings. The conduit installation shall be done in accordance with the General Technical Specification.

All heights specified for points are measured from finished floor level to the bottom of the outlet, except where specified to the contrary.

All outlet points shall be labelled with an engraved label riveted to the cover of the outlet. The label description shall include the circuit number and DB number.

7.2 LIGHT FITTINGS

Outlets for light fittings shall consist of round draw-boxes installed recessed in wall, roof-slab, or fixed ceiling. All down lighters and recessed fluorescent lights shall be connected by a 5A industrial type un-switched socket outlet mounted in the ceiling space with a 3m cab-tire and plug mounted on the light fitting.

The un-switched socket outlet shall be positioned in such a fashion that the socket can be unplugged through the mounting hole for the downlight in the ceiling and in such a way that the face of the socket is vertical. No sockets facing upwards or downwards will be accepted.

7.3 LIGHT SWITCHES

Outlets for light switches shall consist of a 100 x 50 x 50 mm deep draw-box installed recessed in wall or partitioning.

7.4 SOCKET OUTLETS

Outlets for socket outlets shall consist of 100 x 100 x 50 mm deep draw-box installed recessed in wall or partitioning wall.

7.5 TELEPHONE

Outlets for telephone shall consist of 100 x 50 x 50 mm deep draw-box with cover plate, installed recessed in wall or partitioning.

7.6 MANUAL FIRE CALL UNIT OUTLET

Manual fire call unit outlets shall be 100 x 100 x 50mm deep draw-box with cover plate, installed recessed in wall or partitioning.

8 SOCKET OUTLETS

All socket outlets must be 15A (single or double as specified on the drawings) switched socket outlets white or red (for shaved earth) in colour.

These shall be suitable to accommodate SANS 164-1 and SANS 164-2 socket outlets of approved manufacturer with cover plates.

Switched socket outlets shall be installed at the indicated positions on the drawings at a height of 300mm above finished floor level unless otherwise indicated.

The socket outlets shall be linked to the trunking in the ceiling void with a 20mm PVC conduit.

9 LIGHT SWITCHES

Light switches shall be installed at a nominal height of 1,400mm above finished floor level measured to the bottom of the box.

The light switches must be of the 16A type of approved manufacturer with a cover plate.

Key switches shall be of the Crabtree 2461 or Clipsal type with 2 poles.

10 PHOTOCELL

All the exterior and area lights shall be switched directly by photocells and the photocell must be mounted where indicated on the drawings in such a manner that the luminaires will not affect the operation of the photocell.

The photocell must be wired to the distribution board by 3x 2.5mm^2 PVC conductors drawn in conduit in the roof space.

The photocell must comply with the following:

- Area lights must be switched ON when the illumination drops to 50lux
- Area lights must be switched OFF when the illumination is raised above 90lux.
- It must be weatherproof and must have a built-in time delay of approximately 40 seconds
- Built in protection against voltage surges must be provided
- A sample of the proposed photocell must be submitted to the Engineer for approval
- The photocell shall be 16A rated

11 TELEPHONE

All conduits, draw-boxes and outlets for this installation must be supplied and installed in the positions shown on the drawings.

All conduits shall be fitted with 2mm diameter galvanized draw-wires.

12 FIRE DETECTION

All conduits draw boxes and outlet boxes for the fire detection system as indicated on the Fire Detection drawings shall be supplied and installed by the Electrical Contractor in coordination with the Fire Detection Contractor.

13 EXTRACTION FAN

The Electrical Contractor shall supply and install a 250mm diameter extraction fan in all the areas shown on the drawings.

Each fan will be fed from a 5A unswitched socket outlet mounted not further than 600mm from the fan. The fan shall be operated from the lighting circuit in each room.

14 EQUIPMENT

Hand-Dryers

The hand dryers shall be similar or equal to and approved Stiebel Eltron Serra 2200 CA hand dryers or Costa Lambrianos Xlerator hand dryers.

30A double pole isolators in a 100mm x 100mm recessed boxes shall be mounted at 1800mm above finished floor level in each toilet for the hand dryers. From the isolator, a 20mm diameter conduit shall be taken to the position of the hand dryer at 1200mm above finished floor level.

Uninterrupted Power Supply (UPS)

The Electrical Contractor shall supply and install a 20kVA 3-phase-in / 3-phase-out UPS unit in the same room as DB – Main and this shall provide uninterrupted power supply to all the power circuits of the bedhead trunking units.

The UPS unit shall be as per the specifications as attached to this specification document and the tenderer shall complete the information schedule.

Geysers

A 30A single pole isolator in a 100mm x 100mm surface box within 600mm from the geyser. The Electrical Contractor shall liaise with the Mechanical Contractor regarding the position of the geyser.

Bedhead Trunking / Pendants

The contractor shall supply and install horizontal bedhead units as specified in the bills of quantities and these shall be complete with gas outlets, electrical outlets, Nurse Call outlets (where required), reading lights and medical rails/supports.

Connection of gas pipes shall be done by the gas piping contractor under the mechanical contract.

15 MOUNTING HEIGHTS

The mounting heights of equipment must be as detailed below, unless stated otherwise on the drawings:

ITEM	MEASUREMENT TO CENTRE OF OUTLET BOX FINISHED FLOOR LEVEL
Light switches	1,400mm
Socket outlets	300mm
Telephone outlets	300mm
Distribution boards (Flush type)	Centre of DB 1600mm above floor level, but top of architrave not higher than 2,000mm above finished floor level
Wall mounted light fittings	Refer to drawings

16 COLOUR OF EQUIPMENT

The colour of all switch cover plates, switched socket outlets, telephone outlets, isolator cover plates and blank cover plates shall be white.

The colour of all interior and exterior electrical distribution boards shall be electrical orange (Colour B26 to SABS 1091).

Fascia plates for normal sections shall be white, signal red (Colour A11 to SABS 1091) for emergency sections and blue (Colour F06 to SABS 1091) for UPS fed sections.

17 POWER SKIRTING AND ACCESSORIES

The channel and cover should be epoxy coated after manufacture.

The outlet pre-punched on a modular basis should be provided to accommodate socket outlets and future socket outlets.

Double compartment galvanised power-skirting shall be installed at the positions indicated on the drawings. The top compartment shall be used for power wiring and socket outlets, whilst the bottom compartment shall be for telephone, data, and other light current services.

The colour for the power-skirting shall be **hospital grey**.

Standard accessories as supplied by the manufacturer of the power skirting shall be used for the distribution board outlets, elbows, endcaps, and Tees.

The communication compartment of the power skirting shall be linked with 2 x 25mm diameter conduits or as specified from the 100 x 100 mm outlet box behind the power-skirting to the 300mm/200mm cable tray mounted in the ceiling void or above the roof slab.

Where socket outlets are not installed, the punched holes shall be blanked off, painted the same colour as the power-skirting and installed at the back of the covers.

These blanking plates shall be easily removable to permit future installation of socket outlets.

Trunking, conduits, and accessories shall be in accordance with General Technical Specification.

18 CABLE TRAYS

The cable trays shall be manufactured from perforated rolled steel.

The cable trays for the following areas shall be of the following standards:

- Vertical building ducts – hot dip galvanised to SANS 32 & 121
- Plant rooms, substations, service tunnels – electro-galvanised baked enamel
- Damp areas, exposed to weather – hot dip galvanised to SANS 32 & 121

Horizontal trays shall be supported at the following maximum intervals:

- 1.2mm to 1.6mm thick metal with 12mm to 19mm return trays
- 2.5mm thick metal trays with 76mm return
- Cable ladders with 76mm side rail of 2mm thickness
- 3mm thick PVC trays with 40mm return
- 4mm thick PVC trays with 60mm return

Standard accessories manufactured by the manufacturer of the wiring channels shall be used for the distribution board outlets, elbows, and Tees.

No on-site assembled accessories will be accepted.

All wiring channels must be supported from the roof structure by means of threaded rod and hangers as detailed by the manufacturer.

The cost for these supports shall be included in the tender price for the wiring channel.

19 CABLE LADDER

Cable ladder must be of the O-LINE OL76 or equal, similar, and approved by the Engineer in writing before tender closing.

Cable ladder must be finished in hot-dip galvanising.

Cable ladder must be supported as detailed by the manufacturer at intervals not exceeding 1,5m.

Only factory-made accessories for cable ladder in the same finish as that of the ladder shall be accepted.

20 EXCAVATION

Material to be excavated shall be classified as follows:

"Rock" will be held to be composed of boulders each exceeding a nominal diameter of 1 m and solid rock in bulk or banks or ledges, the practicable excavation of which would necessitate the use of explosives and or drilling and wedging.

"Soft rock will be held to be material other than rock, the excavation of which would be economically impracticable if executed by pick and shovel or by means of an ordinary "back actor" without attaching a special mechanical ripper to it.

Soft rock material can only be excavated by either pneumatic tools or by a "back actor" with a special mechanical ripper attached to it. Soft rock shall include soil with loose boulders with nominal diameters between 300 mm and 1 m.

"Pick-able soil" will be held to be material more easily excavated and not falling into the categories of "rock" or "soft rock" such as gravel, earth, turf, scale, sand, silt and clay.

21 CONDUIT

All conduit and accessories shall be PVC conduit except where specifically indicated to the contrary

22 INNOVATIVE WIRING SYSTEMS

Only innovative wiring systems with an extruded aluminium sheath commonly known as “SURFIX” will be accepted. Twin and earth wiring systems without the extruded aluminium sheath will not be accepted.

23 OCCUPATIONAL HEALTH AND SAFETY ACT

All signs and notices as required by the Occupational Health and Safety Act shall be installed.

24 COMPLETION TIME

The tenderer shall indicate the anticipated delivery period of the offer.

25 TESTING

At the completion of the electrical installation, the Electrical Contractor shall test the following:

- Correct operation of all circuits

- Earth resistivity test with 500V Megger
- Earth leakage test on all switched socket outlets with a certified earth leakage test unit
- All luminaires to confirm correct operation of lamps, ballasts, and starters
- Ensures that the load is balanced over the three phases as far as practical

The Contractor shall supply all test equipment mentioned above.

When the Electrical Contractor has successfully done the above tests and inspections, an inspection by the Engineer and a representative of the Supply Authority shall be requested.

26 'AS-BUILT' DRAWINGS

As the successful completion of this project, the Contractor must supply the Engineer with paper prints indicating all cable and sleeve routes. The final retention money will not be released before these drawings are received.

End of Specification – Electrical Installations

SECTION 2: DETAILED PROJECT SPECIFICATIONS – NURSE CALL SYSTEM INSTALLATIONS

1. SCOPE OF CONTRACT

This contract shall cover the supply, delivery, installation, testing, handing over in working order and 12-months maintenance period after first handover of a complete Nurse's Call System at the proposed Intensive Care Unit of the Job Shimankane Tabane Hospital.

Technical considerations concerning the engineering, design, maintenance requirements etc., are of the utmost importance and will weigh heavily in the adjudication of tender received and Tenderers are advised to submit the fullest possible details with their tenders.

The successful tenderer shall ensure that he is conversant with the layouts of all other services before he commences with any work on this building.

2. POWER SUPPLY

The required power supply shall be provided by the Electrical Sub-Contractor.

The complete and full details for the required power supply for the installation shall be provided by Nurse Call Sub-Contractor to the Electrical Sub-Contractor.

3. CONSTRUCTION PERIOD

The precise construction period shall be determined by the building contract and detailed in the building programme.

It shall be expected of the successful tenderer to follow this programme.

4. EARTHING

The installation shall be properly earthed to comply with the applicable Codes of Practise, SABS 0142-1993 as amended, SABS 1063, as well as requirements in the Departmental Standards and to comply with the relevant Local Authority by-laws.

All electronic equipment pertaining to the Nurse's Call System installation shall be properly earthed by means of 2.5mm^2 stranded bare copper wire unless specified to the contrary.

The armouring of all cables shall be bonded to the cable end boxes and cable end plates and used as earth conductors.

After completion of the entire earthing installation, it shall be tested in the presence of the Consulting Engineer and the Department representative.

Tenderers shall provide all the labour and equipment necessary to do these tests within the contract.

5. CABLE INSTALLATIONS

This contract shall cover the supply and installation of the applicable cables required for the complete Nurses'/Emergency Call System as specified.

The drawings are scaled, and measurements can be taken from these drawings.

Conductors shall consist of stranded wires and can be terminated and connected to the control panels.

Cables shall be installed in cable trays provided by others with the routes indicated on the drawings and as resolved and agreed on site with the Engineer.

All cables must be new and delivered to site on cable drums.

Unless specifically approved by the Consulting Engineer beforehand, no joints will be allowed in cables of less than 300m length.

All cable joints shall be guaranteed on workmanship for two (2) years after final handover to the end-user.

6. INSTALLATION OF CONDUITS IN WALLS

The installation of conduits shall be done by the Electrical Sub-Contractor according to the drawings and the Nurse Call Sub-Contractor shall give indication to the Electrical Sub-Contractor should he require additional points.

7. INSTALLATION OF CABLES IN CABLE TRAYS AND LADDERS

The Sub-Contractor shall make use of cable trays and/or ladders on cable routes indicated on the diagrams.

Where applicable, the Sub-Contractor shall arrange with the Main Contractor to provide holes and access through the structure and finishes as required.

The Sub-Contractor shall supply and install supply cables in cable trays and ladders parallel to each other. Cables must present a neat appearance and must under no circumstance be bunched.

The Sub-Contractor shall clamp at maximum intervals of 3m when installed on horizontal trays and at a maximum of 600mm when installed on vertical trays.

The Sub-Contractor shall bond metal trays and ladders to the earth bar of the distribution board to which the supply cables are connected.

8. CONTROL PANEL

Supply, install, connect, test and commission the control panel as indicated on the drawings.

The control panel shall be wall mounted at the Nurse Duty Stations as per the construction drawing.

The control panel must include the room/bed numbers.

The panel must incorporate a bleeper for the Emergency and bathroom tones, a loudspeaker for the nurse call and a latching switch to attenuate the nurse call tone at night. The panel shall include a “power on” indication LED.

The exact size shall dependant on ward design and size.

The minimum paint thickness after baking shall be 0,064 mm.

Special care shall be taken that all sharp corners and edges are painted.

9. WIRING OF CIRCUITS

All circuit cables shall be installed in conduits.

PVC cables and conductors shall comply with SABS 159/1957. Conductors shall be of the stranded copper type throughout.

Conduits shall be PVC and comply with the relevant SABS code and Departmental Specification.

10. UNWIRED CONDUITS AND OUTLETS

Unwired conduits and outlets shall be provided with draw wires unless indicated otherwise on the drawings.

The outlet boxes shall be of the 100 x 100 x 50 type recessed in walls and provided with white baked enamel cover plates.

These conduits shall all be provided with 1.6mm diameter galvanised draw wires.

11. NURSE CALL SYSTEM

The Nurse Call System shall enable a patient to call a nurse for assistance from his/her bed, bath, shower, or toilet. The system shall also make provision for Emergency Call by Nurses to call for assistance.

The system must produce an intermittent audible bleeper tone at the Nurses' Duty Station when the patient nurse call or staff emergency call is enabled. Different audio tones must be produced for normal patient call, bathroom/shower call and emergency call.

A visual mimic panel indicator must be provided at the Nurse Duty Station as well as a light above the door to the passage of the activated unit and at the actual activated unit. The system is to be such that any call may only be reset at the point of origin. The system must automatically activate a nurse call when any of the handheld units is pulled out of the bedhead trunking unit.

The conduit system for the above shall be provided and installed by the Electrical Sub-Contractor.

Cut-outs on the bedhead trunking units / medical pendants for the Nurse's Call positions shall be done by the manufacturer of the bedhead units and the sub-contractor shall make use of these cut-outs.

Allow for the full commissioning and demonstration of the system.

12. UNINTERRUPTED POWER SUPPLY (UPS) AND STANDBY GENERATOR

The hospital facility has a fully functional emergency standby generator which will operate automatically and of sufficient capacity to supply all critical areas with electricity in the event of a power failure.

The contractor shall provide a battery back-up system for the Nurse Call System with the suitable back-up time as required.

13. GUARANTEES

The Sub-Contractor shall provide guarantees against any defects in the material and/or manufacturing shall unconditionally guarantee all the components for a period of 12 calendar months from the date the installation has been accepted by the client.

Should any defect in the components or installation occur before the guarantee period has expired then the Sub-Contractor shall replace same at his own expense.

Only the Sub-Contractor and no-one else shall be liable for the full responsibility related to the guarantees and ensure that allowance is made in his tender for this.

The guarantee shall not cover any intentional damage to property or negligence on behalf of the client.

14. COMPLETION TIME

The tenderer shall indicate his anticipated delivery period in his offer.

End of Specification – Nurse Call Installations

SECTION 3: SCHEDULE OF TECHNICAL INFORMATION – 20kVA UPS Unit

These prices shall include the supply, installation, and commissioning of the following 20kVA UPS unit:

Description	Unit	Requirement	Offered
Nominal Power Rating at 0,8pf	kVA	20	
Output Parameters:			
Inverter type			
Output Power	kW	25	
Output current at rated kVA	A	30A	
Output Voltage	VAC	400V	
Output Voltage Regulation	%	+/- 1%	
Output Voltage THD	%	<2% for linear loads	
Output Frequency	Hz	50	
Output Frequency Regulation	%	50Hz +/- 0.02	
Output Frequency Window	Hz	48Hz - 52Hz synch to mains	
Output Voltage Dynamic Regulation	%	+/- 5% (100% load step) recover to 2% within 5ms	
Overload Capacity in kVA	%FL	105% continuous / 110% 10min / 125% 1min	
Efficiency AC - AC	%	90% at full load and rated input voltage	
Output Protection		Circuit breaker	
Input Parameters:			
Rectifier type			
Input Voltage to rectifier	VAC	400V	
Input Voltage to Bypass	VAC	400V	
Input Voltage Range to Rectifier	VAC	400V +/- 5%	
Input Frequency	Hz	50	
Input Frequency Range for Rectifier	Hz	40Hz to 65Hz	

Input Current THD at nominal voltage	%	<6% at full load	
Input Power Factor at Nominal Voltage		>0.98	
Battery:			
Battery Type		Valve Regulated Lead Acid	
Battery Life at rated kVA	hr	8hr	
Static Bypass:			
Type		Thyristor Bridge	
Rated Current		1.5In	
Overload Capacity in kVA		200% - 1 min / 1000% - 10ms	
Physical Parameters:			
Dimensions	mm		
Weight	kg		
Protection		IP21	
Standards		IEC 62040-3, IEC60146-1-1, IEC 61000-4-2, EN 50091	
Environment:			
Operating Temperature		0 to 40 degrees Celsius	
Humidity		0 - 90% non-condensing	
Maximum Altitude		0 - 2000m without de-rating	

SECTION 4: BILLS OF QUANTITIES - ELECTRICAL & NURSE CALL SYSTEM INSTALLATION

GENERAL NOTES

1. Unless a separate rate for the supply and installation of any item is specifically called for, the supply and installation cost of any item shall be fully included in the unit price.
2. The rate for outlet boxes up to 100 x 100 mm shall be the same regardless of the number of entries. Conduit boxes shall always include the fixing to the conduit as specified.
3. Industrial switch and plug units shall include the fixing to the conduits or trunking as specified
4. Light switches, switch plugs, dimmer units, etc shall include screws, cover plates and other equipment specified
5. All fittings and accessories must always include the connections thereto.
6. 300mm additional length has been measured for conductors drawn into trunking / conduit per outlet point. Tenderers must allow in their rates for any conductor lengths required in addition to the 300mm for his own purpose.
7. All measurements are nett, and Tenderers must allow for wastage in their rates
8. Unless specifically stated in the Bills of Quantities, all prices shall allow for the following items:
    - 8.1. Supply, deliver to site and store new, unused, and undamaged of best available quality and complete with all small materials necessary for installation, testing, commissioning, and rendering in proper working order.
    - 8.2. Installation, fixing in position, running, or laying, as applicable in a thorough and workmanlike manner
    - 8.3. Making of all connections necessary
    - 8.4. All insulation and continuity tests
    - 8.5. Ensuring the proper working serviceability
    - 8.6. Commissioning on completion and maintenance during the guarantee period
    - 8.7. Complete labelling with engraved labels to indicate all functions and instructions that would otherwise be unclear to ordinary users
    - 8.8. Corrosion protection where necessary
    - 8.9. All profits, overheads, supervision, transport, and skilled and unskilled labour
    - 8.10. Inspection by the Engineer and all authorities
    - 8.11. Compliance with all relevant regulations, by-laws, and codes of practice
    - 8.12. Compliance with the Specification
9. The installation is to comply with the Detailed Technical Specification included in this document.

health
Department of
Health
North West Province
REPUBLIC OF SOUTH AFRICA

CONSTRUCTION HEALTH AND SAFETY SPECIFICATION

FOR

Conversion of existing ward 13 to an ICU

JOB SHIMANKANA TABANE PROVINCIAL TERTIARY HOSPITAL

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1 Introduction

Department of Health North West intends to Conversion of existing ward 13 to an ICU. Department of Health North West developed Site Specific Health and Safety Specifications (SSHSS) in line with the Baseline Risk Assessment (BRA) as required by the Construction Regulation 5 (1). The Principal Contractor should use this specification when developing the Site Specific Health and Safety Plan for this project.

1.1 Scope

This SSHSS was developed for the Department of Health North West in line with the Baseline Risk Assessment (BRA) as required by the Construction Regulation 5(1). The contractor should use this specification when developing his Site-Specific Health and Safety Plan as per the requirements of Construction Regulation 7(1)(b).

The Occupational Health and Safety Act, no 85 of 1993 and its Regulations together with SANS Codes set out minimum standards with regards to Occupational Health and Safety. Department of Health North West has developed this Occupational Health and Safety Specifications with these minimum standards in mind and in certain stages the requirements of Department of Health North West exceed the minimum legal requirements to follow best practices and to ensure a healthy and safe workplace for all.

Department of Health North West in no way assumes The Principal Contractors legal liabilities and responsibilities. The Principal Contractor is and remains accountable for the quality and execution of his health and safety programme for his employees. Furthermore, there is no acceptance of liability by the employer which may result from the Principal Contractor failing to comply with the Occupational Health and Safety Specification (OHSS), the Principal Contractor remains responsible for achieving the required performance level.

It is realized that The Principal Contractor have its own Health and Safety Management system and safe work practices. The intention of this Health and Safety Specification is not to change The Principal Contractors Health and Safety management system, but for The Principal Contractor to use its current Health and Safety management system to draw up a project specific Health and Safety plan according to these specifications as well as to legally comply with the Construction Regulations, GNR.84 of 2014.

It is the responsibility of the Principal Contractor and other Contractors to make themselves conversant and comply with the requirements and conditions contained in the various legislation pertaining to their profession and scope of works at all times.

This specification is not exhaustive of all duties imposed by the Occupational Health and Safety Act, no 85 of 1993 and its Regulations, governing the duties and obligations, of a Designer, Principal Contractor and Contractor performing duties in terms of an agreement with the client (Department of Health North West). These duties are fully described in the Occupational Health and Safety Act, no 85 of 1993 and its Regulations and it is the duty of every Designer, Principal Contractor and Contractor to acquaint themselves therewith before commencing work.

This specification is compiled to ensure that the Principal Contractor and any other Contractors working for Department of Health North West directly or through a Principal Contractor, are aware

of the Occupational Health and Safety requirements when working on a Department of Health North West contract, as well as to make them aware of their legal liabilities and responsibilities as per the Occupational Health & Safety Act, Act 85 of 1993, and its Regulations.

1.2 Overview of the Works

The construction will consist of building maintenance and external works. This requires the supply of labour, material, equipment, plant, etc. which are necessary for the maintenance on, electrical and mechanical.

1.3 Definitions and abbreviations

Act:	the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993)
Agent:	means any person who acts as a representative for a client;
BRA:	Baseline Risk Assessment
CIDB:	Construction Industry Development Board
COID Act:	Compensation for Occupational Injuries and Diseases Act
DMR	Driven Machinery Regulations, GNR. 295 of 26 February 1988
HIRA:	Hazard identification and risk assessment
SDS:	Safety Data Sheet
OHS Act:	Occupational Health and Safety Act
SHE:	Safety, Health, and Environment
CR:	Construction Regulations
CHSA:	Construction Health Safety Agent
DoL:	Department of Labour
PC:	Principal Contractor

1.4 Definitions

The following definitions will apply to the SH&SS, acronyms given hereunder will apply:

Audit – A systematic and documented review of the effectiveness of implementation of processes, programmes and procedures, based on Department of Health North West process criteria

“Construction Work” means any work in connection with – the construction, erection, alteration, renovation, repair, demolition or dismantling of or an addition to a building or any similar structure, road, railway, runway, sewer or water reticulation system; or the moving of earth, clearing of land, the making of an excavation, piling, or any similar civil engineering structure or type of work.

Hazard Identification and Risk Assessment and Risk Control (HIRA) - Means a documented plan, which identifies hazards, assesses the risks and detailing the control measures and safe working procedures, which are to be used to mitigate and control the occurrence of hazards and risks during Construction or operation phases.

The Act - Means, unless the context indicates otherwise, the Occupational Health and Safety Act, 1993 (ACT NO. 85 of 1993) and Regulations promulgated there under. (OHS Act)

Hazard - Means a source of or exposure to danger (source which may cause injury or damage to persons, or property)

Risk - Means the probability or likelihood that a hazard can result in injury or damage.

Risk Assessment – A process of evaluating the risk(s) arising from hazards taking into account the adequacy of any existing controls and deciding whether or not the risk(s) is acceptable.

Contractor – An employer as defined in section 1 of the OHS Act, who performs construction work and includes Principal Contractors and Sub-Contractors.

Hazardous Chemical Agent (HCA) - Means any toxic, harmful, corrosive, irritant or asphyxiant substance, or a mixture or substances for which an occupational exposure limit is prescribed, or an occupational exposure limit is not prescribed, but which creates a hazard to health.

SHE - Safety Health and environment

Construction Plant - Encompasses all types of plant including but not limiting to, cranes, piling frames, boring machines, and excavators, dewatering equipment and road vehicles with or without lifting machines.

Health and Safety Plan (HSP) - The content of this document which will be made available on site for inspection by an inspector, Technical Officer, Agent, subcontractor, employee, registered employee organization, health and safety representative, or member of the health and safety committee.

Health and Safety File - Describes the file holding all records on health and safety for the project, which will be available at all, times for evaluation, and copy of which will be forwarded to the client upon completion of the project.

2 Health and safety policy

Principal Contractor is expected to prepare the companies Health and Safety Policy. The policy should declare their attitude and approach to the health, safety and welfare or hygiene of their employees and others. Provision must be made to review the policy regularly and the CEO or Managing Director must sign and date the policy to indicate his commitment to ensuring the health and safety of his employees.

3 Roles and responsibilities

The Principal Contractor is considered to be an employer in his own right and shall comply with all legal requirements pertaining to an employer, which include the responsibility to provide as far as reasonably practicable a safe and healthy working environment for his employees, as per Section 8 of the OHS Act. The Principal Contractor shall appoint competent employees in writing.

3.1 Appointment — Legal Reference

Assistant to CEO — OHS Act 16(2)

Health and Safety Representative	OHS Act 17(1)
Nominated Health and Safety Committee Member	OHS Act 19(3)
Principal Contractor	CR 7(1)(c)(v)
Construction Manager & Alternate Construction Manager	CR 8 (1)
Assistant Construction Manager	CR 8(2)
Health and Safety Officer	CR 8(5)
Construction Supervisor	CR 8(7)
Assistant Construction Supervisor	CR 8(8)
Risk Assessor	CR 9(1)
Structure Inspector	CR 11(2)(a)
Temporary Works Designer	CR 12(1)
Temporary Works Supervisor	CR 12(2)
Excavation Supervisor	CR 13(1)(a)
Demolition Supervisor	CR 14(1)
Competent Person in the use of Explosives	CR 14(11)
Material Hoist Inspector	CR 19(8)(a)
Bulk Mixing Plant Supervisor	CR 20(1)
Explosive actuated fastening device Inspector	CR 21(2)(b)
Explosive actuated fastening device cartridge Controller	CR 21(2)(g)(i)
Construction Vehicle & Mobile Plant Operator Authorised	CR 23(1)(d)(i)
Temporary Electrical Installation Controller	CR 24(c)
Stacking and Storage Supervisor	CR 28(a)
Fire Equipment Inspector	CR 29(h)
Incident investigator	GAR 9(2)
Lifting tackle inspector	DMR 18(10)(e)
Ladder inspector	GSR 13(a)
Certified Explosives Manager	R 12(1)
First Aider GSR	GSR 3(4)
Hazardous Chemical Substance Supervisor	

4 Implementation of the SSHSS

This project specific H&S specification (SHSS) forms an integral part of the contract, and the PC is required to make it an integral part of his contract. This specification must be read in conjunction with the OHSA and its regulations and any other standard relating to work being conducted in a safe manner. The information relative to the baseline risk assessment is to be taken into account when developing a Health and Safety Management System to mitigate any injury or health risk.

No work may commence without written approval of the Health and Safety Plan by the agent. Failure to comply with this requirement will result in a penalty, stoppage of part of, or the whole works with no extension of time or allowable claims.

In case of design changes or change in the scope of work an amended SSHSS may be issued that would incorporate the changes.

The Occupational Health and Safety Agent will visit the project monthly or more frequently depending on the prevailing conditions on site. The Agent will also conduct ad – hoc visits to ensure compliance on site. All activities on site and all appropriate documentation will be

monitored and reported to the Client, Engineer and PC. Non – Conformances will be issued and penalties or work stoppages instructions will be issued where the need arises. Communication between the OHS Agent and PC will be through the Engineer. The authority of the Client appointed OHS Agent shall be that as contemplated in Section 5 of the construction regulations.

5 Project specific risk requirements

Hazard Identification and Risk Assessment (HIRA), and are to be noted when developing the Site-Specific Health and Safety Plan and associated documentation. Identification of low or medium risks does not mean there is no risk involve. In depth's HIRA's and management systems are required to limit the exposure, likelihood and potential consequences as required by the Act and its relevant regulations. Personal Protective Equipment (PPE) will be issued by PC after analysing the hazards associated with his activities. The PPE is the last line of defence and should be used as such, meaning that it should be used after an Engineering, substitution and administrative control measures have been applied.

These are hazards that have been identified and are expected to be prevalent during the execution of the project refer to BRA.

"As built" drawing show services, however, these have been proven to be inaccurate. The contractor must treat all services as live. Electrical and water lines are to be inspected.
Public unrest - due to the volatile political climate leading up to the elections, the Principal Contractor may experience difficulties in the area. Procedure must be put in place to safeguard works and employees.

6 HSE training and competence

Where appropriate qualifications and training are registered in terms of the provisions of the National Qualifications Framework Act, 2000 (Act No. 67 of 2000), those qualifications and training must be regarded as the required qualifications and training and employees must have attended courses of the aforementioned nature to be considered competent in the task.

All employees that form part of the construction work must be trained and competent. Employees formally appointed to perform a certain duty must be in possession of a training certificate, received from an accredited registered training provider. All employees must as a minimum have received site specific safety induction training and must receive daily safe task instruction training (DSTI) before any work commences. Construction Health and Safety Officer must be registered with SACPCMP as Registered Construction Health and Safety Officer.

6.1 Training Needs

There shall be a system in place to determine the training requirements of each individual, based on the tasks that the employee will perform as well as to ensure the health and safety of fellow employees and the public is not compromised in any way. Special attention should be given to employees who are new hires, new to the task or have combined responsibilities.

6.2 Basic Safe Work Training (Induction Training)

Principal Contractor shall ensure that his employees are inducted into his own company Health and Safety Management System as well as basic safe work training (HSE Induction Training). The Principal Contractor shall ensure that his employees, Contractor's employees and visitors are inducted on site specific health and safety procedures. They will be made aware of the risks and hazards that are prevalent to site.

A Daily Safe Task Instruction (DSTI) must be conducted on site with all employees involved in the project. The DSTI must be carried out each day before work commences and proof thereof must be available on site. Each work crew may conduct their own specific DSTI to discuss the hazards, risks and control measures associated with their task for the day.

Where two or more Contractors or work in the same area, they should have a combined DSTI to ensure they know of the additional hazards the other Contractor or work crew will introduce to their operations and what precautions to put in place.

The Principal Contractor shall have evidence that employees have been trained on the relevant procedures prior to and during the project duration. The evidence will be in a form of attendance register.

6.3 Formal Training

All qualifications for which there are SAQA registered training courses, must be regarded as the minimum required qualifications and training. To be deemed "competent" an employee must have received training at a registered training provider, the training course must be registered and if there is an assessment, the employee must have been found competent after the assessment. A person cannot be deemed competent after awareness training only.

The Principal Contractor shall ensure that the employees, as well as the employees of any Contractors that may be used, have received appropriate training for the type of work that will be performed, e.g. First Aid, Mobile Plant Operator, Working on excavations, Risk Assessment training, Safe Demolition Methods, etc.

6.4 Records

Record of all training shall be kept by the employer and shall be readily available. Records shall make provision for refresher training where applicable. Where an employee is legally appointed with certain duties and responsibilities a copy of the training certificate must be attached to the appointment.

7 Duties

Various duties are imposed on the client, designer, principal Contractor and the Agent by the Construction Regulation, 2014, Sections 5, 6 & 7. Department of Health North West will comply and carry out the required duties as contemplated in Section 5 of the Construction Regulations, 07 February 2014 and it is expected from the designer and every Principal Contractor to make themselves conversant with the requirements and duties imposed on them and to ensure that they comply with the requirements of section 6 & 7 at all times.

8 Management and supervision

The Principal Contractor shall ensure that the project is managed safely, and legal compliance is ensured at all times.

A full-time competent person must be appointed as a Construction Manager to manage all construction work, including health and safety compliance. The construction manager may not be appointed to manage more than one single construction site.

The construction manager must appoint construction supervisors responsible for construction activities and ensuring occupation health and safety on the construction site.

The **Principal Contractor must appoint a full-time construction health and safety officer, who is registered with the SACPCMP**, to assist in the control of health and safety aspects on site.

9 Risk management

The Principal Contractor must follow a formal risk-based approach to ensure hazard control measures are implemented to an acceptable reasonable practical level. The Principal Contractor and his employees shall be responsible to ensure all hazards pertaining to his scope of activity are proactively identified, the risks assessed and appropriately eliminated or minimized and managed on an ongoing basis. Risk assessments shall also identify possible and potential environmental, health and hygiene issues pertaining to each hazard with potential exposures and limits.

9.1 Risk Assessment

The Principal Contractor shall, before the commencement of any construction work or work associated with the aforesaid construction work and during such work, conduct a risk assessment by a competent person, appointed in writing and the risk assessment so produced shall form part of the OH&S plan and be implemented and maintained as contemplated in Construction Regulation 9(1). Competence is a factor of training, knowledge, experience and/or appropriate qualifications.

The risk assessment shall include, as far as is reasonably practicable, at least: The task or task step; the identification of the risks and hazards to which persons may be exposed during the task or task step; The analysis and evaluation of the risks and hazards identified, inclusive of a residual risk rating methodology. The method to be used is not prescribed; a documented plan of safe work procedures, to mitigate, reduce or control those residual risks that have been identified as unacceptably high, by means of the rating system; a monitoring plan; a review plan, inclusive of dates to be adhered to; and Ergonomic related risks are to be analysed, evaluated and addressed as part of the process.

Department of Health North West has conducted a Baseline Risk Assessment as per clause 5 (1) a of the construction regulation, which must be used by The Principal Contractor to develop task specific risk assessments before work commences.

9.2 Risk Assessment Monitoring

The Principal Contractor shall ensure that a monitoring plan for all risk assessments are in place. Risk assessments must be monitored to ensure effectiveness and employee understanding. The monitoring of risk assessments shall be formal, and records thereof shall be available for audit purposes.

9.3 Review of Risk Assessment

The Principal Contractor shall review the hazard identification, risk assessments and standard safe working procedures prior to any work activity commencement and at each production planning and progress report meeting as the contract work develops and progresses and each time changes are made to the designs, plans and construction methods and processes. The Principal Contractor shall provide the Employer, Contractors and all other concerned parties with copies of any changes, alterations or amendments as contemplated above.

Activities carried out without conducting a risk assessment or found to be non-compliant with the risk assessment, will be stopped until such time a risk assessment is compiled, and work is carried out according to the risk assessment.

Risk assessments must be fully communicated to all relevant personnel and must be considered when establishing training, awareness and competency requirements.

9.4 Baseline Risk Assessment

Department of Health North West prepared a Baseline Risk Assessment from which the Health and Safety Specifications for this project was prepared. The Baseline Risk Assessment highlights all work for which The Principal Contractor must prepare safe work procedures and or work method statements. It must be noted that the Baseline Risk Assessment is not exhaustive and Principal Contractors are required to identify risks and come up with control measures, this must be identified by Principal Contractor when preparing the Issue Based Risk Assessments. During the briefing, the client will brief tenderers about the hazards and risks that are associated with the anticipated construction work.

9.5 Continuous Risk Assessment

The Principal Contractor shall continuously assess the risks of the activities that are carried out. Risk assessments must be in writing, site specific and must be reviewed continuously to ensure it is current and it address all the relevant hazards and risks associated with the specific activity at the specific site.

The Risk assessment must be discussed with the whole work crew before the activity starts and the work crew must acknowledge in writing having discussed the risk assessment and that they understand it. This acknowledgement must be on site and must be available to the client for audit purposes. The principal Contractor must appoint a competent risk assessor.

The Baseline Risk Assessment for this Project is attached at the back of this document.

10 Legal compliance and document control

a) The Principal Contractor is required to implement systems and procedures to ensure legal compliance through:

- Identification of all relevant HSE legislation, standards and codes applicable to its operations.
- Have available copies of all relevant HSE legislation, standards and codes for reference purposes.
- Update legislation, standards and codes with any changes
- Communicate to all employees any changes that may affect their accountabilities and conformances.
- Incorporate any legal requirements into their HSE management system.
- Monitor and review their HSE management system for effectiveness.

b) The Principal Contractor shall, as a minimum, comply with:

The Occupational Health and Safety Act (Act 85 of 1993) and its Regulations, an up-to-date copy of which shall be available on site at all times.
The Compensation for Occupational Injuries and Diseases Act (Act 130 of 1993), an up-to-date copy of which shall be available on site at all times.
Where work is being carried out on a “mine”, The Principal Contractor shall comply with the Mines Health and Safety Act and Regulations (Act 29 of 1960) and any other OH&S requirements that the mine may specify. An up-to-date copy of the Mines Health and Safety Act and Regulations shall be available on site at all times.

Wherever in the Construction Regulations or this specification there is reference to other regulations (e.g. Construction Regulation 24: Electrical Installations and Machinery on Construction Sites) The Principal Contractor shall be conversant with and shall comply with these regulations.

All legal appointments of The Principal Contractor regarding the Health and Safety of his employees who are to work on the project are addressed and governed by the OHS Act and applicable Regulations. Legal appointments must be in place and must reflect in the project safety file before work commences.

c) Overall Supervision and Responsibility for OH&S

Department of Health North West will appoint the Principal Contractor in terms of Construction Regulation 5(1) (k). A Mandatory agreement as per Section 37.2 of the OHS Act, shall be signed between Department of Health North West and the Principal Contractor. The Construction Health and Safety Agent can sign section 37 (2) on behalf of the Client.

It is a requirement that the Principal Contractor, when he appoints other Principal Contractors in terms of Construction Regulations 7(1)(c), 7(1)(d), 7(1)(f) and 7(3) includes in his agreement with such Principal Contractors the following:
OH&S Act (85 of 1993), Section 37(2) agreement: “Agreement with Mandatory”
OH&S Act (85 of 1993), Section 16(2) appointee(s) as detailed in his/her/their respective appointment forms. (Where applicable)

The signed Mandatory agreements shall be placed in the project file for reference and for audit trail purposes.

d) Specific Supervision Responsibilities for OH&S

The Principal Contractor shall appoint designated competent employees and/or other competent persons as required by the OHS Act and Regulations, as well as this specification. Appointments shall be in writing and the responsibilities clearly stated together with the period for which the appointment is made. This information shall be communicated to and agreed with the appointees. Where applicable, the training certificate must be attached to the appointment. Notice of appointments shall be submitted to the Employer. All changes shall also be communicated to the Employer.

It is a requirement that The Principal Contractor shall provide the Employer with an organogram of all sub-Principal Contractors that he/she has appointed or intends to appoint and keep this list updated and prominently displayed on site.

Designation of OH&S Representatives (Section 17 of the OH&S Act). Where the Principal Contractor employs more than 20 persons (including the employees of sub-Principal Contractors) he has to appoint 1 (one) OH&S representative for every 50 employees or part thereof. This is a minimum (legal) requirement. The Principal Contractor may at his own discretion appoint more OH&S representatives according to site specific requirements. General Administrative Regulation 6 requires that the appointment or election of the OH&S representatives be conducted in consultation with employee representatives or employees (Section 17 of the Act and General Administrative Regulation 6 & 7). OH&S representatives shall be designated in writing and the designation shall include the area of responsibility of the person and term of the designation. OH&S representatives must be experienced, permanently employed by The Principal Contractor or his sub-Principal Contractors, trained and able to move freely within their designated area of responsibility. The client or client representative reserves a right to instruct the Principal Contractor to appoint more Health and Safety Representatives depending on the prevailing conditions on site.

e) Duties and Functions of the OH&S Representatives (Section 18 of the OH&S Act)

The Principal Contractor shall ensure that the designated OH&S representatives perform their functions in respect of the workplace or section of the workplace for which they have been appointed. These functions include conduct continuous monitoring and monthly inspections of their respective areas of responsibility, focusing on unsafe acts and unsafe conditions and report thereon to The Principal Contractor. OH&S representatives shall participate in accident or incident investigations. OH&S representatives shall attend all OH&S committee meetings. The complete list of functions can be found in Section 18 of the OHS Act.

f) Appointment of OH&S Committee (Sections 19 and 20 of the OH&S Act)

The Principal Contractor shall establish an OH&S committee, which shall meet at least once a month, where two or more Health and Safety Representatives have been appointed. OH&S representatives must be appointed as OH&S committee members. The number of management appointed members may not exceed the number of OH&S representatives on the committee.

g) Operational integrity

The operational integrity of plant, equipment, structures and protective systems must be monitored and assured on an ongoing basis throughout the project cycle. Hazards must be identified, assessed and as far as reasonably practicable, eliminated or the risks treated to as low as reasonably practicable (ALARP).

h) Construction Plant & Equipment

The Principal Contractor shall maintain all items of plant and equipment necessary to perform the work in a safe condition.

Department of Health North West reserves the right to inspect items of plant and equipment brought to site and used on site by The Principal Contractor. Should it be found that any item is inadequate, faulty, unsafe or in any other way unsuitable for the safe and satisfactory execution of the work for which it is intended, The Principal Contractor will be advised of such observation / inspection, and The Principal Contractor shall be required to repair, make safe or remove such item from operation and replace it with a safe and adequate substitute.

The Principal Contractor shall ensure that all plant, equipment, and power tools that are brought onto and used on site are:

- Appropriate for the type of work to be performed.
- Placed on a register and inspected by a competent person or the authorized operator before use, daily or monthly dependent on Legislation and project requirements.
- Record inspection findings on a register that must be kept on site.
- The inspection register shall reflect the serial number of the plant, equipment or power tool.
- Maintained and used in accordance with the manufacturer's recommendations.
- Have adequate machine guarding fitted to all exposed rotating or moving parts, as reasonably practicable that have the potential to cause harm.
- All electrical power supply units are protected with operational earth leakage devices.
- Any defective, damaged or sub-standard equipment must be marked as unsafe for use and removed from operation as soon as possible.

i) Standards and Registers

As standard project procedures, The Principal Contractor is expected to:

- Set up an initial set of registers as per the requirements of the OHS Act and Regulations.
- Complete the registers for each piece of plant, tool and equipment brought on and used on site.
- Maintain a complete, continuous and comprehensive inspection and service history in these registers or checklists.
- Ensure daily, weekly, monthly inspections are done and recorded for all plant, tools & equipment by a competent person as required by the OHS Act and Regulations.
- Have the inspection and maintenance records available for audit purposes.

j) Working at Heights

- All work above 2m will be regarded as working at heights and subject to an approved issue-base risk assessment prior to work being undertaken including working from various forms of stationary, portable and mobile machinery and equipment.
- Working at height will include the following controls: -
    - Appointment of a trained and competent scaffold inspector and erector.
- All scaffolding and equipment used for working at heights shall to comply with the requirements of SANS 10085 and Construction Regulations 2014.
- All equipment used for working at heights shall comply with relevant approved design standards.

11 Occupational Health and Hygiene

11.1 Medical Fitness for Duty

All Principal Contractor employees shall undergo medical examinations and be certified fit for duty by an Occupational Health Practitioner before they are allowed to work on site.

The medical certificate must be in the form of Annexure 3 of the Construction Regulations and stipulate the possible exposures the employee might be exposed to during the execution of the project.

It is recommended and in the best interest of The Principal Contractor to implement pre-employment as well as exit medical surveillance, especially with regards to Section 8 of the Noise Induced Hearing Loss Regulation.

11.2 First Aid

According to GSR 3(4), where more than 10 employees are employed at a workplace / worksite, The Principal Contractor shall ensure that there is at least one trained first aider for every group of 50 employees at the workplace/site. First Aid boxes must be provided where more than 5 employees are employed and must be readily available and accessible for the treatment of injured persons at the workplace.

To ensure immediate treatment of an injured person, it is recommended that all work crews have at least one trained first aider, with a fully stocked first aid box, irrespective of the number of people in the work crew. This is especially important when Principal Contractors work at great distances from the nearest emergency facility or town. These persons shall be appointed in writing as the first aiders with their certificates attached as proof of competency.

The minimum contents of the first aid box shall be as per the supplied list in the General Safety Regulations.

All treatments done must be recorded on a register and kept with the first aid box. A trained and appointed first aider must be responsible for the first aid box and its content. Used content must be replenished as soon as possible.

In order to ensure prompt response at the emergency facility it is recommended that the W.Cl 2 forms be partially completed with the employers' details.

11.3 Hygiene Facilities

The Principal Contractor and his Principal Contractors shall ensure compliance to Section 30 of the Construction Regulations with regards to facilities on the construction site as well as where accommodation is provided to employees on remote sites. The Principal Contractor shall ensure that the facilities are kept clean at all times, either through a service provider or self-employed persons. The Principal Contractor shall provide employees with at least one sanitary facility for each sex and for every 30 workers, changing facilities for each sex and sheltered eating areas.

12 Waste management

The Principal Contractor shall comply with all applicable and relevant Waste management legislation, as well as municipal bylaws applicable to waste management.

The Principal Contractor shall remove all waste generated at the construction site on a daily basis or as soon as possible after generation to ensure good housekeeping at all times. The Principal Contractor shall have a waste management plan which must be implemented on the construction site and which will have the objective to ensure that waste is managed according to the Waste Management Hierarchy:

- Reduce what you can. If you cannot reduce then,
- Re-use what you can. If you cannot re-use then,
- Recycle what you can. What you cannot recycle,
- Convert into energy sources. If it cannot be converted to an energy source,
- Dispose of in a landfill – this is only to be done as a last resort and disposed without endangering human health and without using processes or methods which could harm the environment.

13 Hazardous chemical agents management

The Principal Contractor shall ensure that hazardous agents brought onto site are easily identifiable and stored according to the requirements of the Regulations for Hazardous Chemical Agents, 2020.

Where flammable liquids are being used or stored, this must be done in a manner which would not cause a fire or explosion hazard.

The Principal Contractor shall have Safety Data Sheets (SDS) readily available for flammable, hazardous and toxic chemical substances and materials brought onto site and shall ensure that his employees are trained in these SDS's.

Flammable, hazardous or toxic chemical substances may not be stored in empty food or drink containers. Empty flammable, hazardous and toxic containers must be disposed of in a safe manner, which will prevent further use of such a container.

14 Principal contractor

14.1 Consultations, Communications and Liaison

OH&S liaison between the Employer, The Principal Contractor, The Principal Contractors, the designer and other concerned parties will be through the OH&S committee. In addition to the above, communication may be directly to the Employer or his appointed agent, verbally or in writing, as and when the need arises.

Consultation with the workforce on OH&S matters will be through their construction managers and supervisors, OH&S representatives and the OH&S committee. The Principal Contractor shall be responsible for the dissemination of all relevant OH&S information to The Principal Contractors e.g. design changes agreed with the Employer and the designer, instructions by the Employer and/or his/her agent, exchange of information between Principal Contractors, the reporting of hazardous/dangerous conditions/situations etc. The Principal Contractors' most senior manager on site shall be required to attend all OH&S meetings

14.2 Operational Procedures

Each construction activity shall be assessed by The Principal Contractor so as to identify operational procedures that will mitigate against the occurrence of an incident during the execution of each activity. This specification requires
The Principal Contractor:

- to be conversant with all relevant Regulations.
- to comply with their provisions.
- to include them in his OH&S plan where relevant

14.3 Checking, Reporting and Corrective Actions

The Employer will conduct monthly health and safety and document verification audits in compliance with Construction Regulation 5(1) (o) in order to ensure that The Principal Contractor has implemented and is maintaining the agreed and approved OH&S plan.

The Principal Contractor will ensure that periodic health and safety audits and document verification are conducted at intervals mutually agreed upon between the Principal Contractor and any Principal Contractor, but at least once every 30 days.

The Principal Contractor will be provided with a copy of the Health and Safety audit report within seven days after the audit. The employer or his representative may stop any Principal Contractor from executing a construction activity which poses a threat to the health and safety of persons which is not in accordance with the client's health and safety specification and the Principal Contractor's health and safety plan for the specific site.

14.4 Other Audits and Inspections by the Employer

The Employer reserves the right to conduct other ad hoc audits and inspections as deemed necessary. This will include site safety walks.

14.5 Principal Contractor's Audits and Inspections

The Principal Contractor must conduct his own regular internal audits to verify compliance with his own OH&S management system, as well as with this specification. The Principal Contractor shall furthermore ensure that each Principal Contractor`s health & safety plan is being implemented by conducting periodic audits at intervals mutually agreed between The Principal Contractor and Principal Contractors, but at least once per month.

14.6 Inspections by OH&S Representatives and other Appointees

OH&S representatives shall conduct weekly inspections of their areas of responsibility and report thereon to their foreman or supervisor whilst other appointees shall conduct inspections and report thereon as specified in their appointments e.g. vehicle, plant and machinery drivers, operators and users must conduct daily inspections before start-up.

14.7 Recording and Review of Inspection Results

All the results of the abovementioned inspections shall be in writing, reviewed at OH&S committee meetings, endorsed by the chairman of the meeting and placed on the OH&S File.

14.8 Project Health and Safety Management Plan

As per Section 5(1) (l) and Section 7(1) (a) of the Construction Regulations of 2014, The Principal Contractor shall develop, implement and administer a Health and Safety Management Plan. The plan shall be in writing and shall be negotiated between The Principal Contractor and Client or designated OHS Agent and must be approved by Department of Health North West or the designated OHS Agent prior to the commencement of work on site. The plan shall demonstrate management's commitment to ensure employee health and safety as their primary objective during the contract.

14.9 Project Health and Safety File

The Principal Contractor shall compile a project specific Health and Safety File that consist of all the relevant project specific documentation. The Health and Safety file may consist of multiple files, which when combined should contain all the required documentation.

It is recommended that the project specific Health and Safety file contain at least the following:

- Scope and summary of the project as well as any scope changes.
- Notification of Construction Work to DoL / Copy of Work Permit
- Proof of COID registration (Letter of Good Standing)
- Principal Contractor Health and Safety Policy statement signed by management.
- Mandatory Agreement – OH&S Act 37.2 (Between Employer and Principal Contractor)
- Signed Client Health and Safety specification
- Latest copy of the OHS Act end Regulations.

- Company Organogram depicting Health and Safety Responsibilities, including sub-Principal Contractors.
- Employee list including copy of IDs and medicals.
- Project specific Health and Safety Management Plan agreed with the Employer
- Relevant OH&S Legal appointments which includes duties and responsibilities as well as competencies (training certificate)
- Copies of minutes of meetings - OH&S committee and other relevant OH&S meeting minutes
- Site specific Fall Protection Plan (if applicable)
- Risk Assessments
- Principal Contractor Induction material
- Waste management Plan
- Emergency preparedness (first aid, firefighting, emergency plan, etc.)
- Emergency Contact Telephone numbers
- HIV awareness program
- List of hazardous chemical agents used on site.
- Safety Data Sheets of hazardous chemicals on site
- List of plant & equipment to be used on site.
- Inspection Checklists/Registers of plant & equipment and emergency equipment
- List of Sub-Principal Contractors including type of work.
- Sub-Principal Contractor 37.2 Mandatary Agreements
- Sub-Principal Contractor appointments which shall include the type of work The Principal Contractor is appointed for.

14.10 Contracting Philosophy

Any site-specific hazards and safety management expectations will be made known to The Principal Contractor prior to the work commencing on site. Legal OHS requirements contained in the OHS Act and Regulations as well as SANS Codes are the minimum requirements The Principal Contractor must apply during this contract with regards to Occupational Health and Safety. The Principal Contractor shall apply, implement and enforce the minimum OHS Act & Regulations and SANS Codes requirements.

14.11 Workers Compensation Registration

The Principal Contractor shall ensure that his employees are covered for any occupational injuries and illnesses in terms of the Occupational Injuries and Diseases Act 130 of 1993, which cover shall remain in place and up to date for the duration of the project. The principal contractor must ensure that only contractors who have letter of good standing are eligible to work under this contract.

14.12 HSE Non-Compliance

It is a legal duty of the client according to the Construction Regulation 5(1) (q) that a Principal Contractor is stopped from executing any activity which poses a threat to the health and safety of persons. Depending on the seriousness of the non-compliance only the specific activity may be stopped until the non-compliance is rectified or the whole operation may be stopped.

It is also the duty of every employee to take reasonable care of his own health and safety and of other persons who may be affected by his acts as per OHS Act, Section 14(a). Keeping this in mind, it is required of The Principal Contractor to ensure his employees has the right to remove themselves from any unsafe situation or work activity, without any negative consequence to them until such time as The Principal Contractor has made the unsafe situation or activity as safe as practicable possible.

14.13 Indemnity by Principal Contractor

The Principal Contractor shall indemnify the Employer against and from all damages, losses and expenses (including legal fees and expenses) resulting from:

- the loss of output and delay caused by the slowing down or partial or total stoppage of work caused by:
- all or any of The Principal Contractor's workforce as a result of a dispute between all or any of the Principal Contractor's workforce and The Principal Contractor; or
- all or any of the Principal Contractor's suppliers' difficulty or impossibility to deliver goods or materials needed to perform the Works.
- Any unlawful, riotous or disorderly conduct by or amongst the Principal Contractor's personnel."

14.14 The Principal Contractor Conduct

Guidelines to the most important rules that shall be implemented and maintained by the Principal Contractor:

- Complete compliance to the OH&S Act 85 of 1993 and Regulations
- Hazard identification and Risk Assessments for all activities
- Daily communication of DSTI talk before work commences.
- Safe access and egress to and from work areas.
- Good housekeeping and stacking practices.
- Safe lifting, rigging and slinging practices.
- Complying to Legal standards for lifting machinery & equipment
- No lifting in wind conditions exceeding 30km/h (This is a guide and is dependent on risk assessments)
- Securing of tools, equipment and material at heights
- Wearing of appropriate personal protective equipment as identified in the risk assessment.

14.15 Principal Contractor and Contractor Management

The Principal Contractor shall establish, maintain and ensure that all his Contractors establish and maintain HSE standards and systems as necessary and to comply with the Legal requirements as well as these HSE specifications.

The Principal Contractor shall be solely responsible for carrying out work on the project, having the highest regard for the health and safety of his employees and people in the vicinity of his work area.

14.16 Public Health and Safety

The Principal Contractor shall, as far as is reasonably practicable, be responsible for ensuring that non-employees affected by the construction work are made aware of the dangers likely to arise from said construction work as well as the precautionary measures to be observed to avoid or minimise those dangers.

This includes:

- Non- employees entering the site for whatever reason.
- The surrounding community
- Passers-by to the site.

14.17 Designing for health, safety and environment

Designing for safety is a process aimed at minimizing injury, death, property damage or destruction and harm to the environment, by utilizing an approach to identify and eliminate or control hazardous areas. The project Designer and client must implement a process that ensures safety is incorporated in the design process, which includes temporary works as contemplated in the Construction Regulations, 2014 Section 6 and Occupational Health and Safety Act 85 of 1993 section 10.

The Principal Contractor must communicate the anticipated risks and hazards resulting from the design to his employees and establish safe work procedures for the temporary works.

14.18 Incident management

The Principal Contractor shall ensure that a culture exists within his company that promotes the recognition, response, reporting and investigation of incidents, including near misses (near hits). The Principal Contractor must implement a procedure for reporting and investigating accidents, incidents and near misses. The Principal Contractor should have a clear objective and target to obtain zero injuries for the duration of the project and such an objective must be communicated to all employees.

Appropriate corrective actions must be implemented, and the applicable learnings must be shared within The Principal Contractors business to prevent a recurrence of the incident or to prevent the near miss from becoming an incident in future.

14.19 Incidents and Accidents

The Principal Contractor and his Contractors shall coordinate their investigation of all accidents/incidents where employees and non-employees were injured to the extent that he had to be referred for medical treatment by a doctor, hospital or clinic. The results of the investigation shall be entered into an accident/incident register, which must be updated with each accident/indent.

The Principal Contractor shall notify the relevant Department of Health North West Project Manager and or Department of Health North West OHS Specialist of any incident / accident within

the Principal Contractors or his Principal Contractors area of responsibility in writing as soon as possible.

Although the accident / incident is reported to the client, the Principal Contractor has a responsibility and is required by law to report any Section 24 accidents and incidents to the Department of Labour. Any road traffic accident must be reported to the relevant authorities.

It is essential that The Principal Contractor demonstrate that corrective and preventative action has been taken to prevent a similar incident in future and that it is communicated to all The Principal Contractors affected staff. A copy of the investigation, corrective and preventative action taken as well as the attendance register of the employees who attended the discussion of the incident and the action implemented to prevent a similar incident, must be forwarded to the Department of Health North West Project Manager and or the Department of Health North West OHS Specialist.

Investigations must be completed for:

- Near Miss Incidents (To prevent it from becoming an incident)
- First Aid case Incidents
- Medical treatment case Incidents
- Fatalities

14.20 Incident Reporting

The Principal Contractor shall provide the Employer with copies of all statutory reports required in terms of the Act within 7 days of the incident occurring. In addition, The Principal Contractor shall update monthly the Disabling Injury Frequency Ratio (DIFR) and display this information on a signboard at the site office.

The Principal Contractor is responsible for collecting, recording, calculating and reporting his and his sub-Principal Contractors Health & Safety statistics to the Department of Health North West OHS Specialist.
The statistics should contain at least the following for all employees of all Principal Contractors working on the project:

- Total Number of workers
- Total Number of hours worked (on the Department of Health North West project)
- Total Number of Near Miss Incidents
- Total Number of First Aid case Incidents
- Total Number of Medical Treatment case Incidents (Excluding Section 24 type incidents)
- Total Number of Section 24 type Incidents
- Preventative actions taken on incidents that have occurred.
- Communication to employees and Principal Contractors of incidents and preventative actions.

14.21 Project specific construction requirements

The clause contains specific requirements for Contract, which must be adhered to in addition to minimum legislative requirements. The scope of work entails the following risks and hazards that will need to be managed throughout the project life cycle.

14.22 Daily Site Attendance Register

The Principal Contractor shall keep a daily site register so as to be able to identify the entire Principal Contractors personnel on site in case of an emergency or evacuation situation. The attendance register must include permanent as well as temporary workers working on the site.

All site visitors and any new Principal Contractors shall report to security / reception upon arrival at site. The Principal Contractor will only be granted first time access to work on the site if all required documentation has been provided and approved.

All visitors need to sign an attendance register when visiting the site. Visitors include all persons which are not permanently working on the site but excludes temporary site workers. Visitors must undergo site induction training before they are allowed on site to make them aware of the site dangers.

14.23 Emergency Numbers / Emergency Evacuation

A list with emergency numbers must be readily available to first aiders and supervisors. Emergency numbers must be site specific and must display the nearest emergency facilities.

The Principal Contractor shall identify and formulate emergency procedures in the event an incident does occur. The emergency procedures thus identified shall also be included in The Principal Contractor's OH&S plan and communicated as part of induction training.

The Principal Contractor must implement an emergency evacuation procedure on site to ensure that in case of an emergency, all staff will leave their place of work when the emergency siren is sound and proceed to the demarcated emergency assembly point. The emergency assembly point must display the sign "Emergency Assembly Point".

An evacuation route diagram must be displayed and visible at strategic points in buildings and on notice boards.

All staff working on site must be given awareness training on the emergency evacuation procedure and evacuation drills must be exercised to ensure all staff know the correct procedure to follow in case of an emergency.

14.24 Site Security

Certain areas where work must be carried out, is recognized unsafe areas and certain other areas may from time to time become unsafe, due to 3rd party actions. The Principal Contractor must as far as reasonably possibly anticipate unsafe areas and must ensure that his site staff is safe from 3rd party actions, which include but is not limited to:

- Unrests,

- Violent Demonstrations,
- Theft,
- Injury from 3rd parties at all times.

The Principal Contractor must, when work is to be carried out in the above-mentioned areas, make provision for security services to accompany site staff during the execution of their work, as The Principal Contractor is responsible for the Health, Safety and Security of his own staff. The provision for security services must form part of The Principal Contractors tender.

14.25 Personal Protective Equipment

Comply with General Safety Regulations, Section 2. Personal protective equipment (PPE) should, however, be the last resort and there should always first be an attempt to apply engineering and other solutions to mitigating hazardous situations before the issuing of PPE is considered. The hierarchy of hazard elimination must be followed before the option of personal protective equipment is considered. The following hierarchy of controls must be followed:

- Elimination
- Passive Controls
- Substitution – Using a cherry picker or man-lift instead of a ladder.
- Engineering Controls – Installing barrier railings; Installing stairs instead of using vertical ladders.
- Active Controls
- Administrative policies and procedures
- Personal protective equipment

Where it is not possible to create an absolutely safe and healthy workplace The Principal Contractor shall inform employees regarding this and issue, free of charge, suitable equipment to protect them from any hazards being present and that allows them to work safely and without risk to health in the hazardous environment.

The Principal Contractor shall include in his OH&S plan the PPE he intends issuing to his employees for use during construction and the sanctions he intends to apply in cases of non-conformance by his employees. Conformance to the wearing of PPE shall be discussed at the weekly inspection meetings.

14.26 Site Supervision

The Principal Contractor shall appoint a competent Construction Manager who shall be responsible for the construction activities and for ensuring occupational health and safety compliance on the construction site.

14.27 Structures

The Principal Contractor shall ensure that all practicable measures are taken to prevent the uncontrolled collapse of new or existing structures or any part thereof, which may become unstable or is in a temporary state of weakness or instability due to the carrying out of construction work. No structure may be loaded in a manner which would render it unsafe.

The Principal Contractor shall ensure that they assess the structural integrity of the building to ensure that it can safely undergo renovation without compromising its stability.

14.28 Renovations

Ensuring safety during renovations is a important to ensure the health and safety of employees is taken care of. The Principal Contractor shall conduct a through hazard assessment before starting the renovation. Identify potential risks such as structural weaknesses and electrical hazards.
Principal Contractor shall ensure that the renovation project complies with the OHS and its regulations. He/She shall ensure that employees are supplied with appropriate PPE suitable for the renovation activity done. This should include hard hats, overralls, safety boots, eye and and respiratory protection if needed.

14.29 Electrical Equipment

The Principal Contractor shall take adequate steps to ascertain the presence of and guard against danger to workers from electrical cables or apparatus which is under, over or on the site. The exact location of underground electric power cables must be determined before any excavators are used for excavation purposes. The location of overhead electrical cables must be assessed when working with cranes and lifting equipment.

All temporary electrical installations must be inspected at least once a week by a competent person and the records of the inspections must be recorded in a register which must be kept on site.

14.30 Temporary Storage of Flammable Liquids

The Principal Contractor must ensure storage areas of flammable liquids are well ventilated and “No Smoking” signs are placed at the entrances and ventilation ducts of the storage areas. Firefighting equipment must be available in suitable positions around the storage areas.

The Principal Contractor must ensure that good housekeeping is practiced in and around the flammable storage areas.

14.31 Housekeeping

The Principal Contractor shall ensure that suitable and acceptable housekeeping is continuously implemented and maintained on the construction site. Off-cuts and waste must be removed by the end of the shift or as soon as practicable. The Principal Contractor should CR 27 and Environmental Regulations for Workplaces, Section 6(3).

14.32 Stacking & Storage of Material & Equipment

The Principal Contractor shall appoint a competent person in writing with the duty of supervising all stacking and storage operations on site. Stacking shall only take place in areas specifically demarcated for this purpose. Circular items must be secured with wedges or chocks.

Items removed from a stack shall only take place from the topmost layer of the stack. Stacks shall not obstruct any fire extinguishing equipment, first aid equipment, electrical switchgear (DB Boxes) and ventilation or lighting installations. Unstable stacks must be broken down immediately.

14.33 Fire Precautions

The Principal Contractor must provide his own firefighting equipment that is within the service date and safe for use. Firefighting equipment must be on a register and inspected by a competent person who has been appointed in writing.

Suitable and sufficient fire extinguishing equipment must be placed at strategic locations and a sufficient number of firefighters must be available, which must be trained in the use of it.

14.34 Intoxicating Liquor and Drugs

The site limit for intoxication is set to zero to complement a vision of zero tolerance. Any person found to be intoxicated, or consuming intoxicating liquor or illegal drugs, will not be allowed onto the premises and/or will be removed from the premises.

The Principal Contractor has the right to test any person entering the premises for intoxicating liquor or illegal drugs and may refuse entrance on the basis of the outcome of the test.

The Principal Contractor shall ensure that employees taking prescription medicine informs The Principal Contractor of such and shall ensure that the side effect of such medicine does not constitute a hazard to the employee himself or people working in close vicinity to the employee.

14.35 Site Sanitary

The Principal Contractor shall provide and maintain on the Site adequate and suitable sanitary services for employees.
The toilets must be for both male and female with a ratio of 1:30.

14.36 Drinking Water

The Principal Contractor must ensure that an adequate supply of potable drinking water is available for personnel engaged on the Contract. Employees working in hot conditions must consume enough water per hour to prevent dehydration.

Where water is unsafe for human consumption, it must be indicated by means of adequate signage.

14.37 Formwork

The Principal contractor must indicate the plan to implement formwork on the construction site. All employees must be trained and provided with necessary PPE before formwork commences. Equipment used must be pre inspected by a competent person. All defaulted equipment must be

reported and not used. Pre assemble of formwork shutters should be prepared on an open area. Heavy shutters should be lifted with certified chains or slings.

14.38 Scaffolding

Every person required to erect, alter, disassemble and/or inspect scaffolding shall have undergone training and found competent to perform such work. Convenient and safe access must be provided to every scaffold platform. Where the access is a ladder, the ladder shall project at least 900 mm beyond the top of the platform.
All persons working on or from a scaffold platform shall wear safety harnesses which shall be secured to the platform. Scaffolding shall not be erected where electricity can pose a risk.
All scaffolds shall properly propped against displacement and secured vertically on firm foundations. Steel scaffold standards with “heavy”, “medium”, “light” or “very light” platform loading shall not exceed 320, 240, 160 and 80 kg/m^2 of load respectively, and spaced not more than 1.8 m, 2 m, 2.5m and 3 m apart, respectively.
Every scaffold platform shall comply with the following width dimensions:

a) “Heavy” not less than 1125 mm and not more than 1380 mm.
b) “Medium” not less than 1125 mm and not more than 1150 mm.
c) “Light” not less than 900 mm and not more than 1150 mm.
d) “Very light” not less than 675 mm and not more than 1150 mm.
e) A minimum of 3 planks is required on a platform.

The base section of the scaffold must be provided with “foot plate” supports. The size of these plates must be related to the ground conditions. Scaffolding must be secured and effectively braced to ensure stability in all directions. Scaffolding must be secured at suitable vertical and horizontally distances to the structure to which work is being done.
Every plank of a wooden scaffold platform is to be at least 228 mm wide and 38mm thick.
Every plank which forms part of a scaffold platform is to be supported at distances not exceeding 1.25 m and, its ends project not less than 70 mm and not more than 200 mm beyond the last prop.

15.45 Roof work

Any work must be performed within the requirements of OHS Act legislation: Construction Regulation 10 Fall Protection and 16 for Scaffold, GSR 13 for ladders.

15.46 Public awareness

The Principal contractor must indicate in the SHE plan how the workers, visitors and the community will be protected from all the construction activities. The adjacent buildings to the project site must be notified through letters and notices of the hazards and risks associated with the project. The public should be given a platform of raising their concerns emanating from the project to avoid community unrest.

PART IV

STANDARD TECHNICAL SPECIFICATIONS
HVAC

PART IV

STANDARD TECHNICAL SPECIFICATIONS

for

AIR CONDITIONING AND VENTILATION INSTALLATIONS

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4.1. GENERAL

4.1.1. The Standard Technical Specifications are to be read in conjunction with the Detailed Technical Specifications as the latter are intended to amplify the former; only those portions of the Standard Technical Specification which apply to the actual project involved shall be pertinent.

4.1.2. Where Detailed Technical Specifications are at variance with Standard Technical Specifications the former shall prevail as its contents relate directly to the specific project.

4.1.3. Where reference is made to the sub-contractor, this shall be the contractor or sub-contractor appointed in terms of this contract or sub-contract as the case may be. All other specialist contractors or principle contractors associated on the project are defined specifically.

4.1.4. It is in the interests of the Sub-contractor to notify the Engineer when the installation reached various stages of completion in order that the Engineer may inspect the installation and point out discrepancies. These inspections shall be considered informal and under no circumstances shall they, in part or in whole, invalidate the requirements of the documents. Any costs incurred in correcting discrepancies shall be for the Sub-contractor's account.

4.2 CODES OF PRACTICE, LAWS AND STANDARDS

4.2.1 All workmanship and materials used in the execution of the works shall be of the highest class and, where not fully covered by the Specification, shall be carried out in conformity with best modern practice, as determined by the Engineer.

4.2.2 The entire installation shall comply fully with all relevant requirements of Governmental and Local Authorities whose jurisdiction embraces the location of the Site of the Works and the equipment provided for these installations which shall comply in every respect with:

a) National Building Regulations and Building Standard Act (Act 103 of 1977) as amended

b) Occupational Health and Safety Act (Act 85 of 1993) as amended

c) The relevant and applicable specifications and standards of the South African National Standards (SANS).

excepting only where exemption from any such regulations has first been obtained in writing from the said Authorities, provided that the prior approval of the Engineer has been obtained for the application for any exemption.

4.2.3 All electrical wiring shall comply fully with the latest edition of the Standard Regulations for the Wiring of Premises SANS 10142 and the additional requirements of any local authority that has jurisdiction over the Site of Works, as well as being in accordance with the best modern practice.

4.2.4 Wherever relevant, this Specification shall be understood to be amplified to embrace Codes of Practice and Standards promulgated by recognised authorities in the field of Air Conditioning, Refrigeration, Piping, Ventilation, Electrical Technology and all other branches of engineering science applicable to this project.

4.2.5 Standards referred to in this specification are the latest edition, including all amendments, published three calendar months or longer before the closing date of tender

4.2.6 It shall be assumed that the Subcontractor is conversant with the abovementioned requirements. Should any requirement, bylaw, or regulation, which contradicts the requirements of this document, apply or become applicable during the erection of the installation, such requirement, bylaw, or regulation shall overrule this document and the Subcontractor shall immediately inform the Engineer of such a contradiction. Under no circumstances shall the Subcontractor carry out any variations to the installation in terms of such contradictions without obtaining the written permission to do so from the Engineer.

4.2.7 It shall be the responsibility of the Subcontractor to make the necessary arrangements at his own expense with the local supply authority and to supply the labour, equipment and means to inspect, test, commission and to hand over the installation.

4.2.8 The Subcontractor shall supply and install all Notices and Warning signs that are required by the appropriate laws, regulations and/or by this document. . In addition a conformity plaque must be attached to each machine, with the following information written in English:

- Name and address of the Contractor
- Type of material
- Serial number in the type
- Date of manufacture
- Indication of conformity to the legislation of the country (*ce marking)*

4.2.9 The installation must not produce any risks, even potentially, with regard to the safety of the people, the goods and the environment, and in particular:

- Mechanical risks related to mobile moving elements
- Risk of fire and explosion
- Risk of burns related to the use of steam, refrigerant and hot water
- Risk of overpressure related to the use of steam and refrigerant
- Risk of overflow
- Electrical / electrostatic / lightning risks
- Risks of falling of persons or objects
- Risks of pollution
- Risks related to vibrations
- Risks related to noise
- Risks related to hazardous materials used
- Risk related to any of the surfaces finish (cuts, …) on all areas of implementation.
- The use of hazardous consumable materials must be kept to a minimum.

4.2.10 When so requested by the Engineer, provide evidence in the form of certificates, test reports or other written proof that material or components comply with the standards laid down in this specification.

4.2.11 Products that are specified as mark-bearing must bear the mark of the relevant standards body

4.3 CHILLED WATER GENERATORS

4.3.1 Chilled Water Generators shall be of the package type with rated capacity at site conditions at least as specified. The units shall be a standard catalogued item of the manufacturer with the performance tested

in accordance with a recognised authority. Full details of the equipment offered shall be submitted with the Tender.

4.3.2 Chillers shall be provided with a least two completely separate refrigeration circuits which can operate independently of each other.

4.3.3 Refrigerant circuits shall each be provided with a hot gas muffler, combination moisture indicator and sight glass, refrigerant filter drier, liquid line solenoid valve, thermal expansion valve and charging valve. The suction lines shall be insulated with close fitting cellular insulation.

4.3.4 Compressors shall be of the semi-hermetic type and shall have capacity control, self reversing positive displacement oil pump, serviceable oil filters, oil level sight glass and crankcase heater. The compressors shall be fully accessible and completely rebuildable locally.

4.3.5 Compressors shall be driven by a built-in three phase motors. Motors shall be cooled by suction gas passing around the motor windings and shall be thermally protected by embedded thermostats in the motor windings.

4.3.6 Condensers shall be of the shell and tube design and two separate refrigerant circuits. Water heads shall be removable to permit cleaning and replacing of tubes. Water connections shall be flanged. Condensers shall be constructed to provide positive sub-cooling of the liquid refrigerant and shall be complete with safety relief valves, purge cocks and liquid line shut off valves. The condenser capacities shall be sufficient to hold the full system refrigerant charge for pump down.

4.3.7 Water coolers (evaporators) shall be of the shell and tube type construction with removable heads and shall contain two direct expansion refrigerant circuits. Tubes shall be integrally finned seamless copper rolled into ground tube sheets. Shells shall be suitably insulated and vapour sealed.

4.3.8 Machines shall be fully factory wired, piped and charged. Control panels shall include all operating and safety controls as well as terminal strips for external power and interlocking connections. Panels shall incorporate suction and discharge pressure gauges, an oil pressure gauge, suction and discharge switches, oil pressure switch, low chilled water temperature cut-out and temperature controller controlling compressors and unloader sequential operation. Refrigerant connections to devices on the panels shall be flexible enough to prevent transmission of vibration and shall have shut-off valves.

4.3.9 Capacity control systems shall modulate compressor capacities automatically by means of built in chilled water temperature actuated controls. The compressors shall start by a sequence programmed start.

4.3.10 Reciprocating compressors shall be provided with stepped capacity control by cylinder unloading with at least four steps per compressor as well as hot gas bypass control.

4.3.11 Screw type compressors shall be provided with fully modulating control.

4.4 PACKAGED AIR CONDITIONING UNITS - WATER COOLED

4.4.1 Water cooled packaged air conditioning units shall consist of the following components all housed within, or forming part of, their steel cabinets:

Refrigeration compressor(s)
Water-cooled condenser(s)
Refrigeration pipework and controls
Refrigerant gas charge
Direct expansion cooling coil
Centrifugal supply air fans
Motor and vee-belt drive to fans
Cleanable air filters
Electrical switchpanel
Internal electrical wiring.

4.4.2 Casings shall be constructed of not less than 1,2mm thick mild steel panels suitably braced and framed so as to prevent drumming, whilst at the same time being arranged in easily removable panels to facilitate access to any portion of the internal components. Casing panels shall be attached to a sub-frame of welded mild steel sections, which framework shall also serve the purpose of holding all internal equipment in position. The casing panels shall be internally insulated with `Fibreglass' or equivalent non-combustible material, such insulation being adequately secured to the internal surface of the cabinet with a non-combustible adhesive, whilst exposed surfaces of the insulating material shall be coated or covered with a suitable bonding agent to disallow shedding of the material into the packaged unit. The casing and framework shall be thoroughly degreased and then painted with a suitable rust proofing primer prior to the application of two finishing coats of good quality enamel or lacquer in the standard colour of the manufacturer. Openings for condenser water lines, condensate drain lines and power supply lines, shall be provided on one side of the cabinet. The openings shall be provided with rubber grommets.

4.4.3 Compressors shall be of the serviceable hermetic type equipment with suitable type vibration isolators and crank case heater. Compressors shall be located in a sound attenuating compartment located in the unit cabinet. The compressor shall be protected against low oil pressure and excessive winding temperature.

4.4.4 Water cooled condensers of the tube in tube, shell and tube or shell and coil type shall be provided on each refrigerant circuit. The condenser shall incorporate a pressure relief device to comply with Government regulations. All tubing within the condensers shall be copper. Unless otherwise specified, the condenser shall be selected for a fowling factor of not less than 0,000176 m²C/w. Threaded pipe connections shall be provided for water supply and return line.

4.4.5 Refrigeration pipework shall be carried out in seamless refrigeration quality copper tubing, suitable provision being made that the piping is not subjected to any stresses by vibration from the compressor(s). Refrigerant circuits shall incorporate replaceable type filter-dryers, sight glasses and thermostatic expansion valves and shall be factory charged with Refrigerant 22.

4.4.6 Automatic controls within the unit shall include a dual pressure refrigerant switch with manual reset on the high pressure side. Units which do not incorporate pump-down control shall incorporate timing devices to delay starting of compressors in such a manner that refrigerant pressures may first balance between stopping and starting of same.

4.4.7 Supply fans shall be of double inlet forward-curved centrifugal type with their impellers running in sealed, permanently lubricated, ball-bearing plumber blocks located in the suction eye on each side of each fan. Fan impellers shall be statically and dynamically balanced and run well below critical speed. Fan assemblies shall be so mounted within the packaged conditioner that they do not transmit any vibration. Where units having more than one fan are offered, these shall all be driven by a common motor.

4.4.8 Fan motors shall be three-phase squirrel cage type and run at not exceeding four-pole synchronous speed. The motor shall drive the fans via vee belt drive(s), each drive having not less than TWO vee belts.

4.4.9 Direct expansion cooling coils shall comprise of aluminium plate fins mechanically bonded to seamless copper tubing. The coils shall be encased in heavy gauge galvanised steel casing and fitted with a 1,4mm thick rust proofed steel condensate pan so sized and located as to prevent entrainment of condensed moisture into the air stream whilst also ensuring positive drainage of condensate to the drain connection point of adequate size.

4.4.10 Air Filters shall be equal to WASHPLEAT high performance washable pleated panel type housed in adequate holding frames fitted with gaskets to ensure a positive airtight seal around them. Should throw-away filters be the standard of the manufacturer of the packaged conditioner, they shall be discarded, and the foregoing specified type provided in their place.

4.4.11 Electrical Switch panels shall be incorporated to house all switchgear required to operate the various components within the unit. The switch-panel shall comply with best modern practice and incorporate all

necessary protection against overload or short-circuit, being fitted also with a main incoming isolator of sufficient capacity. The electrical equipment shall be fully interlocked so that the compressor cannot operate unless the remote condenser water pump is first operational and the supply air fans are running.

4.4.12 Compressor motors up to, but not exceeding 15 kW each may be started direct-on-line on application to the local authorities. Tenderers shall therefore base their pricing on the assumption that the local authority will grant an application to start compressor motors up to 15 KW each direct-on-line.

4.4.13 Compressor motors above 15 kW will have to be part-winding started and fan motors above 3,7 kW will have to be star-delta started.

4.4.14 Should the standard electrical motor starting arrangements provided by the manufacturer of the packaged air conditioning units not comply with the foregoing, the Contractor will be required to make the necessary modifications to the units to meet these requirements.

4.4.15 Internal electrical wiring shall comply fully with wiring regulations, as relevant, and be adequately secured such that it does not hang loose or exposed where it could be damaged. Adequate earthing shall be allowed.

4.5 PACKAGED AIR CONDITIONING UNITS - AIR COOLED

4.5.1 Air Cooled packaged air conditioning units shall be suitable in all respects for the unprotected outdoor location.

4.5.2 Unit(s) shall consist of the following components all housed within, or forming part of, its steel cabinet:

Refrigeration Compressor(s)

Air-cooled condenser coil(s)

Condenser fans and motors

Refrigeration pipework and controls

Refrigerant gas charge

Direct expansion cooling coil(s)

Centrifugal supply air fans

Motor and vee-belt drive to fans

Electrical heater elements

Cleanable air filters

Electrical switchpanel

Internal electrical wiring

4.5.3 Casings shall be constructed of not less than 1,2mm thick mild steel panels suitably braced and framed so as to prevent drumming whilst at the same time being arranged in easily removable panels to facilitate access to any portion of the internal components. Casing panels shall be attached to a sub-frame of welded mild steel sections, which framework shall also serve the purpose of holding all internal equipment in position. The casing panels shall, unless otherwise specified, be double skin internally insulated with `Fibreglass' or equivalent non-combustible material, such insulation being adequately secured to the internal surfaces of the cabinet with a non-combustible adhesive. Exposed surfaces of the insulating material shall be coated or covered with a suitable bonding agent to disallow shedding of the material into

the packaged unit. All mild steel casing panels and framework shall be thoroughly degreased and then painted with a suitable rust proofing primer prior to the application of two finishing coats of good quality enamel or lacquer in the standard colour of the manufacturer.

4.5.4 Units shall contain either a single refrigeration compressor or may be fitted with multiple compressors. Refrigeration compressors shall be of the hermetic or the accessible hermetic type direct driven by integral suction gas cooled squirrel cage motors at the rotational speed of not exceeding 1500 R.P.M. Compressors shall be mounted on helical spring type vibration mountings. Hermetic motors shall be protected against excessive winding temperatures. The compressors shall be complete with positive displacement reversible force-feed lubrication systems, have low oil pressure protection devices and contain crankcase oil heaters to ensure boil-off of dissolved refrigerant from lubricating oil at such times as when the compressors are stationary.

4.5.5 Units incorporating only one compressor shall be provided with at least two stages of capacity modulation other than full load and shall also be arranged to start in an unloaded position.

4.5.6 Condenser coil(s) shall, unless otherwise specified, consist of copper tubes fitted with mechanically bonded aluminium plate fins, all housed in a robust galvanised steel frame and protected with a suitable galvanised wire mesh screen to prevent mechanical damage to the coil due to hail.

4.5.7 Condenser fans shall be of the slow-running propeller type direct or belt driven by squirrel cage electric motors. The unit shall be provided with a minimum of four or more propeller fans which shall be arranged for vertical discharge through suitably weather-proofed protective wire guards which guard shall provide adequate hail protection. The fan and motor bearings shall be of the permanently lubricated sealed type and the motors shall be resiliently mounted so as not to transmit vibrations to the unit casing.

4.5.8 Condenser air intake and discharge arrangements shall be such that no short-circuited discharge air can be drawn back into the air intake.

4.5.9 Refrigeration pipework shall be carried out in seamless refrigeration quality copper tubing, suitable provision being made that the piping is not subjected to any stresses by vibration from the compressor(s). The refrigeration system shall be split into at least two stages on the liquid side for adequate capacity control. Refrigerant circuits shall incorporate replaceable type filter-dryers, sight glasses, thermostatic expansion valves as well as vapour-proof insulation on the suction lines. The unit shall be factory-charged with refrigerant.

4.5.10 Automatic controls within the unit shall include a dual pressure refrigerant switch with manual reset on the high pressure side and an oil pressure switch with manual reset.

4.5.11 Provision shall be made for pressure relief of the high side refrigerant piping in compliance with government regulations. Provision shall also be made for cycling the condenser fans so that the unit may be capable for operating at full load, down to an ambient temperature of 5ºC db.

4.5.12 Direct expansion cooling coils shall consist of at least two separate refrigerant circuits and shall comprise copper tubes with mechanically bonded aluminium fins. The coil shall be encased in a heavy gauge galvanised shell casing and fitted with a 1,4mm thick rust proofed steel condensate pan so sized and located as to prevent entrainment into the air stream of condensed moisture, whilst also ensuring positive drainage of condensate to a drain connection point of adequate size.

4.5.13 An anti freeze thermostat shall be provided to sense the return air temperature and arranged to reduce the cooling steps available on the compressor and prevent icing of the evaporator coil when the return air temperature is low.

4.5.14 Supply fans shall be of double inlet forward-curved centrifugal type with their impellers running in sealed, permanently lubricated, ball-bearing plumber blocks located in the suction eye on each side of each fan. Fan impellers shall be statically and dynamically balanced and run well below critical speed. Fan assemblies shall be so mounted within the packaged conditioner that they do not transmit any vibration. Where units having more than one fan are offered, these shall all be driven by a common motor.

4.5.15 Fan motors shall be three phase squirrel cage type rated not less than 25% above the power input absorbed by the fans and run at not exceeding four-pole synchronous speed. The motor shall drive the fans via a vee belt drive having not less than two vee belts.

4.5.16 Heater elements shall be of the factory-bent Incoloy type, rated for still air and fitted into the casing in such a manner as to ensure full air flow over each element. The heater elements shall be fitted into a withdrawable fabricated galvanised sheet metal channel frame. The side on which the terminals are located shall be fitted with a terminal box of sufficient size to contain all necessary electrical wiring, the terminal box being fitted with a removable weatherproofed cover so fastened that no screw shall project into the actual terminal box. The electrical wiring within the terminal box shall be effected in Asbestos-Insulated copper wiring capable of withstanding the temperatures to be encountered without breakdown of the insulation.

4.5.17 Air Filters shall be equal to WASHPLEAT high performance washable pleated panel type housed in adequate holding frames fitted with gaskets to ensure a positive airtight seal around them. Should throw-away filters be the standard of the manufacturer of the packaged conditioner, they shall be discarded and the foregoing specified type provided in their place.

4.5.18 A weatherproof electrical switchpanel shall be incorporated to form part of the unit and shall house all switchgear required to operate the various components within the unit. The switchpanel shall comply with best modern practice and incorporate all necessary protection against overload or short-circuit, being fitted also with a main incoming isolator of sufficient capacity. The electrical equipment shall be fully interlocked so that cooling and heating cannot operate simultaneously and so that the compressor cannot operate unless the condenser fans are first operational and the supply air fans are running.

4.5.19 Wiring within the panel and the unit shall comply with wiring regulations as relevant and shall be neatly grouped to horizontal and vertical runs and bound with P.V.C. tape. All wiring shall also be colour-coded in the colours red, yellow and blue for the relevant phases and black for neutral, and busbars being similarly marked. Busbars shall be copper of adequate cross-sectional area, suitably spaced and mounted on stand-off type porcelain insulators, all exposed current carrying parts, connection strips, etc., must be fully insulated in P.V.C. tape of the colours mentioned above. All outgoing leads shall be connected to a marked terminal strip.

4.5.20 Panels shall be fully labelled with black Ivorine labels having 5mm high white lettering and riveted to the cover plates previously referred to. Labels which are merely affixed with adhesive will NOT be acceptable.

4.6 REFRIGERATION CONDENSING UNITS - AIR COOLED

4.6.1 Air Cooled refrigeration condensing units shall be suitable in all respects for the unprotected outdoor location and shall comprise essentially of the following components all factory assembled onto a rigid framework constructed of mild steel sections, and housed within, or forming part of its steel or fibreglass cabinet:

Refrigeration Compressor(s)

Air-cooled condenser coil(s)

Condenser fans and motors

Refrigeration pipework and controls

Refrigerant gas charge

Electrical switchpanel

Internal electrical wiring.

4.6.2 Casings shall be constructed of not less than 1,2mm thick mild steel panels suitably braced and framed so as to prevent drumming, whilst at the same time being arranged in easily removable panels to facilitate access to any portion of the internal components. Casing panels shall be attached to a sub-frame of welded mild steel sections, which framework shall also serve the purpose of holding all internal equipment in position. All mild steel casing panels and framework shall be thoroughly degreased and then painted with a suitable rust-proofing primer prior to the application of two finishing coats of good quality enamel or lacquer in the standard colour of the manufacturer.

4.6.3 Units shall contain either a single refrigeration compressor or may be fitted with multiple compressors. Refrigeration compressors shall be of the serviceable hermetic type direct driven by integral suction gas cooled squirrel cage motors at a rotational speed of not exceeding 1500 R.P.M. Compressors shall be mounted on helical spring type vibration mountings. Hermetic motors shall be protected against excessive winging temperatures. The compressors shall be complete with positive displacement reversible force-feed lubrication systems, have low oil pressure protection devices and contain crankcase oil heaters to ensure boil-off of dissolved refrigerant from lubricating oil at such times as when the compressors are stationary.

4.6.4 Units incorporating only one compressor shall be provided with at least two stages of capacity modulation other than full load and shall also be arranged to start in an unloaded position.

4.6.5 Condenser coil(s) shall consist of copper tubes fitted with mechanically bonded aluminium plate fins, all housed in a robust galvanised steel frame and protected with a suitable galvanised wire mesh screen and hail guard.

4.6.6 Condenser fans shall be of the slow-running propeller type direct or belt driven by squirrel cage electric motors. The unit shall be provided with a minimum of four or more propeller fans which shall be arranged for vertical discharge through suitably weather-proofed protective wire guards. The fan and motor bearings shall be of the permanently lubricated sealed type and the motors shall be resiliently mounted so as not to transmit vibrations to the unit casing. The fans shall be protected against hail.

4.6.7 Refrigeration pipework shall be carried out in seamless refrigeration quality copper tubing, suitable provision being made that the piping is not subjected to any stresses by vibration from the compressor(s). The refrigeration system shall be split into at least two stages on the liquid side for adequate capacity control. Refrigerant circuits shall incorporate replaceable type filter-driers, sight glasses, thermostatic expansion valves as well as vapour-proof insulation on the suction lines.

4.6.8 The unit shall be factory-charged with a refrigerant acceptable in terms of the Montreal protocol and approved by the engineer.

4.6.9 Automatic controls within the unit shall include a dual pressure refrigerant switch with manual reset on the high pressure side and an oil pressure switch with manual rest.

4.6.10 A weatherproof electrical switchpanel shall be incorporated to form part of the unit and shall house all switchgear required to operate the various components within the unit. The switchpanel shall comply with best modern practice and incorporate all necessary protection against overload or short-circuit, being fitted also with a main incoming isolator of sufficient capacity. The electrical equipment shall be fully interlocked so that the compressor cannot operate unless the condenser fans are first operational.

4.6.11 Wiring within the panel and the unit shall comply with wiring regulations as relevant and shall be neatly grouped to horizontal and vertical runs and bound with P.V.C. tape. All wiring shall also be colour-coded in the colours red, yellow and blue for the relevant phases and black for neutral, the busbars being similarly marked. Busbars shall b copper of adequate cross-sectional area, suitably spaced and mounted on stand-off type porcelain insulators, all exposed current-carrying parts, connection strips, etc., must be fully insulated in P.V.C. tape of the colours mentioned above. All outgoing leads shall be connected to a marked terminal strip.

4.6.12 Panels shall be fully labelled with black ivorine labels having 5mm high white lettering and riveted to the cover plates previously referred to. Labels which are merely affixed with adhesive will NOT be acceptable.

4.7 ROOM AIR CONDITIONING UNITS

4.7.1 Room air conditioning units shall be self contained units consisting of unit casings, compressor, evaporator, evaporative fan, condenser, condenser fan, expansion device, refrigerant pipework and controls. The condensing unit shall either form an integral part of the unit for through the wall applications or be separate for split system applications.

4.7.2 Unit casings shall be of sheet metal construction with a baked enamel finish to give an aesthetically pleasing effect as well as ensuring corrosion resistance.

4.7.3 Evaporator fans shall be of the double inlet centrifugal type with integral motor centrally located on a common drive shaft. The motor fan assemblies shall be installed to provide an even air flow across the evaporators as well as the discharge grilles.

4.7.4 Evaporators shall be aluminium fins on copper coil construction and installed to ensure that there is effective condensate drainage for the coil without carry over.

4.7.5 Condensate trays shall be provided under the evaporator to collect condensate. The tray shall be stainless steel, polyurethane or similar non corrosive material.

4.7.6 Condensate shall be disposed of at the condensing unit by evaporating the condensate on the warm condenser coils.

4.7.7 Filters, of the washable type, shall be provided behind the return air grilles. Filters shall be easily removable. Return air grilles on console and split console units shall be positioned in the front facia to enable the units to be mounted on the floor.

4.7.8 Room temperature shall be controlled by means of a thermostat which will automatically switch the compressor or heater on and off. The temperature setting shall be adjustable within an acceptable comfort range.

4.7.9 Compressors shall be of the totally hermetic dome type to operate on 220 volt single phase power supply. Compressors shall be protected against overload.

4.7.10 Condenser coils shall be copper tubes with copper fins for all coastal applications. For inland areas aluminium fins will be accepted.

4.7.11 Condenser fans shall be either propeller or of the centrifugal type and driven by means of a two speed motor arranged to automatically control refrigerant head pressure.

4.7.12 Console units shall be provided complete with wall sleeves, weather louvres and external architraves. Wall sleeves shall be handed to the builder for building in. It is the responsibility of the Subcontractor to ensure that sleeves are installed correctly and the builder shall be provided with detailed instructions regarding installation requirements.

4.7.13 Refrigerant piping for split air conditioning units shall be installed as specified herein. Reference shall be made to the manufacturer's specification regarding pipe sizes, refrigerant lift and pipe lengths. Precaution s shall be taken to ensure efficient oil return compressors and where required, additional oil shall be introduced into the system.

4.7.14 Units shall be suitably insulated to ensure quiet operation.

4.8 AIR HANDLING UNITS

4.8.1 Air handling units may be provided as complete proprietary packages and suitably adapted to meet the specification requirements or alternatively, complete built up air handling units may be offered.

4.8.2 Casings downstream of the coil and including coil sections shall be double skin insulated, to include top, side and bottom panels. Casings upstream of the coil shall be single skin insulated panels.

4.8.3 Panels shall be manufactured from the following materials;

4.8.3.1 Two skins of minimum 1mm thick galvanised mild steel or 3 CR 12 of 304 stainless steel or 1,5mm aluminium sheet metal sandwiching 50mm of insulating materials being foam polyurethane having a density of not less than 36 kg/m.

4.8.3.2 Galvanised, Aluminium and 3 CR 12 sheet metal surfaces shall be painted internally and externally and finished with high gloss epoxy enamel after suitable corrosion protection.

4.8.3.3 Stainless steel casings shall be finished with two coats of high gloss epoxy suitably applied.

4.8.4 Panels shall be fastened together using suitable inert fasteners. The assembled casings shall be air tight with joints between panels sealed by the application of a suitable silicone sealant during construction.

4.8.5 Casings support framework shall be 304 stainless steel sheet metal sections. Stiffening of the casings shall be provided to eliminate drumming under operating conditions.

4.8.6 Condensate trays shall be provided under the complete coil sections to catch any condensate including that due to carry over. Condensate trays shall be suitably insulated with a minimum of 15mm thick isosinurate foam faced with an additional aluminium foil vapour barrier to prevent condensation.

4.8.7 Coil sections shall have heavy duty coil tracks extending the full width of the unit to provide slip-in, slip-out coils for easy service and maintenance. Where cooling coils are stacked, they are to have intermediate drain pans with drop tubes at each end to drain condensate to the main drain pan without flooding the lower coil.

4.8.8 Cooling coils are to be ripple corrugated plate fins on staggered copper tubes. Fins shall have bevelled collars and shall be bonded to the tubes by mechanical expansion. The minimum fin spaces shall not be less than 8 fins per 25mm.

4.8.9 Design of the air handling unit shall ensure an even distribution across the coil banks without leakage between or around the coils.

4.8.10 Fans incorporated within the casings shall be of the double inlet double width centrifugal type as later specified herein, refer Clause 4.22.

4.8.11 Access doors shall be provided on the units to give access to the fan, filter and coil sections. Door openings shall be not less than 600 x 600mm. Doors shall be manufactured similar to the unit panels and door frameworks and appurtenances shall be constructed of stainless steel. The doors shall be hinged and provided with cam locks which can be operated from either side of the door.

4.9 FAN COIL UNITS

4.9.1 Units shall be of the type and arranged for the mounting or as later specified herein and shall consist of the following components all housed within, or forming part of their steel cabinets:

Chilled water fed cooling coil and controls

Electric heater battery

Centrifugal supply air fans

Motor with direct drive to fans

Cleanable air filters

Internal electrical wiring

4.9.2 Casings shall be constructed of not less than 1,0mm thick mild steel panels suitably braced or framed so as to prevent drumming, whilst at the same time being arranged in easily removable panels to facilitate access to any portion of the internal components. The casing panels shall be internally insulated with non-combustible material, such insulation being adequately secured to the internal surfaces of the cabinet with a non-combustible adhesive. The casing and framework shall be thoroughly degreased and then painted with a suitable rust proofing primer prior to the application of two finishing coats of good quality enamel in the standard colour of the manufacturer.

4.9.3 Coils shall comprise of aluminium plate fins mechanically bonded to seamless copper tubing. The coils shall be encased in heavy gauge galvanised steel casings. Units with cooling coils shall be provided with insulated condensate drip pans extended on the coil connection side so as to accommodate condensation from pipe connections and valves.

4.9.4 Fans shall be centrifugal, forward curved, double width constructed of corrosion resistant aluminium. Fan scrolls shall be of moulded reinforced plastic for maximum corrosion resistance.

4.9.5 Motors shall be wound for three speeds and of shaded pole construction with bronze sleeve type bearings with oil reservoirs.

4.9.6 Filters shall be easily accessible and shall be of the cleanable plastic foam type in a rigid frame.

4.9.7 Supply air grilles shall be multi-directional of extruded aluminium or plastic.

4.9.8 Valves and all automatic controls shall be incorporated as later specified herein.

4.10 REFRIGERATION PIPEWORK

4.10.1 Refrigeration pipework between refrigeration condensing units and direct expansion cooling coils in air handling units shall be installed in full accordance with the relevant diagrams.

4.10.2 Refrigeration piping shall be carried out in seamless, bright, clean refrigeration quality copper tubing received from its suppliers with capped or sealed ends. Soft annealed tubing shall be used on all pipe sizes below 19mm O.D. whilst hard drawn tubing shall be utilised on all larger sizes. Joints on soft copper lines shall be flared type, forged or drawn brass fittings similar or equal to 'Mueller-Brass' being used. For joints on hard drawn copper lines use sweat fittings in conjunction with a suitable flux and silver solder. All pipe cuts shall be neatly reamered and cleaned prior to making joints. When brazing any refrigeration pipework, dry nitrogen must be bled through system continuously to stop any build-up of oxidisation in the system.

4.10.3 Liquid refrigerant lines shall incorporate the following components should they not be included within the refrigeration condensing units:

Y-type full-flow strainers

Isolating valves of the diaphragm type to the filter dryers

Moisture-indicating type single part liquid sight glasses

Angle-type, backseating, capped liquid charging valves with flare charging connections fitted with flare-fitting cap nuts

Liquid line solenoid valves

Thermostatic expansion valves of the external equaliser type, at the air handling units

4.10.4 Vibration eliminators of 'ANACONDA' or equal make shall be installed in the positions indicated on the diagrams.

4.10.5 Suction lines shall be vapour-proof insulated with 38mm thick preformed 'ARMAFLEX' sections.

4.10.6 Refrigeration pipework shall be supported at not exceeding 2m centres. Pipes shall be securely clamped to points of support using suitable holderbats. Insulated piping shall have moulded cork inserts of 50mm thickness in place of normal insulation where supports occur, vapourproofing at such positions being carefully executed.

4.10.7 All refrigeration pipework passing through plantroom walls shall have moulded cork surrounds of 50mm thickness by width not less than that of the wall, vapourproofing at such positions being carefully executed.

4.10.8 The sensing bulb of the thermostatic expansion valves shall be securely fastened to the suction lines using copper strip and brass screws, then insulated.

4.10.9 Particular care shall be exercised to ensure that pipework is neatly run in straight lines, this applying the more so to soft copper tubing. Pipes shall pitch 25mm in 6m in the direction of flow to prevent oil traps. No pipes shall be left opened for any period of time.

4.10.10 Oil traps shall be provided on all risers and where necessary, dual risers shall be installed to ensure proper oil return.

4.10.11 All refrigerant pipework shall be colour coded to enable immediate identification at any part of the run at approximately 3 metre intervals.

4.11 REFRIGERANT CHARGE

4.11.1 Refrigerant piping systems shall be charged with refrigerant after evacuation and testing for leaks as outlined below, it being required that the Subcontractor guarantee the installation with respect to loss of refrigerant for the full guarantee period applicable to the Works.

4.11.2 Completed refrigerant circuits shall be tested by means of dry Nitrogen to a pressure of at least 50% above working pressure.

4.11.3 With the system under the pressure of the Nitrogen, brush all possible points of leakage with a solution of soap and water to which a few drops of Glycerine have been added. All soldered joints shall be tapped on with a hammer to break possible flux seals. Any leaks which may be found due to bubbling of the soapy water should be made good after the Nitrogen has first been released. "Patching-up" of a leaking joint is not permitted; the fitting shall be taken out, cleaned and resoldered into the pipework again.

4.11.4 Systems should next be charged with Refrigerant to a minimum pressure of 200 kPa and then be brought to a pressure of at least 50% above working pressure with dry Nitrogen. A 'Halide' or Electronic leak detector shall at this stage be used to detect any further leaks.

4.11.5 Systems found to be free of leaks should be allowed to remain under the pressure for a 24-hour period. If no pressure drop is observed after this period, due cognisance being taken of ambient air temperatures, the Nitrogen mixture may be discharged to atmosphere.

4.11.6 The system shall then be evacuated by means of a suitable vacuum pump to a vacuum of 2,5mm of Mercury, allowed to stand for 12 hours and, no pressure rise having occurred, may be charged with refrigerant via the charging valve.

4.11.7 The refrigerant charge shall be sufficient to ensure the correct evaporative and condensing temperatures to ensure efficient operation of the plant.

4.11.8 Make reference to manufacturer's instructions to ensure correct refrigerant charge dependent on length of pipe runs. When recommended pipe runs are exceeded, make reference to manufacturer's instructions regarding additional oil charge. The Subcontractor shall provide the recommended refrigerant and oil charge.

4.12 COOLING TOWERS

4.12.1 Cooling towers shall be of such a capacity as to match the heat rejection requirements of the Water Cooled refrigeration plant whilst being selected in accordance with the air entering wet bulb temperature given in Part V of the Specification.

4.12.2 Cooling towers shall be of the forced draft type, rectangular in shape and of sectional steel construction. Towers shall consist of three removable sections namely, the fan section, water spray and eliminators section, the third section forming the sump and air distribution plenum.

4.12.3 Forced draft fan sections shall consist of a double inlet forward bladed centrifugal fan fitted into rectangular steel-clad framework so as to form rectangular air entry plena on either side of the fan's suction eyes. The air entrances to the foregoing plena shall be protected with readily removable wire mesh guards. Fan shafts shall be extended beyond one side of the rectangular casing so as to be capable of accepting an outboard driving pulley. Fan bearings shall be located on either side of the rectangular casing accessible via the removable air inlet screens and be of the self-aligning sleeve type. The fan's air volume shall be readily controlled by means of a single aerofoil-bladed damper vane located in the fan discharge and arranged so as to accept readily a damper motor controller.

4.12.4 Driving motors serving the cooling tower fans shall be of the totally enclosed fan cooled squirrel cage three phase type and run at a speed of not exceeding 1500 rpm. The motors shall be mounted on a suitable adjustable base for belt tensioning, the base being located on top of the fan section previously specified. Belt drives shall be adequately rated and shall consist of not less than TWO vee belts and be fitted with a substantial drive guard.

4.12.5 Sump and air distribution sections shall be constructed of heavy gauge hot dip galvanised steel and be complete with the following built-in components:

Fan discharge evase, sloped to disallow water entering the fan and projecting well into the cooling tower.

Access panels, readily removable and watertight.

Pump suction screens, easily removable for cleaning.

Pump suction pipe connections and internal intake piping, all arranged to disallow water cavitation.

Ball-float make-up with suitable provision for mains water supply connections.

Eliminator and water distribution sections shall be of like construction to the sump and air distribution section, and shall each house:

A wet deck tower fill of efficient design constructed of non-corrodible modular metal sections coated with rustproof bitumenised paint, or formed plastic sections.

A spray tree consisting of a galvanised steel pipework header, similar branches and readily removable non-clog brass atomising spray nozzles.

Hot dip galvanised steel moisture eliminators, arranged in easily removable frame sections and of good efficiency.

All necessary supports for the foregoing items.

4.12.6 Cooling towers shall be heavily paint-coated with a high quality corrosionproof paint, which paintwork shall be made good as required once the tower has been installed.

4.12.7 Cooling towers shall be the product of an acknowledged and reputable manufacturer of the type to produce the heat rejection capacity specified in Part V of these Specification.

4.12.8 Bases shall be provided in accordance with the manufacturer's instructions. Cooling towers shall be mounted on suitable R.S.J.s which in turn shall be mounted on vibration insulators all to ensure that the tower does not distort or leak.

4.13 CLOSED CIRCUIT COOLING TOWERS

4.13.1 Unit construction shall be all hot dip galvanised steel and shall consist of a fan section, water spray and eliminator section, sump and plenum section, circulating pump and heat exchanger section.

4.13.2 Forced draught fan sections shall consist of double inlet forward curved centrifugal fans as later specified herein, refer Clause 4.22. Fan housings shall be arranged to prevent water from entering the fans. Fans shall be statically and dynamically balanced. Fan bearings shall be self aligning ball bearings, suitable for a 200 thousand hour average life. Fan shafts shall have exposed surfaces coated with a rust preventative.

4.13.3 Fan motors shall be suitable for outdoor operation and shall be mounted on an adjustable base for belt tensioning. Fans shall be driven through V-belt drives. The motor nameplate power shall exceed the brake power by a minimum of 15% and the motors shall be suitable for the starting method as later specified herein, refer Clause 4.23.

4.13.4 Belt drives shall be designed for a minimum of 25% overload with no less than two matched belts being used. Belts shall be selected and installed in accordance with BS 3790 1973.

4.13.5 Pulleys shall be of the taper lock type and shall be accurately keyed to the shafts and aligned before the system is put into operation.

4.13.6 Belt guards shall be provided and arranged to permit oiling, use of tachometers and other testing and maintenance operations with the guard in place. Guards shall have a front screen of expanded metal.

4.13.7 Heat exchanger sections shall consist of galvanised steel tube bundles enclosed in galvanised steel panels. The entire section shall be removable from the fan and water distribution system. Tube bundles shall have sloping tube to permit the free drainage of the fluid. A vent connection shall be provided at each tube bundle.

4.13.8 Eliminator and water distribution sections shall house wet deck tower spray trees and drift eliminators. Eliminators shall be constructed of extra heavy coated hot dip galvanised steel and shall be removable in easily handled sections. They shall have a minimum of three directional changes with a hooked leaving edge and shall direct leaving air away from the fans.

4.13.9 Pumps shall be of the close coupled centrifugal type with mechanical seals and completely piped to suction strainers and water distribution systems shall be provided and installed on the pan sections such that the suction is flooded at all times and that the pumps will drain freely when the sump is drained.

4.13.10 Sumps shall have sufficient capacity so that air will not be entertained in the outlets when operating and no water will overflow on shut down. Sumps shall be provided with an outlet connection, overflow, valved drain, quick fill and float controlled water make-up. Outlet connections shall be equipped with a suction strainer with mesh size sufficient to retain matter which could block the spray nozzles.

4.13.11 The entire unit shall be mounted on a separate steel base frame.

4.13.12 The unit shall be painted with a high quality corrosion-proof paint, which paintwork shall be made good after installation.

4.14 EVAPORATIVE CONDENSERS

4.14.1 Unit construction shall be all hot dip galvanised steel and shall consist of a fan section, water spray and eliminator section, sump and plenum section, circulating pump and heat exchanger section.

4.14.2 Forced draught fan sections shall consist of double inlet forward curved centrifugal fans as later specified herein, refer Clause 4.22. Fan housings shall be arranged to prevent water from entering the fans. Fans shall be statically and dynamically balanced. Fan bearings shall be self aligning ball bearings, suitable for a 200 thousand hour average life. Fan shafts shall have exposed surfaces coated with a rust preventative.

4.14.3 Fan motors shall be suitable for outdoor operation and shall be mounted on an adjustable base for belt tensioning. Fans shall be driven through V-belt drives. The motor nameplate power shall exceed the brake power of a minimum of 15% and the motors shall be suitable for the starting method as later specified herein, refer Clause 4.23.

4.14.4 Belt drives shall be designed for a minimum 25% overload with no less than two matched belts being used. Belts shall be selected and installed in accordance with BS 3790 1973.

4.14.5 Pulleys shall be of the taper lock type and shall be accurately keyed to the shafts and aligned before the system is put into operation.

4.14.6 Belt guards shall be provided and arranged to permit oiling, use of tachometers and other testing and maintenance operations with the guard in place. Guards shall have a front screen of expanded metal.

4.14.7 Heat exchanger sections shall consist of galvanised steel tube bundles enclosed in galvanised steel panels. The entire section shall be removable from the fan and water distribution system. Tube bundles shall have sloping tube to permit the free drainage of the liquid refrigerant. Tube bundles shall be tested to 2700 kPa air pressure while immersed in water.

4.14.8 Eliminator and water distribution sections shall house wet deck tower spray trees and drift eliminators. Eliminators shall be constructed of extra heavy coated hot dip galvanised steel and shall be removable in easily handled sections. They shall have a minimum of three directional changes with a hooked leaving edge and shall direct leaving air away from the fans.

4.14.9 Recirculating pumps shall be of the close coupled centrifugal type with mechanical seals and completely piped to suction strainers and water distribution systems shall be provided and installed on the pan sections such that the suction is flooded at all times and that the pumps will drain freely when the sump is drained.

4.14.10 Sumps shall have sufficient capacity so that air will not be entertained in the outlets when operating and no water will overflow on shut down. Sumps shall be provided with an outlet connection, overflow, valved drain, quick fill and float controlled water make up. Outlet connections shall be equipped with a suction strainer with mesh size sufficient to retain matter which could block the spray nozzles.

4.14.11 The entire shall be mounted on a separate steel base frame.

4.14.12 The unit shall be painted with a high quality corrosion-proof paint, which paintwork shall be made good after installation.

4.14.13 Evaporative condensers shall be of such a capacity as to match the heat rejection requirements of the refrigeration plant whilst being selected in accordance with the air entering wet bulb temperature given in the detailed Specification.

4.15 AIR COOLED CONDENSERS

4.15.1 Air cooled condensing units shall be suitable in all respects for the unprotected outdoor location and shall comprise essentially of the following components all factory assembled onto a rigid framework constructed of mild steel sections, and housed within, or forming part of, its steel or fibreglass cabinet:

Air-cooled condenser coil(s)

Condenser fans and motors

Refrigeration pipework

Refrigerant gas charge

Electrical switchpanel

Internal electrical wiring

4.15.2 Casings shall be constructed of not less than 1,2mm thick mild steel panels suitably braced and framed so as to prevent drumming, whilst at the same time being arranged in easily removable panels to facilitate access to any portion of the internal components. Casing panels shall be attached to a sub-frame of welded mild steel sections, which framework shall also serve the purpose of holding all internal equipment in position. All mild steel casing panels and framework shall be thoroughly degreased and then painted with a suitable rust proofing primer prior to the application of two finishing coats of good quality enamel or lacquer in the standard colour of the manufacturer.

4.15.3 Units shall contain either single or dual condenser coils to suit the refrigerant circuiting.

4.15.4 Condenser coil(s) shall consist of copper tubes fitted with mechanically bonded aluminium plate fins, all housed in a robust galvanised steel frame and protected with a suitable galvanised wire mesh screen and hail guard.

4.15.5 Condenser fans shall be of the slow-running propeller type direct or belt driven by squirrel cage electric motors. The unit shall be provided with a minimum of our or more propeller fans which shall be arranged for vertical discharge through suitably weatherproofed protective wire guards. The fan and motor bearings shall be of the permanently lubricated sealed type and the motors shall be resiliently mounted so as not to transmit vibrations to the unit casing. The fans shall be protected against hail.

4.15.6 Condenser air intake and discharge arrangements shall be such that no short-circuited discharged air can be drawn back into the air intake.

4.15.7 Refrigeration pipework shall be carried out in seamless refrigeration quality copper tubing, suitable provision being made that the piping is not subjected to any stresses by vibration from the compressor(s).

4.15.8 Provision shall be made for pressure relief of the high side refrigerant piping in compliance with Government regulations. Provision shall also be made for cycling the condenser fans so that the unit may be capable of operating at full load down to an ambient temperature of 0ºC db.

4.15.9 A weatherproof electrical switchpanel shall be incorporated to form part of the unit and shall house all switchgear required to operate the various components within the unit. The switchpanel shall comply with best modern practice and incorporate all necessary protection against overload or short-circuit, being fitted also with a main incoming isolator of sufficient capacity. The electrical equipment shall be fully interlocked so that the compressor cannot operate unless the condenser fans are first operational.

4.15.10 Wiring within the panel and the unit shall comply with wiring regulations as relevant and shall be neatly grouped to horizontal and vertical runs and bound with P.V.C. tape. All wiring shall also be colour-coded in the colours red, yellow and blue for the relevant phases and black for neutral, the busbars being similarly marked. Busbars shall be copper of adequate cross-sectional area, suitably spaced and mounted on stand-off type porcelain insulators, all exposed current-carrying parts, connection strips etc., must be fully insulated in P.V.C. tape of the colours mentioned above. All outgoing leads shall be connected to a marked terminal strip.

4.15.11 Panels shall be fully labelled with black ivorine labels having 5mm high white lettering and riveted to the cover plates precariously referred to. Labels which are merely affixed with adhesive will **NOT** be acceptable.

4.15.12 All switch panels shall have phase failure, phase rotation and low voltage protection with automatic reset adjustable to a maximum period of 10 minutes.

4.16 FEED AND EXPANSION TANKS

4.16.1 Feed and expansion tanks shall be provided on hot water and chilled water installations to allow changes in density of this water to expand freely without damage to the piping systems.

4.16.2 Construction of the tanks shall be equal to Braithwaite sectional hot dip galvanised tanks, site assembled if necessary, with bolts and packings to their manufacturer's recommendations. Tops of the tanks shall be covered but a readily removable drop-in type inspection hatch shall be provided, the hatch complete with handles and vent.

4.16.3 Each tank shall also serve as water supply source for the system it is connected to and shall be complete with, but not necessarily limited to, the following fittings:

High pressure ball valve, with copper ball, 19mm for tanks less than 1800 litres, 25mm for tanks 1800 to 3600 litres and 38mm on larger tank capacities.

Quickfill valved connection, sized as for above ball-float valves.

Overflow and drain connections, 50mm pipe size for tanks up to 1800 litres capacity, 63mm size on 1800 to 3600 litres and 75mm pipe diameter for larger sizes.

Feed/expansion connection of 50mm pipe size for tanks up to 1800 litres capacity and 75mm on larger sizes.

4.16.4 Expansion tanks shall be sized by the air conditioning Subcontractor so that its contents between minimum level and full level are one-tenth of total water content of the system it serves. Minimum water level shall be 230mm from tank bottoms and expanded water level shall be 150mm below overflow connections.

4.16.5 Tanks mounted outside and exposed to the elements shall be insulated with 38mm thick heavy density fibreglass covered with 0,85mm galvanised sheetmetal jacketing and neatly finished, this applicable to tank sides only. The top of the tank need not be insulated but the bottom shall rest on 50mm thick hardwood planks suitably treated against rotting and insect attack.

4.16.6 Furnish sufficiently robust tank stands constructed of mild steel sections, the steelwork painted if indoor located and hot dip galvanised for exterior situations. Tank stands shall be complete with 450mm wide catladders where required to inspect water levels. Stands shall further comply with the relevant clauses on the Specification referring to Equipment Supports, refer clause 4.41.

4.17 WATER TREATMENT PLANTS

4.17.1 Evaporative cooling plants shall be provided with a chemical treatment plant which shall include chemical dosing to inhibit corrosion and scale formation and to protect the system against sludge formation and algae growth.

4.17.2 Cooling towers shall in addition, be provided with side stream sand filters with integral pump and backwash facility in order to filter the circulating water by drawing from the main distribution piping and returning the filtered water back into the system.

4.17.3 Closed circuit systems shall be treated with a chemical such as "Watergy 2753" or equal corrosion inhibitor and scale suppressant. The chemical treatment shall be applied only after the system has been flushed out and filled with clean water.

4.17.4 Subcontractors shall employ the service of a competent water treatment company regularly engaged in the water treatment to Air Conditioning Plant. The water treatment company employed shall provide all necessary service and operation training to ensure the efficient operation of the system.

4.17.5 Routine service of the water treatment plant shall be conducted at a minimum of 12 times during the guarantee period. The purpose of these service visits shall be to prevent potential problems from arising that will reduce equipment efficiency and result in equipment damage. Service reports shall be submitted to the Engineer detailing the work carried out at each service, problems encountered and what action was taken to rectify this.

4.17.6 The water treatment company employed shall have major laboratory back-up capabilities to assist in the solution of problems which may arise.

4.17.7 All water circuits shall include corrosion coupon monitoring with rates not to exceed 2,0 mls per year on mild steels.

4.17.8 Chemical dosing shall be automatic and the system shall include all necessary metering pumps, storage drums, conductivity monitor, bleed off control and all other appurtenances necessary for the efficient dosing and monitoring of the chemicals.

4.18 WATER PUMPS

4.18.1 Pumps shall be of the non-overloading, volute, centrifugal type, horizontal split, with bearing pedestals.

4.18.2 Volute casings shall be cast iron and overhung from heavy duty bearing pedestals. Casings shall have axial suction and radial discharge nozzles and shall be fitted with renewable case wear rings of spun cast iron.

4.18.3 Impellers shall be of the cast bronze radial type overhung and shall be dynamically balanced.

4.18.4 Shafts shall be chrome or stainless steel of sufficient diameter with withstand all stresses imposed and with a critical speed well above the maximum running speed. Shafts are to be supported axially and radially by two deep groove ball bearings built into the bearing pedestals.

4.18.5 Pumps are to be fitted with mechanical seals.

4.18.6 Pump casings shall be provided with an air vent cock at the highest point and a drain cock is to be provided at the lowest point.

4.18.7 Pumps shall be directly coupled to an electric motor which shall be of sufficient capacity to operate over the entire range of the pump without exceeding the motor power ratings.

4.18.8 Couplings between motors and pumps shall be by means of flexible couplings, "Fennerblex" or equal and approved. Couplings shall be provided with a removable galvanised sheet steel coupling guard, minimum 1mm thick, which shall be securely bolted to the bedplate of the pumps.

4.18.9 Characteristic curves for all pumps shall be stable over the entire operating range. Pumps shall operate at or near the point of peak efficiency, permitting operation at capacities approximately 25% beyond the design capacity without exceeding the break-off point. The subcontractor shall submit pump curves for approval with shop drawings and verify the system resistance, including pressure drops through all components, in order to establish the pump head. Pumping heads indicated under the Schedule of Equipment Capacities Required, are merely a guide for tendering purposes.

4.18.10 Pumps and motors shall be mounted on a baseplate of either cast iron or fabricated steel of ample size and strength to hold the total assembly in correct alignment. Suitable drip trays shall also be provided and the baseplate is to be filled with concrete.

4.18.11 A pipe shall be run from each drain point on each assembly and shall terminate with a suitable gap over the nearest floor drain.

4.19 WATER PIPEWORK

4.19.1 General

4.19.1.1 Water piping systems shall be run to general routes indicated on the relevant drawings. Piping shall be arranged to maintain headroom, keeping access ways unobstructed, allowing pipe routes not to interfere with maintenance and adjustment of valves and equipment. Piping should be installed at right angles, parallel to surrounding walls, plumb and of as direct routing as possible. Provide offsets where required to pass columns, beams or other structural features while maintaining headroom and proper clearance for insulation where relevant.

4.19.1.2 Where pipe sizes are not indicated on drawings, pipes shall be sized for a maximum water velocity of 2,5m/s within plantrooms and all other piping shall convey water at a velocity not exceeding 2m/s.

4.19.2 Piping Materials and Strength

4.19.2.1 Chilled water piping shall be seamless steel in accordance with specifications to the ASTM 106 or API 5L GRD B Schedule 40. Piping 50mm and smaller shall have screwed or welded joints. Piping 65mm and larger shall have welded or flanged joints.

4.19.2.2 Condenser water piping shall be galvanised to BS1387 or SABS 62 for pipes up to 150mm nominal bore, and SABS 719 for pipe larger than 150mm.

4.19.2.3 Pipes shall be galvanised in accordance with SABS 763.

4.19.2.4 Where pipework is fabricated, this shall be hot dip galvanised after fabrication. No welding of galvanised pipe shall be permitted.

4.19.2.5 All drainage piping and similar open vented systems shall be galvanised or copper.

4.19.2.6 Mains water supplies shall be hand drawn copper with capillary fittings. Suitable dielectric couplings shall be provided at junctions between copper piping and any galvanised material to prevent electrostatic action.

4.19.3 Fittings

4.19.3.1 Long radius bends shall be used wherever possible, elbows only being permissible where limited space dictates their use.

4.19.3.2 Reductions in pipe sizes shall be effected with reducing sockets, bushing reducers not being allowable for this purpose.

4.19.3.3 Threaded fittings shall be malleable iron to S.A.B.S. 509-1975 Specification or wrought steel to BSS 1740 as relevant.

4.19.3.4 Welded fittings shall be genuine butt-weld fittings to BSS 1740. No welding of threaded fittings shall be permitted.

4.19.3.5 Strainers, screwed Y-Type on pipe diameters up to and including 50mm, flanged Y-type for piping up to 200mm diameter and flanged pot type on larger sizes. Screens shall be fitted with extraction handles for easy removal.

4.19.3.6 Gate valves, screwed brass with brass trim to S.A.B.S. 776-1975 on pipe diameters up to and including 50mm and flanged on larger sizes.

4.19.3.7 Globe valves, screwed bronze with bronze trim on pipe diameters up to and including 50mm and flanged type on larger sizes.

4.19.3.8 Check valves screwed bronze swing check bronze trim on pipe diameters up to an including 50mm and for 65mm and above wafer type double door spring closing Non-slam.

4.19.3.9 All flanged valves to comply with B.S. 4504 or S.A.B.S. 1123.

4.19.4 **Vents and Drains**

4.19.4.1 At all high points of water systems fit Spirax type 05 or equal automatic air vents with integral check valves. Each air vent shall be preceded by a gate valve to allow maintenance of air vents. Automatic air vents shall ensure positive removal of all air from water piping systems. At all low points of the system fit 15mm ball valves with hose unions, these valves so located that the entire piping systems can be completely drained. Fit such drain valves also at all equipment to allow complete drainage.

4.19.5 **Flexible Connectors**

4.19.5.1 At all equipment connections to vibrating equipment, or where shown on the Drawings, fit flexible connectors equal to VIBRO-FLEX. All flexible connectors to have flanged joints and be capable of 875 kPa or 1,5 times the system working pressure, whichever is the higher value.

4.19.6 **Pipe Joints**

4.19.6.1 Pipe joints shall be neatly made, all pipe cuts properly cleaned and reamered. At all connections to equipment use flanged joints or conical face unions for smaller pipe sizes up to 38mm nominal bore. Incorporate sufficient flanged joints, or unions to be the foregoing limited sizes to allow dismantling of sections to pipework which can readily be handled by one tradesman and one unskilled assistant. Use screwed joints on galvanised pipework up to and including 100mm nominal size and black piping up to and including 50mm nominal size. Welding joints shall be made with proper welding sockets. On black piping all sizes may be welded; where galvanised piping is called for above 150mm diameter, use black piping with welded joints and hot dip galvanise after welding. Screwed joints on piping up to 50mm shall utilise P.T.F.E. jointing tape equal to 3-M manufacture; for larger screwed joints use hemp and Stag or equivalent jointing compound. Flanged joints shall include Klingerite gaskets or equivalent. Caulking of joints will under no circumstances be acceptable.

4.19.6.2 Flanges for pipe jointing to BS 4504 or S.A.B.S. 1123 - 1977

4.19.6.3 Welded joints shall be carried out by certificated welders to BS 2633.

4.19.7 **Protection during Installation**

4.19.7.1 Plug open ends of piping, drains, fittings and equipment connections in a workmanlike manner during installation of pipework to keep systems free of rubble, dirt and other foreign matter.

4.19.8 **Pipe Supports**

4.19.8.1 Pipework shall be supported as later specified herein, refer Clause 4.41, at the following maximum centres:

50mm diameter and smaller	3,0m
65 to 100mm diameter	4,5m
125 to 150mm diameter	6,0m
200mm diameter and above	8,0m

4.19.9 **Expansion and Contraction**

4.19.9.1 Pipework installation shall allow generous latitude for expansion and contraction, supports for this purpose being of the roller cradle type. No pipework shall cause any stress on any equipment due to the thermal movement, nor shall it bend or distort from such factors. Fit expansion joints of the bellow type as required to comply with the foregoing and where indicated on the Drawings.

4.19.10 **Flushing and Testing**

4.19.10.1 Piping systems shall be tested, by means of a hydraulic pump to twice the operating pressure of the systems or 700 kPa whichever is the greater. Where this is not permissible due to the relevant maximum allowable piping working pressure, piping shall be tested to the limits set by such maximum allowable working pressure to the Engineers approval.

4.19.10.2 The Engineer shall be notified at least 48 hours prior to commencement of the tests. The pressure test shall be witnessed and approved by the Engineer or his representative.

4.19.10.3 The Contractor shall be responsible for all testing required by State and local authorities or other statutory bodies as requested by the Engineer, or required by the Specification. The Contractor shall provide four sets of all test certificates, witnessed by the Contractor's Authorities, and Engineer's Representative, and detailed so as to identify the area tested.

4.19.10.4 Acceptance of a test by the Engineer will not relieve the Contractor of responsibility for proper materials and workmanship. It shall be the Contractor's responsibility to test all piping, valves, fittings and other items erected by the Contractor in accordance with the Local South African Standard.

4.19.10.5 The Contractor shall remove all safety valves, gauges, instruments and items which could be damaged by the test pressure and shall supply and install blanks, blinds or temporary fittings for testing. The Contractor shall remove blinds, blanks or temporary fittings and replace safety valves, gauges and items which could be damaged by the test pressure on satisfactory completion of the test.

4.19.10.6 The Contractor shall supply all test equipment and materials.

4.19.10.7 The Contractor shall be responsible for the removal of water used in flushing and testing from all piping systems, including attached equipment.

4.19.10.8 Where temporary lines are required for draining, these shall be supplied by Contractor and removed after use, leaving the area in its original condition.

4.19.10.9 Where removal of all moisture or special cleaning is necessary, the method may be specified as additional to any other procedure which follows.

4.19.10.10 All lines and attached equipment shall be thoroughly flushed and cleaned before testing, usually by washing with water. The Contractor shall supply and install temporary flushing screens on the upstream side of all equipment, and shall remove same on completion of flushing. The Contractor shall be responsible for the removal of all resulting debris from the premises.

4.19.10.11 During flushing, all flanged elbows etc., noted as being for flushing purposes will be removed by the Contractor until the flushing has been completed to the Engineer's satisfaction.

4.19.10.12 All such flanged elbows etc., will be re-installed after completion of flushing out and before hydrostatic testing.

4.19.10.13 The Contractor shall be responsible for any and all damage resulting from a test pressure more than ten per cent higher than specified by the Engineer. The Contractor shall supply a safety or relieve value which shall be used at the pressure source to protect systems under test. The Contractor shall be responsible for venting all sections of piping systems, vessels and equipment while flushing, testing and draining to ensure against their collapse by vacuum.

4.19.10.14 Variations of pressure and volume due to temperature changes will be taken into account by the Engineer during pressure testing and the Contractor will be responsible for measuring and recording the average ambient air temperature at the beginning and completion of any test to support any claim for pressure drop due to temperature change. Such temperatures may be checked by the Engineer by reference to an independent body.

4.19.10.15 In the event of a pipeline system failing a test, a new test shall be applied after repairs and corrections have been made. Under no circumstances may repairs and connections be made whilst the pipeline is filled with water.

4.19.10.16 After completion of repairs, the lines will be re-filled, vented, pressurised and tested, including any parts which may have passed a test but which, in the opinion of the Engineer may have been affected by the repairs.

4.19.10.17 The Contractor shall supply test pressure gauges which shall either be dual scale test type gauges, or, if single, indicating scale types, a second gauge shall be used immediately adjacent to the test gauge. Gauges shall be suitable for the maximum test pressure, with dials at least three inches in diameter. The maximum pressure capacity of the gauge shall not exceed twice the test pressure. Gauges shall be checked against a standard gauge.

4.20 PIPEWORK INSULATION

4.20.1 Chilled Water Piping

4.20.1.1 Chilled water piping shall be insulated with preformed sectional resin bonded mineral wool with a density of 160kg/m^3.

4.20.1.2 Insulation thickness shall be as follows:

Pipes up to 25mm diameter	30mm thick
Pipes 32mm to 150mm diameter	40mm thick
Pipes larger than 150mm diameter	50mm thick

4.20.1.3 Insulation shall be supplied with a factory applied canvas wrap and shall be provided with a vapour barrier by applying two coats of "FOSTER SEALFAS 30/36" or equivalent and approved and overcoated with "FOSTER VINYL VAPOUR BARRIER 30/42" or equivalent and approved.

4.20.1.4 Circumferential joints to the insulation shall receive one application of "FOSTER FOAMSEAL 30/40" or equivalent, to the full thickness of the insulation during erection to obviate lateral migration of moisture vapour along the pipe being serviced.

4.20.1.5 All points where pipe supports are used or where the vapour barrier is broken due to cut outs in the insulation, shall be sealed during erection with "FOSTER FOAMSEAL 30/45" or equivalent and approved.

4.20.1.6 All exposed piping shall be provided with 0,5mm thick aluminium sheet cladding over the insulation material. Bends shall be clad with lobster back covering of similar material. Valves and fittings shall be insulated and provided with aluminium cladding.

4.20.1.7 Black pipework shall be painted with primer and one coat undercoat paint prior to insulation.

4.21 FANS

4.21.1 **General**

4.21.1.1 Requirements under this heading apply to fans which are not integral parts of equipment designed and supplied as complete units by the manufacturers. Selection of fans shall be such that the operating point is as close as possible to the point of maximum efficiency. In addition, fans and motors shall be selected such that they are capable of supplying a minimum of 10% above the specified air volume.

4.21.1.2 System resistance shall be calculated by the Subcontractor to meet the requirements of selected equipment. The Subcontractor shall submit his selections to the Engineer for approval before ordering equipment. When selecting the fan, cognizance shall be taken of site altitude, system air temperature and air density at which the system duty shall be met.

4.21.1.3 Belt drives shall be designed for a minimum of 25% overload with no less than two matched belts being used. Belts shall be selected and installed in accordance with the BSS 790-1973.

4.21.1.4 Pulleys shall be of the adjustable speed taper-lock type and shall be accurately keyed to the shafts and shall be aligned before systems are put into operation.

4.21.1.5 Belt guards shall be provided in accordance with the Factories Machinery and Building Works Act 1941 as amended. The guards shall have a front screen of expanded metal and shall be arranged to permit oiling, use of tachometers and other testing and maintenance operations with the guard in place. All fan openings shall be provided with protective wire guards in accordance with the above Act.

4.21.1.6 Fan bearings shall be selected for a minimum of 200 000 (Two Hundred Thousand) h ours average life at the given duty.

4.21.1.7 Lubrication points for fan bearings shall be readily accessible and shall where necessary be extended to the outside of the face casing to permit lubrication of the fan without removal of the fan or appurtenances. Fan shafts and bearings shall be suitably protected from rust and corrosion.

4.21.2 **Centrifugal Fans**

4.21.2.1 Unless otherwise specified, centrifugal fans shall be of the backward curve blade type with single thickness shaped blades designed to give the fan a non-overloading characteristic.

4.21.2.2 Fan casings shall be fabricated from heavy gauge steel adequately reinforced and supported to provide a rigid structure and prevent drumming. Field joints shall be flanged and bolted with gaskets fitted between the flanges to render these airtight.

4.21.2.3 Shafts shall be steel with sufficient mass so that the critical speed of the wheel and shaft is well above the maximum permitted speed of the fan. Wheels shall be tightly fitted and keyed to the shafts.

4.21.2.4 Fan bearings shall be self aligning ball or roller type.

4.21.2.5 Fans shall be driven by an electric motor through a V-belt drive and mounted on an adjustable motor bracket which shall form part of the fan framework.

4.21.2.6 Vibration isolation shall be provided by means of spring isolators which shall be properly selected and installed in accordance with the manufacturer's specifications.

4.21.3 **Axial Flow Fans**

4.21.3.1 Unless otherwise specified axial flow fans shall be inline direct driven type with motor mounted inside the fan housing.

4.21.3.2 Fan casings shall be constructed from galvanised mild steel having a thickness not less than 3mm and having galvanised mild steel flanges at each end, drilled for connections to mating flanges on ducting.

4.21.3.3 Fans shall be multi-bladed aerofoil type all of non-ferrous metal or polyester construction. A varying number of blades to suit the application shall be provided. The fans shall be provided with adjustable pitch blades indexed to permit field adjustment.

4.21.4 **Propeller Fans**

4.21.4.1 Propeller fans shall be direct driven, ring or diaphragm mounted as specified or indicated on the Drawings.

4.21.4.2 The impeller shall be constructed from roll formed galvanised steel or aluminium sheet and shall be statically and dynamically balanced.

4.21.4.3 Vibration eliminators, consisting or rubber in shear mounted between the fan assembly and ring or diaphragm, shall be provided.

4.21.4.4 Exposed fans shall be provided with a suitable wire guard mesh to meet the requirements of the Factories Machinery and Building Works Act 1941 as amended.

4.21.5 **Fan Volume Controls**

4.21.5.1 Volume control of axial and centrifugal fans shall be by means of proprietary vortex dampers.

4.21.5.2 Fans shall be capable of stable operation while varying the supply air quantities from maximum design rating down to 20%.

4.22 ELECTRIC MOTORS

4.22.1 All electric motors on the installation shall be of one make unless integral with the equipment served and shall not operate in excess of 1500 R.P.M. unless previously approved by the Engineers for specific applications. Motors, unless otherwise specified, shall be 380 volt, three phase, 50 Hertz for all sizes from and including 0,4kW upwards; smaller motors may be 220 volts, single phase, 50 Hertz.

4.23 All motors shall be of the totally enclosed, fan cooled type and have metric frame dimensions. Motors shall be quiet in operation to the full acceptance of the Engineers.

4.23.1 Three Phase Motors shall all be squirrel cage induction type, special high torque motors being used on high inertia loads such as large centrifugal fans, where otherwise excessively large motors, necessary to overcome driven equipment inertia, cause operation B.kW to be less than 70% of motor nameplate kW. Starting methods for three phase motors shall be as follows:

Motors up to 4kW	direct-on-line
Above 4kW	Star-delta started, provided that the starting current does not exceed three times the full load amperes.

4.23.2 Single phase motors shall be capacitor start, induction run type with built-in manual reset overload protection.

4.23.3 Nameplate rating of electric motors shall be at least 15% greater than required driven equipment brake drive losses duly accounted for, on motors below 15kW nameplate. On larger motors 10% margin shall suffice.

4.23.4 All switch panels shall have phase failure, phase rotation and low voltage protection with automatic reset adjustable to a maximum period of 10 minutes.

4.24 MACHINERY DRIVES

4.24.1 Direct drive couplings shall be of the non-lubricated type, rated at least 125% of driving motor horsepower and flexible to allow minor misalignment. "Pin-and-Push" type coupling shall not be used, all direct drive couplings being of FENAFLEX type FX as manufactured by Fenner or approved equal. Direct drives shall be accurately aligned using the appropriate instruments to within 0,25mm.

4.24.2 Vee Belt drives shall in no case consist of less than two belts and shall be selected in accordance with manufacturer's rating, plus one additional belt per drive. Sheaves shall be machined cast iron with Taperlock shaft bushes all equal to FENNER; aluminium pulleys will not be permitted. All drives on the installation shall be of the same make and of modern high-capacity belt section such as FENNER Alpha, Beta, etc., Vee-belts shall be fitted in matched sets only.

4.24.3 All drives shall be fitted with adequate drive guards complying with the relevant Government regulations, which guards shall totally enclose all moving parts. Drive guards shall be readily removable for access to the drives. Guards fitted to belt drives shall have an expanded metal fact to enable visual inspection of the drive without the need to remove the guard.

4.25 AIR FILTERS

4.25.1 General

4.25.1.1 Provide and install air filters in the positions as indicated on the Drawings and on all air handling plant providing conditioned air.

4.25.1.2 Filters shall be a standard product of a reputable manufacturer regularly engaged in the manufacture of the particular filter. The manufacturer shall submit evidence to the satisfaction of the Engineer, that the filters have been tested, by an independent South African Authority and that they meet the minimum arrestance efficiency and dust holding capacity specified.

4.25.1.3 Filters shall be tested in accordance with the A.S.H.R.A.E. Standard 52-76 Gravimetric on primary and Opacimetric on secondary and tertiary filters.

4.25.1.4 The systems resistance for selection of fans shall make allowance for resistance of the filters at 80% of the recommended final filter resistance.

4.25.1.5 Manometers shall be provided across each filter bank and shall indicate filter resistance. The clean and change out resistance of the filter shall be clearly marked on the manometer.

4.25.2 Primary Air Filters

4.25.2.1 Primary air filters shall, unless otherwise specified, be washable non woven polyester material, pleated to provide an extended surface with an efficiency of 88%, Gravimetric.

4.25.2.2 Media shall be firmly held in place by rust proofed wire screens to maintain pleat strength and spacing.

4.25.2.3 Media and support screens shall be continuously bonded into aluminium support frames folded to form a robust media support frame. The bonding between media and frame shall be continuous to prevent leakage.

4.25.3 Secondary Filters

4.25.3.1 Secondary filters shall, unless otherwise specified, be of the pocket type manufacture using fine filament, non-woven, polyester media constructed in such a manner so as to withstand vacuum cleaning.

4.25.3.2 Media shall be supported to expose the greatest effective area to air flow and to promote uniform dust loading. The filter shall maintain its rigidity under all flow conditions from maximum air flow to no air flow. This being particularly important on Variable Air Volume systems.

4.25.3.3 Secondary filters shall have an efficiency of 65%, Opacimetric

4.25.4 **Tertiary Filters**

4.25.4.1 Tertiary filters shall be of the high efficiency HEPA type contained in a solid frame with seals which ensure the integrity of the filter without bypass.

4.25.4.2 Media shall be supported to expose the greatest effective area to air flow and to promote uniform dust loading. The filter shall maintain its rigidity under all flow conditions from maximum air flow to no air flow. This being particularly important on Variable Air Volume systems.

4.25.4.3 The supply air fan on all systems with tertiary filters shall be capable of providing the specified air volume with all filters dirty. The fan shall be provided with a speed controller to automatically maintain the specified air volume at all times. The control shall be achieved through a velocity sensor in the supply airstream.

4.25.4.4 Tertiary filters shall have an efficiency of at least 99.999% at 5µ.

4.25.4.5 After installation of the filters, the system shall be validated by an approved testing authority using equipment with a valid calibration certificate.

4.25.4.6 Tertiary filters shall always be installed downstream of the fan and any other system equipment and as close as possible to the supply terminals.

4.25.5 **Filter Handling Frames**

4.25.5.1 Each filter cell shall be provided with a factory made holding frame, constructed of not less than 1,00mm thick stainless steel grade 304 or powder epoxy coated galvanised steel. On primary and secondary filters, a quick release spring type clip shall securely hold the filter cell in place without permitting leakage of air. The holding frames of multiple cell filter banks shall be suitably joined and sealed so as to prevent the leakage of air between the frames.

4.25.5.2 The frames shall ensure that the filters can be accessed for removal and replacement, either side access or rear access

4.26 COOLING AND HEATING COILS

4.26.1 Heating and Cooling water fed coils shall be of the serpentine form, extended surface type with cast iron, brass or copper supply and return headers with inlet, outlet, vent and drain connections on the same end of each coil.

4.26.2 Tubes shall be fabricated from not less than 16mm diameter copper or brass tubing having a wall thickness of not less than 0,5mm and shall be soldered or brazed into the pipe headers unless the headers are thick enough or provided with bosses heavy enough to withstand, without distortion, the stresses imposed due to rolling or expanded the tubes into the headers. Pressure parts of the coils shall be constructed and tested for a working pressure of not less than 1350 kPa.

4.26.3 Fins shall be of the helical or plate type spaced at not less than 12 fins per 25mm (2,12mm centres or 470 fins per meter) for aluminium fins and at not less than 8 fins per 22mm (3mm centres or 333 fins per meter) for copper fins. Helical fins may be crimped or tapered. Crimped fins shall have a nominal thickness of not less than 0,18mm and shall be soldered to the tubes. Tapered copper fins shall have a thickness of not less than 0,2mm at the base and shall be soldered to the tubes or wound with sufficient tension to ensure a permanent bond. Plate type fins may be flat or formed and shall have a nominal thickness of not less than 0,13mm for copper and 0,2mm for aluminium. Plate fins shall be soldered to

the tubes or shall be provided with integral spacing collars at least 3mm wide, or full width of fin spacing if this is less than 3mm, into which the tubes shall be tightly and permanently expanded.

4.26.4 Casings shall be constructed of not less than 2,0mm thick galvanised steel and shall be provided with drilled flanges for bolting to other coil sections or to unit casings. Coil sections having a tube length in excess of two meters shall be fitted with centre braces for tube support and casing rigidity. Multi-coil assemblies shall be supported on hot dipped galvanised steel channel frames. Such supports shall not pierce the drip pans and shall be arranged so that condensate cannot run down them past the drip pans. Flanged sections between coils shall be sealed and covered with 1,0mm thick galvanised sheet metal flashing to prevent air bypassing between the sections and each complete coil assembly shall be installed so that no air bypasses around the edges of the casings.

4.26.5 Condensate drain pans shall be fabricated from 1,6mm thick galvanised sheet steel riveted and soldered and sloped to drain all condensate. A pan shall be installed below each coil and the drain pans of multi-coil assemblies shall be provided with galvanised pipe connections through each drain pan to the lowest drain pan, from whence the condensate shall be piped to the drain point to be provided by others. Drain pans shall be extended 50mm beyond the coil casings on the leaving air side. All condensate drain pans shall be insulated and vapour sealed on the underside to prevent the formation of condensation. The insulation material and adhesive shall be non-combustible.

4.26.6 Eliminators shall be provided on the fan side of cooling coils if there is any possibility of water droplets being carried over into the fan chambers. Such eliminators shall then be designed to eliminate all condensate from the air stream and shall be fabricated from extruded sheet plastic and shall be sectionalised to facilitate maintenance. Should it be necessary to install eliminators then the drip pans shall be extended to drain condensate removed by the eliminators. If eliminators are not provided for by the Tenderer, then the Subcontractor shall provide the Engineer with a written guarantee that no moisture will be carried beyond the drip pans under the operating conditions for which the coils are to be selected.

4.26.7 Sumps for sprayed coils shall be as later specified herein.

4.26.8 Coils shall be suitably protected during shipment and installation so that fins and casings are not damaged. Coils having loose or damaged fins at the time of the final inspection shall be replaced if considered necessary by the Engineer.

4.27 SPRAYED COIL ASSEMBLIES

4.27.1 Sprayed coil assemblies shall be factory manufactured and assembled units of a specialist equipment manufacturer and shall each comprise of the following components contained within or forming part of the casing of the self-contained Sprayed Cooling Coil units which shall be installed in the positions indicated on the Drawings and shall be supplied with treated water from the water treatment plant located in the Sub-Basement Plant Room.

Chilled water fed cooling coil, as previously specified herein,

Recirculated water sump,

Inlet air baffles,

Spray nozzles with associated piping,

Air outlet drift eliminators.

4.27.2 The cooling coil shall be as previously specified in Clause 4.26 of these Specifications and shall be installed within the sprayed coil unit casing assembly so as to prevent air and water bypassing around the perimeter of the coil casing.

4.27.3 The water sump shall be constructed of hot dip galvanised steel of 3mm minimum thickness, reinforced as necessary to carry the weight of the cooling coils, eliminators, etc., and further rust proofed with a

suitable and approved epoxy resin based sealer. The sump shall be suitably insulated with 12mm minimum thickness of factory-applied polyurethane foam. The sump shall be 75mm minimum deeper than the working water level.

4.27.4 Sump fittings shall include the following items, all connections to the sump being made by the use of pipe sockets welded into it before the sump is galvanised.

A suitable anti-cavitation pump suction connection,

A removable copper mesh pump suction screen,

A 20mm NB ball-float valve of the high pressure type, complete with 200mm diameter copper ball and 20mm NB drain and overflow connections.

4.27.5 On the air inlet side of the sprayed coil unit shall be fitted 0,6mm thick galvanised sheet steel suitable rustproof coated, or extruded sheet plastic, air inlet baffles spaced at not exceeding 75mm centres. The baffles shall be suitably stiffened and bent at both the leading and the trailing edges and shall be horizontally arranged in sections and be readily removable for replacement. NO spray water shall pass through the baffles when the spray washer is tested with no air flow through it.

4.27.6 Between the air intake baffles and the cooling coil battery, provided the spray washer system of the unit. The spray washer shall be of the single bank type utilising one set of nozzles spraying in the direction of the air flow.

4.27.7 The spray header to the nozzles shall consist of one horizontal inlet pipe with its inlet water connection welded into one side of the sump. Vertical standpipes shall be fitted to this header with a suitable number of small bore pipe branches being fitted to the former for attachment of the spray nozzles. All pipework within the spray chamber shall be galvanised, as also shall be any pipe supports required.

4.27.8 The spray nozzles shall operate at a pressure of 50 kPa and handle the correct water quantity as called for in the detailed Specifications. The spray nozzles shall provide coverage of the entire coil face area. All nozzles shall be 10mm NB diameter inlet and of the brass "non-clog" type with removable orifice caps.

4.27.9 On the air leaving side of the cooling coil battery a set of vertical drift eliminators are to be installed, these eliminators to have a minimum of three bends and to be of identical construction and finish to the air inlet baffles, a minimum of 300mm in overall length in the direction of air flow and spaced at 75mm maximum centres. The eliminators shall be supported between notched hot dip galvanised or extruded plastic angles on leading and trailing edges and so arranged that no spray water shall be allowed to pass them into the air stream under a test air velocity of 3 meters per second. The eliminators shall be readily removable for access to the cooling coil or for purposes of replacement.

4.27.10 The casing shall be suitably stiffened at the air entering and leaving ends and be constructed of not less than 1,6mm thick galvanised steel sheet rustproof paint-coated and braced and framed with hot dip galvanised steel angles. The casing shall be fixed to the sump below it by means of flanges, cadmium plated bolts and a suitable water-resistant gasket. All seams in the casing shall be adequately sealed with mastic or similar non-hardening substance. Suitable access provisions shall be allowed in the casing for sufficient access to the spray nozzles for servicing purposes, unless the air inlet baffle assembly already affords such access.

4.27.11 The complete unit shall be installed on a reinforced concrete base provided by others. Between the sump of the unit and the concrete base, lay a 50mm thick layer of good quality steam-baked cork insulation and properly vapour proof same with bitumen applied hot. The base shall be pitched towards the drain connections on the unit, to facilitate drainage and cleaning and the drain connection shall be piped to the drain point to be provided by others in the Plant Rooms, in the positions indicated on the Drawings.

4.28 ELECTRIC HEATER BATTERIES

4.28.1 Electric heater elements shall be factory-bent type so arranged that all connections are on the same side. They shall be black heat, 5W/cm rated for still air operation by their manufacturers but operated at a minimum air velocity of 5 meters per second on this project. Elements shall be rated for 250 volt site electricity supply, with consequent lower wattage heat output and lower sheath temperature. Arrangement of heater elements within the heater batteries shall be such that they are uniformly spaced across the width of the duct to present equal air flow over each element. When necessary arrange in staggered rows to ensure best distribution of air flow over individual elements.

4.28.2 Heater elements shall be fitted into a frame attached to a terminal box, the frame fitted into a rectangular opening on one side of the duct. The frame shall be constructed of 1,6mm bent-up galvanised sheet steel channel and the terminal box, frame and heaters assembly shall be readily withdrawable from the heater casing.

4.28.3 Terminal boxes shall be fabricated from 1,2mm galvanised sheet and fitted with a hinged cover fabricated from 15% free area flattened expanded mesh to allow adequate ventilation. No screws, fixings or sharp edges shall project into the terminal box; the hinged terminal cover shall however be secured with clip type fasteners. All wiring within the heater terminal box shall be carried out with silicone insulated stove cable wired to a porcelain terminal strip to which incoming P.V.C. insulated cables are also to be connected. Connections for looping wiring within the terminal box shall be executed with porcelain connectors.

4.28.4 Ductwork attached to heater batteries shall be insulated internally with 6mm asbestos millboard for 500mm on air inlet side and 1000mm on air leaving side, if space permits. Such asbestos shall be fitted over any other internal duct insulation that may be required and the rough edges shall be fitted with galvanised sheet metal covers, riveted to the ductwork, to prevent entrainment of loose fibres into the air stream.

4.28.5 Heater batteries shall be protected against overheating with fire safety thermostats of the manual reset rigid tailstock type sensing temperature in ductwork on the leaving air side of the battery. Thermostat locations shall be such that their operation is unaffected by radiation from the heater elements and their temperature setpoint shall be 55ºC. Thermostats shall have single pole double throw contact arrangement to enable trip condition to be indicated by means of pilot lamps on the relevant electrical switchpanel.

4.28.6 All air handling plants fitted with electric heater batteries shall be so automatically controlled that when the plants are shut down, the operation of heater elements is stopped, but fans shall continue to operate for 3 minutes before shutting down, all to cool off heater elements for prolonged life, as well as to prevent false tripping of fire protection thermostats. Under alarm signal control conditions for shutting down the plants, the fans shall be isolated immediately.

4.28.7 All heaters shall be installed from the top of the ducting where at all possible.

4.29 HUMIDIFIERS

4.29.1 Humidifiers shall have the capacities as called for in the detailed specification.

4.29.2 Humidifiers shall be of the packaged type consisting of submerged resistance heating elements contained in a stainless steel vessel. The container shall be cleanable by means of a removable lime collecting bag. The unit shall be completely automatic in operation and shall include an automatic self flushing system which shall be adjustable to suit the different water conditions. All switching sequences shall be by means of solid state switching.

4.29.3 Steam output shall be adjustable in response to an external automatic control signal. This proportional response must be instantaneous and is to be achieved without boildown or dumping of hot water. Proportional control must be from 0 to 100% variable.

4.29.4 Humidifiers shall be installed in full accordance with their manufacturer's instructions and have their steam injection nozzles fitted in the positions indicated on the Drawings.

4.29.5 Humidifiers shall be piped to suitably selected steam injection nozzles each being of sufficient length so as to extend over the full length of the coils or the ducts, or be the maximum standard length available from the manufacturers of the humidifiers, and positioned for optimum mixing of the steam discharge with the air without condensate forming on any adjacent casings or inside the supply air ducts. Should steam distribution hosing runs, because of their length, cause excessive steam temperature drop and a consequent high rate of condensate within them, then the hoses shall be insulated with suitably sized light density, preformed fibreglass sectional lagging covered with P.V.C. plastic sheeting overlapped over each section and fixed with approved adhesive, as previously specified herein for the insulation of all hot water piping.

4.29.5.1 Each humidifier shall be supplied with two sets of spare replaceable lime collecting bags.

4.29.6 Water connections to and drain connections from the humidifiers shall be carried out in water quality copper tubing using SECUREX or equivalent compression type fittings. The mains water serving the humidifiers must NOT BE TREATED and shall be taken from the mains water supply connections to be provided by others in each plant room in the positions indicated on the Drawings.

4.30 DUCTWORK

4.30.1 Ductwork shall be carried out in accordance with the details shown on the relevant Drawings and be fabricated from prime quality galvanised sheetmetal, except where otherwise called for. Where duct sizes are shown on the Drawings, such dimensions are metal sizes and to include the necessary allowances for any internal insulation which may be specified.

4.30.2 Ductwork shall be fabricated and installed in accordance with the duct construction and installation standards as detailed in the HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE - latest edition as issued by SMACNA (Sheet Metal and Air Conditioning Contractors National Association, Inc. of America) or SANS 1238.

4.30.3 Unless otherwise specified or allowed, main ducts shall be constructed to a minimum of 100mm wg. and branch ducting to a minimum of 50mm wg.

4.30.4 Fittings such as elbows, parallel flow branches, branch connections, off-sets and transitions shall be manufactured and installed in accordance with the SMACNA standards.

4.30.5 All ducting shall be sufficiently airtight to ensure economical and quiet performance of the system and joints shall be suitably sealed in accordance with the relevant SMACNA standards with suitable non-combustible filler compound or adhesive tape applied in accordance with the manufacturer's instructions and to the Engineer's approval.

4.30.6 Access doors shall be provided where indicated or required for inspection, maintenance, and replacement of all instruments, controls and other equipment. In particular, access doors shall be provided at all Fire Dampers, Automatic Dampers, Main Balancing Dampers, Filter Banks, and at the inlet and outlet sides of Axial type fans.

4.30.7 Access doors, where possible, shall be a minimum of 500mm x 500mm square. Where access doors are provided to items of plant these shall be as large as possible to permit access to the plant for maintenance and removal of equipment.

4.30.8 Access doors shall be constructed in accordance with the SMACNA standards and shall be installed in a reinforced frame to ensure that the door is airtight. Access doors shall be hinged and held in position by means of a minimum of two Sashlocks or Camlocks. Where access doors are intended for main access, the locking mechanism shall be capable of operation from both sides of the access door.

4.30.9 Duct connections to vibrating equipment shall consist of a flanged joint, followed by a flexible connector consisting of a fire retardant PVC covered cloth affixed on either side of the joint and a double lock seem to form an airtight flexible joint with a minimum of 50mm separation between metal edges. Ducting at

flexible joints shall be so supported that the ductwork is held square with the adjoining duct and no stress is imposed upon the flexible joint.

4.30.10 Test holes, where provided in ductwalls for admission of testing apparatus, shall consist of a suitable opening having a self-sealing Neoprene rubber grommet.

4.30.11 Flexible ducting shall be coated fibreglass fabric mechanically locked to a galvanised flat steel helix, "Kopes" or equal. The material shall be non-flammable and shall meet the requirement of the fire authorities having jurisdiction.

4.30.12 Flexible ducting shall be suitable for the operating temperature and pressure and shall be secured to spigots by means of circular "Jubilee" securing bonds making air tight connections.

4.30.13 Flexible ducting shall be installed with "easy" bends of not less than one duct diameter centreline and shall be supported to SMACNA specifications to ensure that ducting does not kink. The length of flexible ducting shall be kept to a minimum and shall not exceed lengths of 1200mm.

4.31 DUCTWORK AND PLENUM INSULATION

4.31.1 Ductwork shall be insulated according to the requirements as indicated on the Drawings and in accordance with the following specification.

4.31.2 Internal duct lining shall, unless otherwise specified, comprise 25mm thick 24gk/m^3 density, 8% resin content bonded fibreglass cloth, SONIC LINER, or equal, glued to the inside surface of the ductwork with a fire retardant adhesive equal to EUROPAIR'S EUROBOND self-extinguishing adhesive, the butting edges of the insulation first heavily caulked with FOSTER'S 60-30 mastic, or equal, to seal them. Additionally, the insulation shall be mechanically secured with GRIP NAILS or WELDPINS at 400mm centres and not more than 75mm from the edges of each panel. Insulation ends shall be covered with 0,85 thick galvanised sheet metal strip riveted to the duct panels to prevent the erosion of particles of insulation into the air stream.

4.31.3 Any insulation of which the facing has been damaged shall be properly patched with FOSTER'S 60-30 mastic and fibreglass cloth.

4.31.4 Externally insulated concealed ductwork shall be insulated with 50mm thick, minimum 18kg/m^3 8% resin content bonded fibreglass blanket faced with a fibreglass scrim reinforced aluminium foil kraft facing. The insulation material shall be wrapped around the ductwork and sealed at the joints which shall overlap and be covered with a 50mm wide aluminium foil tape, to ensure vapour proofing.

4.31.5 The insulation shall be applied to the ductwork with EUROPAIR'S EUROBOND or equal, self-extinguishing adhesive and be mechanically secured with 20mm wide aluminium bands strapped around ducting at regular intervals of not more than one meter centres.

4.31.6 Externally insulated exposed ducting shall be insulated with 25mm thick minimum 64kg/m^3 density, 8% resin content, bonded fibreglass batts evenly secured to the ductwork, with EUROBOND adhesive and WELDPINS at 400mm centres, and covered with wire mesh securely attached and plastered to a smooth finish with not less than 12mm thick hard setting compound. All corners shall be neatly rounded off and the finished surface shall be painted as later specified herein for exposed ductwork in Plant Rooms.

4.31.7 Flexible ducting shall be insulated with 25mm thick 12kg/m^3 resin bonded insulation wrapped with a P.V.C. sheath.

4.31.8 External insulation to ductwork and plenum insulation as specified herein shall be undertaken by a firm of specialist insulation contractors employed by the air conditioning Subcontractor, costs for their work being duly allowed for by the air conditioning Subcontractor in his Tender Price. The air conditioning Subcontractor will be held fully responsible for the work of his insulation Subcontractor in all respects.

4.31.9 Exhaust and outside air intake ducting shall not be insulated.

4.32 DAMPERS

4.32.1 Provide dampers where shown on the Drawings, where necessary for shut-off, bypass or volume control purposes, and where required to comply with local fire codes, as relevant.

4.32.2 Volume control dampers shall consist of multiple extruded aluminium aerofoil blades acting in opposed blade fashion with aluminium gears. The blades shall be fitted with rubber sealing strips on their edges and shall be robustly linked together to operate in complete unison. Permanently set dampers shall be provided with suitable devices to facilitate locking them in position such device to consist of a quadrant with "Open" and "Shut" position indication.

4.32.3 Motorised dampers shall include suitable fastenings and supports for motor actuators. The damper blade axle shall be mounted in the damper frame on suitable roller bearings to provide free movement of the blades.

4.32.4 Damper hardware shall be the product of an accredited manufacturer of such items, equal to EUROPAIR. Entire damper sections shall be housed in flanged sheet metal casings of 1,6mm thick galvanised steel. No damper blade shall exceed 200mm in width. Dampers over 900mm blade length shall be sectionalised into separate cells each with its own shafts and bearings to ensure that blade length of each section does not exceed 900mm.

4.32.5 Splitter dampers shall be equal to Titus type AG-45 Air Volume Extractors with No. 2 duct regulator to enable adjustment without access into the duct. Entire installation of splitter dampers shall be such that they do not vibrate or rattle due to air movement over them.

4.32.6 Non return dampers shall be provided as specified or indicated on the Drawings and in all installations where fans are mounted in parallel. The dampers shall be constructed of rigid aluminium blades of not less than 2mm thickness and shall be constructed in accordance with the SMACNA specifications. The non return dampers shall open by means of air flow and close by back draught and shall be free from vibration and rattling.

4.32.7 Fire dampers shall be manufactured to a recognised fire code for a two-hour fire rating. Damper casings shall have flanged ends and single blade units applicable to rectangular ducts, and shall not exceed 300mm blade width. The fire dampers shall further be specialist manufactured by an accredited firm in this field and shall additionally comply in all respects with the requirements of the local municipal fire authorities, in the area where they are to be installed and S.A.B.S. 193-1972.

4.32.8 Damper blades shall be closed by the operation of approved fusible links located where they would be immediately affected by an abnormal rise of temperature of the air stream. When specified in Part Five of the Specifications the blades shall also be actuated by 24 volt D.C. solenoid operators which shall be provided by the damper manufacturers. When closed the blades shall be held by a catch arrangement so as to provide a positive seal against the air stream.

4.32.9 All dampers installed in ducts shall be provided with an inspection opening so that the dampers may be checked and maintained. Inspection openings shall be covered with suitably sealed access panels.

4.32.10 Smoke dampers shall be the product of a specialist manufacturer in this field, built to an acknowledged standard such as Underwriters Laboratories and be smoke tight against an air pressure of 50mm wg. They shall be actuated by 24 volt D.C. Solenoid operators which shall be provided by the damper manufacturers. When closed the blades shall be held by a catch arrangement so as to provide a positive seal against the air stream. Adequate access provisions shall be incorporated in adjoining ductwork to allow resetting of dampers which have tripped.

4.33 SOUND ATTENUATORS

4.33.1 Sound attenuators shall be provided and installed in the positions indicated on the Drawings and shall be selected to provide the Noise Criteria levels as further specified herein. All sound attenuators shall be the

factory fabricated product of an accredited manufacturer of such equipment, such as I.A.C. (International Acoustics Company), DONKIN or TROX, who publish selection data on their products, which data shall be submitted to the Engineers for approval of each sound attenuator offered.

4.33.2 Metalwork on sound attenuators shall be galvanised steel or aluminium and acoustic insulation shall be non-combustible material, properly bonded and covered so as not to permit insulation particles being eroded by air movement over them.

4.33.3 Sound absorbing lining material of sound attenuators in low velocity ductwork shall have a density of not less than 24kg/m^3 and a thickness of not less than 25mm and in medium pressure ductwork the thickness shall not be less than 50mm with a minimum density of 48kg/m_3. Material for cell type sound absorbers shall be of the rigid type. The sound absorbing efficiency at each frequency shall not be less than;

Frequency-cycles per second	250	500	1000	2000	
Percentage Absorption		45	65	70	80

4.33.4 All lining which is damaged in shipment or due to exposure or any other cause shall not be installed and any material which may be damaged prior to the final acceptance shall be replaced as directed by the Engineer.

4.33.5 Casings shall be manufactured of galvanised sheet steel not lighter than the thicknesses previously specified herein for ductwork of the same dimensions, for the various pressure systems.

4.33.6 Kitchen extract ducting sound attenuators shall be either PACKLESS as manufactured by the International Acoustics Company, or equal and shall be suitably treated to the unaffected by the build up of grease which will occur on the attenuator.

4.34 AIR TERMINALS

4.34.1 Air distribution shall be effected by means of grilles or diffusers of the sizes, types and having the discharge patterns as indicated on the Drawings.

4.34.2 Tenderers must reselect grille and diffuser sizes if, for the makes offered, the dimensions called for on the Drawings do not provide for sound power levels later specified herein in Section Seven hereof, when handling the required air volumes.

4.34.3 The Subcontractor shall liaise and co-operate with the firm appointed for the installation of the ceiling, who shall undertake the final lining-up and levelling of the diffusers which shall be installed in conjunction with the ceiling to form an integrated, compatible and acceptable unit.

4.34.4 The finish of all grilles, diffusers and louvres shall be epoxy powder coated, baked enamel or colour anodised, the colour being to the Owner's or Architect's choice of colour, to be advised and approved by the Engineers.

4.34.5 Grilles and diffusers shall be fixed to spigots extended not less than 100mm from the ducting, unless otherwise indicated on the Drawings, and shall be securely fixed so that no screws or other fixing devices are visible.

4.34.6 Supply air grilles shall, unless otherwise specified or indicated on the Drawings, be of the double deflection type consisting of two rows of individually adjustable aerofoil section vanes, front vanes being horizontal, rear vanes vertical, all vanes housed in a surrounding fixing flange with neat mitred joints at the corners. The entire grille assembly shall be of extruded aluminium construction.

4.34.7 All supply air grilles shall be complete with factory fitted opposed blade dampers as later specified herein.

4.34.8 Supply air diffusers shall be of steel or aluminium construction and shall consist of an inner section which is readily removable from the outer core to facilitate access to the control dampers to be located behind the diffusers as later specified. The inner section of the diffusers shall consist of concentric rectangular or circular collars, the outer section consisting of a single rectangular or circular bevel collar provided with concealed fixing devices for attaching it to the supply air ductwork.

4.34.9 Supply air grilles and diffusers shall be provided with multivane opposed blade dampers finished in matt black lacquer. The dampers shall be attached to the rear of the grilles and fitted into the spigot connections to the diffusers and shall be adjustable, by means of a key or lever, from the front of the installed grilles and diffusers.

4.34.10 Return air grilles shall, unless otherwise specified or indicated on the Drawings, consist of aluminium grid core housed in an extruded aluminium fixing flange with neat mitred corners and finished in anodised aluminium to match colour sample to be supplied by the Engineer.

4.34.11 Return air grilles shall be equal to TITUS model 50 F with a 12mm grid core.

4.34.12 Transfer grilles shall be of extruded aluminium construction equal to TITUS model T-700-B grilles fitted to timber frames, to be provided by others, on both sides of openings through walls or partitions thicker than 50mm, alternative standard door grilles may be used with the grille installed on the "public" side and the auxiliary frame installed from the other side.

4.34.13 Door grilles shall be of extruded aluminium construction equal to TITUS model CT-700-BF suitable for fitting into doors of varying thickness and shall be finished in anodised aluminium.

4.34.14 Outside air intake weather louvres shall be of the extruded aluminium fixed vane type fitted with a vermin proof screen on the rear side as well as an opposed acting damper.

4.34.15 Dampers shall be provided with a locking device so that once they have been set for the correct air flow quantity they can be permanently locked in position. Louvres shall be finished in anodised aluminium.

4.34.16 Where indicated on the Drawings the outside air intake weather louvre assembly shall be fitted with filter holding frames with firmly fixed foam rubber gaskets and spring type clips for the attachment of the fresh air filters, as later specified herein. The frames shall be fixed to the weather louvre so as to prevent any air bypassing the filters.

4.34.17 Volume control opposed blade dampers shall be installed where noted on the Drawings. The dampers shall be as previously specified herein in Clause 4.32.

4.34.18 Rubber gaskets shall be glued to the rear of the fixing flanges of all air grilles, diffusers and louvres to ensure airtight seals and prevent smudging.

4.35 CANOPIES AND GREASE ELIMINATORS

4.35.1 Canopies and grease eliminators shall be the make of specialist in this field and shall not be manufactured by the Subcontractor. Canopies shall be equal to CYCLO-Wash or CYCLO-VENT with CYCLO-CLEAN grease filters and shall, unless otherwise specified, be constructed from 1,2mm thick grade 304 stainless steel with a number 3 finish.

4.35.2 Joints and seams shall be of welded construction and be watertight and all exposed welds shall be ground and polished to the original finish of the material.

4.35.3 Grease filters shall contain a series of vertical baffles to change the direction of the air flow and efficiently divert grease particles out of the air stream by centrifugal action. Each filter bank shall contain a condensate trough and removable grease storage container.

4.35.4 Fire Dampers, operated by fusible links, shall be provided in each air outlet connection and shall form an integral part of the canopy construction.

4.35.5 Lights shall be fitted into the canopy construction by the manufacturer.

4.35.6 Canopies having a length of less than 1300mm shall be provided with one, flush mounted, incandescent 100 watt, light fitting opposite each air intake. The fittings shall be square and recessed and shall consist of a steel housing with baked reflective white enamel finish, stainless steel exposed trim and diffuser of tempered glass with prismatic interior. Access for bulb replacement shall be through the face of the fitting without the use of tools.

4.35.7 Canopies having a length of more than 1300mm shall be provided with one flush mounted two lamp fluorescent light fitting opposite each air intake for every 2000mm of canopy length. The fittings shall have a steel housing with baked reflective white enamel finish, stainless steel exposed trim and diffuser of tempered glass with prismatic interior. Access for tube replacement shall be through the face of the fitting without the use of tools.

4.35.8 Canopies installed in the public view shall in addition be fitted with a 12,5mm square aluminium grid core shall be supported on a 25mm return on the inside edge of the canopy and shall be fitted in 600mm wide sections and be easily removable for cleaning.

4.35.9 Wet type canopies, equal to CYCLO-WASH shall be provided complete with control panel to provide automatic operation of the exhaust and make-up air blowers in addition to the wash and run cycles of the ventilator.

4.35.10 Control panels shall be constructed of 1,4mm thick galvanised steel and the front frames, doors and exposed trim shall be fabricated of 1,2mm grade 304 stainless steel having a number 3 finish.

4.35.11 Operation of the control sequence shall be initiated by front panel push button switches with individual wash and run indicator lights. An additional front panel indicator light and buzzer shall provide a warning in the event of a low detergent condition. Each control panel shall contain a hand shut-off valve, line strainer, solenoid valve and union connections for the hot water line. The detergent pump shall be capable of being adjusted to inject the proper amount of detergent into the hot water line.

4.35.12 Hot and cold water connections shall be provided adjacent to each wet type canopy by others, each connection shall be terminated within two meters of the canopy in an isolating valve. The Subcontractor shall allow for all necessary pressure reducing valves, filters and appurtenances necessary for the efficient operation of the system. Drain connections shall be provided by others within two meters of each canopy.

4.36 AUTOMATIC CONTROLS

4.36.1 Provide, install and set into operation all the automatic control devices shown on the relevant Diagrams and interlock same as required to perform their function correctly. The Subcontractor shall note that the various controls shown on the Drawings and as mentioned herein indicate the basic control elements and functions required only; they shall additionally furnish all ancillaries necessary to fulfil the desired plant operation.

4.36.2 Automatic control valves shall have bodies, discs, stems and sealing gland designed for not less than 1600 kPa operating pressure. Valves 40mm and smaller shall be gunmetal with union ends and machined seat. Valves 50mm and above, shall be cast steel with flanged connections. The sealing gland shall be of the double O-ring type permitting replacement without removing the valve. Spindle and plug shall be stainless steel.

4.36.3 Automatic valve and actuators shall be supplied separately, the assembly of which shall be done without the need for special tool or adjustment. Valves shall be opened by the actuator and closed by means of a return spring. A visible position indicator shall be provided. The actuator shall permit manual operation at the valve.

4.36.4 Automatic damper actuators shall be electro-thermal or electro-hydraulic, to suit the load requirements, linear stroke actuators with overload protection and spring return. The stroke of the push rod shall be controlled such that the stroke corresponds proportionally to the control signal.

4.36.5 Automatic valve and damper actuators shall be controlled by means of an electronic controller.

4.36.6 Electronic controllers shall be suitable for the application intended and shall provide P, PI or PID control as selected. The controller shall incorporate a manual/automatic switch. In addition, the P band and dead zone shall be adjustable. A plug-in service testing point shall be provided to facilitate commissioning of the installation. The mode of operation shall be adjustable.

4.36.7 Step control function shall be achieved by means of an electronic on/off controller. The controller shall provide for either switching of stages with decreasing valve or switching of stages with increasing valve or sequencing of stages with different modes of operation. The unit shall incorporate an adjustable switching time delay and shall provide for adjustable switching interval and differential on all stages. A plug-in service tester point shall be provided to facilitate commissioning of the installation.

4.36.8 Temperature and Humidity control shall be as indicated on the wiring Diagrams and/or specified in Part 5 of the Specifications.

4.36.9 All plants shall be controlled by means of a remote sensor mounted in the location indicated on the Drawings. When not shown, the sensor shall be located where it will respond to arrange temperature on humidity in the room.

4.36.10 All air conditioning and central ventilation plants as well as plants indicated on the Drawing as being controlled shall be switched on and off automatically by means of a programmable time switch.

Unless otherwise specified, the time switch shall have the following functions;

Day of week display

Time display

Auto/Off switch

Keyswitch to prevent programme alteration by unauthorised persons

Key pad for programming

Plus one hour override

Battery reserve of 24 hours minimum to maintain memory

4.36.11 The time switch shall generally be installed remote from the central plant and as such will act as a manual override switch. A manual override switch shall also be provided at the plant.

4.36.12 Thermostats and humidistats generally shall be mounted 1,8m above the floor unless otherwise indicated on the Drawings, and shall not be mounted on outside walls or partitions between offices if other locations are possible. Thermostats mounted on outside walls shall be provided with insulating bases.

4.36.13 Room thermostats and room humidistats in which the adjusting mechanism is integral with the sensing element shall have locked or concealed adjusting devices by means of which the operating points can be adjusted through a range of not less than 5 degrees and 10 per cent, respectively, above and below the operating points specified.

4.36.14 Electric temperature control systems operating at less than the normal, lighting circuit voltage shall be provided with transformers to supply power for equipment.

4.36.15 Transformers and line voltage controllers serving individual ventilating or air conditioning units may be fed from the fan motor leads, and other transformers and controls fed from the nearest distribution panelboard or motor control centre, utilising circuits provided for the purpose and not spare circuits or circuit provided for other purposes. Individual room controls and zone controls may be connected to any convenient outlet circuit providing power consumption does not exceed 3000 watts.

4.36.16 Transformers other than transformers in bridge circuits shall have primaries wound for the current available and secondaries wound for the correct control circuit voltage. Each transformer shall have capacity to operate simultaneously all apparatus connected to it and shall be capable of carrying a 25 per cent overload for one hour. No control transformers shall be rated less than 200 VA. Each transformer shall be enclosed in a steel cabinet with conduit connections and shall have a fused disconnect switch on the primary side, and a fuse cut-out or thermal cut-out on the secondary side.

4.36.17 All three phase equipment shall have phase failure, phase rotation and low voltage protection with automatic reset adjustable to a maximum period of 10 minutes.

4.36.18 Duct thermostats used for temperature control shall be remote sensing element type with controller mounted on a panel. Sensing elements (remote bulb averaging type or rigid stem) shall be located where they will respond to a representative temperature within the duct or casing. Operating and adjusting thermostatic mechanisms shall be enclosed in metal or phenolic resin cases and shall be installed outside of ducts and casings. Where ducts or casings are insulated, thermostats shall be mounted flush outside of insulation in such a manner that moisture will not condense on thermostat or on supports.

4.36.19 Where the distance from a bulb to a sensing element panel exceeds manufacturer's maximum recommended capillary length, a remote transmitter, mounted on the outside of the duct, shall be used between the elements and the operating and adjusting mechanism on the panel. Capillary tubes or wires other than stainless steel elements and operating mechanisms shall be protected by conduit moulding or flexible armour. Excess capillary lengths shall be neatly coiled and fastened out of the way. Capillaries and wiring shall pierce thermal insulation at the smallest practicable number of points and shall be properly sealed wherever they pierce an insulation vapour seal.

4.36.20 Pipe and Tank Thermostats shall be of the immersion type with liquid filled separable sockets. Where the socket is located more than 1,5 metres above the floor or where the operating and adjusting mechanism is specified to be panel mounted, the thermostat shall be of the remote sensing element type with liquid filled separable socket and the mechanism shall be mounted on a wall or column 1,5 metres above the floor or panel mounted. Where the distance from the bulb to a panel exceeds the manufacturer's recommended capillary length, a remote transmitter shall be used as specified for duct thermostats. Separable sockets shall be of brass or stainless steel heavy enough to withstand pulsations and turbulence in the fluid controlled. Protection of capillary tubing and wires shall be as specified for duct thermostats.

4.36.21 Fire safety thermostats of the rigid tailstock type shall be mounted in the return air stream to each unit or behind the common return air opening to the plant room as applicable and as indicated on the Drawings, to sense the return air temperature and shut down the entire system should the return air temperature exceed 40ºC. These thermostats shall be of the manual reset type.

4.36.22 Plants shall be started in sequence by means of time delay relays. The timing between switching stages shall be set at not less than 15 seconds.

4.36.23 Where applicable, the temperature control circuit of each water-cooled unit shall be interlocked with a water flow switch in the condenser water line so that the compressors will not operate unless the flow switch contacts are closed.

4.36.24 Heaters shall be interlocked with an air pressure differential switch mounted on the discharge duct of the respective unit to sense the air flow within the supply air duct in which the heaters are installed. Sail-switches will not be acceptable.

4.36.25 Heater circuits shall also be interconnected through a fire safety thermostat, with manual reset feature, to break the circuit should the temperature of the air in the duct exceed 55ºC. These safety thermostats shall also be of the rigid tailstock type and shall be mounted on the side of the ducts downstream of the heater batteries between 300mm and 600mm from the heating elements.

4.36.26 Where applicable for water-cooled systems, condenser water temperature shall be automatically controlled at the cooling tower as refrigeration will be required to operate on a year-round basis.

4.36.27 A remote sensor type proportional temperature controller with its sensing element suitably located to measure the temperature of condenser water flow shall be provided. This instrument shall control a damper actuator fitted to a damper in the cooling tower fan discharge, and shall cause variation of the air volume handled by the tower fan in response to condenser water temperature. A limit switch attached to the damper motor shall shut down the fan when the damper reaches the fully closed position and start when the damper reaches the fully open position.

4.36.28 Each refrigerant circuit within packaged air conditioning units shall include a dual pressure switch with manual reset on the high pressure side and an oil pressure switch, with manual reset feature, to stop the compressor if the oil pressure drops below a preset minimum, all as previously specified herein.

4.36.29 Ventilation and exhaust fans shall be interlocked with the air conditioning plant or as called for on the relative Wiring Diagram or indicated on the Drawings.

4.36.30 Fresh air intake fans shall be interlocked to operate only when the plant is switched on.

4.36.31 Static pressure controller shall be electronic remote sensing differential pressure detector mounted in the position indicated on the Drawings and arranged to sent a remote signal to a universal proportional controller which shall operate a motorised damper. The controller shall give a digital reading of the static pressure within the duct.

4.36.32 Pressure controller on chilled water shall be electronic remote sensing pressure detector mounted in the position indicated on the Drawings and arranged to transmit a signal to a universal proportional controller which shall operate a control device as required and indicated on the Drawings. The controller shall give a digital reading of the pressure within the system.

4.36.33 Sump pumps shall operate automatically under the control of their float switches. A single pole double throw selector switch contained in the relevant switchpanel shall allow manual selection of which pump can operate and which would be on standby. A high level alarm float switch shall initiate a warning light and bell at the switchpanel and bring the standby pump into operation.

4.36.34 **Building Automation System (BACS) Specification**

4.36.34.1 General

The Building Automation System (BACS) supplier shall furnish and install a fully integrated building automation system, incorporating direct digital control (DDC) for energy management, equipment monitoring and control, suitable for the building usage.

The control strategies shall be developed to ensure that the specified environmental conditions are maintained, whilst giving due regard to minimising of energy consumption in accordance with Building Regulations Part L2, and any subsequent revisions.

Materials and equipment installed shall be the catalogued products of the approved supplier and shall be the manufacturer's latest standard design that complies with the specification requirements.

The installer of the building automation system shall provide documentation supporting the

manufacturer's compliance with ISO-9002 (Model for Quality Assurance in Production, Installation and Servicing). The intent of this specification requirement is to ensure that the products from the manufacturer are delivered through a Quality System and Framework that will assure consistency in the products delivered for this project.

All peripheral equipment e.g. sensors, pressure switches, control valves and actuators, shall be of the same manufacture as the direct digital control modules and outstations.

The design of the BACS network shall be such that additional outstations may be added to the network in the future or the network expanded with minimal disruption to the normal operation of the system. Each local area network LAN shall have a minimum of 20% spare capacity to install additional devices.

The system design shall utilise the latest technology in "open" network architecture, distributive intelligence and processing, and direct digital control.

The automation level main plant DDC controls to be freely programmable based on DMAP programming language.

The products used in constructing the BACS management and automation level shall conform to the BACnet protocol on a LONtalk data communications network, for building automation and control networks. All products types shall have attained a BACnet Testing Laboratories (BTL) listing and display the BTL logo

Room units shall utilize a two-wire communication link at each controller with the capability for acquisition of room temperature, local set point, integral temperature indication and digital set point display, as specified by the control application.

The overall system-operating concept must be structured such that the data can be accessed at any point in the network(s) commensurate on the operator's access authority (security key/passwords).

It shall be possible, with additional hardware if necessary, to interrogate the system remotely via the following possible methods

- Telephone connection
- Building IT network
- Web browser technology with password access via IT networks
- Alarm reporting to mobile pagers/phones/e-mail etc
- Energy usage monitoring and control via Desigo Insight Building Management Systems.

4.36.34.2 Drawings and Records

Submit drawings for all equipment to be provided, including but not limited to:

.1 Software packages
.2 Management station central equipment
.3 Schematic diagrams showing system configuration and interconnection of management stations and all field panels.
.4 Descriptive data of all operating, user and application software including complete operators manuals, and programme manuals.

Final as-built documentation including the above items shall be included in the operation and

maintenance manuals.

Provide final documentation to serve the diverse needs of personnel concerned with instruction, operation, procurement, installation and maintenance.

Drawings and final documentation will be reviewed to ensure that such documents are in keeping with the intent of this specification and fully meet the requirements in terms of content and format.

Delivery of the final approved documentation, in hardcover 2-ring or 4-ring binders with index page and index tabs, is required before the Certificate of Substantial Completion will be issued.

Maintain a complete and current copy of all reviewed drawings at the job site.

All Licence rights to the control systems manufacturer's software packages shall be transferred to the client at the time of hand over. User Registration must be made on behalf of the client, direct to the control system manufacturer by the specialist System House Partner.

Three copies of all of the control system manufacturers Monitoring or BACS software shall be provided on CD-ROM, or other mass storage device, together with copies of any graphics and databases that may be required to re-install the system after a fatal computer failure.

4.36.34.3 Reference Standards

Provide electrical material and installation in accordance with the appropriate requirements, and in accordance with applicable sections of the current edition of the applicable local codes for electrical work and signalling systems. Install wiring in conduit or approved totally enclosed raceways. Do not use cable raceways or troughs. Approved ceiling plenum cable is acceptable where permitted by the local Authorities.

Provide electrical and electronic equipment which meets the CE conformity requirements as defined in CE directive 89/336/EEC Low voltage directive 73/23/EEC.

Provide BACS system which supports ANSI/ASHRAE BACnet Standard 135.

Automation level freely programmable DDC controllers shall have attained BACnet Laboratories (BTL) listing and shall display BTL logo.

The configuration of the Building Management System shall provide an "open" network architecture conforming to the ASHRAE's BACnet/IP protocol standard CEN ISO 16484-5.

The field level terminal unit controls shall conform to the ANSI/EIA Standard 709.1, employing the LonTalk protocol, and the product interoperability standards defined by the LonMark® Association.

Modem interfacing provisions shall meet EIA RS232C. Modems shall comply with the local required communication protocol with minimum transmission rate of 28,800 baud.

All equipment and systems installed under this Contract shall meet following specifications on electromagnetic compatibility:

Interference immunity according to EN50082-2
Emitted interference according to EN50081-1

Provide equipment which functions and meets all detailed performance criteria when operating in the following minimum ambient condition ranges:

Operating Temperature - 0 to 50 deg C [32 to 122 deg F] (Class 3K5 to IEC 721)
Relative Humidity 10% to 85% non –condensing (Class 3K5 to IEC 721)

The limits above, are minimums and shall not take precedence over ranges detailed in this or the

manufacturers specification.

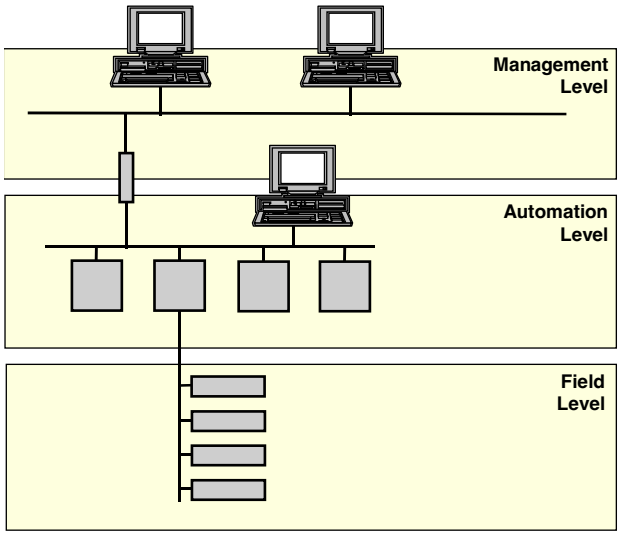
4.36.34.4 General System Architecture

The system shall be logically structured into distinctive levels based on the functions, performance, modularity and autonomy required at each level. Based on these requirements the most appropriate technology will be used. A physically flat architecture may only be appropriate to small systems.

Functionality shall be realised always on the most appropriate system level as defined below to ensure maximum resilience of the system

Each level shall be autonomous from the other. Applying three levels ensures the best performance, easier fault finding, better fault tolerance and expandability.

The levels are defined as Management Level, Automation Level and Field Level.



Peer to peer communication shall be possible on all system levels.

The system design shall be modular in structure to allow straight forward extensions.

4.36.34.5 Management level Functionality

Personal computer based operator management stations shall be provided for plant supervision and operation, alarm management, information and database management function. All real-time control functions shall be resident in the DDC controllers to facilitate greater fault tolerance and reliability.

The operator management station should be capable of multi-tasking 32-bit programs by utilising a Microsoft Windows 2000 or XP operating system.

The management station shall be capable of the following:

1 Display of graphical representations of the plant overlaid with live data
2 Monitor and operate / influence process devices
3 Receiving of alarm messages from the process level and directing them to the appropriate reporting device e.g. printer, pager, fax, e-mail
4 Monitor process devices for communication problems and other device faults.
5 Adjusting time strategies in the process level.
6 Long term storage of logged data from the process devices

7 Archiving / retrieve data to/from long term data storage
8 Display graphically the logged data
9 Custom application programming

The management station shall allow supplier independent integration of further subsystems.

The management station can either be stand alone or connected together via an IT network.

When management stations are connected together they must be capable of sharing data. Either one management station should become a network server or a dedicated server should be used.

For maximum fault tolerance, the management stations connect to the process level via point to point communications. This shall be via RS232, Ethernet/TCP/IP LAN / WAN or via AutoDial links.

The user interface shall be based on a basic taskbar, which is always visible, and which provides at all times a summary of the most important system information and essential system functions which are:

.1 Alarm summary which indicates for at least 3 priority groups the number of active alarms and system message status, site connection status and time and date .
.2 Control of access privileges and security mechanisms for access to program modules and third-party software at log-in and log-out.
3 User- and password-dependent access to systems and sub-systems.
.4 Automatic user-specific start sequences
.5 Facility to establish and terminate connection to various sites
.6 Simultaneous connection of at least of 4 sites via serial connections / 50 sites via LAN/WAN connections for a comprehensive overview on geographically distributed projects

Provide functionality such that any of the following may be performed simultaneously on-line, and in any combination, via user-sized windows. Operator shall be able to send information between applications reducing the number of operation steps.

System access control for individual access to sites, applications, functions and objects

Dynamic colour graphics and graphic control

Plant operation with explorer – all objects shall be displayed in a graphical tree structure in order to access points which are not included / defined in the graphics

Alarm handling – all the alarms shall be displayed in a graphical tree structure in order located alarms quick and easily.

Alarm routing to printers, pager, cellular phones/SMS, fax, e-mail on designated locations

Trend data module, including dynamic trend data definition and graphical presentation

History logging for alarms, user actions, system events and messages

Scheduling for operation and programming of the time programmes

Remote communications software, supporting remote access from/to process devices on automation via:
.1 AutoDial links (both dial-up and dial-down)
.2 ISDN facilities
.3 Ethernet / TCP/IP Local Area Networks
.4 TCP/IP Wide Area Networks

4.36.34.6 Management level network

The management level network shall use the standard BACnet protocol and shall be able to deal with the high data traffic with complex data structures between management stations and between the management station and the process level.

The network technology must be based the IT standards Ethernet and TCP/IP, and be compatible with the latest LAN, WAN technology.

When connected to an IT network this can be either a dedicated IT network for the building management stations or own the clients IT network.

When connected to a clients IT network, the management stations and process devices connected to that network have to co-exist with the other network devices.

Where the system works over more than one building over a large area (WAN - Wide Area Network), the client will be responsible for Data management devices ensuring the BACS can send information over routers, fire walls etc.

4.36.34.7 Automation level

Functionality

The Process devices control and monitor main plant equipment within a building. Each DDC controller shall have the ability to perform all the following routines.

.1 Process control & interlock functions.
.2 Generate alarms/events based on comparing measured values against know parameters.
.3 Time control strategies
.4 Runtime totalisation
.5 Trend logging of specific data-points with transmission of the logged values to the management level
.6 Energy calculations
.7 Backup of the data/program

The process devices shall be able to operate autonomously and independently from the management level.

The DDC control modules to be selected from either modular or compact type of device to suit the most economic inclusion of all data points specified.

The input/output connection to Modular controllers shall be via individual plug-in modules suitable for the particular peripheral device. The digital modules shall have visual indication of the status of the input/output. Digital input modules shall be capable of accepting control voltages up to 230vac and will have integral status indication.

Software application tool to utilize freely programmable DMAP software programming language.

In the event of a sensor failure an alarm shall be raised and the software application default to a safe value.

DDC Control Module Specification

Based on ANSI/ASHRAE standard 135-2001 (BACNet), ENV13321-1
Operation standalone or as part of LonTalk (clause 11) system network TP/FT-10, 78kBits with Built in BACnet/Lontalk interface
Optional connection to operator terminal, management station and via Web browser with Web server device.

Freely Programmable
Flash ROM, real time processing and multi tasking
32 bit dual processor system, 1.5 MB program memory
Supply voltage AC 24V +/-20% 50/60 Hz
Event driven data transmission
Automatic mains recovery
PPS2 connection for up to five two wire QAX room units
Digital output to be 250V 2A rated changeover contacts
Historical data memory storage
Software application stored in non volatile memory
Battery back up
Automation level network

All controllers and other devices shall communicate using the standard BACnet protocol.

The communications shall be able to transfer control parameters between devices at high speed and transmit logged data to management stations. The communications shall use change of state based communications to allow high event transmission speed on all transport media including AutoDial links.

This network shall be independent of the management network because IT networks require shutdown due to maintenance and because the network traffic could affect the performance of the IT network and vice versa.

The communications must be able to deal at least with following basic BACS functions:

.1 Change parameter
.2 Read parameter
.3 Share value with another process device
.4 Transmit alarm/event
.5 Transmit current logged data
.6 Time strategies, including optimum start and stop

Local Operator Terminals

A local operator terminal shall allow full operation of all DDC control modules connected to the LonTalk BACnet network. Functions to include

.1 Alarm monitoring with acknowledgement and visual and audible alarm indication.
.2 Pop up window with detailed message for alarms and events
.3 Alarm and event history
.4 Data point display and operation of all measured values, setpoints, plant states, operating states and parameters
.5 Graphic based display and operation of all time schedules, exception calendar, online trending and heating curve.
.6 User specific configurable overview of main values in plant
7 Multi user level access protection

The operator terminal shall have a high resolution 6 line illuminated display for graphics and text, keys for operation and a visual and audible common alarm indication. The textual information displayed must reflect the layout of building and plant with clear English descriptions of up to 40 characters.

The operators terminal shall be capable of being located either at any outstation or remote, powered by a local transformer. It shall be capable of being mounted in control panel door, backplate mounted, wall mounted or portable.

Each MCC enclosure shall be provided with local operators terminal mounted on the control panel facia.

Additional local operator terminals shall be able to be added to each control system, if required by the client, all of which shall be able to address any function on any control module. The additional operator terminal shall automatically read data from the network without the need for any pre configuration of the device.

Access all DDC Controllers on the network

Embedded Web Server

The system shall have the facility for a Web server to be added to allow full operation of all automation station control modules connected to the LonTalk BACnet network via a standard thin client/web browser. Functions to include

.1 Display of graphical representations of the plant overlaid with live data
.2 Data point display and operation of all measured values, setpoints, plant states, operating states and parameters
.3 Alarm monitoring with acknowledgement and visual and audible alarm indication.
.4 Alarm and event history
.5 Alarm transmission via SMS and e-mail
.6 Operation of all time schedules, exception calendar and heating curves.
.7 Reading of trend data with facility to export data to Microsoft Excel.
.8 Multi user level access protection
.9 Ethernet or Modem connection

All information accessed via the web browser shall be stored in web server device connected to the LonTalk BACnet network to allow access from any PC workstation with suitable Ethernet/IP network or modem connection. No installation of any custom software shall be required on the operators PC workstation.

BACS Web Server software shall support browsers used by Personal Digital Assistants like Siemens, 3Com, Palm Pilots and other Internet appliances.

Field level
Terminal Unit Controllers
All the terminal unit controllers shall fullfil following general requirements:
LONMARK communication
AC230 V power supply
mountable with screws or DIN rail
optional terminal cover for local installation without cabinet
Downloadable application software /adjustable parameter set, The type of use shall be defined by downloadable pre-tested application software.

The Terminal Unit controls on field level shall be capable of:

.1 Process control & interlock functions.
.2 Autonomous operation.
.3 local operating units

Common functions like grouping, scheduling, etc., shall be realised within a master controller on automation level. Each master controller shall have the ability to perform any of all the following routines:

.1 Process control & interlock functions
.2 Generate alarms/events based
.3 Time control strategies
.4 Runtime totalisation

.5 Trend logging of specific data-points with transmission of the logged values to the management level
.6 Energy calculations
.7 Backup of the data/program
.8 Energy calculations
.9 Backup of data/program

Room Units (for local operation)

All the room units shall fulfil the following general requirements:

Ergonomically designed plastic housing
Suitable for wall mounting or mounting flush over standard wall box, cable entry surface or flush;
Include mounting plate and accessories
Two-wire connection to the controller
Standard RJ45 socket for connection of a commissioning and room temperature;
Selection of automatic or manual fan speed control

All terminal unit controllers supplied on the project shall have the facility for local setpoint adjustment via a room unit.

It shall be possible to group the controllers as required (according to building zone or user), these groups being capable of communication over the LON bus.

For each 2-wire bus cable, all controllers connected to the LonTalk data bus must be capable of being operated remotely via service terminals at each controller or room operation unit.

Upward-compatibility with other hierarchical levels, such as operating, management and remote management systems (with the BACnet protocol in addition to manufacturer-specific protocols) is an essential and compulsory requirement.

Terminal Unit Controllers Basic functionality

The controllers shall fulfil the following real-time functions as a minimum:

Control and interlock for specific comfort conditions in rooms and self-contained zones

Provision of optimum comfort for the user while consuming the minimum of energy

The operation of all room functions in accordance with individual requirements, also via LONMARK protocol on the LON bus

Local operation using room operating units with individual adjustment facilities using 2 wire bus.

Remote operation and/or display via LONMARK on the LON bus

Room occupancy determined manually via the room unit or automatically via occupancy sensor

Detection of influencing variables, e.g. via window switches (energy hold-off)

Control of the room temperature in heating and/or cooling mode, and of the air volume (comfort mode)

Room temperature increased or reduced in unoccupied rooms (Stand-by mode)
Individual setpoint resets

Individual allocation of time programmes

Ability to communicate with other controllers, and with higher-level systems for programming and operation, including management stations for purposes such as the use of energy management functions

Integration of all room functions where required, including the facility to combine HVAC control with the control of lighting and blinds

4.36.34.8 Engineering

The possible uses of the controllers shall be defined in the form of pre-programmed standard HVAC applications which can be downloaded from an application library with a software tool. Following pre-tested standard applications shall be at least available:

Fan coil systems:

Electric heating coil
2-pipe system with change-over
2-pipe system with change-over and electric reheater
4-pipe system
4-pipe system with supply air temperature limitation
2-pipe system with change-over and outside air damper
4-pipe system with outside air damper
2-pipe system (cooling) and radiator
4-pipe system with air-side control

Common functions of above fan coil applications:
Window contact, occupancy detector, 3 operating modes
Manual fan control with room unit
Automatic fan control (single-speed or three-speed)
Options with 2-pipe systems: heating only, cooling only or change-over, via LON bus

VAV systems:

Single duct supply or extract air system
Single-duct supply air system with reheater/cooler
Single-duct supply air system with electric reheater
Dual duct supply and extract air system
Dual duct supply and extract air system with reheater/cooler
Dual duct supply and extract air system, with electric reheater

Common functions of above VAV applications:
Window contact, occupancy detector, 3 operating modes
Built-in pressure sensor
DC 0 ... 10 V inputs for external pressure sensors
Control of compact volume controllers
Direct control of damper actuators

Integrated room management applications:

The combined applications shall consist of a HVAC application:
Fan coil
Heated / chilled ceilings and radiators
VAV systems
With one ore more of following electrical functions:
Groups of lights on/off
Groups of lights dimmed
Blinds up/down (with or without slat adjustment as required)

4.36.34.9 Field Level Network

All controllers and other devices shall communicate using the standard LonMark protocol on the LON bus. Network variables, data structures and mechanisms involved shall correspond to the >Integrated Room Management< template supplied by LNO in LonMark.The individual room management system must ensure demand-based control of individual thermal comfort, while at the same timekeeping energy demand to a minimum.

Integration into a common communications network must be achieved peer-to-peer and with the next higher hierarchical level via the LON bus interface and LonMark protocol.

Use of communication standards

Only the following standards are appropriate to be used at the three levels.

.1 Management level- BACnet, Ethernet TCP/IP
.2 Automation level- BACnet on Lon
.3 Field level- LonTalk with LonMark profiles

Where a configuration software tool is used to set-up the network and devices from a number of manufactures to be connected to the same network, only one tool from one manufacturer shall be used to configure the whole project to ensure consistence and interoperability.

If the standard creates a project specific database in order to configure network, the client shall have ownership of that database.

Integration of secondary systems

Integration's shall be carried out at the most appropriate level within a system, depending on the functions and interaction required. The following integrations must be possible.

LonWorks
LonMark
BACNet /LonWorks
BACNet/IP
OPC

Integration of standard proprietary buses :Modbus, M Bus, KNX

As part of the requirements for an open system devices with a Native BACnet protocol shall be connected onto a common field bus backbone network directly without any Gateway/Protocol converter device.

If interaction is required between different sub-systems, the integration shall be carried out at either the automation or field level. The integration must not occur at the management level.

Link to a third party software package such as a Planned Preventive Maintenance package or a Energy Monitoring package shall be carried out at the management level.

When sharing alarm and historical information with Maintenance Management and Energy Management packages, the management system shall provide the information in a standard commercially available format e.g. MS Access and using standard mechanisms e.g. ODBC .

Real-time "live" information shall be transferred form the management system to a third party package e.g. MS Excel, either by a standard inter-application mechanism e.g. DDE or OPC or by developing a connection by using a documented API for the management system.

Where a physical connection is required between a 3rd party device and the management system, the sub-system supplier shall provide the necessary line drivers and cables, documentation and support to make the connection into the device that will provide the protocol conversion.

4.37 SWITCHPANELS AND CONTROL BOARDS

4.37.1 Provide and install, in the positions indicated on the Drawings, switchpanel and control boards complying in operating principals with the automatic control sequences as described before and the relevant control and wiring Diagrams.

4.37.2 The Schematic Control Diagrams serve to illustrate the mode and sequence of operation and the required protection interlocking, and circuits may be modified to accept individual suppliers electrical components selected by in so doing no inherent protection or mode of working shall be adversely affected.

4.37.3 The Subcontractor shall be responsible for the checking and modifying if necessary, of all wiring Diagrams prepared by the Engineer for the guidance of the Subcontractor and any errors shall be brought to the attention of the Engineer before work is started on the equipment or installation.

4.37.4 Before commencing with the manufacture and wiring of the switchpanel and control boards the Subcontractor shall submit three copies of up-to-date wiring Diagrams, schematic ladder type Diagrams of the control systems and dimensioned panel layout Drawings to the Engineer for approval. All Drawings shall show the correct terminal numbers and wire identification numbers to be used.

4.37.5 The Engineer shall be informed of all modifications to the wiring made until the end of the guarantee period and updated Drawings shall be submitted immediately after each modification is made.

4.37.6 The complete electrical installation and all electrical equipment and materials covered under this Subcontract shall comply with the latest edition of the S.A.B.S. Specification. The workmanship and installation shall comply with the "Standard Regulations for the Wiring of Premises".

4.37.7 All components of a similar nature shall be of one make with corresponding parts being interchangeable. All equipment shall be of robust construction and have ample ratings for the duties imposed.

4.37.8 System Fault Levels for which the switchpanel components shall be designed and selected shall be at least as specified in Section 5 or indicated on the Drawings. It shall be the responsibility of the Subcontractor to ascertain the correct fault level from the Engineer which shall n not less than 5 kA.

4.37.9 All equipment in the switchpanel such as fused switches and moulded case circuit breakers, controlling outgoing circuits, shall be rated accordingly. Where moulded case circuit breakers are not capable of dealing with this fault level, they shall be backed up by HRC fuses which must be capable of being replaced without any other circuit being switched off to do so, and must be capable of being made "dead" for replacement.

4.37.10 Switchpanel and control boards shall be of the floor mounted type for panels having a total face area in excess of 1,2m², and wall mounted if less than 1,2m². Where switchpanel exceed 1,2 metres in length they shall be divided into multi-sections.

4.37.11 All switchpanel, unless otherwise specified, shall be arranged for front access only and top cable entry with the main incoming isolators positioned on the extreme left hand side of each switchpanel. The switchpanel shall be arranged for top exit via cable ducts.

4.37.12 All switchpanel shall be adequately ventilated either by natural or forced ventilation.

4.37.13 When starting equipment creates higher than normal ambient temperatures the switchpanel shall be adequately ventilated by means of splash-proof top ventilating openings provided with vermin proof screens.

4.37.14 The switchpanel and control centres shall be the products of specialist manufacturers of this class of equipment, as approved by the Engineer, and shall be purpose made to contain all switchgear, controls, instruments and indicating equipment, and shall be complete with all internal wiring, all conforming with the following requirements.

4.37.15 Switchpanel and control centre casings shall be fabricated from 2,0mm thick mild steel suitably stiffened with mild steel sections and fitted with removable hinged doors, with flush-mounted locks each provided with triplicate keys, as well as removable panels secured with chromium plated dome nuts.

4.37.16 Wall mounting panels shall be of the surface type with removable inner mounting chassis.

4.37.17 Floor standing switchpanel and control centres shall be mounted on channel section mild steel bases.

4.37.18 Door widths shall not exceed 900mm for all switchpanel and all doors, removable covers, door pillars, mullions, etc., shall be dust resistant and provided with oil resistant, closed-cell composition, synthetic rubber or similar gaskets. Gasketed surfaces shall be so constructed that gasketing material is retained by metal channels and does not depend entirely on an adhesive holding the gasket on a flat metal surface.

4.37.18.1 All fixing screws shall enter holes tapped into an adequate thickness of metal or nuts welded to the back surface of the metal plates. Self-tapping screws will not be acceptable.

4.37.19 The switchpanel shall be so designed that, with the doors open, no switchgear is exposed, this being concealed behind removable recessed 1,6mm thick cover plates neatly slotted to allow protrusion of circuit breaker toggles only. All switches, the main circuit breakers, on/off handles, instruments and indicating equipment, reset buttons and pilot lamps only shall however be fully exposed and operable, as relevant, without the need to open the doors to the switchpanel, this equipment being flush mounted on suitable panelled sections of the switchpanel on one side of or above the access doors.

4.37.20 Adequate barriers shall be provided in the switchpanel and control boards to segregate each load circuit compartment from all others, and from the busbar chamber, in such a way that transmission of flame from one compartment to another is minimized.

4.37.21 Each cubicle shall be self-contained and hold only the equipment for one circuit. It shall be capable of being isolated and the equipment worked on without interfering with other equipment. Ample access and space shall be allowed for inspection, repair and replacement of equipment and component parts.

4.37.22 The electrical equipment within the panels shall be mounted on steel chassis located behind the coverplates previously referred to. Such chassis shall also be used for the mounting of the relevant busbars.

4.37.23 The finish of the panels shall be epoxy powder coated or baked enamel. The boards shall be given three coats of paint after an initial coating of zinc-rich primer to give a high-class gloss finish.

4.37.24 Busbars shall be provided in hard drawn annealed copper loaded to not more than 1,55 Amps/mm² of copper on a 50ºC rise and shall be enclosed in a top horizontal and accessible compartment with steel casing separating the busbars from other equipment. Busbars shall be mounted on porcelain or epoxy resin type busbar insulators mechanically braced to withstand 40 000 Amps through fault current. The clearance between busbars shall not be less than 40mm between phases and 25mm to earth, and they shall be secured by bolts having a diameter of not less than the thickness of the busbars with a minimum diameter of 8mm.

4.37.25 Machined bolts and nuts with washers and spring washers shall be used and busbar supports shall have a maximum pitch of 900mm. Connections shall be made by means of copper, preferably double indent, compression lugs. All busbar joints shall be silver or tin plated and connected with high tensile steel cadmium plated bolts and lock washers. Busbars shall be taped up after all connections are made

4.37.26 Neutral bars are to be not less than half the cross-sectional area of phase busbars, but not less than 25mm x 6mm, and are to be mounted on porcelain or epoxy resin type insulators, where heaters or other phase to neutral loads are used.

4.37.27 Where neutral bars are purely on the control side, 15mm square brass bars with 2 tapped holes per way may be used, mounted on bakelite or equal insulators.

4.37.28 Earthing strips of not less than 25mm x 6mm copper shall run full length of the complete floor standing panels, either at the top or bottom of the panels where it must be securely bolted to the switchpanel framework to ensure good continuity.

4.37.29 Wall mounted switchpanel shall be provided with an earthing brass bolt of not less than 10mm diameter, securely fixed to the panel chassis.

4.37.30 All wiring within the panels shall be neatly grouped in horizontal and vertically run approved fire resistant P.V.C. trunking with clip-on removable covers. All wiring shall also be colour-coded in the colours red, yellow and blue for the relevant phases and black for neutral, the busbars being similarly marked.

4.37.31 Power wiring shall be of 2,5mm² minimum section P.V.C. covered stranded wire rated for 600 volts.

4.37.32 Control wiring shall be minimum 1,5mm² P.V.C. covered, stranded, 250 volt grade wire with bared ends soldered.

4.37.33 All switchpanel shall be carefully designed and sized to ensure ample space for wiring and making-off incoming cables.

4.37.34 Fused switches shall be of the fault making, load breaking type selected for the continuous rating of not less than the full load rating of the equipment which they control.

4.37.35 All fused switches shall be of the 500 volt metal clad type with self-aligning switch contacts of the quick make and break type having two breaks in series per pole. Switch covers are to be hinged and mechanically interlocked so that the cover can be only opened with the switch in the "off" position. Cartridge fuse links shall be fitted on each live pole. The sizes of the fuses shall be determined by the load or starting characteristics of motors and the system fault level.

4.37.36 All fuses shall be of the HRC type with a minimum rupturing capacity to suit the system fault levels at 400 volts. Spare fuses of 25% of the total quantity with a minimum of three of each size and type, including control circuit fuses shall be provided.

4.37.37 Isolators shall be of the "on load" type and of ample rating for the maximum load applicable. Live side terminals on all isolators must be shrouded or otherwise insulated against inadvertent contact.

4.37.38 Isolators installed within the switchpanel shall be housed in separate enclosures, the door of which shall be interlocked with the switch operator to prevent the door from being opened unless the switch is in the open position and prevent closing of the disconnecting switch while the enclosing door is open unless a manual bypass is actuated, also to prevent closing of the disconnect switch until the door hardware is fully engaged. The stem operating the isolator shall not be less than 12mm in diameter and shall not be longer than 100mm. Provision shall be made available for padlocking the disconnect switch in the open position only with up to three 10mm shackle padlocks regardless of whether door is open or closed.

4.37.39 Air break circuit breakers shall be of the double break type, and shall have a continuous rating not less than the total full load rating of the equipment. They shall have a fault capacity suitable for the design level of the system. They shall have adjustable overloads, covering the operating range of the equipment served, which shall be series tripping up to 800 Amp and C.T. - operated above this value.

4.37.40 Moulded case air circuit breakers shall be rated to comply with the fault level and current rating specified to suit the load and shall be fitted with thermal overloads and instantaneous magnetic over-current releases.

4.37.41 The breaking capacity, in kilo-amps, shall be suitable for the prospective fault current expected in the circuit. Under-voltage shunt trips shall not be incorporated unless specifically called for.

4.37.42 Miniature circuit breakers shall be to S.A.B.S. 156/1963. All parts of the mechanism shall be of corrosion resisting material or suitable protected by plating or other approved means to prevent corrosion from normal atmospheric conditions. All circuit breakers shall, as far as possible, be of the same type and manufacture throughout the installation.

4.37.43 Current transformers shall be air insulated and shall have an accuracy within 2% of the 0-100% scale output.

4.37.44 Magnetic contractor shall not be smaller than N.E.M.A. size 1 or equivalent, with encapsulated operating coils rated at 220 Volt, 50Hz. Each starter is to be furnished with one spare N.O. (Normally Open) and one N.C. (Normally Closed) auxiliary contacts rated at 5 amperes. Each starter shall also have provisions for adding two additional sets of auxiliary contacts, either normally open or normally closed. Contacts and coils shall be replaceable without removing the entire contactor from the cubicle.

4.37.45 Motor Starters shall comply with BS775 and NEMA specifications and shall have two thermal overload relays which shall be of the bimetallic ambient temperature compensated, manual reset type. Overload relays shall be resettable at any time after tripping without rendering the relays inoperative. All terminals shall be shrouded and the contact mechanism shall be trip-free so that the non-teasable snap action contacts cannot be held closed against continued overload. The ultimate trip current of overload devices shall be a nominal 115% of the motor full load current. With special hard starting, e.g. axial flow fans, it may be necessary to increase the nominal value but in no case shall the overload ultimate trip current exceed 130% of the motor full load current.

4.37.46 Control relays shall be either of the heavy duty industrial type, 600 volt with minimum 10 ampere replaceable contacts and shall be equipped with 220 volt, 50 Hz holding coils for continuous operation within a voltage range of 200 to 260 volts. Holding coils shall be replaceable without removing the entire relay from the cubicle or;

4.37.47 Alternatively the control relays may be of the plug-in type, hermetically sealed in plastic containers.

4.37.48 Phase Reversal Relays shall contain contacts so that on failure or phase reversing the plants will stop. The relays shall be equal to Cutler-Hammer Igranic and shall be installed as indicated on the Wiring Diagrams.

4.37.49 Timers shall be of the synchronous drive type equal to SIEMENS or TESCH.

4.37.50 Rotary switches shall be gauged type, minimum rating 6 amperes at 220 volts single phase, have engraved plastic faceplates for usage designation and equal to Telux or Kraus & Naimer. Where called for they shall be key operated type, supplied with three sets of keys.

4.37.51 Sequence controllers to start plant with minimum of 15 seconds time delay between each start-up of motors of 5kW and over shall be provided to avoid heavy current inrush on plant start-up. Sequence controllers shall be synchronous motor driven type and shall automatically recycle to zero position after power interruption and on normal plant shutdown.

4.37.52 Pilot lights shall be of the low voltage incandescent, multi-lamp, push to test type, equal to SWISSTAC SERIES 2, with 18 x 24mm rectangular "plexiglass" face engraved to indicate the function as noted on the Wiring Diagrams. The colours of the face plates shall be as noted on the Wiring Diagrams to generally indicate the following:

Indication	- Amber
Operation	- Green
Failure or Alarm	- Red

4.37.53 Pilot lights shall be grouped in the sequence of operation of the plant components with amber coloured lamps generally above green lamps and the red "failure or alarm" lamps below the respective green "operation" lamps.

4.37.54 Reset Pushbuttons shall be similar in appearance and size to the pilot lights, equal to SWISSTAC SERIES 2, and shall be mounted adjacent to the Red Failure or Alarm pilot lamps on the switchpanel.

4.37.55 The main incoming switch of each switchpanel shall be fitted with three Ammeters and one Volt meter with selector switch.

4.37.56 Kilowatt-hour meters shall be fitted as specified on the Drawings. The meters shall have 6 digits and manual reset knob. Above 100 Amp the kWh-meter shall be fitted with current transformers.

4.37.57 Ammeters shall be fitted where specified or shown on the Drawings. Ammeters over 50 Amps shall be operated by current transformers of the ring type. Ammeter shall have an accuracy of 2% of the scale range or better. For non-inductive loads the scale of the Ammeters shall not exceed the maximum current drawn by more than 40%. Motor ammeters shall be suitable for the starting current of the motor, and shall have an expanded scale in the region of the operating current.

4.37.58 Volt Meters shall be of the moving iron or moving coil type.

4.37.59 All indicating instruments shall be of the flush mounted square faced pattern with 96mm dials.

4.37.60 Pressure and temperature reference instruments shall be anti-vibration mounted where they may be subject to vibration.

4.37.61 Compensating cables to be run separate from all other cabling.

4.37.62 Each power circuit shall be contained in its own, individually isolatable compartment, and shall be furnished with its own circuit breaker as shown on the Drawings.

4.37.63 Each control circuit shall be protected with a single pole miniature circuit breaker. Controls shall be suitable for 220 volt operation.

4.37.64 Terminal boards or blocks shall be mounted in each switchpanel for all external connections and shall be so located that they are readily accessible from the front of the switchpanel, and not in the wiring gutter leaving it completely free for power and control wiring. If terminal blocks are of the "split" disconnect type the female part shall be secured to the removable unit cubicle and the male part free and be of a closepin type. The disconnect type terminal blocks shall be held together with screws or clamps. Terminal strips shall be properly labelled and panel and field wiring shall be marked accordingly by means of numbered ferrules. Not more than one incoming and one outgoing wire shall be fixed to any one terminal.

4.37.65 Labels showing the unit designations shall be provided adjacent to each of the terminals.

4.37.66 The Switchpanel shall be fully labelled with engraved black ivorine labels having 6mm high white lettering. The labels shall be riveted to switchpanel cover or chassis plates to identify all switchgear, relays, instruments and controls, etc., on the face of or inside the switchpanel.

4.37.67 Equipment operating above 250 volts shall be fitted also with a red danger label.

4.37.68 Embossed Tape or Labels fixed with adhesive will not be acceptable.

4.37.69 The Subcontractor shall be responsible for marking all switchgear and other equipment on the wiring diagrams with the working of the labels to be used.

4.37.70 All cable terminals shall be clearly identified by permanent labels.

4.37.71 Every wire inside and outside the switchboard shall be fitted with ferrules and labelled with identical numbers at both ends.

4.37.72 All terminal numbers and wire identification numbers shall correspond with identical numbers which must be shown on the wiring and control diagrams.

4.37.73 Works tests may be witnessed at the discretion of the Engineer, who shall be given one month's prior notice in writing of the date on which they will take place. Three copies of wiring Diagrams and ladder type schematic Diagrams complete with terminal numbers shall be sent to the Engineers at least 14 days before testing can be commenced.

4.37.74 Testing shall be carried out on all complete equipment, including;

4.37.75 High voltage insulation and insulation resistance tests to earth and between phases.

4.37.76 Satisfactory operation of relays shall be proved.

4.37.77 Closing and opening operation of all starters and contactors shall be satisfactorily demonstrated.

4.37.78 All mechanical interlocks shall be satisfactorily demonstrated.

4.37.79 Satisfactory operation of pilot lights.

4.37.80 Satisfactory operation of current and voltage instruments.

4.37.81 Operation of all control circuits shall be proved by simulating operation of switching devices in the external circuit.

4.37.82 In addition, all components parts shall comply with the type tests specified in the S.A.B.S. or B.S. Standards.

4.37.83 The pre-delivery test is not a final acceptance test, and does not absolve the Subcontractor from his responsibility for the switchpanel.

4.37.84 All protective devices throughout shall be correctly set by the Subcontractor to the approval of the Engineer. Before any circuit is energised, the Subcontractor is required to obtain all the necessary data for correct settings to be established.

4.37.85 The Subcontractor shall be responsible for the complete electrical installation. Selection of equipment of appropriate rating and capacity, including the rupture capacity of fuses and circuit breakers, covered under this Subcontract.

4.37.85.1 Provide for each item of equipment located out of sight of the electrical switchpanel serving same, a remote lock-up stop housed in a dustproof case. Where located in positions exposed to the weather, they shall be waterproof type fitted with suitable watertight cable entry glands.

4.38 ELECTRICAL CABLING AND WIRING

4.38.1 General

4.38.1.1 Mains electricity supplies as relevant, will be provided by others, including making-off of cables within the electrical switchpanel provided by the air conditioning Subcontractor who shall attend upon and liaise with whoever brings power cabling to his switchpanel.

4.38.2 Cabling

4.38.2.1 Termination of P.V.C. insulated armoured cables

4.38.2.1.1 All cables shall be terminated with approved glands ensuring a watertight connection between the sheath, gland and equipment. In cases where copper earth conductors are joined to the armouring, special glands adhering to S.A.B.S. 150-1970, shall be used.

4.38.2.1.2 The glands to be used shall be constructed so that the armouring of the cable is clamped between two bevelled cores with a screw-clamp.

4.38.2.1.3 Glands shall be suitable for PVC SWA and PVC sheathed general purpose 600/1 000 volt cable.

4.38.2.1.4 The non-watertight glands shall be easily converted to watertight glands by means of sealing rings and waterproofing shroud. The glands shall be Pratley, Captive Cone or other approved type. The glands shall be fitted with an earth terminal.

4.38.2.1.5 On the cable entry side of the barrel, a groove shall be provided, to accommodate a rim of the waterproof shroud.

4.38.2.1.6 The shrouds shall be made of non-deteriorating neoprene or synthetic rubber, and shall be resistant to water, oil and sunlight. The shrouds shall fit tightly around the glands and cable.

4.38.2.1.7 Epoxy-resin jointing materials shall be "Scotch-Cast" Splicing Kits or approved alternative and shall be used strictly in accordance with the supplier's recommendations.

4.38.2.1.8 Copper cables shall be terminated either by crimped or soldered lugs. Termination of aluminium cables are to be made by a method approved by the Engineer.

4.38.2.1.9 The cable gland shall be screwed to the gland plate or equipment and fixed with a locknut.

4.38.2.1.10 A Neoprene or P.V.C. shroud shall be used to seal the gland and sheath watertight.

4.38.2.1.11 Cable cores shall be connected to equipment with suitable lugs.

4.38.2.1.12 Exposed armouring shall be covered with bitumen-base paint.

4.38.2.1.13 Cable ends shall be supplied with the necessary earth connection.

4.38.2.1.14 A P4000 "SANKEYSTRUT" channel or other approved means of support shall be provided to remove mechanical stress from the cable glands.

4.38.2.2 Connection of cable cores

4.38.2.2.1 Ferrules shall be used as far as possible where cable cores are connected directly to equipment with screws against the conductor strands. Alternatively cable ends shall be soldered.

4.38.2.2.2 Contact surfaces shall be cleaned properly where cable cores are bolted onto terminals. Suitable lugs shall be used.

4.38.2.2.3 Lugs may be crimped or soldered. For larger size cables purpose designed mechanical or pneumatic crimping tools shall be used.

4.38.2.2.4 Care shall be taken to leave no strands exposed when cutting away insulation from cable cores to fit into lugs.

4.38.2.2.5 The correct size of lugs shall be used for each size of conductor.

4.38.2.3 **Fixing of cables**

4.38.2.3.1 Cables may be installed in one of the following ways:

On horizontal cable trays,
Against vertical cable trays with suitable clamps,
Against horizontal or vertical metal supports or brackets with suitable clamps, or
On clamps which are fixed to the structure.

4.38.2.4 Clamps

4.38.2.4.1 Suitable clamps (cleats) which will secure cables without damage shall be used. Clamps shall consist of adjustable metal wings which clamp to a metal support, or consist of two halves that are bolted together. Wooden blocks shall only be used in exceptional circumstances with the approval of the Engineer. The correct clamps size to fit the cable shall be used. Cables of different sizes may only be fixed by a common clamp when the clamp is specially made to accommodate the various cables.

4.38.2.5 Distance between fixings.

4.38.2.5.1 The maximum spacing between cleats (clamps) to which the cables are fixed in horizontal and vertical cable routes shall be determined from the table below. Additional cleats shall be installed at each bend or offset in the cable run. The maximum distance between supports or cleats for multi-core cables shall be 20 times the outside diameter of the cable with a maximum spacing of 550mm for unarmoured cables and 30 times the outside diameter of the cable with a maximum spacing of 900mm for armoured cables.

4.38.2.6 Maximum spacing of support cleats (mm)

Cross-Sectional	Armoured Cables		Unarmoured Cables		Mineral Insulated Cables	
Area of Cable	Cable Routes		Cable Routes			
Conductors mm²	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical
1,5	450	750	300	400	600	
2,5	450	750	300	400	600	
6,0	600	750	300	400	600	
10,0			750	900	400	450	900
16,0			750	1000	450	550	900
25,0			900	1000	450	550	1200
35,0			900	1000	450	550	1200
Larger than 35,0			900	1000	450	550	1200

4.38.3 **Wiring and Conduits**

4.38.3.1 **E**xcept in cases where cables are specified, all wiring shall be P.V.C. insulated, single core stranded copper conductors and bare stranded or green P.V.C. insulated copper conductors for earth continuity in compliance with S.A.B.S. 150 and the installation shall comply with S.A.B.S. code of practice for the wiring of premises S.A.B.S. 0142-1981 as amended.

4.38.3.2 The colour of the conductors for all 220V circuits shall correspond to the colour of the supply phase for that circuit. Neutral conductors shall be black. All other conductors in the board, supplying control circuits, etc. shall be coded in colours other that those specified above. A colour code shall be devised for each board and the colour code shall be shown on the wiring Diagrams. All conductors that terminate at terminal strips and all conductors used for the internal wiring of the switchboard, shall further be identified at both ends by means of durable cable marking ferrules. P.V.C. or other tape is not acceptable. The numbers of the markers shall also be shown on the wiring Diagrams.

4.38.3.3 Conduits shall be heavy gauge, welded or solid drawn to S.A.B.S. specifications. All joints shall be screwed. No conduit less than 200mm shall be used. Conduit fittings and boxes shall be of enamelled malleable iron.

4.38.3.4 Galvanised conduits and conduits fittings shall be installed in positions exposed to weather, or in moist surroundings. Where galvanising has been removed by threading, cutting, etc., the exposed parts shall be suitably treated or painted to render weatherproof, and rust resistant.

4.38.3.5 Conduit shall either by screwed and locknutted to, or locknutted on both sides, and bushed on the inside of the box or appliances in which it is terminated. Only solid brass bushes shall be used. Alternatively, and particularly in distribution boards, conduits shall be terminated with couplings and brass male bushes.

4.38.3.6 Conduit in roof spaces shall be run parallel and at right angles to roof members and shall be secured to these members by means of saddles and screws.

4.38.3.7 No conduit is to cross an expansion joint in the structure without an approved arrangement for crossover. Where details of crossover are not given, the Subcontractor shall refer to the Engineer for instructions.

4.38.3.8 The Subcontractor shall notify the Engineer in good time before any conduits in concrete are covered so that tubing may be inspected and checked before concrete is cast, and shall attend on the Engineer during such inspections.

4.38.3.9 Conduit for future requirements shall be terminated with boxes and overlapping coverplates, and fitted with galvanised steel draw-wires. Where such conduit terminations project from the wall or slab, they shall be fitted with couplings and plugs. Such terminations in exposed positions shall be sealed with bitumen and protected with weatherproofing paint.

4.38.3.10 Inspection facilities shall be provided at every third change of direction in a run of conduit and at maximum intervals of 10 meters on straight runs. The use of tees and elbows will only be allowed in exceptional cases and shall be inspection type.

4.38.3.11 Exposed conduits shall be fixed with steel saddles of same finish as conduit on centres not exceeding 2 meters.

4.38.3.12 Conduit boxes to be cast in concrete shall be secured to shuttering by means of 5mm screws and nuts, unless some other method of fixing is approved by the Engineer.

4.38.3.13 Drawboxes and blank boxes in R.C. slabs, beams, columns, or in walls shall be fitted with substantial oversized metal coverplates, fixed with countersunk screws, before surrounding surfaces are painted. Drawbox positions must be approved and care shall be taken that they do not affect the appearance of the building adversely. Where possible a single coverplate shall be fitted for a number of adjacent drawboxes.

4.38.3.14 Drawboxes in roof spaces which are only accessible above ceiling, shall not be installed in positions where clearance from ceiling to roof is less than 1 meter.

4.38.3.15 Blank switch and plug boxes shall be fitted with blank coverplates and screws to match those specified for switches and switch sockets.

4.38.3.16 Mounting heights of boxes shall be as indicated on the Drawings which shall refer to the distance between the centre of the outlet box and the finished floor level, unless otherwise specified or indicated. Where two similar outlets occur adjacent to each other, these shall line up accurately horizontally, unless otherwise indicated.

4.38.4 **Earthing**

4.38.4.1 All earthing shall be carried out in accordance with wiring regulations, earthing connections being executed with appropriate copper earthing strip using brass bolts, nuts and washers to ensure continuity to main building earth provided by others.

4.38.4.2 Each run of P.V.C./S.W.A. multi-core cable or mineral sheathed cable shall carry an additional conductor to be used for earth continuity and properly made-off for this purpose. On P.I.L.C.S.W.A. cable use a separate bare stranded copper earth continuity conductor with minimum section 1/2 of size of conductor inside cable.

4.38.5 **Cable Trays**

4.38.5.1 The Subcontractor shall supply and install all cable trays or ladders as specified or as required by the cable routes including the necessary supports, clamps, hangers, fixing materials, bends, angles, junctions, reducers, T-pieces etc.

4.38.5.2 For coastal areas CABRAC CABLE TRAYS or equal and approved shall be provided as supplied by B.R.C. Weldmesh (Pty) Limited, Telephone No. (011) 894-3246/9.

4.38.5.3 The cabrac shall be the medium duty type pre-galvanised epoxy coated.

4.38.6 **Cable Ladders**

4.38.6.1 **General**

4.38.6.1.1 Metal cable ladders shall consist of 76mm high side rail of 2mm minimum thickness. Cross pieces consisting of P3300 "SANKEYSTRUT" channel sections shall be spaced at maximum intervals of 250mm. Where cables of 10mm² or smaller are installed on cable ladders, the spacing of the cross pieces shall be 125mm. Cables shall be clamped in position by means of purposes made cable clamps that fit into the cross pieces. Cross pieces consisting of slotted metal rails which accommodate plastic or metal cable binding bands, may be used in vertical cable runs against walls etc. where the prior approval of the Engineer has been obtained. These cross pieces are not acceptable in horizontal cable runs.

4.38.6.2 Finishes

4.38.6.2.1 Metal cable ladders shall be finished as follows:

In coastal areas	hot-dipped galvanised to S.A.B.S. 763 or epoxy powder coating
False ceiling voids	electro-galvanised or epoxy powder coating
Vertical building ducts	hot-dipped galvanised to S.A.B.S. 763 or epoxy powder coating
Plant rooms, substations, service tunnels, basements	electro-galvanised or epoxy powder coating
Damp areas, exposed	hot-dipped galvanised to S.A.B.S. 763 or epoxy powder coating
Undercover industrial applications	hot-dipped galvanised to S.A.B.S. 763 or epoxy powder coating

4.38.6.2.2 The abovementioned finishes shall apply unless specified to the contrary in the Detailed Technical Specifications. Hot-dipped galvanised or electro-galvanised trays and ladders shall be cold galvanised at all joints, sections that have been cut and at places where the galvanising has been damaged. Powder coated trays and ladders shall likewise be touched up at joints, cuts and damaged portions using spray canisters recommended by the manufacturer of the trays and ladders.

4.38.6.3 Supports

4.38.6.3.1 Trays shall be supported at the following maximum intervals:

1,6mm thick metal trays	- 1m maximum spacing
Metal trays with folded over return and 50mm upstand	- 1,22mm spacing
2,4mm thick metal trays, and 75mm return	- 1,5m spacing
Metal cable ladders	- 1,5m spacing
3,0mm thick P.V.C. trays with 40mm return	- 1,0 maximum spacing
4,0mm thick P.V.C. trays with 60mm return	- 1,5m maximum spacing

4.38.6.3.2 In addition trays and ladders shall be supported at each bend, off-set and T-junction.

4.38.6.4 Joints

4.38.6.4.1 Joints shall be smooth without projections or rough edges that may damage the cables. The Subcontractor will be required to cover joints with rubber cement or other hardening rubberised or plastic compounds if in the opinion of the Engineer joints may damage cables. Joints shall as far as possible be arranged to fall on supports. Where joints do not coincide with supports, joints shall in the case of trays with single returns (items (a) and (c) of 4.15.8) be made by means of wrap-around splices of the same thickness as the tray and at least 450mm long.

4.38.6.4.2 The two cable tray ends shall butt tightly at the centre of the splice and the splice shall be bolted to each cable tray by means of at least 8 round head bolts, nuts and washers. Splices shall have the same finish as the rest of the tray. Where joints which do not coincide with supports occur in trays with folded over returns, tight fitting metal guide pieces, at least 450mm long, shall be inserted in the folded returns to provide the necessary support to the two cable tray ends. Splices as described above shall be provided if trays sag.

4.38.6.5 Fixing

4.38.6.5.1 Trays shall be bolted to supports by at least two hexagon headed bolts and nuts per support. Bolts shall be securely tightened to avoid cables being damaged during installation. The use of square nuts may not be permitted.

4.38.6.6 Fixing to the structure

4.38.6.6.1 The supports for cable trays and ladders shall in all cases by securely fixed to the structure by means of heavy duty, expansion type anchor bolts. It is the responsibility of the Subcontractor to ensure that adequate fixing is provided since cable trays and ladders that work loose shall be rectified at his expense.

4.38.6.7 Accessories

4.38.6.7.1 Horizontal and vertical bends, T-junctions and cross connections shall be supplied by the Subcontractor. The dimensions of these connections shall correspond to the dimensions of the linear sections to which they are connected. The radius of all bends shall be 1000mm minimum. The inside

dimensions of horizontal angles or connections shall be large enough to ensure that the allowable bending radius of the cables is not exceeded. Sharp angles shall have a 45º cornice.

4.38.6.8 Installation of cables

4.38.6.8.1 Cables shall be installed adjacent and parallel to each other on the trays with spacings as determined by the current ratings. Horizontal trays and ladders shall in general be installed 450mm below slabs, ceilings etc. to facilitate access during installation.

4.38.6.9 Earthing

4.38.6.9.1 Metal trays and ladders shall be bonded to the earth bar of the switchboard to which the cables are connected. Additional bar copper stranded conductors or copper tape shall be bolted to the tray or ladder where the electrical continuity cannot be guaranteed.

4.38.7 **Cable Trunking**

4.38.7.1 **Construction**

4.38.7.1.1 Cable trunking shall consist of butting sections constructed from high grade sheet steel having a minimum thickness of 1,6mm.

4.38.7.1.2 It shall be rust proofed by an approved metalising process, finished with one coat of rust resisting paint and one coat of high grade stove enamel.

4.38.7.1.3 The lids of the trunking shall be made from the same material, shall be removable over the whole length of the trunking and secured at centres not greater than 450mm.

4.38.7.1.4 Adjoining lengths of trunking shall be correctly aligned and the two sides at right angles to the cover shall each be joined to the corresponding sides of the adjacent trunking by means of internal fishplate connectors.

4.38.7.2 Installation

4.38.7.2.1 Support of cable trunking shall be at least as follows:

Trunking Size	Maximum spacing of Hangers and Fixings
Up to 76 x 76mm	600mm centres
Up to 150 x 76mm	1 000mm centres
Up to 380 x 200mm	1 200mm centres

4.38.7.2.2 The trunking shall be mechanically continuous throughout. At each joint in the trunking continuity shall be maintained by the installation of copper or brass links secured by brass nuts, locking washers or bolts. Self-tapping screws will not be acceptable.

4.38.7.2.3 All tees, reducers, angles and other accessories for trunking shall have folded and welded corners.

4.38.7.2.4 All trunking bends shall be of easy sweep design with fillet corners, and where branch or cross-over connections are made the edges of the apparatus shall be rendered smooth with approved edging strips.

4.38.7.2.5 Where trunking is not directly fixed to surfaces it shall be hung from straps or rod hangers arranged to support the trunking rigidly in both directions.

4.38.7.2.6 Where inverted trunking is used the cables shall be retained in their individual compartments by clips at not less than 1m intervals. Groups of cable shall be secured within the trunking with plastic tape.

4.38.7.2.7 The Electrical Subcontractor shall arrange his layout of trunking in conjunction with other trades and no work shall commence until the Electrical Subcontractor has verified that his trunking will not clash with the services of other trades by means of co-ordination Drawings to the Engineer's approval.

4.38.7.2.8 Adequate allowance shall be made for expansion and contraction on all runs and where the trunking passes over expansion joints in the building structure, expansion couplers shall be provided.

4.38.7.2.9 Care shall be taken to ensure that water, concrete and other foreign matter are not allowed to enter trunking particularly where trunking is cast into or through structural concrete or floor screeds.

4.38.7.3 **Coverplates**

4.38.7.3.1 All channels up to 125mm wide shall have snap-in cover plates of metal or P.V.C. Cover plates for wider channels shall be of metal and shall be fixed by means of screws which shall permanently be tapped into the cover plates spaces at suitable intervals to prevent warping. The finish of the covers shall comply with paragraph 4.10.9.

4.38.7.4 Connections

4.38.7.4.1 Adjoining lengths shall be correctly aligned and securely joined by means of fishplates and mushroom bolts, washers and nuts or connection pieces that are pop-rivetted to both adjoining sections. All adjoining sections shall be rectangular and shall butt tightly. Covers shall fit tightly across the joint.

4.38.7.5 Vermin proofing

4.38.7.5.1 All cable channels shall be vermin proof after installation. Holes shall be covered by means of screwed metal plugs or by means of metal strips that are bolted or pop-rivetted to the channel. Wooden or other plugs which are driven into holes or other temporary plugs or covers are not acceptable.

4.38.7.5.2 When installing trunking the Subcontractor shall ensure that:-

4.38.7.5.3 When cut, filled or drilled, the connections shall be given one coat of approved anti- corrosive paint subsequent to the removal of all burrs.

4.38.7.5.4 When conduits enter trunking, the connection shall be made with two locknuts and a female brass bush.

4.38.7.5.5 All burrs caused by drilling or machines shall be removed prior to the installation of cables and the fixing of lids.

4.38.7.6 **Internal finishes**

4.38.7.6.1 All bends shall be of easy sweep design with 45º cornices. Burrs and sharp edges shall be removed and the inside edges of all joints shall be lined with rubber cement or other suitable rubberised or plastic compound to prevent conductor insulation laceration.

4.38.7.7 Services

4.38.7.7.1 Multiple duct runs or internal metal partitions shall be used where conductors for power, control and other services are present.

4.38.7.8 **Materials and finishes**

4.38.7.8.1 Cable ducts shall be of the "SANKEYSTRUT" type or similar. The ducts shall be rolled from 1,2mm minimum sheet steel and shall be finished as follows:

In coastal areas (under all installation circumstances)		hot-dipped galvanised to S.A.B.S. 763 or epoxy powder coating
Cast in concrete	- pre-galvanised	hot-dipped galvanised to S.A.B.S. 763 or epoxy powder coating
False ceiling voids	-	hot-dipped galvanised to S.A.B.S. 763 or epoxy powder coating
Surface mounted in plant rooms, substations, service tunnels, basements -		epoxy powder coating or electro-galvanised
Damp areas, exposed to weather, underground runs in contact with earth		hot-dipped galvanised to S.A.B.S. 763 or epoxy powder coating
Undercover industrial applications		hot-dipped galvanised to S.A.B.S. 763 or epoxy powder coating

4.38.7.8.2 Hot-dipped galvanised or electro-galvanised ducts shall be cold galvanised at all joints, sections that have been cut and at places where the galvanising has been damaged. Powder coated ducts shall likewise be touched up at joints, cuts and damaged portions using spray canisters recommended by the manufacturers of the channels.

4.39 INSTRUMENTS

4.39.1 Provide and install instruments where shown on the applicable Drawings or mentioned herein as follows, the instruments to be fully metricated to local standards. All instruments shall be installed within Plant rooms where possible and shall be mounted at eye level and, if necessary, remote sensors shall be provided to ensure eye level accessibility. All instruments shall be installed in positions not affected by Plant vibration.

4.39.2 Instruments shall be of the circular dial type, having equal sized dials between 75mm and 100mm in diameter, unless otherwise specified, and the same finish in either stainless steel or chrome plated. All panel mounted instruments shall be suitable for flush mounting and fixing from within the panels without screws projecting through the panels.

4.39.3 Instruments shall be provided with pointers or have painted on their dials green lines to indicate the normal operating ranges of the services indicated and red lines to indicate any minimum and/or maximum limits.

4.39.4 Air and water temperatures shall be measured with stem or remote bulb type thermometers which shall have a guaranteed accuracy within 1% around the entire dial range and a means for recalibrating the instruments on Site. Thermometer ranges shall be suitable for the service and shall not exceed 50% above or below the normal operating temperatures for each instrument.

4.39.5 Stems or bulbs sensing temperatures in pipes shall be fitted into oil filled brass wells and bulbs in ducts or plena shall be neatly fitted on insulated brackets to the satisfaction of the Engineer.

4.39.6 Bulbs sensing wet bulb temperatures shall be provided with suitable cotton socks and copper/brass wet bulb tank with ball float make-up piped to raw mains water supply, overflow and drain connection, the latter piped to drain. Wet bulb tanks shall preferably be the product of a control instrument manufacturer. Two spare cotton wicks per wet bulb sensor shall be provided.

4.39.7 Water pressure gauges shall be glycerine filled Bourdon tube type, scaled from 0 to 150% of operating pressure and of steam quality and first grade accuracy. Each pressure gauge shall be preceded by a siphon tube and high quality gauge cock.

4.39.8 Orifice plates complete with cocks shall be provided and installed at all positions necessary to enable readings to be taken of water flow quantity. The orifice plates shall fit between flanges in the water piping and be provided with permanently affixed brass engraved plates indicating orifice diameter. Orifice plates shall be as supplied by NEGRETTI & ZAMBRA and sized to use standard water flowmeters as procurable from the firm from which orifice plates are purchased. The Subcontractor shall note that he shall be responsible to set water quantities by use of the orifice plates and shall therefore be in possession of a portable flowmeter suitable for the orifice plates he installs.

4.39.9 Air pressure gauges shall be 50mm dial scaled from 0 to 150% of normal operating pressure, equal to JOHNSON CONTROLS manufacture.

4.39.10 Static pressure indicators shall be of the diaphragm actuated, dial and pointer type graduated to read from 0 to 50% more than the maximum allowable static pressure and shall be installed to sense the leaving main supply duct pressure. The gauges shall be connected to static pressure tips of approved design.

4.39.11 Kilowatt-hour meters shall be of the house service type, approximately 162 x 112 x 100mm deep, of robust construction, housed in a dust proof sealed metal or plastic case, shall utilise a magnetic suspension for the disc and shall comply with BSS 37.

4.39.12 The meter element shall be suitable for operation on single phase, or three phase as specified, 50 Hertz AC system and shall be of the indicator type, capable of continuously carrying the rated current. Accuracy shall be "Commercial Grade" as defined in S.A.B.S. 01.

4.39.13 The registering mechanism shall be of the cyclometer type giving a reading of six figures, the lowest indicating tenths of a unit.

4.39.14 The meters shall be suitable for the supply voltage specified and the rated current shall be as directed.

4.39.15 Voltmeters shall be of the moving iron flush mounting type, rectangular or circular and size as specified. They shall be suitable for vertical switchboard mounting and studs shall be provided for back connection. The voltmeters shall be suitable for operation on a 50 Hertz system, and be calibrated as required. The voltmeters shall be manufactured in accordance with BSS 89 to industrial grade accuracy as specified therein.

4.39.16 The voltmeters shall be protected by high rupturing capacity cartridge fuses to S.A.B.S. 172 : housed in suitable insulated fuse carriers with a panel-mounted base. Voltmeter selector switches shall be incorporated.

4.39.17 Ammeters shall be and of the moving iron flush mounting type and of the pattern, size and scale range as specified. Ammeters for use in motor circuits shall have a suitably compressed overload range.

4.39.18 Ammeters selector switches shall be installed if specified. Selected switches having spring loaded contacts running over copper segments are not acceptable.

4.39.19 Combined maximum demand and indicating ammeters shall be flush panel mounting, rectangular in shape, the dial size being approximately 125 x 125mm or 80 x 80mm as specified. The ammeters shall comply with BSS 89.

4.39.20 The instrument shall comprise a moving iron ammeter showing the instantaneous current value, combined with a maximum ammeter employing a bimetallic spiral device which will indicate the mean current value on the basis of a 15 or 30 minute period as noted, and which is fitted with a residual pointer to indicate the maximum mean current reached during any period between manual resetting.

4.39.21 All three indications shall be registered on concentric scales, and instruments having small moving iron ammeters with window cut-outs scales are not acceptable. The bimetallic system shall incorporate ambient temperature compensation.

4.39.22 The instrument shall be used with a current transformer having a 5 ampere secondary winding. 6 Ampere or 8 ampere instruments may be offered, scaled to the full load primary current of the current transformers, with an additional overload scale in the case of 6 amp instruments.

4.39.23 Power factor indicators shall be housed in pressed steel cases. Shadowless scale plates shall be fitted. Instruments shall comply with BS 89. Indicators shall be suitable for flush mounting in switchboards. Current rating shall be 0,5 to 5 A continuous at the rated voltage. Power factor range shall be from 0,5 PF lead to 0,5 PF lag, and size shall be as specified.

4.39.24 Elapsed time meters shall be of the flush mounting type, square phenolic frame, suitable for switchboard mounting. Registers shall be calibrated in hours and tenths of hours. Cyclometer details to be noted. Voltage range shall be 200 - 250 V 50 Hz unless otherwise noted. Motors shall be self-starting, synchronous, non-reversing and shall be energised from the same supply as the apparatus being metered.

4.39.25 Transducers shall be suitable for use in remote indication systems for alternating current and voltage using lightweight telephone type pilot wires. Outputs shall be suitable for operating moving coil instruments and recorders.

4.40 EQUIPMENT BASES

4.40.1 Provide, as called for in the detailed specification or as indicated on the Drawings, equipment bases of the applicable type as specified below:

4.40.2 Inertia bases shall comprise a reinforced concrete pad of mass one and a half times that of the equipment to be mounted upon it. A welded mild steel tray, suitably reinforced and of sufficient depth to contain the required weight of concrete, shall be provided by the Subcontractor. Welded into such trays shall be a suitable template complete with the necessary ragbolts suitable for rigidly affixing the equipment to the base, once concrete has been cast in it. The Principal Contractor will pour concrete into the tray and smooth plaster it with coloured granolithic finish. The steel tray is to be positioned on a 80mm high smooth plastered "housekeeping" plinth, such plinth provided by the Principal Contractor and 150mm larger than the steel tray all round. The inertia base shall be separated from the plinth by suitable vibration isolators, as later detailed, proper provision in the design and construction of the steel tray being made for the attachment of the necessary vibration isolating mountings.

4.40.3 Floating steel bases shall be shop-fabricated from mild steel channel sections of sufficient strength and rigidity using welded joints. Such bases shall, unless otherwise called for elsewhere or noted on Drawings, be of rectangular shape and at least 80mm larger in all plan dimensions than the equipment to be mounted onto it. The construction of the base shall be such that proper provisions are incorporated for attaching laterally or fitting beneath it, vibration isolators of the type which each application may require. The Principal Contractor will provide a level plastered 80mm high "housekeeping" plinth on which to mount the aforementioned steel base, the plinth to be 100mm minimum larger than the base all round.

4.40.4 Static plinths, 80mm minimum high, shall be provided by the Principal Contractor for mounting non-vibrating equipment upon them, the plinths to be rectangular in shape unless otherwise shown on the Drawings and 100mm larger all around than the equipment to be mounted upon them.

4.40.5 The Subcontractor shall provide and position, where required, a channel iron frame, with mitred welded corner joints, and sheet-metal bottom tray for the Principal Contractor to fill with concrete. The finish of the plinths shall be tinted granolithic.

4.40.6 Anti-vibration mountings shall be utilised in conjunction with the aforementioned bases, as relevant and as indicated on the Drawings, for the following listed items of equipment.

4.40.7 All anti-vibration mountings shall be installed in full accordance with their manufacturer's application instructions, the model numbers mentioned herein referring to equipment of Mason Industries Inc., although other approved makes would also be acceptable.

Equipment	Minimum Static Deflection	Type of Mounting	Model
Centrifugal chillers and Reciprocating Compressors/Chillers	50mm	Helical spring with levelling adjustment	SLF
Cooling Towers over or non-occupied areas		Neoprene Vibration Pads	NK WMW
Over occupied areas with levelling adjustment	To suit fan speed	Restrained Helical spring	SLR
Centrifugal Pumps or over non-occupied areas		Neoprene Vibration Pads	NK WMW
Over occupied areas	25mm	Helical Spring with levelling adjustment	SLF

Equipment	Minimum Static Deflection	Type of Mounting	Model
Fans			
Up to 500 rpm 500 to 1200 rpm Above 1200 rpm	65mm	Helical Spring with levelling adjustment	SLF
Axial Flow Fans	6mm	Neoprene in sheer and compression	3ON
Air Conditioning units Air Handling units and Condensing units on concrete floors or bases	To suit fan speed	Neoprene Vibration Pads	NK or WMW
Air handling units and Air Conditioning units over occupied areas	To suit fan speed	Helical spring with levelling adjustment	SLF
Minor rotating and equipment in non-critical areas	6mm	Neoprene in sheer compression	N

4.40.8 Full details of all floating steel bases and all anti-vibration mountings selections shall be approved by the Engineer prior to the mountings being ordered and the bases fabricated.

4.40.9 Where applicable, the Subcontractor shall exercise particular care to prevent damage to the roof slab waterproofing when hoisting, positioning and connecting plant and equipment and shall note that he will be held responsible to repair any damage caused as a result of this installation.

4.40.10 All equipment and particularly that which is mounted on the roof shall operate without objectionable noise or vibration being transmitted to the full satisfaction of the Engineer.

4.41 EQUIPMENT SUPPORTS

4.41.1 Where equipment supports, stands, platforms and suspension brackets are indicated, specified or necessary for ductwork, pipework, tanks, air handling units, cooling towers, etc., the Subcontractor shall provide supporting structures capable of carrying the load without distortion, affixed to the building structure in such a manner as not to subject it to undue stress.

4.41.2 Supporting of any rotating equipment shall incorporate vibration mountings of the type and selection specified in the applicable clauses referring to equipment bases herein.

4.41.3 All methods of suspension or supports shall be submitted to the Engineer for approval and for reference to the Structural Engineers where necessary, prior to manufacture or installation.

4.41.4 Generally, supports shall preferably be proprietary products such as Unistrut or failing this, shall be of mild steel sections, purpose fabricated for their application. Under no circumstances whatever will sheet metal straps be accepted as a supporting method. All supports shall cradle the item to be supported; supports shall not be riveted or welded to the equipment to be carried except in exceptional circumstances approved by the Engineer. Rod hangers shall not exceed one meter in length and be of minimum diameter 12mm. For longer suspensions use mild steel angles. Angle iron supports shall be of 38mm x 5mm minimum. All supporting structures for equipment located in unprotected areas shall be hot dip galvanised.

4.41.5 Fastening methods shall employ REDHEAD or RAWBOLT anchor bolts or their equivalent, for fixing supports to the building structure, it not being permissible to utilise gunpowder shotdriven bolts for this purpose unless prior approval be obtained.

4.41.6 Pipework supporting holderbats shall be the product of a recognised manufacturer of such equipment, shop-fabricated saddles or similar devices being unacceptable unless limited space available necessitates their use. On insulated pipework, hardwood inserts consisting of two half-round machine cut pieces of timber shall be clamped around the pipe, insulation being cut away at any such points, to allow proper support fitting. Wooden inserts shall be of the same thickness as adjoining insulation and 50mm longer than the width of the holderbat support, to permit correct finishing of the insulation or vapour sealing to them.

4.41.7 Flexible pipes shall be supported on Unistrut or equivalent perforated galvanised cable tray, manufactured by specialists, shop-fabricated trays or racks not being acceptable. The cable tray shall be suspended or bracketted using suitable mild steel angles.

4.41.8 Reference shall be made to manufacturer's requirements regarding equipment supports and these requirements shall be fully complied with.

4.42 NOISE AND VIBRATION

4.42.1 Particular care shall be taken in the selection, application and installation of all equipment used to ensure that if operates below the maximum allowed noise levels, as specified in Part Five hereof, and with the least vibration possible, all to the full satisfaction of the Engineer.

4.42.2 The following measures shall be taken where necessary, whether specifically called for or not, all to ensure quiet vibration-free operation of the equipment forming part of the air conditioning and ventilation installations.

4.42.3 Rectangular ductwork in the vicinity of critical areas shall be provided with internal acoustic insulation.

4.42.4 Anti-vibration cuff connections or flexible joints shall be used on ductwork where it joins vibrating equipment such as fans and air conditioning units.

4.42.5 Pipework connecting rotating or vibrating machinery shall be provided with anti-vibration flexible joints, all as previously specified.

4.42.6 Equipment shall be mounted on vibration isolators of the correct type and selection, dependent upon deflection requirements versus vibrating frequency.

4.42.7 Pipework and ductwork shall be suspended or mounted using suitable supports with vibration isolators to prevent transmission of vibration from them to the structure to which they are attached, where necessary only.

4.42.8 Suitable sound attenuating devices shall be incorporated within ductwork to reduce airborne noise to acceptable levels, as indicated on the Drawings and specified in Part Five hereof.

4.42.9 The Subcontractor shall provide sound level data to the Engineers on the completion of the installation detailing the noise levels in octave bands for each separate air conditioned and ventilated areas.

4.42.10 Noise measurements for the sound level data shall be taken during full or nearly full cooling load conditions by an approved organisation. No measurement shall be taken closer than 1 meter from any outlet, ceiling, wall or floor surface.

4.42.11 If, in the opinion of the Engineer, any equipment operates with, or transmits from it, objectionable vibrations or noise above the levels specified for the individual areas, it will be necessary to rectify or replace such equipment to the full approval of the Engineer at no additional cost to the Owners.

4.43 PAINTING AND CLEANING

4.43.1 No untreated metal surfaces shall be permitted on the project. Items which are not galvanised or similarly protected against rust and corrosion shall be painted, as later detailed herein. No equipment, hangers, brackets etc., shall be permitted to be delivered on site in unprotected form; they shall be factory-coated with an approved zinc-rich prime coat before despatch from their place of manufacture.

4.43.2 Painting shall comprise the following consecutive processes. First thoroughly clean, descale and degrease all surfaces, in accordance with acknowledged good practice, follow with a good coating of approved zinc-rich primer and one coat of universal undercoat, finish with two coats of quality high-gloss enamel of an acceptable make. Final finish shall be to the full approval of the Engineer.

4.43.3 With the exception of certain air conditioning piping, items with a galvanised finish, such as cable trays, need not be painted but shall be properly cleaned with a suitable proprietary galvanised iron cleaning fluid. Where galvanised finish is painted, it shall be primed with a Calcium Plumbate Primer.

4.43.4 Particular care shall be taken that appropriate primers be used as a basis for painting and that paint be of high quality manufacture, all to provide a completely satisfactory finish to the approval of the Engineer. It shall be noted that galvanised surfaces are to be treated to ensure proper bonding of paint.

4.43.5 Whereas it would not be necessary to paint any ductwork, conduits or pipework installed in roof voids, shafts, masonry ducts, etc. or where not normally visible, it is a requirement that such equipment be properly cleaned, treated with two coats of rust-proofing paint if not galvanised or not metal subject otherwise to rust.

4.43.6 Where the inside of ducting is visible through grilles and diffusers or any other openings the visible section of the interior of the duct shall be painted matt black after degreasing and priming as specified above.

4.43.7 All plant and equipment on the project shall be painted and colour-coded in accordance with standards recognised in the Republic of South Africa and, where possible, to comply with relevant South African Bureau of Standards Colour Codes, or as later specified herein.

4.43.8 All plant and equipment shall be painted in accordance with a colour code given and where factory painted items such as the Air Conditioning Units, Cooling Towers and Pumps are not painted a colour similar to that specified they shall be repainted by the Subcontractor.

4.43.9 Factory painted equipment which is required to be repainted to comply with the specified colour code shall be rubbed down prior to being given two coats of gloss enamel paint, or as required in accordance with the paint manufacturer's recommendations and depending upon the type of paint applied at the factory.

4.43.10 On completion of the installation the Subcontractor shall clean all equipment properly, remove all superfluous materials from the site, make good black granolithic finished equipment bases with black concrete paint, sweep out Plant rooms and make the Plant completely presentable before calling upon the Engineers to accept the plant as finalised, after completion of the "Preliminary Tests".

4.44 LABELLING AND IDENTIFICATION

4.44.1 All equipment shall be labelled and identified using white Traffolite labels having 10mm high black lettering engraved on them; where two similar items exist, they shall additionally be numbered for clarity in identification. Labels shall be neatly riveted or secured using epoxy based glue, no other type of adhesive being acceptable.

4.44.2 Prepare a complete piping diagram for the complete installation also showing drains, vents, etc., and give every valve on the project a designation. Fit every valve with an identification tag of engraved plastic or aluminium 3mm thick, 40mm diameter, such tag affixed to the valve with key tag type ball chain of chromium plated finish. The aforementioned piping diagram shall form part of plant operating instructions later referred to in this Specification.

4.44.3 Designate and identify each automatic control device such as 3-way valve, thermostat, damper motor, etc., and fit to each a white Traffolite label having 5mm high black lettering, the labels glued on with epoxy-based adhesive. Prepare a complete control diagram of the installation and label with relevant designations mentioned above, all to form part of plant operating instructions which are later mentioned herein.

4.44.4 Identify pipes, ducts, equipment, by colour coding as previously mentioned herein. In addition to this label pipes and ducts with directional arrows neatly stencilled onto finished paintwork or in the form of a durable proprietary transfer. Arrows shall be at not more than 5 meter intervals and not less than 100mm long, of good colour contrast to equipment colour background.

4.44.5 Belt guards and items of plant containing belt driven equipment shall be fitted with a label stating the number of and sizes of the belts for each vee belt drive. The labels shall be of the same type and dimensions and shall be fixed as specified for all equipment.

4.44.6 Designate and identify each automatic control device such as 3-way valve, thermostat, damper motor, etc., and fit to each a white Traffolite label having 5mm high black lettering, the labels glued on with epoxy-based adhesive. Prepare a complete control Diagram of the installation and label with relevant designations mentioned above, all to form part of plant operating instructions which are later mentioned herein.

4.44.7 Identify all Plant rooms as "Air Conditioning" or "Air Handling Plant Room" with 5mm thick engraved P.V.C. sheet notices having 25mm high black lettering on a white background.

4.44.8 Provide and install all necessary notices required in terms of Governmental and Local Authorities' laws, such as "No Entry to Unauthorised Person", at all Plant room entrance doors, etc. Such notices to be silk-screened onto 3mm minimum thickness P.V.C. sheet, as obtainable from Messrs. Mine Safety Appliances.

4.44.9 On multiple split systems pipework identification shall be installed at approximately 3 metre intervals.

4.45 COMMISSIONING AND TESTING - PRELIMINARY TESTS ON COMPLETION

4.45.1 Following completion of the Works, or any portion of the Works as specified or directed by the Engineer, the Subcontractor shall balance, set and test the Works, or portion of the Works, in accordance with the following requirements, to establish the capacity and satisfactory performance of the Plant.

4.45.2 All balancing, settling and testing shall be done by the Subcontractor entirely at his own expense. The Subcontractor shall provide all facilities and apparatus for the testing of the Plant and shall carry out such tests as may be necessary to satisfy the Engineer that the Plant meets with the requirements of the Specifications.

4.45.3 The Subcontractor shall also carry out or attend upon all tests required by Government and Local Authorities who have jurisdiction over the Works and shall obtain all necessary certificates of approval and acceptance and provide the Engineer with triplicate copies of all such certificates prior to or at such time as, providing the Engineer with copies of his "Preliminary Test" report.

4.45.4 All test instruments shall be checked for accuracy by the manufacturers, suppliers or approved laboratory and certified copies of certificates showing the degree of accuracy shall be supplied to the Engineer together with the "Preliminary Test" reports.

4.45.5 Gauges, thermometers, ammeters and other instruments specified as part of the permanent Plant may be used for test purposes providing that the Subcontractor ensures that all such instruments are accurately calibrated. The Subcontractor shall check the accuracy and calibrate all such instruments against laboratory tested instruments.

4.45.6 The Subcontractor shall when required, provide the Engineer with equipment selection and performance data for all major items of plant, such as Air Conditioning Units, Air Handling Units, Cooling Towers, Pumps, Fans and Sound Attenuators.

4.45.7 The Subcontractor shall keep full and proper written records of all tests conducted and commissioning information, such data to be properly indexed and clearly set down to form part of the Operating and Maintenance manuals called for in the Specification.

4.45.8 The Engineer reserves the right to inspect any item of equipment during manufacture or before delivery to Site. The Subcontractor shall make available any item for such inspection.

4.45.9 Electrical switchpanel shall be inspected by the Engineer at their place of manufacture, prior to delivery to Site. At such inspection and testing, the Subcontractor shall demonstrate the functioning of the switchpanel to the Engineer. Any defects in materials, finishes and operations of the switchpanel shall be corrected at their place of manufacture prior to delivery to Site.

4.45.10 The Subcontractor shall, on handing over the Installation or any portion thereof, to the Engineer, also provide the necessary certificates as proof of having conducted a satisfactory electrical test to the requirements of the electricity supply authority, such certificate emanating from such authority and permitting full use to be made of the installation without the need for further tests.

4.45.11 The Subcontractor shall properly test and call for inspection by the Engineer, any work which is to be covered, concealed, built-in, otherwise closed up or rendered inaccessible, before such closing up takes place. The Engineer may require any work of this nature which he has not been called on to inspect before closing up, to be uncovered or made accessible to its inspectors entirely at the Subcontractor's expense, making good included.

4.45.12 Prior to the "Final Tests", to be attended by the Engineer, the Subcontractor shall balance, set and test the following to establish the capacity and performance of the Plant. All such "Preliminary Tests" shall be recorded by the Subcontractor who shall provide the Engineer with three typed copies of all test

recordings which shall set out the procedure, data and instrument readings obtained as compared with the specified capacities and the manufacturer's name plate ratings where applicable. Such preliminary test reports shall be accompanied by one preliminary draft set of Operating and Maintenance Instructions prepared in accordance with the requirements as detailed herein.

4.45.13 On receipt of an acceptable preliminary latest report and draft copy of the Preliminary Operating and Maintenance Instructions the Engineer shall advise the Subcontractor in writing that he may arrange for the final acceptance tests.

4.45.14 The "Preliminary Tests" shall include the following:

Completed sections of water pipework shall be tested with water pressure of not less than 700kPa or 50% above the maximum working pressure, whichever is greater, at the lowest point in the system. Care shall be taken to avoid putting excessive pressures on mechanical seals, safety devices etc., which are not designed to withstand pressures used in tests. The system shall be filled and all air vented before the actual test pressure is applied. Test pressure shall be applied when water and average ambient temperatures are approximately equal and constant. Test pressure shall be maintained for not less than 30 minutes without appreciable drop after the force pump has been disconnected. Leaks in screwed fittings shall be corrected by remaking the joints. Leaks in welded joints shall be cut out and rewelded and not caulked. All testing must be performed and systems approved prior to covering or concealing piping.

On completion of the entire installations, all water circulating systems shall be flushed and balanced to provide the water quantities circulated through all heat transfer equipment as specified or required to provide the capacity specified. All temperature control valves shall be fully open during balancing and all regulating valves shall be permanently marked at the final settings. All balancing valves shall have their handwheels removed and stored, with the Spare Parts on completion of the tests.

Drains shall be tested for proper functioning by pouring water down them at a rate of at least four times normal drainage quantity.

Compressed air piping, except low pressure control piping, shall be tested at not less than 1000kPa. This pressure shall be maintained for one hour without pumping. A correction of the final pressure of not more than 13kPa for each 3ºC change in average ambient temperature during the test will be permitted. Leaks shall be corrected as specified for water piping.

Low pressure temperature control air piping shall be tested with 200kPa air pressure. This pressure shall be maintained for one hour without pumping during which time the pressure shall not drop more than 8kPa. A correction of the final pressure of not more than 3,5kPa for each 3ºC change in average ambient temperature during the test will be permitted. Leaks shall be corrected by remaking the joints and not by caulking.

Field assembled refrigerant piping and apparatus shall be tested with dry carbon dioxide or nitrogen plus a small amount of refrigerant. Test procedures shall be in accordance with the latest edition of the American Standard Safety Code for Mechanical Refrigeration. Leaks in pipe joints shall be4 corrected by remaking the joints. Caulking will not be permitted. The vacuum test shall follow the pressure test.

Charging of the equipment with refrigerant shall follow the vacuum test as closely as is practicable to minimise the possibility of air or moisture being returned to the system. After charging and prior to capacity tests, joints in refrigerant piping and apparatus shall be checked with a halide torch or other equally sensitive leak detector. If leaks are found, the system shall be pumped down and the leaks corrected.

Capacities of Refrigeration Machines, Cooling Towers, Pumps, Air Conditioning Units, Air Handling Units, Condensers, Heaters, Fans and other equipment shall be determined by operating tests of not less than four hours duration, after stable conditions have been established. Test procedures shall be in accordance with applicable portions of ASME and other recognised test codes as far as field conditions permit. Capacities shall be based on temperatures and air and water quantities measured during such tests.

Water quantities shall be measured with calibrated orifice or venturi type flow meters. Water quantities read from pump curves shall not be used for determining capacities.

Temperature differences required for determining capacities shall be measured by thermometers having graduations that permit interpolations having an accuracy of plus or minus 0,5 degrees C.

Air quantities may be measured by pitot tube, anemometer or velometer, depending on the velocity and other conditions of flow.

Check alignment of all equipment drives prior to setting into operation.

Air systems shall be checked for obstructions and balanced to provide the required air quantities at each outlet without objectionable noise and draughts and so that the velocity of the air is relatively uniform over the area of the outlet.

Velocity meters may be used to test all outlets and for duct velocities up to 1,55 m/s, above which velocities shall be measured with Pitot tubes. Properly capped openings shall be provided in ducting as required. Final settings of all volume adjusting devices shall be permanently marked.

Air duct systems shall be adjusted and balanced so that air quantities at outlets are as specified, further, the distribution from supply outlets is free from drafts, and uniform over the face of each outlet.

The entire air distribution system shall be adjusted and balanced in accordance with the "Manual for Balanced Adjustment of Air Distribution System" as compiled by SMACNA.

Air quantities specified for fans include for duct leakage. The sum of the air quantities of all outlets would normally be accepted at a tolerance of plus or minus 5% of that specified for the fans.

The air quantities at the terminals would normally be accepted at a tolerance of plus or minus 10% provided the total air supplied to the particular space is within a tolerance of plus or minus 5%.

Airflow quantities shall not be reduced by artificially increasing the system resistance by more than plus or minus 5% of the total system resistance.

4.45.15 Airflow quantities shall be determined by a combination of the following:

- Airflow by means of anemometer over filter bank or coil.
- Main duct airflow by means of a pitot tube traverse.
- Pressure differential across and power consumption of fan.
- Supply air quantity at terminals using a calibrated hood.

4.45.16 Should it be necessary to re-balance any air system due to partitioning or repartitioning of the conditioned space after the specified conditions have been obtained and accepted by the Engineer, then such re-balancing shall be carried out as an extra to the Subcontract and shall be authorised, by the issue of a "Variation Order", by the Engineer.

4.45.17 Sound tests to demonstrate compliance with sound guarantees shall be made at locations selected by the Engineer.

4.45.18 Sound levels shall be measured with sound meter complying with the latest American Standards Association. The "A" scale shall be used for overall sound level readings. Where sound levels are specified in octave bands, the above sound level meter shall be supplemented by an Octave Band Analyser complying with the latest American Standards Specifications for an Octave Band Filter Set No.

Z24.10, published by the American Standards Association. The sound level meter shall be set on the "C" scale of all octave band readings.

4.45.19 "Equipment components" of room noise levels (those portions of total room noise levels attributed solely to air conditioning equipment) shall be determined at any point within a room not less than 1,8 meters from air terminals.

4.45.20 Sound level readings shall be taken on a Sunday morning when the building is unoccupied and when activity in surrounding areas, and background noise levels in areas tested, are at a minimum and relatively free from sudden changes in noise levels. Readings shall be taken with no equipment operating and with all air conditioning equipment, capable of transmitting sound to the space tested, in operation.

4.45.21 All automatic controls and safety devices shall be checked for correct performance and satisfactory operation and set to the respective settings required, such settings to be recorded.

4.45.22 All electrical switchpanel shall be checked for the correct functioning of all components and electrical interlocks and all time clocks, time delay relays and automatic control devices shall be set for their correct function.

4.45.23 The running current of all electrically operated equipment shall be recorded and compared with the manufacturer's name plate ratings, which shall be recorded together with any other relevant data stamped on the name plates. All overload protection devices shall be set to the correct values, which shall be recorded.

4.45.24 The Subcontractor shall ensure that the plants operate satisfactorily and uninterruptedly for a period of 7 days prior to final acceptance by the Engineer. Evidence of this, for air conditioning systems, shall be given in the form of 24 hour long continuous recordings of temperature and humidity, which recordings shall cover at least 50% of the areas handled by any one plant and shall be handed over to the Engineer prior to inviting him to the Final Tests and acceptance of the completed installations.

4.45.25 The original recorder graphs shall be supplied to the Engineer and the Subcontractor shall also obtain and provide the Engineer with the daily maximum dry and wet bulb temperature readings recorded in the area on the same days as the inside conditions are recorded. Such information may be obtained from local weather stations.

4.46 OPERATING AND MAINTENANCE INSTRUCTIONS

4.46.1 The Subcontractor shall furnish to the Engineer before the Works are taken over, such Operating and Maintenance Instructions, together with Drawings of the Works as completed, and in sufficient detail to enable the Employer to operate, maintain, dismantle, re-assemble alter and adjust all parts of the Works.

4.46.2 The Works shall not be considered to be completed for the purposes of taking over until the required Instructions and Drawings have been supplied to the Engineer.

4.46.3 A draft copy of all written instructions shall be submitted to the Engineer for approval together with the required copies of the "Preliminary Test" report, as previously specified herein, prior to the preparation of the final copies.

4.46.4 After approval of the draft manual, the sub-contractor shall submit three copies of the document in hard copy, bound in a hard cover with the details of the project clearly indicated on the spine. In addition, an electronic copy of the complete document on a CD and in pdf format shall be supplied together with electronic copies of all the as built drawings in dwg or dxf format. The CD shall be labelled and indexed.

4.46.5 The "Operating Instructions" shall include the following:

4.46.5.1 INDEX (in detail)

4.46.5.2 DESCRIPTION OF PLANT (as installed)

4.46.5.3 OPERATION OF PLANT (as installed) to include:

Automatic and manual start-up and shut-down procedure

Operation and Sequences of all automatic controls

Scheduled description of all Control and Safety Instruments listing function, make, model number, range and differential (when applicable), and setting of each instrument.

Functions of all switches, indication lamps, reset button and alarms, and instructions for adjusting and re-setting all controls and cut-out switches.

4.46.5.4 PLANT AND EQUIPMENT

Scheduled list of all major plant and equipment to include

- Description
- Make
- Model Number
- Supplier's name and address.

4.46.5.5 TEST REPORT

Copy of "Final Test" report as accepted by Engineer. (Draft copy of "Operating Instructions" for Engineer's approval may contain a copy of the "Preliminary Test" report).

4.46.5.6 MAINTENANCE INSTRUCTIONS

In schedule form setting out each item of plant, the description and frequency of the required maintenance operations as necessary for preventive maintenance of the Plant as installed.

4.46.5.7 SPARE PARTS

List of spare parts supplied (in accordance with these Specifications) and recommended with detailed description of each part, make, model or part number and supplier's name and address.

4.46.5.8 DESCRIPTIVE LITERATURE

To include manufacturer's operating and maintenance instructions, performance curves or charts and spare parts lists where applicable and when available.

4.46.5.9 DRAWINGS

List of all Drawings and photographically reduced, Size A3, copies of all "as installed" Drawings and Diagrams to include the following:

Plant layout Drawings showing the actual positions and sizes of all plant and equipment, ducts and pipes, the location of all dampers, valves and controls and the measured air quantities at all air intake and discharge points.

Control and Wiring Diagrams and Schematic Piping Diagrams noting, where applicable, the normal and abnormal gauge readings, control points, scale settings and time settings, differential bands, throttling

ranges, time delays and the overload settings and actual rated amperages of all electrical components, and any other relevant variable and adjustable items, to permit checking and adjustment of all instruments, controls and motor functions.

4.46.5.10 COPIES OF INSTRUCTIONS IN PLANT ROOMS

A copy of the "Operation of Plant" instructions shall be mounted within a glazed or plastic covered frame in the Plant Rooms, in positions to be approved by the Engineer.

Copies of the Schematic Piping Diagrams and the Control and Wiring Diagrams shall be mounted within glazed or plastic covered frames in the Plant rooms, in positions to be approved by the Engineer.

Copies of Government Acts and Local Regulations, as required, shall be mounted within glazed or plastic covered frames in the Plant rooms, in positions to be approved by the Engineer.

4.46.6 A plant log book shall be provided and handed over to the Owner. The log book shall be a hard covered book containing details of each item of machinery together with provision for making service notes.

4.46.7 The Subcontractor shall instruct the Owners in the correct operation and use of the Plants. For this purpose the Subcontractor shall allow for the time of a competent instructor for a total of 5 days and four return trips to the Site for the purpose of providing such instructions.

4.46.8 During this period the Subcontractor shall fully explain the layout, operation and maintenance of the plant to the Owners or the Owners' representatives.

4.46.9 At the conclusion of this period of instruction the Subcontractor shall obtain from each of the Owners, an acknowledgement, in writing, that the instruction has been properly given for the prescribed period. Two copies of the acknowledgement shall be forwarded to the Engineer.

4.47 MAINTENANCE

4.47.1 The Subcontractor shall maintain and service the Plant, in accordance with the following requirements for a period of twelve months calculated from the date of Taking Over or, in the event of more than one certificate having been issued by the Engineer, from the respective dates so certified.

4.47.2 During the "Maintenance Period" the Subcontractor shall service the Plant regularly at monthly intervals and make good any Defects in accordance with the provisions of the conditions of contract of these Specifications.

4.47.3 The Maintenance of the Plant shall be carried out during normal working hours and at each service the Sub-contractor shall attend to the following.

4.47.4 Report to an official nominated by the Employers on arriving and again on leaving the Works. Such person shall sign a monthly "Service Report" giving details of any Defects reported and made good, temperature readings taken, etc. A copy of each such "Service Report" shall be submitted to the Engineer by the Subcontractor within fourteen (14) days of each service.

4.47.5 Check the function of each item of the Plant including all automatic controls and safety devices for correct operation and lubricate, adjust, clean and/or replace components and ancillaries as necessary.

4.47.6 Clean all washable air filters and check all disposable media type air filters serving the air conditioning plants check for pressure drops, fitting additional filter material if required.

4.47.7 Drain cooling towers, air washers, etc., as relevant, clean their sumps thoroughly, clean all pump suction filters and thereafter refill with water.

4.47.8 Remove, clean and replace all strainers contained in all water pipework and pneumatic control systems.

4.47.9 Check all refrigeration systems for leaks, refrigerant dryness, sufficient oil in the compressors, sufficient refrigerant gas or any other defects and correct as required.

4.47.10 Check the electrical switchpanel replacing any burnt contacts or pilot lamp bulbs which have failed.

4.47.11 Take and record Wet and Dry Bulb temperatures in each of the conditioned areas and outside. Temperature readings shall be taken with a reliable calibrated psychrometer and all readings shall be recorded on the "Service Report".

4.47.12 Attend to any complaints made, with respect to the Plant, by the official nominated by the Employer, being the only other person authorised to instruct the Subcontractor or make any complaint, (other than the Engineer). No other person shall have any right to instruct or make any complaint to the Subcontractor.

4.47.13 While attending to any Defects and the Servicing of the Plant the Subcontractor shall not unduly disturb the functions of the occupants in the areas concerned.

4.48 ELECTRICAL SUPPLY

4.48.1 The Employers shall provide suitable 3 phase and/or single phase electricity supplies, in the positions indicated on the Drawings.

4.48.2 The 3 phase, 4 wire and earth electricity supplies shall be connected to the incoming terminals of the main isolator in the air conditioning plant switchpanel or in the air-cooled packaged air conditioners, as applicable.

4.49 MAINS WATER SUPPLY

4.49.1 Mains water supply connections, where applicable, will be provided at the position indicated on the Drawings, and the Subcontractor shall allow for the connection from the point indicated to the equipment supplied in accordance with these Specifications. Where not indicated, it shall be allowed that water will be provided within 3 meters of the point of connection to the equipment and terminated with a valve.

4.49.2 The mains water supply pipe shall have a nominal bore of not less than 25mm and shall be provided with a shut-off valve.

4.50 DRAINS

4.50.1 Provide all necessary drain piping laid to suitable falls from every item requiring such drainage. Such drains shall be run to the adjacent relevant drain points shown on the Drawings. . Where not indicated, it shall be allowed that the drain shall be run 5 meters from the point of connection to the equipment and terminated over a tundish supplied by the plumber.

4.50.2 Drainage pipework from air handling plant and in plantrooms shall be adequately sized, not less than 32mm and carried out generally in medium grade galvanised piping, all connections to equipment being effected with conical-faced unions or flanged.

4.50.3 All drains from cooling coil pans for condensate disposal shall be fitted with proprietary U-traps to prevent backflow or non-drainage due to negative air pressures.

4.50.4 Drainage pipework of longer than 4,5mm run shall be provided with cleaning eyes on all bends to facilitate maintenance.

4.50.5 Drainage pipework from split units and fan coil units shall be uPVC class 6 with solvent welded joints. The drains shall be not less than 25mm and shall be run individually. Where two or more drains connect, the minimum pipes size shall be 50mm.

4.50.6 Drains shall be run to a fall of at least 1:40 and shall be adequately supported to ensure tat the condensate drains completely and no traps are formed.

4.50.7 Under no circumstances shall drains be run into storm water drains.

4.51 EXCLUSIONS

4.51.1 The Tendered price shall specifically be understood to EXCLUDE all the following items, it being stressed that such items will be provided by others to details given by the Sub-contractor, as relevant.

4.51.2 The provision of all Plant rooms and equipment spaces shown on the Drawings, complete with level floors, lighting, suitable airtight access doors and any other builder's work, as relevant or as indicated on the Drawings.

4.51.3 The provision and making good of any openings required through walls, floors, ceilings and roofs, as well as any timber framing or flashing necessary for same. The sub-contractor shall clearly indicate the positions of the openings and liaise with the building contractor for the cutting and making good of the openings.

4.51.4 All concrete work associated with the provision of equipment bases as detailed herein.

4.51.5 Any item, comprised of timber, bricks, mortar or concrete which can reasonably be construed as builder's work, together with the building-in of any item required.

4.51.6 The architectural concealment of any equipment to be installed by the successful Tenderer. This would apply particularly to piping and ducting.

4.51.7 The provision of masonry shafts and ducts as shown on the Drawings, complete with smooth internal plastered finish.

4.51.8 All openings in glazing in windows for the installation of fans.

4.51.9 The provision of mains water supply points, each terminating in a gate type isolating valve within three meters of the equipment it serves.

4.51.10 Drainage points provided in the positions and of the sizes indicated on the Drawings, such drains for general equipment drainage and condensate disposal.

4.51.11 The bringing up and connecting to the incoming terminals of the main isolators in each switchpanel suitably rated 380 volt, 3 phase, four wire electricity supplies. 220 volts, single phase outlets for plugged equipment or terminating with a switched isolator for directly coupled equipment

4.51.12 Any other item mentioned in these Specifications or on the accompanying Drawings as being expressly for the provision of others.

PART IV

STANDARD TECHNICAL SPECIFICATION

for

PLUMBING, DRAINAGE & FIRE PROTECTION INSTALLATIONS

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1. GENERAL

The standard specifications included define the standard of equipment and materials as well as the quality of the services required for the various sections of the installation. Not all the clauses in this section of the standard specification shall necessarily be applicable on the contract. Refer to the detailed or material specification for materials and equipment to be used.

1.1 The contractor shall at all times adhere to this specification unless otherwise specified on the drawings and/or in the detailed specifications.

1.2 The engineers' drawings show broad principles of design, general layouts, schematic arrangements and when read together with the specifications and the drawings of other disciplines and other contractors, they carry sufficient information to enable the contractor to determine how the installation is to be installed, operated, services and maintained.

1.3 Pipe sizes and possible positions are shown on the engineers' drawings. Fittings, valves, strainers etc must adapt to these pipe sizes.

1.4 The contractor shall submit workshop drawings, samples, catalogues, performance characteristics etc., on all equipment, except when specifically included by the engineer.

1.5 The contractor shall take in situ measurements for installation of the equipment of the system and produce complete workshop drawings for fabrication and installation. These drawings shall be co-ordinated by the contractor with all other relevant equipment and services. Dimensions given on the engineers' drawings are only a guide and should be adapted to suit the relevant measurements of the specific fittings and/or equipment.

2. DEFINITIONS AND ABBREVIATIONS

2.1 Definitions of terms used herein:

"Provide" : to supply, install and connect up, complete and ready for safe and regular operation particular work referred to unless specifically indicated or specified otherwise.

"Install" : to erect, mount and connect complete with all related accessories.

"Supply" : to purchase, procure, acquire and deliver complete with all related accessories.

"Work" : all labour, materials, equipment, apparatus, controls, accessories and other items required for proper and complete installation.

"Concealed" : embedded in masonry or other construction, installed in furred spaces within double partitions or hung ceiling, in trenches, in crawl spaces or in enclosures.

"Exposed" : not installed underground or "concealed" as defined above.

"Indicated", "Shown" or "Noted" : as indicated, shown or noted on drawings and/or specifications.

"Similar" or "Equal" : of approved manufacture, equal in materials, weight, size, design and efficiency of specified product.

"Approved", "Satisfactory", "Accepted" or "Directed" : as approved, satisfactory, accepted or directed by the Engineer.

2.2 Abbreviations:

"SABS" : The South African Bureau of Standards and the number following shall refer to the latest amendment of the relevant specification or Code of Practice as the case may be.

"BSS" : British Standard Specifications

"NB" : Nominal Bore

"WWP" : ; Water Working Pressure

"WOG" : ; Water, Oil, Gas

"PB" : Polished Brass

"CP" : Chromium Plated

"AASHTO" : American Association of State Highway and Transportation Officials.

"AISI" : American Institute of Steel Industries

"CKS" : Co-ordinating Specifications issued by the Central Co-ordinating Committee under the auspices of the South African Bureau of Standards.

"CSIR" : Council for Scientific and Industrial Research

2.3 **Diameters of Pipes**

All diameters of pipes given are the nominal bore or external diameters in accordance with the normal conventions of the materials being used.

3. CODES OF PRACTICE, LAWS AND STANDARDS

All workmanship and materials used in the execution of the works shall be of the highest class and, where not fully covered by the Specification, shall be carried out in conformity with best modern practice, as determined by the Engineer.

It shall be the contractor's responsibility to ensure that the entire installation fully complying with all relevant requirements of governmental and Local Authorities whose jurisdiction embraces the location of the Site of the Works and the equipment provided for those installations which shall comply in every respect with the National Building Regulations and Building Standards Act, Act 103 of 1975 and the Occupational Safety Act, Act Nº6 of 1983, both as amended to date, excepting only where exemption from any such regulations has first been obtained in writing from the said authorities, provided that the approval of the Engineer has been given prior to application for any exemption.

All materials and equipment supplied and installed shall carry the SABS or BS mark of approval unless otherwise specified or agreed to in writing by the engineer. Where alternatives are offered, the submission is to include full details of the item together with tests and compliances with any other standards.

All electrical wiring shall comply fully with the latest edition of the Standard Regulations for the wiring of Premises, SABS 0142 and the additional requirements of any local authority who has jurisdiction over the Site of Works, as well as being in accordance with best modern practice.

Wherever relevant, this Specification shall be understood to be amplified to embrace Codes of Practice and Standards promulgated by recognised authorities in the field of Plumbing and Drainage Technology and all other branches of engineering science applicable to this project.

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

It shall be the responsibility of the contractor to make the necessary arrangements at this own expense with the local supply authority and to supply the labour, equipment and means to inspect, test, commission and to hand over the installation.

The Subcontractor shall supply and install all Notices and Warning signs that are required by the appropriate laws, regulations and/or by this document.

4. ORGANISATION AND STAFF CONTRACT

In addition to the site supervisor and/or foreman, the contractor shall employ as many competent and experienced persons as may be necessary for the purpose of the contract and shall be bound to remove from the contract works any person to whom the employer or his agent or the principal contractor may reasonably object by reason of any failure, neglect, incompetence or substandard work execution by or under the supervision of such person.

The duties and responsibilities of the contractor's management staff shall include but not be limited to the following:

Selection of equipment and components into working assemblies in conformance with the design concept in the subcontract specification.

Submission of equipment and installation drawings for approval in accordance with the required procedure.

Programming and planning of the work to fit in with the overall principal contractor's programme.

Attendance at routine site progress meetings and programme monitoring meetings organised by the principal contractor.

Conducting of all tests required.

Expediting of the work.

Directing his employees to ensure efficient, timely and safe execution of the work, and co-operation with the principal contractor and other trades to ensure such execution.

Attendance at meetings from time to time with the engineer in order to discuss any technical matters that need clarification.

5. CO-ORDINATION WITH OTHER TRADES

The contractor shall acquaint himself with the general arrangement of all other services

and ensure that in fixing the work it will not obstruct the fixing or future maintenance of the contract works or other services.

He shall also fully co-operate with other trades and take all reasonable precautions to ensure that he does not impede the progress of, or damage their work.

6. TEST AND INSPECTION PRIOR TO COMPLETION

Except where otherwise provided in the contract, the contractor shall provide all labour, materials, power, fuel, accessories and properly calibrated and certified instruments necessary to carry out such tests. Arrangements for such tests shall be made by the contractor and he shall give at least 72 hours notice to the engineer, in writing, of the test prior to commencement.

In the event of the plant or installation not passing the test, the employer shall be at liberty to deduct from the contract price all reasonable expenses incurred by himself or his agents attending the repeated tests.

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

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

After complete installation of the system all equipment shall be tested, adjusted and readjusted until it operates to the satisfaction and approval of the engineer and the client.

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

7. SHOP DRAWINGS

7.1.1 The subcontractor shall prepare at his own expense and shall submit copies of shop drawings for all fabricated work, working or setting out drawings, shop details and schedules to the Owner's representative for approval as stated below, and related work shall not be performed by the subcontractor until such approval has been given.

7.1.2 As soon as approval has been given, the subcontractor shall furnish the Owner's representative two prints of the approved shop drawings, setting out drawings and schedules. The subcontractor shall also furnish to the Works as many prints of the approved shop drawings and schedules as are required. No work shall be performed from shop drawings and/or catalogues not stamped with the Owner's representative's approval, and such stamped drawings and/or catalogues shall be kept available at the job site as evidence of such approval.

7.1.3 The subcontractor shall be responsible for dimensions, design of adequate connections, details for the satisfactory construction of all work and the furnishing of materials for work required by the subcontract even if not indicated on the submissions that have been approved by the Owner's representative.

7.1.4 The Owner's representative will check drawings for design only and approval of the drawings, schedules and catalogues by the Owner's representative shall not be construed as a complete check and shall not relieve the subcontractor of his responsibility as above stated. If the submissions differ from the requirements of the subcontract, the

subcontractor shall make specific mention of each difference in his letter of transmission, with a request for substitution, together with his reasons for same, in order that, if acceptable, suitable action may be taken by the Owner's representative. Otherwise, the subcontractor will not be relieved of the responsibility for executing the work in accordance with the requirements of this subcontract.

7.1.5 Corrections of shop drawings by the Owner's representative are not intended to change the scope of work. Should any such corrections constitute a change of scope of work, the subcontractor shall notify the Owner's representative in writing within not more than seven calendar days of such change and shall not proceed with the fabrication until so authorised by the Owner's representative. Claims for change of scope, made after performance of the work constituting the claimed change of scope, will not be considered.

8. "AS-BUILT'" DRAWINGS AND MANUFACTURERS INFORMATION

The Subcontractor shall provide the Engineer with a complete signed transparent set of "as-built" drawings together with stored drawings in DXF electronic format as a pre-requisite to final payment; and the Engineer shall hand the set over to the Owner after having established their correctness. The "as-built" set shall include all mechanical and electrical work.

Where possible, a transparent copy of Architects or Engineers drawings shall be used and the Subcontractor may purchase copies of the necessary transparencies from the relevant party. If "as-built" variations cannot be clearly shown thereon, then the Subcontractor shall prepare supplementary transparent drawings that will properly impart the necessary information. Manufacturer's and Subcontractor's shop drawings shall be corrected to correspond with the "as-built" drawings and copies of each shall also be furnished to the Engineer.

"As-built" drawings shall be maintained on a current basis as work progresses, and all deviations in work as actually installed accurately entered, at least once a week, on paper prints of design drawings affected, with such prints kept available at the site for the inspection of the Engineer. At the end of each month, the record for the month, properly identified by notes, shall be transferred to the original drawings by competent draughtsmen. Within seven days after the end of each monthly period, submit to the Engineer one paper print of each drawing affected showing the latest corrections.

The contractor shall submit 3 (three) sets of comprehensive operating and maintenance manuals, to the engineer, after first obtaining his approval thereof.

The operating and maintenance manuals shall at least contain the following:

(i) A description of the system together with details and specifications of all equipment and items used in the works.

(ii) Detailed instruction in the operation of the system.

(iii) Details and schedules of how and when to maintain the plant and equipment.

(iv) List of spares to be carried, complete with part numbers and supplier(s) of equipment.

(v) Names and addresses of staff of the contractor or supplier(s) or subcontractor(s) to be contacted in case of an emergency etc.

(vi) Guarantees for all equipment and fittings etc.

9. QUALITY ASSURANCE SYSTEM

The contractor shall institute an approved Quality Assurance system (QA) which shall be submitted to the engineer for his approval. The records of this QA system shall be kept throughout the duration of the contract and shall be submitted to the engineer at regular intervals as required by the engineer.

10. OPERATING AND COMMISSIONING OF PLANT AND INSTALLATION

The completed system shall be put into operation after all tests and adjustments have been carried out to the satisfaction of the engineer. The contractor shall run and operate the system for a period of time as specified by the engineer and train the staff of the client to operate and maintain the system for a period as required by the engineer, which will not exceed one month.

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

The contractor shall submit a full commissioning report.

11. GUARANTEE OF INSTALLATION AND EQUIPMENT

The contractor shall obtain guarantees from the manufacturer(s) and/or supplier(s) to the effect that each piece of equipment shall comply with the required performance and also that it will function as part of the complete system.

All equipment including the complete installation and the system as a whole shall be guaranteed for a period of 12 (twelve) months after the written acceptance o\by the engineer of the completed and operational system.

12. MAINTENANCE OF THE INSTALLATION DURING THE PERFORMANCE GUARANTEE PERIOD

The contractor shall furnish, free of charge, all maintenance on the entire equipment supplied by him for the guarantee period. Maintenance shall include systematic examination and adjustment of all this equipment at least every 3 months. The contractor shall, in the course of such maintenance or on call during the maintenance period, repair or replace defective parts as required and shall use only genuine standard parts produced by the manufacturer of the original part, Renewals or repairs resulting from misuse of air wear and tear, however, shall not be made at the expense of the contractor where certified as such by the engineer. Specified spares shall not be used during this period. If any spaces are used due to operational necessity and with the engineer's permission, such spares shall be replaced by the contractor.

The maintenance period shall only begin with completion of the Main Contract and when the engineer has certified the contract works as completed, unless otherwise specified.

13. COMPLETION OF CONTRACT WORKS

Completion of the contract works will only occur after the following procedure has been certified by the engineer as having been carried out in accordance with the specification.

a) Physical completion of all systems has been reported to the principal contractor by the contractor, and all defects made good. The principal contractor to satisfy himself that all work has been completed satisfactorily before reporting to the engineer.

b) Acceptance tests have successfully taken place as specified and test results have been witnessed (where required), recorded and approved by the engineer.

c) "As-built" drawings, commissioning reports and maintenance and operations manuals have been submitted to and approved by the engineer.

d) The employer's nominated operator(s) has received instruction in the operation of the contract works by the contractor.

e) The installation or part of the installation shall only be deemed handed over when completed, tested and fully commissioned and then signed off by the Engineer.

14. WORKMANSHIP AND INSTALLATION

14.1 Piping General

Materials and workmanship shall be the best of their respective kinds. Only new and undamaged materials shall be used in the Works. Materials to be permanently installed into the works shall not be used for any temporary purposes on site. Work shall be to the approval of the engineer and shall be executed in accordance with the relevant manufacturer's written recommendations and instructions.

Drawings are generally diagrammatic and indicative of work to be installed. Run and arrangements of piping shall be approximately as indicated, subject to modifications a required to suit conditions at building, to avoid interference with work of other trades, or for proper, convenience and accessible location of all parts of piping systems. Due to small scale of drawings all required offsets, fittings, valves, traps, drains etc., may not be indicated. Refer to and carefully check architectural, structural, electrical and mechanical drawings and details, noting locations where walls, partitions, ceilings, beams, columns and other surfaces are furred, location of beam cuts, location of pipe shafts and conflicts with work of other trades and arrange work accordingly, providing all offsets, fittings, valves, traps, drains etc., required to meet such conditions.

Run piping in wall chases, recesses, pipe shafts and hung ceilings where same are provided. No piping shall run in floor fill unless indicated or specifically approved. Exterior utilities are diagrammatic and exact location and invert elevations shall be as indicated or required to meet existing conditions. Install piping under buildings as high as possible. Do not permanently close up, fur in or cover piping before examination and test.

Run piping as straight and direct as possible, in general forming right angles with or parallel to walls or other piping and neatly spaced with risers erected plumb and true. Install piping so that there is clearance of at least 25mm between finished coverings (fitting hubs on uncovered piping) of piping and also between finished coverings or fitting hubs and adjoining work, Hang piping at or in ceiling from construction above, as close as possible to bottom of slabs, beams etc., maintaining maximum headroom at all times. Obtain from Engineer approved ceiling heights and install work above this height.

No piping shall be run in elevator machine rooms (except where special ducts are provided), telephone rooms containing telephone equipment, relays and terminal strips, and electric rooms and closets containing exclusively equipment such as transformers, switchgear, motor control centres, panelboards, or similar items of equipment, and in emergency generator room. Elsewhere, no piping shall be run within 1,75m laterally of such electrical apparatus as motor control panels, switchboards and electric motors, except for branch piping connecting to equipment.

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

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

Exposed CP piping about fixtures and equipment shall not show tool marks or more than one thread at fittings. Fittings, valves and hangers on CP piping shall have CP finish.

Use reducing fittings for changes in pipe sizes. Use no bushings except with special permission.

Use extra heavy pipe for nipples where unthreaded portion is less than 40mm. Use no close nipples, except with special permission; use only shoulder nipples.

Provide unions or flanges in connections to risers, by-passes and equipment.

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

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

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

14.2 Expansion Swings

Make adequate provision for proper expansion and contraction of piping and for piping passing through building expansion joints. At connections of branches to water mains and risers and at connections to heaters, tanks, pumps, coolers and other equipment, provide sufficient number of elbow swings to allow for proper expansion and contraction of piping. Provide adequate elbow swings, or expansion loops, or approved type expansion joints, wherever indicated or required to allow for proper expansion and contraction of mains and risers.

Where flanged "Bellows" type expansion compensators are specified they are to be installed as detailed and in accordance with the manufacturer's recommendations.

Should these compensators be specified for installation in wood truss roof structures the Contractor is to report to the engineer, who will provide details of the location and installation requirements.

14.3 Sleeves

Provide sleeves large enough to accommodate pipe and its covering passing entirely through floors, ceiling, walls, or partitions. Pack sleeves through firewalls or slabs in accordance with engineer's requirements.

Provide cast iron or steel pipe sleeves for pipes passing through exterior walls, footings or beams or through floors (interior) or machinery rooms containing Plumbing, Heating, Ventilation, or Air Conditioning equipment, and here extending 50mm above finished floor. Provide sleeves through exterior walls below grade and floors specified above with continuously welded centre flange buried in construction. At exterior walls, make pipe watertight in sleeve with oakum packing and caulked lead joints on both sides of wall.

Except as otherwise noted, provide 0,710mm galvanised iron sleeves for all pipes passing through roof slabs, interior floors, ceilings, walls or partitions, unless framed opening is provided in general construction.

Copper pipes shall have PVC sleeves or be covered with "Thermoflex" or equal protection strip where they pass through walls.

Sleeves shall extend 10mm beyond finished surface.

14.4 Escutcheons

Unless otherwise noted, provide exposed pipes, both bare and covered with approved type cast brass or cast iron escutcheons where they pass through walls, partitions, floors, or ceilings; held in place by set screws or on covered pipes by internal spring tension. In toilet rooms, at tile walls and in connections with chromium plated piping, escutcheons shall have chromium plated finish.

Where sleeves, hubs or fittings project slightly from wall, partition, floor or ceiling, provide special deep type escutcheons to cover each case.

14.5 Offsets

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

15. MATERIALS

15.1 General

All materials, etc. specified herein under a trade name, catalogue number or reference shall be either exactly as described or, in the opinion of the Engineer, of equal quality, specification and mass in all respects to those described. Written approval shall be obtained for the use of any alternative to the specification before the submission of tenders, otherwise it will be assumed that the specified materials, etc. have been allowed for in the tender.

Materials shall be new, unused, best of their respective kinds and free from defects.

Galvanising shall be by hot process on both inside and outside of pipe with zinc coating averaging at least 600g/m² and free from defects.

For Chromium Plating, materials shall be cleaned and polished before plating and plated heavily, thoroughly and evenly and guaranteed not to strip or peel. Steel or cast iron shall be firstly copper plated. Brass, copper and copper plating shall be nickel plated before

chromium plating. Finish shall be polished or satin as further specified.

15.2 **Copper Pipe Installations**

The installation of copper piping systems shall be done in accordance with the manufacturer's Code of Practice and all relevant codes, standards and regulations.

Copper pipes shall only be installed downstream of galvanised mild steel pipes when applicable.

Where dissimilar metals are joined, di-electric or isolating couplings shall be used. This is not required where copper and brass dezincified alloys join.

Copper pipes shall be of the hard drawn type Class "O" according to SABS 460 and shall be joined by means of capillary soldered type fittings. Compression fittings should not be used unless specifically authorised by the engineer and only on Class 2 or 3 piping.

The soldering flux to be used shall be water based and easily flushed out, withstand temperatures above 240^{o}C and shall contain no ammonia. The flux shall be non-toxic when dissolved in water.

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

The heat source to be used shall be propane gas with induction air, at a temperature not higher than 240^{o}C. The pipe ends and fittings shall be cleaned and wiped with an approved solder flux, before soldering. The pipe and fittings shall then be fitted together and heated to the correct temperature before the solder is applied. Care must be taken not to add too much or too little solder to the joint. Immediately after setting of the solder the joint shall be wiped clean with a wet cloth. Pipes shall be washed out as soon as possible after jointing and all traces of flux shall be removed.

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

Pipes chased or built into walls or floors shall be wrapped with 2 layers of building paper or similar approved material. Hot and cold water pipes running next to each other shall have a minimum clearance of 50mm.

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

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

Pipe hangers and brackets shall be installed according to the manufacturer's specification on the following maximum spacings. Vertical pipes shall be supported at least at every floor.

PIPE DIAMETER (mm)	HORIZONTAL (metre)	VERTICAL (metre)
15	1.3	1.9
22 & 28	1.9	2.5
35 & 42	2.5	2.8
54	2.5	3.9
67 – 108	2.8	3.9

All copper pipes open to structural damage shall be protected by steel sleeves or a structurally designed cover.

Where flanged fittings are used cadmium plated bolts, nuts and spring washer shall be used to join these flanges.

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

Shut-off valves shall be installed on all branch pipes, connections to equipment, sanitaryware and other fittings as indicated by the engineer.

All pipes shall be marked in accordance with SABS 0140 or as specified by the engineer.

15.3 **Galvanised Steel Pipe Installations**

All galvanised steel pipes shall, unless otherwise specified, be medium gauge mild steel screwed and socketed pipes to SABS 62 and shall be normalised and marked as such by the manufactuer. Pipes shall be hot dipped galvanised to SABS 763.

All fittings shall be malleable cast iron fittings to SABS 509 and galvanised to SABS 763.

All 100 diameter and larger pipes shall be joined with Class 16 flanged couplings to SABS 1123/1600. The bolts, nuts and washers to be used on these joints shall be cadmium plated.

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

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

NORMAL SIZE (mm)	HORIZONTAL (mm)	VERTICAL (mm)
15 Ø to 20 Ø	1.2m	1.8m
32 Ø to 40 Ø	1.8m	2.5m
50 Ø to 150 Ø	2.5m	3.0m

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

All pipes shall be marked according to SABS 0140 or as specified by the Engineer. All exposed pipes shall be painted to the required colour as specified by the architect.

Make joints in screwed piping with hemp and "Stag" jointing compound approved by the engineer and sparingly used with good quality hemp. For pipes larger than 80mm Ø a jointing compound such as Eperdermix 32 shall be used. Hemp and jointing compound

shall be used sparingly and applied to the male thread only.

Any pipe buried shall have at least 900mm cover and be coated and wrapped to SABS 1117 and tested in the presence of the engineer.

All pipework and fittings shall be pressure tested and sterilised to the engineer's specifications.

Valves shall be installed on all branch pipes and ball-o-stop valves on al connectors to basin pillar cocks, sink mixers, cistern type WCs and other fittings, as indicated by the engineer.

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

15.4 uPVC Underground Pipe Installations

Unless otherwise specified all underground pipework >50mm Ø shall be Class 12 uPVC to SABS 966 with rubber ring type joints.

All bends shall be uPVC Class 12 type fittings with rubber ring joints.

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

No solvent weld type fittings will be allowed.

All cast iron fittings shall be coated and wrapped to SABS 1117.

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

All backfilling shall be to the engineer's specification and approval.

Pipe trenching and bedding:

AREA	MINIMUM COVER	BEDDING TYPE	MAIN FILL
Vehicle Traffic	1100	Flexible pipe bedding as per SABS 1200 LB	Soilcrete
Under surface bed	600		Soilcrete
Other areas	900		90% MOD AASHTO

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

No concrete shall come into direct contact with the uPVC pipe. At the thrust blocks the end shall be wrapped with a "Densopol 80 HT Tape" or similar approved.

All pipes shall be laid with at least 900mm cover to the top of the pipe.

Marker blocks shall be installed at all tees or changes of directions.

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

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

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

Suitably sized air release valves built into valve chambers shall be installed at all high points of the pipe line.

15.5 HDPe Pipe Installations

15.5.1 Underground Pipework

Unless otherwise specified all underground pipework <50mm Ø shall be Class 12 Type 4 HDPe pipe to SABS 533.

All fittings shall be of "Plasson" compression type, conforming to ISO/DIS 3458.

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

All backfilling shall be to the engineer's specification and approval.

Pipe trenching and bedding:

AREA	MINIMUM COVER	BEDDING TYPE	MAIN FILL
Vehicle Traffic	1100	Flexible pipe bedding as per SABS 1200 LB	Soilcrete
Under surface bed	600		Soilcrete
Other areas	900		90% MOD AASHTO

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

Marker blocks shall be installed at all tees or changes of directions.

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

All pipework shall be pressure tested with all joints uncovered to the satisfaction of the engineer.

Suitably sized air release valves built into valve chambers shall be installed at all high points of the pipe line.

15.5.2 Drainage Pipework

HDPe drainage pipework shall be "Geberit" or equal system utilising standard drainage fittings.

The pipe shall be annealed to eliminate residual manufacturing tension stresses.

The following jointing methods are acceptable for the pipe system depending on application:

Butt welding for general pipe joints
Electroweld sleeve coupling in areas of limited access
Ring seal socket for individual prefabricated sections
Expansion socket where movement is necessary
Screw threaded joint for detachable connections
Flange connections for connection to equipment

Joints shall be made with a smooth interior to ensure there is no restriction flow inside the pipes.

15.6 Vitrified Clay Pipe and Fittings

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

The jointing method to be used shall be polypropylene couplings with integral rubber seal similar or equal to "Vitrosleeve" according to SABS 974.70 allowing up to 2.5^{o} angular movement per joint and 5mm line displacement per joint. The joint shall retain an effective water seal with respect to the above conditions with a 6 metre water head.

Pipes shall be cut by an approved pipe cutter after which the end shall be trimmed by means of a pipe trimmer to remove any sharp edges.

All fittings underground shall be of vitrified clay and shall comply to SABS 559.

15.7 Supercast Cast Iron Pipe and Fittings

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

The pipes and fittings shall be joined by means of stainless steel neoprene couplings as supplied by the manufacturer of the pipe system. The coupling shall be installed according to the manufacturer's specification and be tightened with a torque wrench to a torque of 6.8 Nm.

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

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

15.8 uPVC Soil and Waste Pipes and Fittings

Where specified uPVC soil, vent and waste pipe systems can be used for underground and above ground drainage installations. This piping shall conform in all respects to SABS 791 for underground systems and to SABS 967 for above ground system.

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

15.9 Structural Wall uPVC Pipes and Fittings

Where specified a structural wall uPVC drainage pipe can be used for underground drainage systems. This piping system shall be used with standard underground uPVC pipe fittings as specified under item 3.4, equipped with rubber ring joints. The pipe shall be equipped with z-lock type rubber ring joints.

16. VALVES FOR DOMESTIC WATER INSTALLATIONS

16.1 Gate Valves Underground in Valve Chambers to connect to uPVC Piping (65 NB and larger)

Gate valves to be equipped with non-rising spindle, spherical graphite iron body to SABS 936 Grade 42, cast iron nitrile butadine rubber covered gate, stainless steel spindle, nitrile butadine rubber 0-rngs and seals, cast iron bonnet and gunmetal thrust collar to BS 1400 LG2.

The valve shall conform to SABS 664 and/or 665, and shall be capable of withstanding a working pressure of 1600 kPa.

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

16.2 Gate Valves Underground in Valve Chamber to connect to HDPE Piping

The gate valves shall be of the dezincified brass type with brass gate, brass body, non-rising spindle and BSO threaded socket ends. The valve shall conform to SABS 776/1965 Class 125. The valve shall be able to withstand a working pressure of 1600 kPa. The valve shall be fitted with a handwheel on an extended spindle shaft of +/-700mm to close in a clockwise direction and installed to detail.

16.3 Gate Valves Above Ground for Temperature up to 40°C to connect to Steel Piping (65 NB and larger)

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

The valve shall conform to SABS 664 and/or 665, and shall be capable of withstanding a working pressure of 1600 kPa.

The valves shall be fitted with flanged ends to SABS 1123/1600 (1977), hand wheel to close the valve in a clockwise direction and installed in an upright position or side ways to a maximum 90° from upright.

16.4 Gate Valves Above Ground for Temperatures above 40°C to Connect to Steel Piping (65 NB and larger)

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

The valve shall conform to SABS 665 and shall be capable of withstanding a working pressure of 1600 kPa and a temperature of 90°.

The valve shall be fitted with flanged ends to SABS 1123/1600 (1977), hand wheel to close the valve in a clockwise direction and installed in an upright position or side ways to a maximum 90° from upright.

16.5 Gate Valves Above Ground to fit to Copper Pipes (65 NB and larger)

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

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

16.6 Gate Valves Above Ground to fit to Copper Pipes (65 NB and larger) continued

The valve shall be equipped with flanges to SABS 1123/1600, hand wheel to close the valve in a clockwise direction and installed in an upright position or side ways to a maximum 90° from upright.

16.7 Gate Valves Above Ground for Temperatures up to 100°C (up to 50 NB)

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

The valve shall be able to withstand a working pressure of 1600 kPa.

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

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

16.8 Ball-O-Stop Valves (15mm Ø – 25mm Ø)

Ball-o-stop valve shall be a full-way ballcock type with BSP threaded ends. These valves shall conform to SABS 1056 Part 3 and shall be rated for a test pressure of 2000 kPa. Valve shall be chrome finished when exposed.

16.9 Angle Regulating Valves

Angle regulating valve shall be a 15mm Ø chromium plated angle regulating valve with a 350mm chromium plated copper tube and capnuts where required.

16.10 Valve Tag and Charts

Provide on all valves and controls, identifying numbered metal tags, including letter to indicate system, fastened by heavy brass hooks or chain.

Tags: Not less than 50mm sqaure, 1.25mm thick, aluminum with stamped numbers and letters filled in with black paint.

Provide separate diagrammatic charts showing essential features of each system with all valves and control lettered and numbered to correspond to designation on metal tags. Also furnish list of all valves and controls giving location and function.

Charts and lists: Type, size and character as approved. Mount in glazed metal frames permanently fastened in locations as approved by the consulting engineer.

17. STRAINERS

17.1 Strainers for Connection to Steel or uPVC Pipes (65 NB and larger)

This strainer shall be of the Y-type with cast iron body, stainless steel or bronze strainer element and shall be equipped with flanged ends to SABS 1123/1600)1977). The hole sizes of the strainer element shall be maximum 1mm Ø and be removable without dismantling of pipework. The strainer shall be suitable for a temperature of up to 90°C at a 1000 kPa pressure rating and installed with the element facing downwards or a maximum

of 45° sideways.

17.2 Strainers for Connection to Copper Pipes (65 NB and larger)

This strainer shall be of the Y-type with bronze or dezincified brass body, stainless steel element and must be equipped with flanged ends to SABS 1123/1600 (1977). The hole sizes of the strainer element shall be maximum 1mm in diameter. The strainer element shall be removable without dismantling of pipework. The strainer shall be suitable for a temperature of up to 90°C at a 1000 kPa pressure rating and installed with the element facing downwards or a maximum of 45° sideways.

17.3 Strainers for Connection to Steel and Copper Pipes (up to 50 NB)

The strainers shall be of the Y-type with bronze or dezincified brass body, stainless steel strainer element and must be equipped with BSP threaded socket ends. The hole sizes of the strainer element shall be maximum 0.8mm in diameter. The strainer shall be suitable for a temperature of up to 90°C at a 1000 kPa pressure rating and installed with the element facing downwards or a maximum of 45° sideways.

18. NON-RETURN VALVES

18.1 Non-Return Valves for Cold Water (65 NB and larger)

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

The non-return valve shall be equipped with a cast iron body, aluminium bronze plates, stainless steel springs and neoprene seals on the plates. The valves shall be suitable for a working pressure of 1000 kPa.

18.2 Non-Return Valves for Hot Water (up to 100 Ø) and Cold Water (up to 50 NB)

The non-return valve shall be of the spring loaded piston type, with bronze or dezincified brass body, stainless steel spring and bronze disc with neoprene seal fitted with BSP threaded socket ends. The valve shall be suitable for a working pressure of 1000 kPa and a temperature of up to 90°C. All valves shall be installed so as to be removable without extensive pipework removal.

19. AIR RELEASE VALVES AND VACUUM BREAKERS

19.1 Double Orifice Double Acting Air Release Valves with Sizes from 50 NB to 200 NB

The air release valve shall be fitted with small and large orifice. The air release valve shall be fitted with a cast iron body, stainless steel or fibre glass balls, integral shut off valve and flanged ends to SABS 1123/1600.

The valve shall be suitable for maximum pressure of 1600 kPa.

19.2 Single Orifice Air Release Valves for Main Water Lines with Sizes from 25 NB to 50 NB

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

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

The valve shall be suitable for maximum pressure of 1600 kPa.

19.3 Single Orifice Double Purpose Air Release Valves for Domestic Water Lines up to 15NB

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

The valve shall be capable to withstand a working pressure of 1000 kPa at 110^{o}C.

19.4 Vacuum Breaker up to 40mm Ø

The vacuum breaker shall be fitted with neoprene seal, spring loaded disc in a dezincified brass or bronze body. The valve shall seal water tight and shall be designed to withstand a working pressure of 1000 kPa and a temperature of 90^{o}C.

20. PRESSURE REDUCING VALVES

20.1 Combination Pressure Reducing Stations

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

20.2 Large Pressure Reducing Valves (65 NB and larger)

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

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

The valve shall be equipped with flanged ends to SABS 1123/1600.

20.3 Small Pressure Reducing Valves (15 NB – 50NB)

The pressure reducing valve shall be equipped with brass body, balanced single seat and integral strainer. The valve shall be able to handle a wide range of incoming pressure while the downstream pressure stays constant with maximum inlet pressure of 1000 kPa and a maximum water temperature of 40^{o}C.

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

21. WATER METERS

21.1 Combination Water Meters

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

21.2 **Water Meters (50 NB and larger)**

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

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

21.3 **Water Meters (up to 50 NB)**

The metre shall be of the volumetric rotary piston type with brass body equipped with union couplers. The meter shall have an accuracy of not less than 09%. The meter must be able to operate up to a water pressure of 1000 kPa at a water temperature of 40°C.

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

22. ADJUSTABLE BALANCING VALVES

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

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

22.3 On completion of the project the chart shall be handed to the maintenance manager.

22.4 The calibrated adjustable balancing valves shall be of the angle valve type equipped with bronze valve body, bronze disc, internal seals with BSP threaded ends. The valve shall b fitted with stop cock connection ends on inlet and outlet onto which the differential pressure gauge can be coupled to. The valve shall be equipped with an indicator on the valve handle to show the position of the valve opening. The valve shall be suitable for operating at a temperature of 90°C against a pressure of 1000 kPa.

23. DRAINAGE SYSTEMS

23.1 **General Requirements**

The complete sanitary drainage systems, including connections to main outfall sewer and drainage connections to plumbing fixtures, kitchen and other equipment requiring same shall be installed in accordance with requirements of the Authorities having jurisdiction and the National Building Regulations and Building Standards Act of 1977 as amended.

The Subcontractor shall arrange with the local authorities for all inspections and tests.

Before any part of a drainage system is permanently covered or otherwise rendered inaccessible it shall be inspected and approved by the local Authority and the Engineer.

All equipment, materials and labour necessary for inspection and testing as required shall be made available by the contractor.

All plumbing and drainage work shall be carried out under the direct supervision of a registered plumber and drain layer in terms of the requirements of the local authority and Act. A copy of the registration certificate of all persons carrying out or supervising such work shall be kept on site for inspection at all times. The contractor shall in addition be registered by the local authority.

23.2 **Drains**

All drains shall be laid in a straight line between points where changes of direction or gradient occur.

Where drains pass under any wall other than a free-standing wall such drain shall be of cast iron pipe and shall be completely encased in concrete not less than 100mm thick measured at the hub.

Where any drain passes under a building or where indicated, the pipe shall be cast iron and shall be encased in concrete, along its entire length, not less than 100mm thick measured at the hub. The drain shall be so arranged that all junctions, bends and access eyes are readily accessible.

Access to drains shall be in accordance with the requirements of the local authorities and Act.

Horizontal drainage piping shall be installed at a gradient not less than that indicated, unless approved by the Engineer.

All exposed drainage pipe and pipework within the building shall be spun cast iron pipe or HDPe drainage pipe as specified.

Underground piping external to the building shall, unless otherwise specified or indicated, be vitrified clay pipe or structural wall uPVC as specified.

Vent pipes shall be spun cast iron using approved drainage fittings.

Connections to fixtures shall be provided with approved type reseal traps and shall be installed to be readily accessible.

All pipe laying is to be carried out in accordance with the procedure described in SABS 058.

Laying is to commence at the points of junction with existing drains or at points of discharge.

Before each pipe is laid, it shall be examined to ensure that the bore is clean and any foreign material removed. Plug open ends and junctions, whenever work is suspended, to prevent the entrance of rubbish during construction.

Gulley traps are to be finest quality salt glazed stoneware with outlet jointed to drain and with hopper head fitted with cast iron pierced grating and frame, the whole set on and encased in cement concrete 1:3:6 carried up 75mm high as kerb, finished on exposed places with 20mm granolithic with angles rounded including excavation and casing.

Cleaning eye covers shall be cast iron A.B.C. covers and frames, jointed to top of drain with Gaskin and T.O.K. strip grooved for and including stopper with raised letters "C.E", cast on same, bedding in tallow and screwed to frame with gunmetal set screws. The frame shall be encased in cement concrete 1:3:6 finished on top with untinted granolithic

including excavation and casing.

Manholes, unless otherwise described, shall be constructed of precast reinforced concrete rings, with cast iron frames and covers, in accordance with the Drawings. The invert channels shall be smooth and semicircular in shape conforming to the inside of the adjacent sewer section. Changes in direction of flow shall be made with a smooth curve of as large a radius as the size of the manhole will permit. Changes in size and grade of the channels shall be made gradually and evenly. The invert channels shall be formed directly in the concrete of the manhole base, or shall be built up with mortar, or shall be half tile laid in concrete, or shall be constructed by laying full section sewer pipe through the manhole and breaking out the top half after the surrounding concrete has hardened. The floor of the manhole outside the channels shall be smooth and shall slope toward the channels not less than one inch per foot (1:12) nor more than (1:6). Free drop inside the manholes shall not exceed 450mm measured from the invert of the inlet pipe to the top of the floor of the manhole outside the channels, and drop manholes shall be constructed whenever the free drop would otherwise be greater than 450mm.

All manholes to be with stepirous fixed in the factory.

Where ground waters are suspected, a special concrete foundation must be built against the buoyancy forces. The calculation will be issued by the Engineer.

23.3 Vents

The drainage system shall, unless otherwise specified, be of the one pipe system and all necessary vents and anti-syphonage pipe shall be provided in accordance with the system requirements and in accordance with the relevant bylaws.

Vents extending above the roof level shall be located at least 3m away from any window, door or air intake opening, and shall be properly flashed.

Vent piping shall be run with long radius bends at changes in direction and shall be graded back towards the drain.

When the "so vent" system is used, the fittings shall be Besaans du Plessis "nu vent" or equal and shall be provided with openings as indicated or required.

When back to back W.C. arrangement is used, a double bend shall be provided between the W.C. outlet and the "nu vent".

23.4 Stainless Steel Floor Traps and Floor Chanels

23.4.1 Stainless Steel Floor Traps

Stainless steel floor traps shall be installed where indicated on drawings for kitchen, abattoirs, dining halls etc. These units to be manufactured according to the details supplied in the detail specification. The units are to be manufactured from 304 stainless steel with a load capacity of 1500 kg. The floor traps shall have minimum flow capacity of 3 litre/second.

23.4.2 Cast Iron Floor Traps

Cast iron floor traps shall be used where indicated on the drawings or specified. These units shall be manufactured out of cast iron as per detail supplied in the detail specification. The units shall be fitted with a water seal and a large sludge box and lid to be easily removable for maintenance purposes. The units shall be designed in such a manner as to provide access to the drainage system and to be used as a cleaning point.

23.5 Soilcrete

Soilcrete shall be used in trench backfilling where specified indicated and where sewer trench bottoms are below the 45^{o} angle of building foundations.

The compaction of the soilcrete shall be as follows:

Soilcrete shall consist of an approved soil or gravel mixed in a concrete mixer with 5% of Portland demand (per volume) and only sufficient water to give a consistency that will permit the soilcrete to be placed. Concrete vibrators shall be used, so that all voids between the pipes and excavation sides and between culverts in the case of multi-barrel culverts are properly fitted. The height to which the soilcrete shall be filled, shall be determined by the engineer or be as show on the drawings and any remaining backfill shall be carried out as described above using a granular material.

The aggregate must consist of approved soil or gravel containing stones not bigger than 38mm and with a plasticity index not exceeding 10. Detrimental percentages of silt or clay must be avoided and the aggregate shall be obtained from an approved source.

23.6 Testing of the Drainage Installation

The contractor is to carry out all the tests on the drainage installation as required by the Local Authorities and shall receive their approval before requesting final payment and hand over of the installation.

The Engineer shall be informed when the tests are to be carried our in order that he may witness and approve these.

All drains are to be tested by passing a ball, 20mm smaller in diameter than the internal pipe diameter, through the drain and it shall pass without assistance.

24. DOMESTIC WATER SUPPLY SYSTEM

24.1 General

Provide complete domestic hot and cold water supply systems, including connection to supply authority, hot water heating equipment and required hot and cold water connection to plumbing fixtures, kitchen and other equipment requiring same all as indicated.

Run piping free of traps wherever possible, and grade and valve for complete control and drainage of system with drain cocks at low points and at base of risers.

Provide on main water branches to dishwashers, domestic washing machines and where noted, properly sized shock absorbers.

24.2 Prevention of Water Contamination

Wherever possible, provide over-rim water supplies to plumbing fixtures and equipment. Provide necessary below-rim connections, water closet and urinal flush valves, hose bibs and hose connections with approved vacuum breakers and/or check valves as noted or required.

Kitchen or other equipment supplied under other divisions of work and/or by owner, and having below-rim water supply connections, may not arrive on job in code approved condition, in which case Subcontractor shall provide missing vacuum breakers and/or check valves, or re-locate same to code approved positions.

24.3 Pipe and Fittings

Unless otherwise noted hot and cold water pipe shall be copper tubing with cast bronze or wrought copper solder capillary fittings. Connection to valves and fittings shall be by means of copper to iron adaptors male or female as required. Cold water piping above 65mm shall be galvanised mild steel.

Exposed piping at plumbing fixtures shall be CP copper pipe with CP threaded cast brass fittings.

Make connections to equipment with flanges or unions and with threaded adaptors used for swing connections. Terminate noted plugged or capped connections in threaded plug or threaded nipple and cap as required, unless otherwise noted.

Provide insulating bushings, couplings, unions, or flanges where brass or copper piping connects to galvanised piping at location of equipment connection.

When copper pipe is built into walls, floors, etc. and when laid underground, the piping shall be wrapped for its entire built-in length with Denso tape or equal approved protective covering.

The use of brown paper or any building paper is forbidden.

24.4 Insulation

The Subcontractor shall provide insulation as specified herein on all hot water pipes and hot water heaters.

The Contractor shall provide a suitable storage area for all insulation on site prior to fitment. He will be liable for replacement of same due to damage, as determined by the Engineer, at his own expense.

Where pipes are installed in service ducts, ceiling voids and where specified shall be insulated with “Thermaflex” pre-formed pipe insulation sections. This insulation shall be used with pipe systems where the maximum temperature is 80^{o}C, for temperature higher than 80^{o}C pre-formed fibreglass sections shall be used with galvanised sheet metal muffs.

All bends and T-pieces shall be cut in 45^{o} metre box to form a neat joint. All joints shall be glued together with a contact adhesive as supplied by the manufacturer. Pipe sizes larger than 50mm Ø shall be insulated with pre-formed fibreglass sections with canvas covers glued together with cold wood glue.

Thermaflex Thickness Table

Pipe Size (Steel)	Pipe Size (Copper)	Thermaflex Thickness
50mm Ø	54mm Ø	25mm Ø
40mm Ø	42mm Ø	25mm Ø
32mm Ø	35mm Ø	25mm Ø
25mm Ø	28mm Ø	20mm Ø
20mm Ø	22mm Ø	20mm Ø
15mm Ø	15mm Ø	20mm Ø

All hot water pipes in service tunnels, service corridors and where exposed to damaged and/or weather shall be insulated with pre-formed fibreglass sections covered with galvanised sheet metal muffs in a water tight manner. Sheet metal muffs shall be installed with the joints overlapping at least 50mm and the longitudinal overlap pointing downwards to prevent ingress of water. The sheet metal muff shall be strapped with 10mm galvanised straps by means of a strapping tool with a minimum of 2 straps/section. All pipe bends, T-pieces etc shall be insulated with at least 25 Ø fibreglass rope covered with

a 12mm thick layer of self setting fibre cement. A reinforcing gauze shall be wrapped over the fibre cement while wet and then painted with a mastic paint when dry.

Fibreglass Section Thickness Table

Pipe Size (Steel)	Pipe Size (Copper)	Thermaflex Thickness
100mm Ø	108mm Ø	65mm Ø
80mm Ø	76mm Ø	55mm Ø
65mm Ø	67mm Ø	55mm Ø
50mm Ø	54mm Ø	55mm Ø
40mm Ø	42mm Ø	55mm Ø
32mm Ø	35mm Ø	40mm Ø
25mm Ø	28mm Ø	40mm Ø
20mm Ø	22mm Ø	30mm Ø
15mm Ø	15mm Ø	30mm Ø

A protective coating equivalent to "Foster Sealfos Coating 30-36" or "Decadex Fire Check" shall be brush applied over the canvas. Coatings shall be applied in accordance with manufacturer's recommendations.

Exposed piping shall in addition be provided with 0,56mm thick galvanised sheet metal cladding over the insulation material. Bends shall be clad with Lobster Back bends also of 0,5mm thick galvanised sheet metal. Cladding shall be secured by stainless steel bands or non-ferrous pop rivets every 50mm.

Cladding shall be painted as previously specified for pipes.

24.5 Automatic Air Relief Valves

Provide automatic air relief valves, Sarco or equal, at all high points in hot water piping circuits and where indicated. Air relief valve shall be 15mm, suitable for a working pressure of 16 bar, with non-shock water. Drain piping shall be taken to discharge at a deep seal trap or point as indicated. A stopvalve is to be fitted on the upstream side of all air relief valves.

24.6 Trace Heater Tape

Where indicated hot water piping shall be traced with electrical trace tape. "RAYCHEM HWAT" or equal and approved, which shall automatically maintain a constant temperature of 50ºC. The tape shall be fixed to the pipe at least every 300mm with approved type adhesive tape capable of withstanding the rated temperature without damage.

The tape shall be installed in accordance with the manufacturer's instructions and shall be inspected and approved by the Engineer before insulation of the pipework.

The tape shall be rated for 220V and shall be limited in length to ensure a maximum of 15A supply. When this rating is exceeded the system shall be divided in separate supplies to limit the current.

The Plumbing Contractor shall provide all trace heating tape, end caps, junction splices, junction boxes, and all necessary fittings for the trace heating system as recommended by the supplier and specified by the Engineer.

The complete system, up to and including the connection to the electrical supply point shall be installed, tested, and commissioned by the Contractor.

Install and test the system in stages if so ordered by the Engineer to facilitate work of others. Repair defects disclosed by tests, or if required by the Engineer, replace defective work.

24.7 **Hot Water Circulators**

Provide and install where specified hot water circulating pumps, in-line type, with close grained cast iron casing, and bronze, balanced impellers. Pumps shall be of the capacity and head as indicated, and have spring loaded mechanical seals, with rubber ring rotating against stationary carbon seat.

24.8 **Immersion Thermostats for starting Pumps**

Provide for the automatic control of hot water circulators, immersion type thermostats in the return water line. Thermostat shall operate mercury switch, which shall start and stop the pump.

24.9 **Pressure Gauges**

Provide a pressure gauge on each water service at meter location, on discharge headers, on house and hydropneumatic tank pumps, on inlet and outlet of each master pressure reducing valve assembly, and where noted.

Pressure gauges shall be 80mm diameter with black enamel cast iron case, brass ring with heavy glass, phosphor bronze single spring Bourdon tube, phosphor bronze bushed rotary precision movement and suitable dial range with at least 1% accuracy with brass tee handle cock. Pressure gauges shall be calibrated in bars or mb.

24.10 **Thermometers**

Provide dial type thermometers in oversized tees and nipples on HW supply and return lines, and where noted.

Thermometers shall be 80mm diameter with CP brass case, threaded ring with heavy glass, vapour pressure or liquid actuated bronze single spring Bourdon connection with copper bulb.

24.11 **Tests**

Test piping and prove tight as specified and/or required by Authorities having jurisdiction; in presence of Engineer and said Authorities, who shall be given 48 hours notice in advance before tests are made. Make preliminary tests and prove satisfactory before requesting witnessing of final tests. Make tests in stages if so ordered by the Engineer to facilitate work of others. Repair defects disclosed by tests or if required by Engineer, replace defective work.

Subcontractor shall be required to attend with the Engineer and give all assistance required and provide such tools, materials, implements and instruments as are necessary for tests. The Engineer reserves the right to call for such additional tests, such as dynamic tests, as he may consider necessary.

Subcontractor shall be responsible for work of other Trades disturbed or damaged by tests or repair and replacement of work and shall cause work so disturbed or damaged to be restored to its original condition at own expense.

The pipe installation shall be hydraulically pressure tested by means of a suitable manually operated or mechanically driven pressure pump.

A pressure of at least 1.5 times the working pressure of the class rating of pipes, or fittings shall be applied for a period of time specified in the specifications or as recommended by the manufacturers.

Tests should not be performed against closed valves.

Leakage which occurs shall be measured and calculated and checked against the allowable losses.

If the completed section of pipe complies with all specifications and passes the tests and inspection, it could be approved and the contractor may be instructed to backfill the open sections of trench at the joints and connections, where applicable.

The contractor shall then proceed to build all the valve chambers, inspection chambers etc.

24.12 Sterilising of Water Pipes

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

At least 14 days prior to the commencement of sterilising the contractor shall submit the full details of the proposed method of sterilising the pipeline to the engineer for his approval.

The contractor shall provide all necessary materials, tools, equipment and labour necessary to sterilise the pipeline. After sterilising the pipeline the contractor shall, at no extra cost, empty the pipeline and dispose of the water in a manner approved by the engineer.

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

a) Chlorine of lime to SABS 295 yielding 33% free chlorine by mass.

b) Calcium hypochlorite to SABS 295 yielding 70% free chlorine by mass.

c) Chlorine gas applied by chlorinator.

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

After pressure tests have been made, the unit to be disinfected shall be thoroughly flushed with water until all entrained dirt and mud have been removed before introducing the chlorinating material which shall provide a dosage of not less than 50 parts per million and shall be introduced into the water lines in an approved manner.

The treated water shall be retained in the pipe long enough to destroy all non-sporic-forming bacteria. Except where a shorter period is approved, the retention time shall be at least 24 hours and shall produce not less than 10 parts per million of chlorine throughout the line at the end of the retention period.

All valves on the lines being disinfected shall be opened and closed several times during the contract period. The line shall then be flushed with clean water until the residual chlorine is reduced to less than 1.0 parts per million. From several points the contractor shall take samples of water in properly sterilised containers for bacterial examination. The disinfection shall be repeated until tests indicate the absence of pollution for at least 2

days. The unit will not be accepted until satisfactory bacteriological results have been obtained. The contractor shall arrange for a field laboratory, approved by the Consultant, to conduct all bacterial examinations required.

It is required to take a control sample of the incoming water at the same time as the other samples are taken.

25. FIRE SYSTEMS

25.1 General

Materials and equipment shall be of a type and size approved by the local Fire Department, the Owner's Insurance Underwriters and the engineer.

Systems as installed shall meet the requirements of the local Authorities having jurisdiction and the Owners Insurance Underwriters and receive approval of same before final payment.

25.2 Pipe and Fittings

Pipework, above ground, shall be galvanised steel pipe to SABS 62 heavy.

Pipework, below ground, shall be uPVC Class 16.

Fittings shall be screwed or flanged as specified and shall be suitable for a WWP with non-shock water of 25 bar.

25.3 Valves

Valves shall be suitable for the pressure duty required, and shall be of a suitable pressure class, depending on the mounting location.

Valves shall be sealed or locked in the correct position by means of an approved lock and chain.

Hosereel valves shall be 20mm CP bronze shut off valves, globe type with threaded ends. Valves shall be "Hattersly" or equal suitable for a WWP of 16 bars with non shock water and shall be clearly marked with an arrow and the words "oop" - "open" in red. Valves shall be suitable for the installation of an approved sealing device.

25.4 Hose Reels

Hose reels shall be red enamelled type of all steel construction, and provided with wall mounting bases, spindles and glands and shall be securely fixed to the wall with suitable "rawl" bolts and plate washers.

Hose reels shall be fitted complete with supply pipe, nozzle cock and hose guide in conformity with SABS 543 and bear the SABS mark. Fire hose shall be reinforced rubber 20mm nominal bore, having 32mm outside diameter and shall be in 30m lengths, unless otherwise specified.

25.5 Fire Hydrant

Fire hydrant valves shall be 65mm angle type, with brass on gunmetal body and polished brass trim. The hydrant shall be provided with quick coupling female outlets with brass cap and brass chain.

Handwheel shall be cast iron, painted red and shall have the words "open" - "oop" together

with direction arrows embossed on the face. Hydrant shall be suitable for WWP of 18,5 bar with non-shock water and shall be tested to 20 bar.

Hydrants shall be in accordance with SABS 1128, Parts I and II and shall have the instantaneous pattern connection, unless otherwise specified.

25.6 Fire Extinguishers

Portable fire extinguishers shall be of the size and type specified and installed in the positions as indicated on the drawings.

Fire extinguishers shall be provided with brackets and fixed to and including 230mm x 760mm x 22mm chamfered oiled hardwood backboard bolted with and including four 9mm bolts with plate washers cut and pinned to brick or concrete wall.

Fire extinguishers shall be in accordance with and shall bear the SABS mark and shall be approved by the Authorities having jurisdiction over the site.

Soda acid water extinguishers shall be in accordance with SABS 889 and shall be of the gas cartridge type.

Dry powder type extinguishers shall be in accordance with SABS 810 and shall be of the gas cartridge type.

25.7 Testing

The entire fire reticulation system shall be pressure tested to a maximum pressure of 20 bar measured at the lowest point in the system and a minimum of 12 bar at the highest point. Where the head of water causes the maximum pressure to be exceeded, the system is to be tested in sections.

26. GAS INSTALLATION

26.1 General

Run piping free of traps with drain pocket consisting of nipple and cap at low points.

Pipework to be installed in accordance with the requirements of the supply authorities and to the approval of the Engineer. Installation shall be carried out only by registered gas piping fitters. Copies of their certificate of competence shall be submitted to the Engineer before installation work commences.

26.2 Pipe and Fittings

Pipe : Bare Steel. Fittings welded or flanged.

Provide copper union between nipples on equipment side of individual gas cocks.

26.3 Control Valves

Provide stop cock at connection to each piece of gas burning equipment.

Valves and stop cocks, except service cock : threaded or flanged iron body lubricated plug valve, 10 bars WOG class.

Attach wrench to each valve.

26.4 **Test**

Test gas piping with air at 1 bar which pressure shall be maintained for at least 30 minutes without drop.

While the pipework is under pressure, each joint on the system is to be checked using a suds mixture to ensure all joints are perfectly sealed.

27. SANITARY FITTINGS

Install and connect up kitchen and toilet fittings as specified in the schedules, or provided under work of other divisions and/or owner, and provide required trim and "P" traps for same as specified.

Provide water supply fixtures with stop valves. Exposed pipe fittings, traps, escutcheons, valves, valve handles and accessories, both above and below fixtures, shall be CP brass (covering tubes not permitted).

Water supply and drainage nipples shall be brought to the wall and covered by CP escutcheons.

Supply fixtures shall be renewable seat composition washer, all metal indexed handles and integral on separate screwdriven or lockshield stops. No manufacturer's name allowed on exposed portion of fixtures.

During course of construction, protect exposed fittings from damage and cover fixtures with wooden protection housings. Uncover and thoroughly clean fixtures and fittings when directed.

Fixture connections shall be at least as follows:

Fixture	Drain	Vent	CW	HW
Water Closets Flush Valve	100mm	50mm	32mm	-
Urinals	50mm	40mm	25mm	-
Showers	40mm	40mm	15mm	15mm
Wash Hand Basins	32mm	32mm	15mm	15mm
Bath	40mm	40mm	20mm	20mm
Sink	40mm	40mm	15mm	15mm

Sanitary fittings shall be installed as follows:

27.1 Precast Concrete Wash Troughs

Precast concrete wash troughs shall be bedded on top of pedestals which shall be bedded on floors in 1:3 cement mortar.

27.2 Stainless Steel wash Troughs and Wash Hand Basins

Stainless steel wash troughs and wash hand basins shall be fixed to walls on a pair of 20mm diameter galvanised mild steel pipe brackets with flanged ends cut and pinned 150mm deep into walls in 1:3 cement mortar.

27.3 Acrylic Resinous Wash Hand Basins

Acrylic resinous wash hand basins shall be fixed to walls on a pair of standard painted cast iron brackets screwed to underside of basin and bolted to wall with 6mm diameter expanding bolts.

27.4 Ceramic Wash Hand Basins

Ceramic wash hand basins shall be fixed to walls on a pair of standard painted steel or cast iron brackets bolted to wall with 6mm diameter expanding bolts.

27.5 Acrylic Resinous Baths

Acrylic resinous baths shall be bedded in 1:5 cement morar on three cross rows of bricks or bedded solid on a layer of dry river sand and fixed to wall with galvanised steel brackets under edges (in the middle of the sides against walls) bolted to wall with 6mm diameter expanding bolts and sealed along top against wall finishes with patent mildew resistant silicone rubber.

27.6 Washdown Closet Pans and Cisterns

Washdown closet pans shall be bedded on floors in 1:3 cement mortar. Cisterns shall be fixed to walls with 6mm diameter expanding bolts.

27.7 Ceramic Urinals

Ceramic stall and slab urinals shall be bedded on floors and against wall in 1:3 cement mortar. Slabs, channels, treads etc. shall be jointed in 1:3 cement mortar and pointed in white cement.

Ceramic bowl urinals shall be fixed to walls on standard steel brackets bolted to wall with 6mm diameter expanding bolts. Cisterns shall be fixed to walls on standard brackets bolted to wall with 6mm diameter expanding bolts.

27.8 Stainless Steel Urinals

Stainless steel urinals shall be bedded on floors in 1:3 cement mortar and with backs and sides against walls filled in with fine unreinforced concrete. Cisterns shall be fixed as cisterns for ceramic urinals.

28. WATER STORAGE GEYSERS

28.1 Domestic Geysers

The geysers shall be installed as indicated and specified on the drawings and this specification.

All work is to be executed in a first class workmanlike manner and all equipment supplied shall be of new high quality material, design and manufacture, suitable for providing an efficient, reliable and trouble free service.

It will be the contractor's responsibility to select such equipment and to position it into a building space as provided. Where no specified make or quality of material is directed, a standard article as approved by the engineer shall be supplied.

The contractor shall ensure, before ordering of equipment, that the plant room dimensions and access to the plant room are to his satisfaction. Special care shall be taken not to damage equipment during positioning and installation. All faulty and damaged equipment shall be replaced by new before handover (or made good, only if approved by the engineer).

All materials to be used shall be compatible with the total installation.

The water temperature of the geysers shall not be higher than 80°C and shall be set at a temperature as indicated in the detail specification.

The piping to be used shall be as specified in the detail and standard specification for domestic hot and cold water installations.

The contractor shall ensure that the necessary equipment is installed to protect the geyser from over pressure and over temperature. The necessary test and approval certificates for the geysers shall be supplied to the engineer.

These geysers shall comply with SABS 151. The units are to be manufactured out of a steel cylinder welded by means of the MIG CO_2 process, the interior of the cylinder shall be porcelain coated by means of the vacuum process and the exterior shall be spray coated and fired to 870°C. the unit is to be insulated with a high density insulation material. The insulation is to be covered with a 0.8mm fully bondirized steel with a baked enamel finish. The unit shall be equipped with wall brackets for mounting purposes.

Each geyser shall be equipped with an immersion element as specified, incalloy elements are to be used for hard water.

The elements are to be controlled by means of a fail safe thermostat which shall be adjustable between 40°C and 75°C. The geyser is also to be equipped with the following:

- Temperature and pressure relief set at 600 kPa and 97°C
- 20mm dia in and outlet BSP thermal sockets
- Magnesium sacrificial anode

The unit shall be designed for a working pressure of 400 kPa. Each geyser is to be furnished with a 5 year warranty.

Geysers installed in ceiling voids and in areas where leaks can cause damage, shall be instaled with a drip tray. The safety and expansion relief valves and drip tray shall be piped to the outside or nearest drain point.

28.2 **Under Basin and over Basin Water Storage Heaters**

These water storage heaters shall comply with all the relevant IEC standards and Government Notice 466 (Electrical Safety Standard for Appliances). This specification covers geysers up to 30 litre in storage.

The unit is to be rated for a maximum operating pressure of 700 kPa.

The unit is to be manufactured out of a lap welded steel cylinder by means of the MIG CO_2 process. The unit is to be internally coated with two coats of thermofused porcelain with a magnesium sacrificial anode. Insulation material to be high density polyurethane foam. The outer casing shall be manufactured out of injection moulded ABS plastic finished in appliance white.

The unit shall be equipped with the following:

- 700 kPa safety valve
- Correctly sized expansion valve
- Direct immersion element

- Control thermostat adjustable between 40°C and 75°C with fusible link for over temperature cut

- 15mm dis BSP threaded female sockets for water in and outlets.

The units shall be furnished with a 5 year warranty.

28.3. **Industrial Hot Water Generators**

Hot water generators shall be semi pressure vessels of the vertical or horizontal configuration as indicated. The size and capacity of the generator shall be as indicated on the drawings.

The cylinders shall be manufactured in accordance with S.A.B.S. or equal code. Mild steel aluminium flame sprayed and epoxy coated after the surface has been shotblasted.

The vessels shall be of welded construction with dished ends to B.S. 5500 and shall be provided with welded flanged connections as indicated for heater batteries and all piping connections.

Screwed sockets may be welded into the vessel for instrument connections. Where these are provided, the insulation shall be applied around the connections and finished neatly with sheetmetal surround without sharp edges or protrusions.

The vessel shall be provided with a minimum 400 x 450mm oval manhole for inspection and cleaning.

The vessel shall be pressure tested to 1.1/2 times the working pressure but not less than 700 kPa.

The generators shall be provided with immersion heaters of the capacities indicated. Elements shall conform with S.A.B.S. or equal standard.

The tanks shall be insulated after installation with 50mm thick mineral wool with a density of 88kg/m^3 or equivalent glass fibre insulation and covered with 0.8mm thick galvanised sheetmetal cladding, pop rivetted in position. Cladding shall be neatly installed without sharp edges or protrusions. Escutcheons shall be provided around all tappings.

The generator shall be provided with tapping for bulb connections for thermometers, thermostats, pressure gauges and any other instrumentation necessary or indicated.

The generator shall be provided complete with a safety valve set to release at 150 kPa above design working water pressure and shall be sized sufficient for the rate of heat rise provided by the element and the production of steam in the event of a failure. The discharge from the safety valve shall be taken without further connections to discharge in a place of safety but shall also be visible.

The generator shall be provided complete with thermostat to control the temperature of the water and to switch the element on in stepped sequence. The number of steps shall be as indicated. A safety thermostat shall be provided to trip all elements in the event of the water temperature rising too high. The safety thermostat shall be of the manual reset type and shall be set to operate at 70° C. All thermostats shall be set, sealed, and of a tamper-proof type.

Provide on top of each generator a dial type thermometer and pressure gauge.

Provide a control board to operate the boilers. The board shall be of the "Packaged" type incorporating prewired controls, circuit breakers, 3 phase magnetic contactors and all items necessary for the operation of the boiler. The element shall be wired in stop

configuration. Refer to the electrical section of this section for further details.

The installation of the boilers, control panel and wiring shall form part of this subcontract. Power shall be provided at the control panel however, final connection to the panel shall form part of this installation.

Shop drawings of vessel and control panel shall be submitted to the Engineer for approval prior to manufacture.

29. CONTROL PANEL AND ELECTRICAL WIRING INSTALLATION

29.1 General

The Subcontractor shall supply and install a complete 3 phase - 4 wire 400 Volt wall mounted control panel assembly to SABS 1180 which shall be complete with main isolator, contractor, circuit breakers, busbars, step controllers, temperature controllers, ammeters, current transformers, fuses, indicating lights, interlocking remote control wiring and interconnecting wiring as necessary. Spare fuses and indication lamps shall be provided as necessary.

The installation shall be installed in accordance with the latest edition of SABS 0142-1987, Code of Practice for the Wiring of Premises, as amended, as well as Local Municipal By-Laws and Regulations and Regulations of the Local Supply Authority.

The Subcontractor shall commission and test the entire installation in accordance with the requirements of the Local Authority, Supply Authority and the Engineer at his own expense. All test equipment shall be provided by the Subcontractor at his expense. Testing shall be carried out in the presence of the Engineer who shall be notified timeously of the dates of such tests in writing to allow them to be witnessed.

"As built" drawings of the switchboard shall be installed inside the panel and THREE sets shall be submitted to the Engineer on completion of the installation. The following information shall be indicated:-

a) A complete wiring diagram of the equipment indicating terminal numbers, numbers and colours of conductors connected to terminal strips and the numbers and colours of the conductors utilised for internal panel wiring.

b) All labelling information on a separate sheet.

c) The make, catalogue number and capacity of all equipment, including electrical equipment.

29.2 Surface Mounted Switchboard

Surface mounted switchboards shall be equipped with a 1,6mm² thick galvanised steel reinforced tray with gusseted corners. Securing lugs shall be provided for fixing the tray to walls or any other structure. A solid brass or cadmium plates steel earth connection stud and nut shall be provided.

All joints shall be welded. The tray shall be square and neatly finished without protrusions. The front tray sides shall be rounded with an edge of at least 20mm to accommodate flush doors. Removable panels shall be secured by means of "Camloc" or "Dzus" fasteners.

The switchboard shall be of ample size to accommodate all the necessary switchgear, control equipment etc. and shall be provided for heaters where specified to facilitate "load shedding".

Pilot lights shall be provided on the front panel to indicate power on, heater step on (one per step) and boiler high temperature trip.

All busbars, cables, wiring etc. shall be colour coded in accordance with the SABS requirements.

External wiring for low voltage, control interlocking, alarm, measuring and D.C. circuits shall terminate on numbered terminal strips of the "KLIPPON" or "ENTRELEC" or equivalent manufacture. The correct terminal size, as recommended by the manufacturer for each conductor to be connected shall be used throughout. The terminal numbers shall appear on the wiring diagrams of the switchboard. Terminals for power wiring shall be separate from other terminals. Terminals for internal wiring shall not be interposed with terminals for external circuits.

Labelling shall be Black on White ivorine except warning labels which shall be Red on White ivorine.

All metal components of the framework, panels and chassis shall be finished with a high quality
baked enamel finish. Prior to painting, all metal parts shall be thoroughly cleaned of rust, millscale, grease and foreign matter. Immediately after cleaning all surfaces shall be covered by an electrolytically applied rust inhibiting, tough, unbroken metal phosphate fibre and then thoroughly dried.

Within forty eight (48) hours after phosphating, a passivating layer consisting of a high quality zinc chromate primer shall be applied, followed by two (2) coats of high quality baked enamel to SABS 783 type 1. The minimum paint thickness after baking shall be 0,06mm and shall have a shock resistance of 25kg-cm or 0,9mm soft steel plate and scratch resistance of 2000 grams.

The electrical installation between the switchboard and the equipment shall comply with SABS 0142. Armoured cabling shall comply with SABS 150 and shall be neatly run on galvanised cable tray installed on walls and overhead providing a maximum headroom at all times.

Local isolation shall be provided at all items of equipment e.g. boilers, pumps etc. in accordance with the code of practice.

Earthing of non-conducting metal parts and equipment shall comply with the code of practice.

30. TRENCHES AND EXCAVATIONS

The following shall be in the classification of the materials to be excavated.

Material Class "C" shall comprise granite, chert, quartzitic sandstone, slate and rock of similar or greater hardness in undecomposed boulders exceeding 0,15m³ in volume, the practical excavation of which, in the opinion of the Engineer, would normally necessitate the use of explosives.

Material Class "B" shall comprise hard material other than that classified as Class "C" above, the economic excavation of which, in the opinion of the Engineer, warrants the use of pneumatic tools or mechanical breakers and shall include hard shale, compact ouklip and rock of similar hardness.

Material Class "A" shall comprise all materials to be excavated other than those classified as Class "B" or Class "C" above and shall include made-up ground, rubbish, gravel, sand,

shale and clay.

All items of drains, manholes and pipe excavations, etc. are measured as being in Class "A" material unless otherwise described.

If the contractor considers that any of the excavation encountered is in Class "B" or "C" material he shall immediately notify the Engineer and/or the Quantity Surveyor for a ruling; failing such notification the excavations shall be deemed to be in Class "A" material and shall be valued accordingly.

The contractor shall notify the Quantity Surveyor when the excavations, or parts thereof, are completed and before any filling is done, in order that all necessary site measurements may be taken.

The contractor shall notify the Engineer when the excavations, or parts thereof, are completed and ready to receive constructions. No work shall be built until the excavations have been approved.

Should any ground fall in (other than that required to be excavated) owing to omission or inadequacy of support or to any act, neglect or carelessness of the Subcontractor, such ground will not be paid for as excavations but it shall be dug out and deposited on the site (or carted away) and returned, refilled and rammed as directed and entirely at the contractor's expense.

No trench for any drain shall be excavated less than 530mm wide. The bottoms of trenches are to be well rammed and finished to regular and even falls, and the falls and the barrel of the pipes shall rest on solid ground and holes shall be cut around joints of sufficient size to enable the jointing and filleting to be properly performed.

All hollows, unnecessary excavations below pipes, soft and loose places or uneven bottoming in rock cutting are to be cleared out and filled in with cement concrete Class "15". Carefully fill in and pack around with soil for 600mm above pipes. Fill in and ram well the remainder of the trench in 230mm layers up to ground level. The contractor shall provide all necessary sight rails, boning rods, open or close planking and strutting, staging, etc.

The contractor shall ensure that the trenches are maintained in a safe condition at all times.

PART IV

Standard Quality Specification for

Steam and Condensate Reticulation

STANDARD QUALITY SPECIFICATION FOR STEAM AND CONDENSATE RETICULATION

1.1 DEFINITIONS

According to the manufacturer's instructions: The manufacturer's instructions at the time of tender.

Approval: Approval by the Department in writing and is limited to visual appearance of the work, material or components. Approval does not relieve the Contractor from compliance with the specification.

BS: British Standard.

Department: The Chief Engineer of the Gauteng Provincial Department of Public Transport, Roads and Works or his duly authorised representative/agent.

Drawings: Drawings forming part of the contract documents and any modification thereof or additions thereto delivered by the Department to the contractor during the execution of the works.

NBR: National Building Regulations.

Particular Specification: A specification that is drawn up as a supplement to the Project Specification to specify items for a particular contract not covered by the Project Specification. The Particular Specification has preference over the Project Specification.

Standard Specification: The latest edition (as revised) of the standard quality specification of the Department.

SANS: South African National Standards

SABS: South African Bureau of Standards.

SABS-CKS: Specifications prepared by the SABS mainly for the procurement of products for the use of government departments.

Specified: As specified in the Project Specification, Particular Specification, drawings, Bill of Quantities or in any other contract document.

1.2 SUMMARY OF SABS SPECIFICATIONS APPLICABLE TO THE STANDARD QUALITY SPECIFICATION FOR STEAM AND CONDENSATE RETICULATION

SANS 10064		:	The preparation of steel surfaces for coating
SANS 1200 HC		:	Corrosion protection of structural steelwork
SANS 1091		:	National colour standards for paint
SANS 12944-4		:	Paints and Varnishes –Corrosion protection of steel structures by protective paint system Part 4. Types of surface and surface preparation.
SANS 460		:	Plain ended solid drawn copper tubes for potable water.
SANS 1067 - 1		:	Part 1 – Compression fittings
SANS 1067 - 2		:	Part 2 – Capillary solder fittings
SANS 455		:	Covered electrodes for the manual arc welding of carbon and carbon manganese steels
SANS 10044		:	Welding : Parts I and 2
SANS 10238		:	Welding and thermal cutting processes – Health and safety
SANS 121		:	Hot-dip galvanised zinc coatings on fabricated iron and steel articles – Specification and test methods.
SANS 3575		:	Continuous hot-dip zinc-coated carbon steel sheet of commercial, lock forming and drawing qualities
SANS 1186-1		:	Symbolic Safety Signs Part I : Standard signs and general requirements.
SANS 62-1		:	Steel Pipes Part 1 : Pipes suitable for threading and of nominal size not exceeding 150 mm.
SANS 62-2			Steel Pipes Part 2 : Screwed pieces and pipe fittings of normal size not exceeding 150 mm.
BS 10		:	Specification for flanges and bolting for piping, valves and fittings.
BS 3601-22		:	Specification for carbon steel pipes and tubes with specified room temperature properties for pressure purposes
BS 4504		:	Circular flanges for pipes, valves and fittings (PN designated)
	3.1	:	Specification for steel flanges
	3.3	:	Specification for copper alloy and composite flanges.
BS 5000-99		:	Machines for miscellaneous applications.
BS EN 1561		:	Founding. Grey cast irons.
BS EN 1563		:	Founding. Spheroidal graphite cast iron.
BS EN 1982		:	Copper and copper alloys. Ingots and castings.
BS EN 10213-1		:	Technical delivery conditions for steel castings for pressure purposes. General.

BS EN 10213-2	:	Technical delivery conditions for steel castings for pressure purposes. Steel grades for use at room temperature and at elevated temperature.
ASTM B61	:	Standard Specification for Steam or Valve Bronze Castings.
ASTM B62	:	Standard Specification for Composition Bronze or Ounce Metal Castings.
ASTM A 126	:	Standard Specification for Gray Iron for Valves, Flanges, and Pipe Fittings.
ASTM A 216/A 216M	:	Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service.
ASTM A 389/A 389M	:	Standard Specification for Steel Castings, Alloy, Specially Heat-Treated for Pressure-Containing Parts, Suitable for High-Temperature Service.
ASTM A 395/A 395M	:	Standard Specification for Ferritic Ductile Iron Pressure – Retaining Castings for use at Elevated Temperatures.
ASTM F 1139	:	Standard Specification for Steam Traps and Drains.
ASTM F 1369	:	Standard Specification for Heaters, Convection, Steam and Hot Water.
ASTM F 1508	:	Standard Specification for Angle Style, Pressure Relief Valves for Steam, Gas and Liquid Services.
ASTM F 1565	:	Standard Specification for Pressure-Reducing Valves for Steam Service.
API 5L	:	Specification for line pipe.
OHS ACT	:	The Occupational Health and Safety Act, Act 85 of 1993.

STANDARD QUALITY SPECIFICATION FOR STEAM AND CONDENSATE RETICULATION

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LIST OF ADDENDUMS

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Addendum B – Maintenance schedule for Steam and Condensate Reticulation

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STANDARD QUALITY SPECIFICATION FOR STEAM AND CONDENSATE RETICULATION

1. PIPING

1.1 STEAM PIPING

Steam piping for steam over 120°C and up to 2000 kPa must be heavy walled, solid drawn steam quality tubes and must be free from defects.

Pipes up to 150mm must be black steel pipe to SANS 62, heavy class.

Pipes 200mm and over must be black steel pipe to BS 3601-22 or API5L.

Use eccentric reducers with the straight part at the bottom where the size of horizontal piping changes. Install pipes with a minimum slope of 1 in 240. Drain steam pipes by means of dirt pockets and steam traps at all low points in the system and as indicated on the project drawings.

1.2 CONDENSATE PIPING

Condensate pipes must be of heavy duty, solid drawn copper, class 2 according to SANS 460. The copper pipe must be suitable for steam services and must be suitable for a working pressure of at least 1000 kPa.

Refer to the Project Specification where stainless steel will be specified if required.

Condensate pipes can alternatively be of 304 stainless steel if specified in the Project Specification

Install approved vacuum breakers at the highest point on gravity return pipes.

Refer to the Project Specification for material requirements

Pumped condensate mains may be constructed from medium grade, solid drawn, steam quality tubes to SANS 62.

1.3 PIPE JOINTS

- **Joints on steam lines**

Side notes are explanatory only and do not form part of the contract. Underlined text is for the attention of the Engineer

Steam lines up to 40mm diameter may be screwed or welded.

Steam lines 50mm and larger may not be screwed. Joints may be welded or flanged. Flanges however may only be used if it is essential to remove sections of line.

Provide flanges (or unions for lines up to 40mm diameter) at valves, fittings and at points where dismantling of equipment is required for maintenance purposes.
Use only steam quality sealing tape for screwed joints on steam piping. Do not use hemp and red lead.

Flanges on steel pipes must be of steel according to BS 4504 and to BS10.

All flanged joints must be provided with a full face mineral fibre gasket with a thickness of not more than 3mm. Gasket material must be suitable for steam applications.

Use only unions with bronze or gunmetal seats suitable for steam. Union faces must be conical or spherically shaped.

Do not use malleable iron unions or unions with packings.

- **Joints on condensate lines**

Use only copper capillary fittings and bronze or silver solder joints. Use brass screw fittings only between copper to steel joints. Use only conical faced bronze unions on condensate lines.

- **Joints in roof spaces**

Weld all pipes of diameter 25mm and larger in roof spaces. Provide flanges at every branch connection. Provide all valves 50mm in diameter and larger with flanges. Follow the most direct, shortest but logical route. Do not obstruct access for workers.

1.4 BRANCH LINES

Take steam branch lines from the top of the main line to ensure no condensate carry-over.

Provide a T piece where branch is connected.

Side notes are explanatory only and do not form part of the contract. Underlined text is for the attention of the Engineer

1.5 BENDS AND ELBOWS

Use full radius bends for all piping installations. Elbows may only be used in specific instances and only after approval has been granted in writing by the Department.

1.6 PIPE EXPANSION AND CONTRACTION

Install expansion loops, off-sets and compensators on steam and condensate piping as indicated on the project drawings.

1.7 PIPE SUPPORTS, ANCHORS AND GUIDES

Provide pipe supports at the intervals as indicated in the following tables. Provide pipe anchors and guides in the positions as indicated on the project drawings.

Support horizontal steam pipes as follows:

Nominal Pipe Size	Maximum Span (m)
15 to 20	2,5
25 to 32	3,0
40 to 50	3,5
65 to 80	4,5
100 and Above	6,0

Support vertical piping with the first horizontal support just before and the second horizontal support just after the vertical pipe. Support the vertical pipe with guides at the same span as indicated for horizontal pipes.

The maximum support spacing for condensate pipes must be as follows:

PIPE NOMINAL SIZE	MAXIMUM SPAN
15 – 20 mm	1,0m
25 – 40 mm	2,0m
50 mm and over	2,5m

Manufacture pipe supports, anchors and guides according to standard drawings ME 04 06 01 to ME 04 06 08.

Side notes are explanatory only and do not form part of the contract. Underlined text is for the attention of the Engineer

2. THERMAL INSULATION

2.1 GENERAL

Thermal insulation work must be executed by specialists in this field. Manufacturer's recommendations regarding the application of insulation materials, cladding, adhesives, etc., must be strictly observed. Adhesives, sealants and coatings must be compatible with the insulation material. Insulation, adhesives and finishes must be resistant to rotting, mould, fungal growth, decay, or attack by vermin.

Pipe work and equipment must be tested, painted and inspected, and approved prior to the application of thermal insulation.

Supply certified tests from an approved body for the following:

- The thermal conductivity of the insulating material(s) at operating temperature

- The surface spread of flame index of the insulating materials, adhesives and other finishes.

2.2 PIPE WORK INSULATION

Use mineral wool or fibre glass for insulation. The density for mineral wool must be at least 185kg/m³ and for fibre glass at least 96kg/m³. Insulation thickness for these materials must be as follows:

PIPE DIAMETER	INSULATION THICKNESS
15 – 40 mm	40
50 mm and over	50

Obtain prior approval from the Department for other insulation materials than those mentioned above. Do not use insulation materials which, contains asbestos.

Side notes are explanatory only and do not form part of the contract. Underlined text is for the attention of the Engineer

Clad insulated piping with 0,5mm thick pre-rolled galvanised sheet metal. Secure sheet metal sections with bands and clips at not more than 450mm centres. The overlap between sections must not be less than 40mm.

Arrange sections to be water shedding. See ME 04 03 01 for detail.

Refer to the Project Specification for aesthetic requirements

Use stainless steel, chromadek or aluminium sheet metal sections for aesthetic reasons if specified in the Project Specification.

Elbows must be lagged with “lobster back” bends or alternatively insulating material must be wound around the bend and then plastered with hard setting compound and smoothly trowelled off. Waterproof the compound with a fibre glass membrane and acrylic waterproofing paint when set.

Do not insulate valves, unions, strainers, flanges, etc. Insulate dirt pockets. Weatherproof the ends of adjacent insulation and paint with acrylic waterproofing paint.

2.3 INSULATION OF CALORIFIERS

Secure a 50mm thick, 40 kg/m³ density, glass wool mattress to the calorifier’s shell. The thermal conductivity of the insulation must be approximately 0,045 W/m°C.

Clad the insulation with 0,9mm galvanised sheet metal with neat, preformed sections riveted in place. Do not paint the cladding.

3. VALVES

3.1 GENERAL

Valves must be of an approved manufacturer and must be suitable for steam and condensate applications. Pressure and temperature ratings must be according to the manufactures requirements for the system into which the valves are to be installed.

Matched flanges must correspond in construction and dimensions to flanges on equipment. Provide the correct bolts, nuts, washers, and packings.

3.2 VALVE CONSTRUCTION AND MATERIALS

Valve construction and materials must comply with the following specifications.

Side notes are explanatory only and do not form part of the contract. Underlined text is for the attention of the Engineer

Bronze Valves	:	BS EN 1982, ASTM B61 and ASTM B62
Cast Iron Valves	:	BS EN 1561 and ASTM A 126
S.G. Cast Iron Valves	:	BS EN 1563 and ASTM A 395/A 395M
Cast Steel Valves	:	BS EN 10213 Parts 1 & 2 and ASTM 216/A 216M

3.3 STEAM VALVES

All steam valves must be of the globe type with replaceable discs and seats. Seats must be manufactured from 304 stainless steel and discs must be manufactured from a high grade nickel alloy. Valve bonnets may be of the screw-in, union or bolted type.

Use PN16 rated steam valves on pipelines smaller than 100 mm diameter and with pressures up to 750 kPa. Use PN25 rated steam valves on pipelines 100 mm diameter and larger and with pressures up to 1200 kPa.

Hand wheels must be of no-heat design and may be of pressure die-cast aluminium or of malleable iron.

When specified valves must be provided with a back seating facility so that the gland packing can be replaced when the valve is fully open i.e. back seated.

Do not modify valves. Submit manufacturers detailed drawings to the Department for approval.

3.4 CONDENSATE VALVES

Condensate valves must be of the globe type with replaceable discs and seats. Seats must be manufactured from 304 stainless steel and discs must be manufactured from a high grade nickel alloy. Valve bonnets may be of the screw-in, union or bolted type.

Use the same valves on condensate pumped mains as for condensate lines.

Use PN16 rated steam valves on pipelines smaller than 100 mm diameter and with pressures up to 750 kPa.

Side notes are explanatory only and do not form part of the contract. Underlined text is for the attention of the Engineer

4. STEAM TRAPS

4.1 GENERAL

Specify the type of steam trap to be used in the Project Specification and on the project drawings

Refer to the Project Specification and the project drawings for the type of steam trap to be used. Steam traps must comply with ASTM F 1139.

Trapping arrangements for a particular pipe size must have the same overall dimension from union face to union face to ensure interchangeability for maintenance purposes.

Steam traps must be suitable for corrosive condensate having a pH value of approximately 5 and must be of stainless steel, bronze or gun metal, or high quality cast iron.

Do not use traps of brass or malleable iron. Trap components must be of stainless steel. Do not use bimetallic, liquid expansion or inverted bucket traps.

Size steam traps to suit the capacities indicated on the project drawings. Steam traps must be suitable for the system pressure and temperature and must be rated for operation between 35kPa to 1400 kPa gauge.

The Contractor must base his tender price on the trap types as indicated on the project drawings.

Final selection of the steam traps must be done in conjunction with a specialist supplier. Submit all steam trap selections and manufacturers data to the Department for approval.

For arrangement layouts see ME 04 02 01.

4.2 BALANCED PRESSURE THERMOSTATIC TRAP

Use these traps under conditions of constant pressure and where quietness of operation is required i.e. steam heaters etc.

Side notes are explanatory only and do not form part of the contract. Underlined text is for the attention of the Engineer

4.3 FLOAT TYPE THERMOSTATIC TRAP

Use these traps where quietness of operation is required i.e. intensive care wards and for drainage of systems where the pressure in the unit being drained can vary i.e. steam coils.

Do not use these steam traps on autoclaves.

5. NON RETURN VALVES

Use disc type wafer check valves or mushroom check valves rated for steam and condensate services.

Submit all final selections to the Department for approval.

6. PRESSURE REDUCING VALVES

Pressure reducing valves must comply with ASTM F 1565.

Reducing valves of up to 20mm in size may be of the direct acting type. Use only pilot operated type pressure reducing valves for larger sizes. All reducing valves must have replaceable seats.

Downstream pressures must not vary more than 0,5% over the range of 0 to 100% capacity. The pressure rise under dead end conditions must not exceed 1%.

Reducing valves must be selected in conjunction with specialist suppliers and must be suitable for the pressure, temperature and load requirements as indicated on the project drawings and specified in the project specification. Ensure that the suppliers provide the correct springs for direct spring diaphragm type reducing valves. These valves must be marked with a metal label indicating the spring range.

Provide capacity charts, drawings and other manufacturer's data to the Department for approval.

Side notes are explanatory only and do not form part of the contract. Underlined text is for the attention of the Engineer

Where two or more reducing valve arrangements of a particular size are installed they must have the same overall dimension between union faces to ensure interchangeability for maintenance purposes.

Install reducing valve arrangements as per the project drawings.

For arrangement layouts see ME 04 02 02.

7. SAFETY VALVES

Safety valves must comply with ASTM F 1508.

7.1 STEAM SAFETY VALVES

Install safety valves where shown on the project drawings. Set relief valves to be fully opened at 3% above the normal working pressure. The safety valve must be rated at 1,5 times the capacity of the reducing valve arrangement when installed after a pressure reducing valve.

Safety valves must be of the spring loaded pop type with lockable lever, bronze bodies and with screwed side discharge connections. Relief valve springs must be cadmium plated to prevent corrosion and valve seats must be of non-corrodible material.

The area presented by the valve in the fully open position must be less than the area of the discharge pipe. Full lift and relieving capacity must be obtainable on 3% accumulation. The discharge pipe must be of the same diameter or larger than the size of the safety valve.

Seal safety valves at their pre-set blow-off pressures by means of a padlock or sealing wire with lead seal.

Pipe the safety valve to atmosphere in the shortest possible but logical route, so that it cannot cause damage or injury to property or persons. Provide a 5 mm weep hole at the first bend at the riser.

7.2 HOT WATER SAFETY VALVES

The construction of safety valves on hot water systems must be the same as described for steam. They must however be proportional lift valves and must be of the pressure and temperature operated type suitable for the conditions specified in the project specification and on the project drawings.

Safety valves must be of the spring loaded type with lockable lever, bronze bodies and with screwed side discharge connections. Relief valve springs must be cadmium plated to prevent corrosion and valve seats must be of non-corrodible material.

Set these valves at 3% above the normal working pressure and set the temperature setting at 82°C. Pipe the discharge to the floor and terminate 25mm above the floor.

Side notes are explanatory only and do not form part of the contract. Underlined text is for the attention of the Engineer

7.3 COLD WATER SAFETY VALVES

The construction of safety valves on cold water systems must be the same as described for steam. It must however be proportional lift valves. It must be of the pressure sensitive type and suitable for the conditions specified in the project specification and on the project drawings.

Safety valves must be of the spring loaded type with lockable lever, bronze bodies and with screwed side discharge connections. Relief valve springs must be cadmium plated to prevent corrosion and valve seats must be of non-corrodible material.

Set these valves at 3% above the normal working pressure. Pipe the discharge to the floor and terminate 25mm above the floor.

8. STRAINERS

Strainers must be suitable for steam and condensate services and must be of the Y-leg type with stainless steel screens. The screens must be removable and screen perforations must not exceed 0,8mm where the strainer is installed prior to a reducing valve, 1,5mm for normal steam services or 3mm for water services.

Install the strainers with the leg in the horizontal position to prevent water logging during off range periods.

9. STEAM SEPARATORS

Install steam separators on steam lines where indicated on the project drawings. Separators must be suitable for steam services and must have cast steel bodies with flanged ends.

10. PRESSURE GAUGES

Pressure gauges for steam and water services must be of the Bourdon tube type with 10mm bottom entry connection and 100mm diameter dials marked in kPa.

Fit gauges with “U” or ring type siphon and cock. Glass covers must be easily removable without having to strip the complete gauge. The range of the gauges must approximate double the normal working pressure of the system.

Side notes are explanatory only and do not form part of the contract. Underlined text is for the attention of the Engineer

Gauges must be accurate within ± 2% over the complete range of operation. Provide a calibration certificate to the Department when requested.

The safe working pressure of the system must be marked in red on the dial.

11. THERMOMETERS

Thermometers must be of the dial type with 100mm diameter dials. Provide each thermometer with a stainless steel well. The wells are to be installed in compliance with the thermometer manufacturer's requirements.

Thermometers can have bottom or rear entry connections and must be installed in easily readable positions.

12. SIGHT GLASSES

Install single window sg iron, bronze or brass sight glasses where indicated on the project drawings. Sight glasses must be suitable for horizontal and vertical installation at a working pressure of at least 500 kPa gauge. The glass diameter must not be smaller than 50 mm diameter. Do not use combination check sight glasses.

13. STEAM EQUIPMENT

13.1 GENERAL

The equipment described in this clause utilises steam as the energy source, therefore its inclusion in this document as part of steam services.

The equipment described hereafter is often used in other services, e.g. steam fan convectors are used in central heating systems where steam is the energy source. In such cases, this specification must be read in conjunction with the relevant services specification.

Heaters must comply with ASTM F1369.

13.2 CALORIFIERS

Refer to the project specification for pressures, temperatures and capacities.

All calorifiers must be constructed in compliance with the pressure vessel requirements of the Occupational Health and Safety Act regulations (Act 85 of 1993).
Calorifiers must be suitable for the steam and hot water pressures and temperatures as specified on the project drawings and in the project specification. The capacity of the calorifiers must be as specified in the project specification.
Calorifiers must be corrosion protected inside and out be either galvanizing or polymer coating as per item 18.

Side notes are explanatory only and do not form part of the contract. Underlined text is for the attention of the Engineer

Provide fittings and equipment on calorifiers as indicated on standard drawings ME 04-04-01 and ME 04-04-02.

The steam battery must be manufactured from solid drawn tin coated copper tubing to SANS 460, class 2 or higher. These must be secured to the tube plate by means of expansion or screwed fittings. Either method must be guaranteed against leaks for 24 months.

All coils must be able to withstand a working steam pressure of at least 1200 kPa.

Install the calorifiers in such a position to ensure easy withdrawal of the heater battery.

13.3 FAN CONVECTORS

Fan convectors must be suitable for operation with a steam supply of up to 750 kPa and with a temperature up to 173ºC. Coils and fittings must be pressure tested to twice the maximum working pressure plus 350 kPa, i.e. to 1850 kPa (gauge).

Steam operated fan convectors must have single row, finned coils. The coil tubes must be made of solid drawn copper and the design must allow unrestricted expansion of each tube. Fins must be of copper or aluminium and must be securely attached to the tubes. Fan convector capacities must be based on air entering temperature of 15ºC, a steam pressure of 350 kPa gauge and with the fan speed at normal, with due allowance for system resistance.

Fan convector casings must be of powder coated, heavy gauge sheet steel and must be neat in appearance. The colour of fan convectors must be as specified in the project specification.

The depth of the fan convectors must not exceed 350 mm.

The type of fan convector required, i.e. wall mounted, ceiling mounted or recessed type must be as indicated on the project drawings and specified in the project specification. Use anchor bolts suitable for the wall material to mount the fan convectors against the wall.

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Bolt ceiling mounted units to the roof structure. Provide additional angle iron supports between trusses and support the units from the angle iron.

Fan convector units must be fitted with centrifugal fans and TEFC motors. Bearings must be sealed for life. Fans and motors must be mounted on anti-

vibration pads. The noise rating of the unit must not exceed 55 dB. Motors must be suitable for 220 V 50 Hz operation and must be protected against thermal overloading. The fan coil unit must be able to withstand high working temperatures.

Provide a washable filter for each unit. Filters must be easily removable.

Each fan convector must be fitted with thermostatic on/off control and fan speed control. It must be possible to operate the fans without heating.

13.4 UNIT HEATERS

Unit heaters must be suitable for the steam temperatures, pressures, air temperatures, etc., as stated for fan convector units above.

General construction and selection requirements must be as stated for fan convector units above.

All steam fittings and trap sets must be concealed in the unit cover.

Unit heater capacities must be as specified in the project specification.

Unit heaters must be of the horizontal discharge type with a minimum air flow of 0,2 m^3/s.

13.5 STEAM HEATING COILS

The capacities of steam heating coils must be as indicated in the project specification and on the drawings.

Steam coils may be constructed from the following materials. Tubes from copper, Fins from copper or aluminium and Frames from copper or stainless steel of at least 1,5mm thickness. Mount steam coils on frames which must be suitable for bolting to ductwork, unit casings, etc. Support coils on a rigid angle iron framework and tilt coils slightly to ensure proper condensate drainage.

Provide each coil section with inlet, outlet, vent, vacuum breaker and drain connections. Install valves, trap sets, instrumentation, etc., as per ME 04 04 04.

Steam coils must be suitable for the steam pressures and temperatures as specified in the project specification. Steam heating coils must be of the single pass type and each section must have supply and return connections. The coil design must allow for unrestricted expansion of tubes.

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Test all pressure parts of steam coils to a pressure of 1,5 times the normal working pressure.

The coil must be designed for a Safe Working Pressure of 1200 kPa.

The face velocity of heating coils must not exceed 2,5 m/s.

Protect coil face areas with galvanised sheet metal covers and remove the covers only when commissioning commences.

14. CONDENSATE TANKS

Refer to standard drawing no ME 04-05-01 and ME 04-05-02 for the construction of condensate and flash tanks.

Condensate tanks must be of 6mm thick steel all welded construction. Support the tank on a strong 50mm angle iron frame at approximately 500mm above floor level to ensure a flooded suction to the pumps. Provide all fittings as per the standard drawings.

Refer to the project drawings for the capacity of the condensate tank.

15. CONDENSATE PUMPS

Refer to the project specification for design capacities, pressures and temperatures

Condensate pumps can be of the electrically or steam driven type. Condensate pumps must be able to deliver the required capacity at the steam and condensate pressures and temperatures, as specified in the project specification.

Use pump and motor combinations with base plates and couplers. Mono block pumps may also be used provided that the design is of such a nature that heat is not transferred to the motor..

The shaft between the pump and motor must be fitted with a slinger ring.

Fit pumps with mechanical seals, bronze or stainless steel impellers and stainless steel shafts.

Lubricated pumps must be provided with oil or grease reservoirs with sufficient capacity for at least 6 months operation.

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Protect drives and couplers on base plate mounted units according to the Occupational Health and Safety Act, Act 85 of 1993.

If the pump is of the back pull-out type the common base plate or coupling

must be of such a design that removal of the pump base with shaft is possible without disturbing the motor.

Provide dowels for re-locating the pump and motor.

The pump and motor must be quiet in operation and the pump must run at maximum efficiency.

Condensate pumps must be suitable for pumping condensate at 2°C below boiling point at atmospheric pressure on site.

16. ELECTRICAL WORK AND CONTROLS

All electrical work must be according to the Department's Standard Quality Specification for Electrical Work. The contractor must submit wiring diagrams for approval. Electrical motors must conform to BS 5000-99. All electrical work will be inspected by the Department.

17. WELDING

Welding must be carried out in accordance with the current edition of SANS 10044 Parts I and 2 where applicable. Health and safety standards when welding or cutting must be according to SANS 10238.

Employ welders in possession of a valid, approved competence certificate where required by the Occupational Health and Safety Act, Act 85 of 1993, e.g. for welding on pressure vessels under supervision of a competent Inspection Authority.

The joints in the weld run, where welding has been recommenced, must be as smooth as possible and must show no pronounced hump or crater in the weld surface.

The profile of the weld must be uniform, of approximately equal leg-length and free from overlap at the toe of the weld. Unless otherwise specified the surface must be either flat or slightly convex in the case of fillet welds, and with a reinforcement of not more than 3mm, in the case of butt welds.

The weld face must be uniform in appearance throughout its length.

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Filler metal electrodes must be of an approved type for the material being used and must be kept in a dry condition. All electrodes must conform to SANS 455.

Allow for welded pipe joints (where chosen by the Department's Representative) to be X-ray tested by the SABS or other approved body or for joints to be cut for examination purposes. Remove these joints and make good at own cost.

All welds must show proper fusion.

18. CORROSION PROTECTION

18.1 GALVANISING

All hot-dip galvanising must be carried out in accordance with SANS 121 and SANS 3575 as applicable.

Component design, fabrication and inspection of articles for hot-dip galvanising must be done in accordance with SABS 0214.

The Department has the right to inspect all steel components before galvanising, and to reject or ask for remedial treatment of any material which, are considered to be unsuitable. This applies particularly to welds.

18.2 PAINTING

Prepare and paint all steelwork and pipe work prior to insulation as per the following SANS:

- The preparation of steel surfaces for coating : SANS 10064 and SANS 12944-4

Corrosion protection of structural steelwork : SANS 1200 HC

- National colour standards for paint : SANS 1091

Paint support structures and brackets black, unless specified otherwise in the project specification.

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19. NOTICES

Supply and install all notices and warning signs that are required by SANS 1186-1. Markings on equipment e.g. pumps, motors and vessels must be according to SANS 0147 and OHS Act.

All steam and condensate valves must be marked with the manufacturer's brand name, pressure and temperature ratings, material of body, disc, stem and seat, identification numbers, size and fluid recommendation.

20. STANDARD EQUIPMENT

Maker's nearest standard equipment will be considered. Submit for approval to the Department.

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LIST OF STANDARD DRAWINGS APPLICABLE TO THE STANDARD QUALITY SPECIFICATION FOR STEAM AND CONDENSATE RETICULATION

SYMBOLS

- ME 04 01 01-2 - Key to symbols

FITTINGS

- ME 04 02 01-2 - Trapping arrangements.
- ME 04 02 02-1 - Reducing valve arrangement.

PIPING

- ME 04 03 01-1 - Steam pipe insulation.
- ME 04 03 02-1 - Copper pipe joints.
- ME 04 03 03-1 - Destructive tests on pipe welds.

EQUIPMENT

- ME 04 04 01-1 - Calorifiers.
- ME 04 04 02-1 - Calorifier.
- ME 04 04 03-1 - Connections to autoclaves.
- ME 04 04 04-1 - Heating coil control piping.
- ME 04 04 05-1 - Steam humidification.

CONDENSATE

- ME 04 05 01-1 - Condensate collecting tank.
- ME 04 05 02-1 - Flash tanks.

PIPE SUPPORTS

- ME 04 06 01-1 - Pipe hanging assembly.
- ME 04 06 02-1 - Ceiling and Truss supports.
- ME 04 06 03-1 - Wall support.
- ME 04 06 04-1 - Master supports.
- ME 04 06 05-1 - Roller assembly.

- ME 04 06 06-1 - Sliding type support.
- ME 04 06 07-1 - Anchors.
- ME 04 07 08-1 - Road crossing for pipes.

SERVICE AND MAINTENANCE PROCEDURES SCHEDULE SHEET

FOR

STEAM AND CONDENSATE RETICULATION

ITEM NO.	SERVICE REQUIREMENT DATA	MONTHLY INTERVALS				
		1	3	6	9	12
1.	Inspect steam piping and equipment. Rectify leaks where required.	X				
2.	Check pipe and equipment insulation and rectify where required		X			
3.	Note and record steam pressures	X				
4.	Clean strainers on steam and condensate lines		X			
5.	Check condensate flow through sight glasses. Record satisfactory/unsatisfactory operation of steam traps. Rectify if required.	X				
6.	Check and record equipment pressures and temperatures.	X				
7.	Check and record space temperatures	X				
8.	Check for leaks at valve glands and tighten if required	X				
9.	Check operation of condensate pumps. Rectify leaks if required	X				
10.	Check operation of safety valves. Record results			X		
11.	Check and record operation of pressure reducing valves. Record upstream/downstream pressures.			X		
12.	Check paint work on brackets, supports and equipment and touch-up where required.					X
13.	Check condition of pipe supports and hangers. Make sure that pipe work can expand/contract freely					X
14.	Check condition of pressure and temperature gauges and replace where required.		X			
15.	Clean dirt pockets					X
16.	Check and clean fan convectors and unit heaters.	X				

COLOUR SCHEDULE FOR MECHANICAL INSTALLATIONS

PLANT ITEM	BASIC COLOUR (300mm Wide)	COLOUR CODE INDICATOR FIRST BAND (100mm Wide Centered on Basic Colour)	REMARKS
Medical Gas Piping			
Oxygen	White		
Carbon dioxide	Light stone (C37)	Light Brunswick green (H07)	
Nitrous oxide	Light stone (C37)	Ultra Marine (F09)	
High pressure compressed air	Arctic Blue (F28)	Salmon Pink (H40)	Mark: MA-HP in black
Low pressure compressed air	Arctic Blue (F28)	Black and White (50 mm wide each)	Mark: MA-LP in black
Vacuum	Primrose (C67)		
Vacuum receivers	Primrose (C67)		
Compressed air reservoirs (HP)	Arctic Blue (F28)	Salmon Pink (H40)	
Compressed air reservoirs (LP)	Arctic Blue (F28)	Black and White (50 mm wide each)	
Fire Protection Services			
Fire mains	Signal red (A11)	-	
Carbon dioxide	Light stone (C37)	Signal red (A11)	
General Pipe Services			
Drain pipes	Black	-	
De-mineralised water	Brilliant Green (H10)	White	
Compressed air	Arctic Blue (F28)		
Potable Water			
Cold	Brilliant Green (H10)	Cornflower (F29)	
Hot	Brilliant Green (H10)	Crimson (A03)	
Gas Lines			
Acetylene	Light stone (C37)	Maroon (A01)	
LPG	Light stone (C37)	-	Mark: LPG
Oils			
Diesel fuel	Golden brown (B13)	White	

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PLANT ITEM	BASIC COLOUR (300mm Wide)	COLOUR CODE INDICATOR FIRST BAND (100mm Wide Centered on Basic Colour)	REMARKS
Condenser Water System			
Condenser water supply and return pumps	Lime Green (H41)	-	
Chilled water pumps	Lime Green (H41)	-	
Chilled Water System			
All primary and secondary chilled water supply and return pipes	Ultra Marine (F09)		
Chilled water pumps	Ultra Marine (F09)		
Central Heating			
Supply	Verdigris green (E22)	-	
Return	Light Brunswick green (H07)		
Miscellaneous			
Air compressors, vacuum pumps, chillers, cooling towers, heat pumps, water pumps, etc.	Standard Manufacturers colours	-	
Brackets, supports, bases, base plates, pipe hangers	Black		
Pump and fan drive guards	Signal Red (A11)		
Steam Services			
Steam mains	Cladding colour	-	
Bends	Silver/Aluminium		
Condensate main	Copper pipe or Cladding colour as applicable	Crimson (A03)	
Steam Humidifiers	Heat resistant Aluminium	-	
Uninsulated pipes, steam traps and fittings (steam and condensate)	Heat resistant Aluminium	-	
Brass or bronze constructed steam traps, valves and fittings	Unpainted		
Hot well tanks	Heat resistant Aluminium	-	
Boilers: coal-fired, oil-fired or electrode	Bright stainless steel cladding		
Boiler front and back	Black		
Hot water storage vessels	Galvanised steel cladding		
Heat exchangers	Heat resistant Aluminium		
Blow down pipes	Heat resistant Aluminium		
Boiler feed water	Verdigris green (E22)		
Stokers, hoppers, conveyors (coal and ash)	Black		
Hot metal ducting	Heat resistant Aluminium		
Flues, stacks and grit arrestors	Heat resistant Aluminium		

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PLANT ITEM	BASIC COLOUR (300mm Wide)	COLOUR CODE INDICATOR FIRST BAND (100mm Wide Centered on Basic Colour)	REMARKS
Top 2 metres of :			
1. Mild steel stack	Matt black		
2. Stainless steel stack	-		
Hot surface of boiler controls and valves	Golden yellow (B49) with Signal red handles (A11)		
Hand rails and stanchions	Golden yellow (B49)		
Kick guards	Black		
Walkways	Black		
Plant Rooms			
Doors & Walls (internal)	Light Grey (G29)		
Steel roof trusses	Aluminium		
Floors	Light Brunswick Green (H07)		
Ceilings	White		
Electrical Services			
Electrical and control panels	Light orange (B26)		
Electrical panels fed with standby/UPS power	Signal red (A11)		
Electric duct heaters in plant rooms	Signal red (A11)		
Cable trays	Galvanised		
Electric motors	Light orange (B26)		
Air Conditioning/Ventilation Ducting			
Conditioned air	Arctic Blue (F28)		
Foul air	Biscuit (B64)		
Exhaust/Extract/ Recirculated air	Mountain Mist (G57)		
Outside air	Pastel Green (H65)		
Warm air	Pastel Yellow (C75)		

Notes:

1. Put directional arrows on all pipe lines : Stickers inside buildings
   : Paint on outside buildings

   Arrow width must be at least 12mm and arrow length must be 3 times the pipe diameter.

2. Provide colour coding and arrows at pipe branches, directional changes, both sides of wall/slab penetrations and at ± 10m intervals on straight runs.

3. Unless indicated otherwise in the Project Specification all pipework in plant rooms must be painted in full with the relevant colour code markings added as required.

4. Paint ducting only if specified in the Project Specification.

5. Apply the basic colour at intervals only unless specified otherwise in the Project Specification.

Side notes are explanatory only and do not form part of the contract. Underlined text is for the attention of the Engineer

PART IV

STANDARD TECHNICAL SPECIFICATION

FOR THE

MEDICAL GAS INSTALLATION

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1. WORKMANSHIP AND MATERIAL

The contractor shall be a recognised piped gas and vacuum installation firm specialising in this field.

The contractor shall employ only skilled artisans and technicians who are competent in this type of work and shall have served a recognised training course in medical gas pipeline installation. Details of the artisans' training to be submitted before work commences.

Material shall be new of best quality and available for medical gas installation.

2. PIPING

The routing of all oxygen, medical air and vacuum piping is shown on the drawings.

All piping shall comply with SABS 460-75, as amended 1979, BSS2781/72-C106 and shall be similar or equal to Maksal Type MG tubes for the conveyance of medical gasses. All pipes shall be marked by the manufacturer.

All sizes quoted are outside diameter, not nominal bore.

No joints in pipelines other than silver soldered capillary joints to terminal tail pipes, or a connection to a value in a box, should be buried in a wall, floor or partition. When this is unavoidable, the pipes shall be carried in a PVC sleeve. Where pipe work is installed in a wall, these shall be installed through PVC conduit.

All piping, valves and fittings to be used in this installation for the conveyance of the medical gases and vacuum shall be de-greased and oxygen clean.

All pipes delivered to site shall be bundled together and sealed with an adhesive tape marked "*medical gas pipes*".

All fittings and valves, as hereinafter specified, shall be supplied to site in sealed plastic bags.

Pipe caps shall only be removed and sealed bags shall only be opened on site when a pipe joint is due to be made.

All medical gas piping shall be adequately supported to prevent sagging or distortion. Pipe supports shall be at the following centres:

PIPE SIZE (mm O.D)	MAXIMUM INTERVAL VERTICAL RUNS (m)	MAXIMUM INTERVALS HORIZONTAL RUNS (m)
10	1,2	1,0
12	1,2	1,0
15	1,8	1,2
22	1,8	1,2
28	2,4	1,8
35	2,4	1,8
42	3,0	2,4
54	3,0	2,4
67	3,6	3,0
76	3,6	3,0

Supports for surface pipe work shall provide clearance to permit painting of the surface. Supports should be of suitable material and, where necessary, treated to minimise corrosion and prevent electrolytic action between pipes and supports.

All piping which passes through wall or concrete slabs shall be encased in PVC sleeves of a size larger than the diameter of the pipe to allow for expansion and contraction.

Only capillary hard solder fitting for M.G. Copper Classes 0 shall be used. The fittings shall be degreased similar to the medical grade copper tubing.

All piping joints, except those at equipment requiring screw, flare nut or flange connections, shall be made by using wrought copper capillary sockets with internal stops.

Compression unions shall be of the Cone type or Yorkshire N° 111 or similar and equivalent.

Self fluxing silver solder having physical properties equal to Afrox Solveroid and a melting point of 450°C shall be used to make these joints. No borax and alcohol mixtures or resin and similar paste fluxes may be used.

The recommended heating source shall be an oxygen-acetylene flame.

The use of excessive flux shall be avoided and the correct amount of solder must be used in order to give a good joint but prevent excess material running into the pipe line.

All screwed joints shall be made with a tape suitable for oxygen use.

All visible piping shall be colour coded as further specified.
Interior wall mounted piping shall be secured in bronze, brass or white plastic sparge type holder bats. Pipe runs in covered ways under eaves and on the outside of buildings shall be secured in brass sparge type bats.

All copper piping shall be cut with sharp wheel pipe cutters to provide full bore of pipe at cut. Hacksaws will not be permitted to avoid metal filings in pipes. All burrs shall be removed.

3. ISOLATING VALVES

Isolating valves shall be installed wherever shown on the drawings. They shall be of a size equal to that indicated for the pipe line in which they will be installed.

All valves except those in the gas-bank room and the plant room shall be housed in a metal tray, as indicated on the drawing and hereinafter specified.

All isolating valves for gases shall be of the diaphragm type with bronze bodies and diaphragms for the gas handled. They shall be suitable for a working pressure of 1 000kPa gauge.

Valves for the vacuum shall be of the through-way Ball cock type with neoprene or nylon rings and with a clear indication of the "*OPEN*" and "*CLOSED*" positions. Globe valves which positively open the seats are also acceptable. They shall, however, only be mounted with their spindles horizontal. Diaphragm valves and taper through-way valves are not permissible for the vacuum service.

All valves for gas and vacuum up to and including 19mm shall be provided with a mounting flange. Pipe lines shall be properly secured by holder bats in close proximity on either side of each valve.

Valves shall be secured into the pipe line by one of the following methods:

3.1 Gas Line Service up to 25mm Diameter

(a) Capillary silver soldered joints. This method is only acceptable for valves specially made for this type of coupling and with the correct size of sockets for the pipe i.e. 0,025 - 0,1mm clearance.

(b) Flare nut compression ring connections for valves specially fitted with them.

(c) Screw connection. Here o-ring or taper unions with silver solder capillary outer-halves for connection to the piping shall be used

3.2 Vacuum Line Service

Only methods (b) and (c) above shall be used for vacuum valves up to 28mm Diameter.

For valves 28mm diameter and over, valves shall be flange coupled. Flanges on pipe lines shall be silver soldered and neoprene gaskets shall be installed between flanges.

4. ISOLATING VALVE BOXES

Isolating valve boxes shall be installed where shown and as detailed on the drawings.

Each box shall be constructed of 1,2mm thick powder coated white sheet steel. All isolating valves shall be mounted on a 1,6mm back-plate. A hinged access door shall be provided complete with switchboard panel type turn-key lock.

An engraved name plate shall be fitted to the door of all valve boxes to read as follows:

Authorised Persons Only
Medical Gas
Isolating Valves
Do Not Close

Engraved ivorine name plates shall be provided inside the cabinet to identify each valve and the valves shall be painted according to the colours specified in Fig 1 of SABS 06-19 57

A notice indicating the room or ward fed shall be fixed inside the box.

Valve boxes shall be installed with their lower edge not less than 2m above floor level.

5. MEDICAL GAS OUTLET POINTS

Medical gas outlet points shall be installed in one of the following ways as indicated on the drawings and shall be Afrox Heyer or equivalent. SABS approved.

* Surface mounted

* Flush Mounted

* Mounted in bedhead units

* Mounted in medical gas pendant/boom arms.

Medical gas outlets must conform to the S.A.B.S. specification SABS 1409 - 1986.

Medical gas outlet points and probes must feature the following:

1) Non-interchangeability between probes and valve housings, and non-interchangeability between valve housings and back bodies between the various gas types.

2) Quick release of the probe with single handed operation.

3) Provide for installation of a non-return valve in the backbody to facilitate maintenance of the outlet point without interruption of gas supply to other medical gas outlet points.

4) Probes with fitted ball-type non-return valves which present uncontrolled whipping of male probe hose connections after release (except vacuum probes).

5) Colour coding and labelling of each type of medical gas outlet point.

6) All backbodies are identified by locating index pins and are name stamped.

7) Unique shape of the valve housing to ensure non-interchangeability of probes.

8) Locating holes in the valve housing which match only the index pins of the correct type of backbody.

9) Both surface and concealed (flush) mounted points are covered and protected by either a cover box or plate. In either case the cover box/plate is a one piece "wipe clean" plastic cover which is colour coded and marked with the name of gas in both official languages.

10) Provision for the installation of a blanking plate to the backbody to prevent damage to entry of dirt during installation and for pressure testing purposes.

Medical gas outlet points when surface or flush mounted should be installed at a height of approximately 1,5m above finished floor level.

When a group of outlet points are installed adjacent to each other the order from left to right shall be:

a) Oxygen

b) Nitrous Oxide

c) Vacuum

d) Air Low Pressure

e) Air High Pressure

f) Other medical gases (e.g. scavenging, Entinox, etc.)

6. STRAINERS

Pipe strainers shall be well supported to allow for cup removal without distortion of piping.

Strainers shall be fitted before all automatic control valves, traps and pressure regulators unless a strainer is incorporated in the latter.

7. NON-RETURN VALVES

Non-return valves shall be provided where indicated on the drawings and shall be similar or equal to Broomwade type with patent thin plate valve and noiseless in operation.

8. GAS CYLINDER MANIFOLD INSTALLATION

Oxygen and Nitrous Oxide manifolds shall be provided to connect equal banks of gas cylinders to provide equal "duty" and "reserve" storage capacity. The manifolds shall be provided with an automatic change-over from "duty" to "reserve" banks of cylinders.

The automatic change-over shall occur at a cylinder pressure which will ensure the greatest possible utilisation of the contents of the cylinder banks.

Means shall be provided for manual change-over from one half of the manifold to the other if this becomes necessary.

8.1 Pressure regulating valves shall be capable of maintaining the indicated delivery pressure within ± 0.14 bar of the valve setting up to the maximum flow rate of the system, providing the gas cylinder pressure is above change-over pressure. There shall be separate pressure regulating valves of each cylinder bank and the control system should be designed so that the cylinders of one bank can be changed or the pressure regulator for one bank can be overhauled without loss of continuity of the gas supply. A non-return valve shall be inserted between each cylinder tail pipe and the manifold to minimise loss due to the leakage.

8.2 Means shall be provided so that an emergency supply of gas is available in the event of manifold failure. This will also permit the coupling of a gas cylinder, via a pressure regulator and excess pressure relief device, to act as a temporary source of supply while the manifold is isolated for repair or maintenance.

8.3 The delivery pipe line from the manifold shall be fitted with a self-closing pressure relief valve of a type which can be locked or sealed and set to lift at a pressure of 25% above the designed distribution pressure. The valve should be of brass or bronze and designed and de-greased for oxygen service and should be installed immediately upstream of the emergency supply panel. It should have a flow capacity at least equal to that of the pressure regulator immediately upstream of it. The discharge pipe shall be at least one size larger than the main pipe line. This discharge pipe line shall be vented to atmosphere, outside the building, in an area where discharge of oxygen will not constitute a fire risk, where no hazard will arise from the discharge of nitrous oxide and where it is not liable to injure personnel when discharging. It shall be well clear of any openable window or air intake. The ends of the discharge pipe lines shall be turned downwards to prevent the ingress of dirt and moisture and so placed and protected that frost cannot form or be collected upon them.

8.4 Three pressure gauges shall be provided on each automatic manifold and these should be marked to show the gas which they are to supply. Two shall indicate the pressure, one on each high pressure side of the manifold, the third shall show the supply pressure. The gauges shall be de-greased for oxygen. They shall be marked with a band in the operating range.

9. IDENTIFICATION OF PIPELINES

All medical gas pipelines should be colour coded in accordance with BS1710 as indicated in the table below. Pipelines in unoccupied areas shall be left unpainted.

However, they shall be colour coded by means of bands at regular intervals (so that identification can take place easily without having to trace the pipeline) at valves, branches and before and after passing through walls.

Identification labels are to be applied on each pipeline at regular intervals and adjacent to isolation valves. Each label shall be correctly colour coded, shall indicate the type of gas in the pipeline and shall have provision to indicate the direction of flow of the gas.

GAS	BAND 1	BAND 2	BAND 3
Oxygen	White	-	-
Nitrous Oxide	Ultramarine Blue	-	-
Vacuum	Primrose Yellow	-	-
L.P. Air	Black	White	-
H.P. Air	Black	White	Black
Scavenging	Light Orange	-	-
Entinox	White	Ultramarine Blue	

NOTE: Each band to be not less than 50mm and to be continuous around the circumference of the pipe.

10. CLEANLINESS

It is stressed that during the installation of medical gas pipelines, care is taken to ensure that dirt, oil, etc. are not allowed to enter the pipeline, valve, etc.

Pipe caps should not be removed until the pipe is to be installed and after installation open ends are to be blanked off/capped to prevent the entry of dirt, etc.

Should on site cleaning of piping, valve, etc. be necessary then the equipment to be washed with a suitable solvent, 1,1,1, methaline chloride. The residue remaining upon evaporation of the solvent shall not exceed 0,0376 g/m² of interior surface. The bore of the tubing shall be cleaned free from deleterious films and deposits.

Upon completion of the installation the entire system must be blown clean using medical grade compressed air to remove any dirt/slag etc. that is in the system.

11. ALARM SYSTEMS

11.1 General

Medical gas alarm systems shall fulfil the following two functions:

a) Routine indication that any of the medical gas supply systems has gone from normal to fail and that appropriate action should be taken.

b) Indication that there has either been a complete failure or a failure on the system is imminent.

Medical gas alarm panels (main and slave panels) shall be located in areas as indicated on the drawings.

Medical gas outlet points when surface or flush mounted should be installed at a height of approximately 1,5m above finished floor level.

11.2 Design

Medical gas alarm panels shall be designed to monitor all the piped medical gases in the hospital and must indicate when the medical gas status goes from normal to fail, as follows:

Oxygen Nitrous Oxide Manifold - Right Bank	-	Normal/Fail
and Entinox (each separately indicated)- Left Bank	-	Normal/Fail
Vacuum System -	-	Normal/Fail
Compressed Air Plant	-	Normal/Fail

The alarm panel should indicate the failure of any of the medical gas as follows:

a) When the medical gas bank is exhausted, the green light indicating normal condition is extinguished and the flashing red light indicating fail condition comes on.

b) As soon as the medical gas is exhausted and the flashing red light comes on, an audible alarm is actuated which can only be muted by pushing an accept button.

The flashing red light must continue to flash until the fault is rectified.

Should a second medical gas fail before the first gas fault is rectified, the flashing red light for second failed gas will come on and the audible buzzer will be re-activated.

The alarm panel shall include a test button so that the function of all circuits (including audible alarm) can be tested.

The equipment utilised and design of the system must be fail safe so that in the event of a damaged cable, etc., an alarm condition will be activated.

The equipment utilised must be such that preventative maintenance checks can be done without disrupting the supply of gases to the hospital.

The medical gas alarm panel shall also have the following features:

a) Mimic display of the various gases monitored complete with the correct colour codes.

b) Liquid crystal display which:

During normal condition will display that all systems are correct.

In the event of a failure (in addition to the flashing red light and audible alarm) the L.C.D. will display which gas service has failed (e.g. oxygen manifold - right bank - fail) and will instruct a responsible person what corrective action to take (e.g. phone Mr X on Ext. 117 - After Hours 888-8888).

12. SYSTEM TESTS AND COMMISSIONING

12.1 General

All manifolds, compressors, air driers, vacuum pumps, pipelines, etc. must be tested for satisfactory operation prior to handing over to the hospital authorities.

While it is the responsibility of the contractor to hand over the system in correct working order to the hospital, the final responsibility rests with the hospital to ensure that:

a) The system is leak tight

b) All plant items are monitoring the status of the medical gases correctly.

c) Adequate gas continuity tests are conducted to ensure no "crossing over" of gas pipelines has occurred with possible dire results.

d) The system in general is in a safe and good working state.

12.2 Tests Conducted Prior to the System Being Formally Handed Over.

The following tests must be carried out by the contractor and witnessed by authorised representatives of the hospital before the final hand over of the installation.

a) Pressure drop test to determine leakage in pipelines only.

b) Pressure drop test to determine leakage in the complete installation.

c) Check for satisfactory mechanical operation and non-interchangeability for each outlet point by means of test probes.

d) Continuity test (anti-confusion test) to check for any crossed pipelines which could lead to fatal consequences.

e) Check pressure, flow rate and pressure drop at each outlet unit.

f) Check satisfactory operation of manifold changeover system.

g) Check satisfactory operation of liquid oxygen, compressed air and vacuum plants and all manifolds (including emergency supply manifolds).

h) Check performance of alarm signalling system.

i) Purge the completed installation with medical air.

j) Purge the completed installation with the working gases.

If the relief valves cannot be set to protect the installation during the pressure test they should either be temporarily replaced by others which can withstand the test pressure or be blanked off.

Copies of the witnessed and signed tests are to be included in the Operating and Maintenance Manuals.

Leak testing of each complete system from point of supply (i.e. manifold) to outlet points must be conducted over a period of twenty four hours utilising a pressure recorder to monitor any loss in pressure. Suitable compensation in accordance with the gas laws must be made for temperature fluctuations during the test period.

Each pipeline system must be pressure tested to 10 bar or 1,5 times normal working pressure whichever is the greater.

Vacuum pipelines should be tested at 6 bar.

12.3 Tests of formal Handing Over of the Installation

Upon completion of the tests outlines in 13.2 and prior to the installation being commissioned and used the following tests will be conducted and be witnessed by both the contractor and hospital authorities.

a) Using a suitable oxygen gas analyser each medical gas outlet point will be checked for the identity of the gas at the outlet point. Should there be more than one gas which will register zero on the oxygen analyser, the system tests must be done by pressuring one system at a time.

b) Each outlet point will be tested for correct operation using the appropriate male probe adaptor.

c) A flow meter, pressure gauge probe assembly shall be plugged into each medical gas outlet. A flow of 30 litres per minute shall be recorded to a pressure drop not exceeding 35kPa.

A record of each medical outlet location (Room N° etc.) and the result of the above tests will be made and witnessed upon the completion of the tests.

The original is to be retained by the Hospital Administrator and copies are to be included in the Operating and Maintenance Manuals.

Contractors will provide at least two copies of detailed Operation and Maintenance Manuals as further specified.
The contractor will be responsible for instructing the responsible person from the hospital in the correct operation and maintenance of the medical gas installation.

13. OPERATING AND MAINTENANCE MANUALS

The contractor shall provide three copies of the Operating and Maintenance Manuals of the system upon completion of the medical gas installation.

The O & M Manuals must include:

13.1 Description of the System/s

13.2 Equipment Data:

Manufacture and Address
Model Numbers
Size and Rating
Spares - list of spares and supplier's name and address

13.3 Operating Procedures:

Start and Stop Procedures
Abnormal and Emergency Operating Procedures
Adjustment and Regulations
Safety Devices and Settings

13.4 Maintenance:

Routine Maintenance Schedules
Maintenance Procedures and Check Lists

13.5 Drawings:

Complete set of "as installed" drawings and "as built" wiring diagrams.

13.5.1 Copies of Test and Commissioning Data

14. OXYGEN SUPPLIES

Oxygen shall be provided by means of 2 x bottle rack including all fittings and accessories as indicated on the drawings and specification herein. The number of bottles per rack will be as detailed in Part V of this specification.

The system shall be arranged to operate as duty and standby and shall be installed in the position indicated.

Although materials and equipment to be utilised in medical gas installations are covered further in this specification, it must be stressed that all equipment used in medical oxygen systems is degreased for oxygen service, using only approved materials and procedures and must be clearly marked: *OXYGEN SERVICE - DO NOT OIL*.

15. NITROUS OXIDE SUPPLY

Nitrous oxide shall be provided by means of 2 x bottle racks including all fittings and accessories as indicated on the drawings and specified herein. The number of bottles per rack will be as detailed in Part V of this specification.

The system shall be arranged to operate as duty and standby, and shall be installed in the position indicated on the drawing.

16. COMPRESSED AIR SUPPLIES

Two compressed air supplies are required as follows:

1) 700 kPa supply to theatres for pneumatic tools (Designated HA).

2) 400 kPa supply to all areas as indicated (Designated LA).

The medical air compressors supply system shall consist of the following:

1) Two identical compressors each rates at 75% of the design maximum flow at normal operating pressures.

   The compressors should be controlled so that the standby compressor will cut in when the lead compressor cannot satisfy the demand.

2) Two after coolers - one for each of the compressors.

3) Two air dryers, each air dryer sized to cope with the output of both compressors running simultaneously.

4) Two full sets of filters in parallel so that one set of filters can be maintained or repairs without interrupting of restricting the supply of air to the hospital.

5) Each set of filters will be able to handle the output of both compressors running simultaneously.

6) A suitable sized air receiver to provide "storage" of air to help limit the number of starts and stops of the compressors.

16.1 Air Compressors

Medical compressed air should not contain oil or oil vapours in excess of the limits specified and should be dust free and dry. Compressors may be of an approved oil lubricated type, carbon ring or water sealed type provided that the appropriate eliminators are provided for oil droplets, oil mist, water droplets and solids as indicated before.

P.T.F.E. ring compressors should not be used because of the risk of the production of offensive and toxic gases of the rings become overheated.

Oil lubricated compressors include screw type, reciprocating and Rotary vane machines.

16.2 After Coolers

After coolers shall be provided and may be air cooled or water cooled. The temperature of the compressed air leaving the after coolers should be approximately 8°C to 15°C above that of the cooling medium, and about 35°C to 40°C in summer.

Each after cooler should be fitted with an automatic drain trap. The auto-drain should be lead via a tun-dish to the nearest drain point.

16.3 Air Receivers

The receiver shall be of welded construction with dished ends, tested and stamped by an Independent Inspection Authority in terms of the most recent Machinery and Occupational Safety Act (1983). It shall be fitted with a safety valve set at a pressure 10% above the cut-out pressure of the compressors and a 75mm diameter dial pressure gauge with gauge cock. The maximum working pressure shall be marked in red.

The receiver shall be galvanised internally and externally. The tank shall be painted with a suitable metal primer undercoat and final enamel coat. The pipe connections to the receiver shall be resilient to absorb vibration.

The receiver shall be fitted with an automatic drain which is piped to a suitable drain point.

16.4 Air Dryers

The system shall be provided with air dryers of the refrigerated type.

16.5 Air Filtration

It is important for all the reasons stated in the previous sub-sections that the quality of air at the point of use is at the highest level possible. Filtration of the air is therefore vital to remove:

* Moisture
* Solids
* Oil and oil vapour

To achieve medically pure air from an air compressor supply three stages of filtration shall be utilised:

"*COARSE FILTRATION"*

This involves the use of a suitable bulk coalescing filter complete with auto drain and relief valve to remove bulk solids and liquids down to 1 micron. (Domnick Hunter grade A0 filter.)

"*FINE FILTRATION"*

A final stage coalescing filter capable of removing particles down to 0,1 micron complete with autodrain and relief valve must be used. (Domnick Hunter grade AA filter.)

"*OIL ABSORPTION FILTRATION*"

It is advised on all compressor installations (even if oil free machines are used) oil vapour removal filters are installed to remove any oil vapour carry-over. These filters filter down to 0,1 micron. (Domnick Hunter grade AC filter.)

It is important that the compressed air filter elements are replaced on a routine basis to prevent the element becoming clogged, thereby causing a pressure and flow drop, or carry-over of contaminations.

A differential pressure gauge (or a suitable pressure gauge system to determine pressure drop shall be fitted across each filter.

16.6 Air Pressure Regulators

The air compressor supply system shall supply both high pressure and breathing air to the hospital.

The main air supply pipeline will divide in the plant room with regulators to reduce to the correct pressures in the respective pipelines.

It is important that the regulators are:

a) Adjustable within the desired pressure range.

b) Sized to ensure minimum and constant pressure drop across the regulator.

c) Constructed from materials suitable for medical air systems - i.e. diaphragms, seats, etc. will not release any toxic substances.

d) Sized to ensure minimum restriction occurs across the regulator.

e) Cleaned as for oxygen - this is to prevent contamination of the pipeline by any residual oil from manufacture.

A safety valve shall be fitted down stream of the low pressure regulators to protect (in the event of regulator failure) breathing apparatus, cuffs, etc.

The safety valve must be set to lift at a pressure of approximately 5.5 bar. It shall be sized to handle the full flow upstream of the regulator. The discharge pipe shall be vented to a safe area and the end of the pipe turned downstream to prevent the ingress of dirt and moisture.

16.7 Control System

The control system of an air compressor supply system must include/provide/perform the following:

a) Control the two compressors so that one compressor is duty compressor and the other compressor is standby.

b) When the duty compressor cannot cope with the demand the standby compressor will cut in.

c) Provide for auto/manual/off control of the:

- Compressors
- Air Dryers

d) Provide ammeters for each compressor.

e) Provide hour run-meters for each compressor and air drier.

f) Have indication for run and trip conditions for compressors and air dryers.

g) Emergency stop button.

h) Have a timer to automatically alternate the duty and standby compressors and air dryers on a weekly/monthly basis.

i) Provide the necessary inputs to the medical gas alarm system.

The electricity supply to the compressors and air dryers shall be taken from an "essential" circuit on a standby supply.

17. VACUUM SYSTEM

17.1 General Design

The medical vacuum system shall be designed to maintain a vacuum of approximately 400mmHg below a standard atmospheric pressure of 760mmHg (i.e. an absolute pressure of approximately 360mmHg) in the pipeline at the most remote outlet points. The system shall be as indicated.

17.2 Vacuum Pumps

The vacuum system shall be operated by at least two identical pumps. Each pump shall have a capacity equal to 75% of the total design flow. This capacity will usually result in one pump being adequate to meet the demand actually arising at any one time. Each pump should be designed for continuous operation at this load.

17.3 Vacuum Receiver

A vacuum receiver should be provided to provide "storage", so that the duty pump does not run continuously on light loads. Typically vacuum pumps shall run continuously when the load is in the range of about 25% to full load. The receiver should be designed to comply with the latest requirements of the Machinery and Occupational Safety Act (1983).

The receiver capacity shall be sufficient to ensure that the number of stop/start cycles does not exceed 10 per hour (or the maximum number of start/stops specified for the pumps).

17.4 Bacterial Filters

Filters shall be provided in parallel between the vacuum bottle trap and the receiver. The arrangement and capacity of the filters shall be such that one filter may be serviced without interrupting or restricting the vacuum service as a whole. The filters shall have a penetration not exceeding 0,05% when tested by the sodium flame test in accordance with B.S. 3928. Proper arrangements shall be made for safety when changing the filters.

17.5 Control System

The control system of a vacuum supply system shall include/provide/perform the following:

a) Control the two vacuum pumps so that one pump is the duty pump and other pump is standby.

b) When the duty pump cannot cope with the demand the standby pump will cut in.

c) Provide for auto/manual/off control of the vacuum pumps.

d) Provide ammeters for each vacuum pump.

e) Provide hour run-meters for each vacuum pump.

f) Have indication for run and trip conditions for each vacuum pump.

g) Emergency stop button.

h) Have a timer to automatically alternate the duty and standby vacuum pumps on a weekly/monthly basis.

i) Provide the necessary inputs tot he medical gas alarm system.

The electricity supply to the vacuum pumps shall be taken from an "essential" circuit on a standby supply.

18. MEDICAL GAS BEDHEAD PENDANTS

Medical Gas Bedhead and Pendants are supplied by others with cut out for gas points and outlets. The contractor shall supply and install the terminating point including outlet points to the bedhead or pendant units.

19. SCOPE OF WORK

19.1 The sub contractor shall provide a safe, complete and fully functional medical gases installation and shall conform to the following:

19.2 SABS 0224 medical gas pipelines systems.

19.3 Occupational Health and Safety Act (Act No. 85 of 1993) as amended.

19.4 Standard Specification for Electrical Installations pertaining to mechanical equipment.

19.5 SABS 099-1974 The Construction of Air Receivers.

19.6 SABS 1453-1988 Copper tubes for Medical Gas and Vacuum Systems.

19.7 SABS 763-1977 Hot-dip (galvanised) zinc coatings.

19.8 SABS 1062-1985 Vacuum & Pressure Gauges.

19.9 SABS 1409-1986 Outlet Sockets and Probes for Medical Services used in Hospitals.

19.10 SABS 0142 Wiring of Premises.

19.11 CKS 64-1967 Compressed Air for Breathing.

19.12 CKS 605-1987 Medical Gas Regulators.

19.13 R158 Regulations - Hospital Norms.

PART V

DETAILED SPECIFICATION

FOR THE ICU WARD

MEDICAL GAS INSTALLATION

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5.2 SCOPE OF WORK

5.2.1 The Subcontract, as detailed in these specification documents and the accompanying drawings, comprises the manufacture, supply, transport and delivery to site, offloading, hoisting, installation, testing, setting into operation, leaving in complete working order, guarantee and the maintenance of the entire Medical Gas plant and the provision of all labour, materials, Subcontractor's equipment and everything, whether of a temporary or permanent nature required in and for such manufacture, supply, transport and delivery to site, offloading, hoisting, installation, testing, setting into operation, leaving in complete working order, guarantee and maintenance, so far as the necessity for providing the same is specified in or reasonably to be inferred from the contract. This should be read in conjunction with the **Standard Quality Specification for Medical Gas and Vacuum Installations**.

5.2.2 No building work shall be included in the subcontract and all such work, as later herein specified as being specifically excluded from this contract, shall be carried out by others in accordance with the drawings and details provided by the Engineer or the contractor as applicable and approved.

5.3 PROGRAMME

5.3.1 The programme for the works shall be agreed with the Principal Contractor.

5.3.2 The entire installation is to be complete commissioned, tested and taken over by the Engineers before the completion date. The price is to include for all overtime and weekend work required to meet the programme dates.

5.3.3 The Subcontractor shall be required immediately after acceptance of his tender to liase with the main contractor to develop the programme of his works and to draw up the programme.

5.3.4 Such programme shall show the times for the preparation of drawings, ordering and delivery times promised by the suppliers for each major item of plant, manufactured items, installation times and the programmed dates for testing and commissioning the plant.

5.4 DRAWINGS

5.4.1 Tender Drawings

The drawings accompanying this specification, as numbered below, shall be deemed to indicate the general layout and requirements only and are not shop drawings.

The Engineer shall provide the Subcontractor, free of charge, with three sets of specification documents, to include all tender drawings.

5.4.2 Architectural and Structural Drawings

The Subcontractor shall ensure that he is in possession of all information required for the installation of the Works and shall, if necessary, obtain copies of all relevant drawings from the Client.

5.4.3 Builder's Work Drawings

All Builder's work and work to be carried out by others in accordance with the specification to be provided by the sub contractor. The Subcontractor shall provide such drawings as may be necessary to suit the plant offered by him, and accepted by the

Engineer, and shall submit to the Engineer in duplicate any revisions which shall be made to such drawings.

Such builder's work drawings shall indicate the location and extent of all foundations, bases, openings, timber frames and all other builder's work and the capacities and/or dimensions of all electrical and water supply points, the method of terminating such supplies and the position of the connection points, the position and dimensions for all water drainage connections and any other work to be provided by others for the works, as detailed in these specifications.

The drawings shall be drawn to scale and in sufficient detail to enable the Contractor to execute the work without any misunderstanding.

Within a reasonable period after receiving such drawings, the Engineer shall signify his approval, or otherwise, and one signed copy o each approved drawing shall be returned to the Subcontractor.

When approved, the following number of copies of each such drawing shall be delivered to the following:

Architect:	1 Paper Print
Consulting Engineer:	2 Paper Prints + AutoCAD disk
Contractor:	3 Paper Prints

5.4.4 **Shop Drawings**

The Subcontractor shall submit to the Engineer, for approval, duplicate copies of all shop drawings as required for the manufacture and installation of the works or as the Engineer may reasonably require.

All shop drawings for work outside of plant rooms shall be drawn to a scale of not smaller than one in fifty and all drawings of work within plant rooms shall be drawn to a scale of not smaller than one in twenty-five. All details shall be drawn to a scale to show the detail required.

Within a reasonable period after receiving such drawings, the Engineer shall signify his approval, or otherwise, in writing and one signed copy of each approved drawing shall be returned to the Subcontractor.

The Subcontractor shall not, unless otherwise directed by the Engineer, in writing, commence with any work prior to the approval of the relative shop drawings. Work installed prior to the approval of shop drawings shall be liable to rejection by the Engineer and removal and/or replacement by the Subcontractor, at his cost, if it is considered by the Engineer to deviate from the Specification.

The Subcontractor shall also supply additional copies of all approved drawings in accordance with the requirements of Clause 4.46 of Part IV (Operating and Maintenance Instructions) of the Specifications.

Drawings approved as above described shall not be departed from except as authorised by the Engineer.

The Engineer shall have the right at all reasonable times, to inspect at the factory of the Contractor, all drawings of any portion of the Works.

5.4.5 Mistakes in Drawings

Any expense resulting from an error or omission in or from delay in delivery of the shop drawings, shall be borne by the Subcontractor.

The Subcontractor shall be responsible for any discrepancies, errors or omissions in the drawings and other particulars supplied by him whether such drawings and particulars have been approved by the Engineer or not, provided that such discrepancies, errors or omissions are not due to inaccurate information or particulars furnished in writing to the Subcontractor by the Engineer or Architect. The Employer shall be responsible for drawings and information supplied in writing by the Engineer or Architect and for the details of special work specified by either of them.

5.4.6 Schedule of Drawings

Drawing Nº	Description
M4-501	ICU Ward – Medical Gas First Floor

5.5 GENERAL DESCRIPTION OF WORK

This is an existing hospital located in the North West Region in Rustenburg. The building lies between Heystek Street, Nelson Mandela drive and Kloof Street. The Works consist of a refurbishing an existing building into an ICU Ward.

5.6 MEDICAL OXYGEN INSTALLATION

5.6.1 Plant Room

Supply to the ICU shall be from an existing Medical gases plant

A bank of two cylinders shall be provided for duty and a further bank of two cylinders shall be provided for changeover. An automatic shuttle assembly with manual bypass shall be provided between the cylinder banks. Racking for spare cylinders shall also be provided. The complete oxygen manifold and automatic shuttle assembly shall be manufactured off site by a reputable company. (e.g. Crubia Engineering)

5.6.2 Distribution Pipe work

From the plant room medical oxygen shall be piped to the areas as indicated on the drawings

5.6.3 Zone Shut off Valves

Isolation valves for oxygen supply shall be provided to isolate the various areas as indicated on the drawings.

Termination for extensions shall be valved and plugged.

5.7 MEDICAL VACUUM INSTALLATION

5.7.1 Plant Room

The ICU medical vacuum shall be from an existing plant provided in accordance with SABS 0224

5.7.2 Distribution Pipe work

Vacuum shall be distributed to the various areas as indicated on the drawings.

5.7.3 Zone Shut off Valves

Isolation valves for medical vacuum shall be provided on vacuum bottle traps
Termination for extensions shall be valved and plugged.

5.8 MEDICAL COMPRESSED AIR INSTALLATIONS

5.8.1 Plant Room

The medical compressed air plant for the ICU Ward shall be provided from existing medical gas plant in accordance with SABS 0224

.

5.8.2 Distribution Pipe work

From the plant room low pressure medical compressed air shall be piped to outlets as indicated on the drawings

5.8.3 Zone Shut off Valves

Zone shut off valves for low pressure shall be provided for each high care ward.

The location of the zone shut off valves shall be as indicated on the drawings.

High pressure air shall be delivered to the Theatres from where it shall be reduced to provide the low pressure air to the outlets.

5.9 VALVE BOXES

All valve boxes shall be suprack type with solid hinged doors. Overall height shall be 340mm over wall flange, 240mm high door and 210mm high clear opening. The flanged cover and door shall be in G.M.S. with white powder coated epoxy finish. The back box shall be in hot dipped galvanised mild steel for building into brickwork.

The width of the valve box shall allow sufficient space for the number of zone shut off valves installed. A sample of the recessed valve box shall be delivered to site for approval.

5.10 VACUUM TRAPS

Each medical vacuum trap shall comprise of removable 4.5ℓ glass bottle (clamped for ease of withdrawal) and provided with a multi-port valve or according to drawing no. MM 1105/000 - 401. A sample trap shall be submitted to site for approval.

5.11 ALARM PANELS

One master alarm panel shall be provided in the gas cylinder storage room. One slave panel shall be provided at the nurse call station/s.
The following will be monitored:

O_2 Manifold	Left bank	normal/fail
	Right bank	normal/fail
N_2O Manifold	Left bank	normal/fail
	Right bank	normal/fail
Vacuum Plant		normal/fail
Compressed Air Plant		normal/fail

The complete wiring and conduiting for the medical gases installations shall be carried out by the medical gas contractor.

5.12 MEDICAL GAS OUTLETS

Medical gas outlets shall be Heyer type provided to SABS 0224, HTM 22 and SABS 1409.

Outlets shall be cleaned, degreased and delivered to site in individual sealed plastic bags.

The quantity of medical gas outlets is as per Bill of Quantities.

The medical gas points shall be supplied and fitted into Bedhead Trunking Units by the sub contractor.

MEDICAL BED HEAD UNITS
The medical bed Head units shall be Hutz or equally approved Fixed Pendant type complete with 1 x pillar assembly and of the type as per drawing M4-501 Rev TD

5.13 BUILDERS WORK ITEMS

The following work shall be carried out free of charge to the Medical Gasses Contractor.

- Provision of openings in walls, floors and roof during initial building construction only.
- The casting and forming of plinths or upstands required for the mounting of items of plant i.e. compressors and vacuum pumps.
- Self-cleaning waterproof floors below plant where required.
- Building in of pipe sleeves and steel frames (provided by the medical gas sub-contractor) for the passage of pipes.
- Building in of medical gas isolation valves boxes (provided by the medical gas sub-contractor).
- Painting of walls and ceiling in the plant rooms.

5.14 ELECTRICAL CONTRACTORS ITEMS

The following work shall be carried out free of charge to the medical gases contractor:

- Supply of the required 3 phase 380V 50Hz electrical supplies to the control panels for the vacuum pumps and air compressors in the plant room.
- Supply of the required 3 phase 380V 50Hz electrical supplied to isolators adjacent to the control panel of the following equipment:

a) Oxygen manifold room
b) Main control panel.

All electrical supplies to medical gas isolators to be on emergency standby power.

5.15 FACILITIES PROVIDED TO THE MEDICAL GASES CONTRACTOR

An area on site for storage and site office.
The use of mess rooms, latrines, health and welfare facilities where so provided.
Use of scaffolding free of charge where such scaffolding can be used by the main contractor and other sub-contractors.
Provision of all power, fuel and water required for installation and testing.

5.19 CO-ORDINATION WITH THE STRUCTURE AND LIASION WITH OTHER SERVICES CONTRACTORS

The contractor shall ensure that all openings and sleeves required through the structure are provided for the internal medical gas installation. Where the location of equipment or fixture outlets or connections are in conflict with structural elements the contractor shall be responsible for the co-ordination and liaison with the engineer and the architect to ensure that conflicts are resolved in the most acceptable manner to the architects and structural engineers' requirements.

The contractor shall be mindful of all elements of the services and structural design from the time his initial involvement with the project and services drawings and architects drawing shall be examined from any possible conflicts.

The entire installation shall be carried out by the contractor bearing in mind the relationship between his work and the work to be carried out by other services subcontractors. Generally, drainage services and air conditioning duct routing shall take precedent over the other mechanical services with regard to co-ordination in the vertical plane.

Where pipe work may be run on common gang hangers the services shall be co-ordinated to avoid duplication of fixings. The contractor shall be responsible for liaison with all other services contractors to ensure that conflicts and misunderstandings are avoided and brought to the attention of the engineer immediately and in time to avoid interference with the programme of the works.

5.20 BUILDING EXPANSION JOINTS

Piping shall not pass through building expansion joints or at points subject to settlement unless proper pipe expansion joints have been provided.

5.21 HANGERS AND SUPPORTS

All hangers and supports shall be hot dipped galvanised and to BS.3974 and shall be manufactured by "Mupro", "O" line, "Unistrut" or "Flamco" or approved equal. All pipe clamps shall be "Mupro" rubber lined.

Fixings to the underside of post tension concrete slabs shall be carried out in locations to avoid the steel tension cables in the slab. The contractor shall obtain the approval of the main building contractor before fixings in each area are carried out.

5.22 MEDICAL GAS MATERIAL

All droppers and underground piping must be medical grade annealed copper piping according to SABS 1453. All other piping must be medical grade hard tempered copper piping, supplied in straight lengths, and must comply with SABS 1453. Branch off piping may be in the " half-hard" condition to facilitate the bending.

5.22.1 PIPES AND FITTINGS

The sizes for main runs and branch lines are indicated on the main drawings. Droppers may be no less than 10mm for pressurised medical gases and 12mm for vacuum. No horizontal supplies to vacuum droppers may be less than 15mm.

5.22.2 PIPE SLEEVES

Pipes running through walls and floor slabs shall be provided with split PVC sleeves. The diameter of each sleeve shall be provided to suit the pipe size. Oversized sleeves shall be rejected. Spaces between pips and sleeves shall be packed with approved rope and sealed where required.

In certain cases the provision of thermaflex insulation over final pipe finish may be permitted by the engineer in lieu of a sleeve.

5.23 NOISE

The noise level in and hospital rooms shall be NC35 maximum. The air compressors and vacuum pumps shall be enclosed in the manufacturers or the manufacturer's recommended attenuation housing

The sub-contractor shall allow all costs for achieving the required NC rating.

5.24 GUARANTEE

The medical contractor shall guarantee the materials apparatus and workmanship of his installation for a period of 12 months. The guarantee must be valid for a period starting on the date of handover by the medical gas contractor of the complete installation to the owner and is accepted by the engineer as complete and in working order.

The contractor shall cede to the proprietor the remainder of any equipment guarantees which he received from his suppliers and which extends beyond the periods of guarantee stated herein.

5.25 MAINTENANCE FOR THE MEDICAL GASSES INSTALLATION

5.25.1 General

The contractor shall be responsible for carrying out four full maintenance services on the medical gases' installation after handover and acceptance of the installation.

The contractor shall prepare a detailed inspection service report sheet showing the functions to be carried out and the intervals between such functions to enable records of servicing to be maintained.

This sheet shall have spaces for signature of both the contractor's serviceman and the hospital to verify that maintenance duties have been carried out.

The service is to be undertaken in the presence of a representative of the client hospital staff.

5.25.2 Call Outs

During the maintenance period of 12 months, the contractor shall respond immediately to Client or tenants requests for emergency service. All repair work required is to be carried out by contractor without delay.

5.25.3 End of Maintenance Period

At the end of the maintenance period the contractor shall provide the engineer with signed record copies of the maintenance inspection. The contractor shall also provide to the engineer confirmation form the client that the entire installation is in proper working order on the last day of maintenance.

5.26 TESTING

The medical gas contractor, after the complete installation and testing of the medical gas plant, pipeworks and outlet points, shall together with the designated hospital representative and engineer, test all vacuum, oxygen and low-pressure air outlet points. A Medical Gas Certificate shall be issued to certify the installation for every individual outlet in every unit / room / ward in the Hospital.

5.26.1 PIPING AND MEDICAL GAS OUTLET POINTS

Carry out all tests in accordance with SABS 0224. Test all piping to 1050kPa. There must be no pressure within 24hours after connecting the test equipment for the gas and compressed air installations.

Provide a chart recording for each gas tested. Make use of a 24-hour pressure drop recorder.

Confirm the gas type at each outlet by using an oxygen analyser to distinguish different gases.

5.26.2 MANIFOLD TEST

Bring both sides of the manifold to full operating pressure with only the low-pressure outlet valves closed and all gas bottles connected. Close all cylinder valves tightly. There must be no drop in pressure indicated on the high-pressure gauge after a period of 24 hours.

5.27 OPERATION

The medical gas service / part or whole of the installation shall not be put to operation without a Medical Gas Certificate issued by the contractor and duly signed by authorised hospital personnel and issued to the consultants and architects.

5.28 **SCHEDULE OF RATES FOR VARIATIONS**

A schedule of rates for all medical gases, material and labour shall be agreed with the engineer before the contract is awarded.

The priced Bill of Quantities shall be used as the basis for the schedule of rates to be agreed with the engineer.

5.29 **SCHEDULE OF INFORMATION**

Tenderer is to submit details of equipment offered. Acceptance of the tender does not imply acceptance of the equipment offered which shall be supplied in full compliance of the specification.

5.29.1 AIR COMPRESSORS

Manufacturer _____

Model _____

Type _____

Capacity each _____

kW Rating _____

O/A Dimensions _____

DB Rating _____

DB Rating after attenuation housing _____

Country of Origin _____

5.29.2 AIR DRYERS

Manufacturer _____

Model _____

Type _____

Capacity _____

kW Rating _____

O/A Dimensions _____

Country of Origin _____

5.29.3 PRE-FILTERS 1 MICRON

Manufacturer _____

Model _____

Type _____

Capacity _____

Nominal Parameter _____

O/A Dimensions _____

Country of Origin _____

5.29.4 COALESCING FILTERS 0.003 MICRON

Manufacturer _____

Model _____

Type _____

Capacity _____

Nominal Diameter _____

O/A Dimensions _____

Country of Origin _____

5.29.5 ODOUR REMOVAL FILTERS (ACTIVATED CHARCOAL)

Manufacturer _____

Model _____

Type _____

Capacity _____

Nominal Diameter _____

O/A Dimensions _____

Country of Origin _____

5.29.6 LINE PRESSURE REGULATORS LPA

Manufacturer _____

Model _____

Type _____

Capacity _____

Nominal Diameter _____

O/A Dimensions _____

Country of Origin _____

5.29.7 LINE PRESSURE REGULATORS HPA

Manufacturer _____

Model _____

Type _____

Capacity _____

Nominal Diameter _____

O/A Dimensions _____

Country of Origin _____

5.29.8 INTERFACE PANEL (AIR COMPRESSORS)

Manufacturer _____

Model _____

Type _____

O/A Dimensions _____

Country of Origin _____

5.29.9 FLEXIBLE PIPE CONNECTIONS (AIR COMPRESSORS)

Manufacturer _____

Type _____

Nominal Diameter _____

Country of Origin _____

5.29.10 ANTI VIBRATION MOUNTING (AIR COMPRESSORS)

Manufacturer _____

Type _____

Nominal Diameter _____

Country of Origin _____

5.29.11 AIR RECEIVER

Manufacturer _____

Material of Construction _____

Finish _____

Construction Standard _____

Test Pressure _____

O/A Dimensions _____

Country of Origin _____

5.29.12 VACUUM PUMPS

Manufacturer _____

Model _____

Type _____

Capacity each _____

kW Rating _____

O/A Dimensions _____

DB Rating _____

DB Rating after attenuation housing _____

Country of Origin _____

5.29.13 VACUUM RESERVOIR

Manufacturer _____

Material of Construction _____

Finish _____

Construction Standard _____

Test Pressure _____

O/A Dimensions _____

Country of Origin _____

5.29.14 BACTERIAL FILTERS

Manufacturer _____

Model _____

Type _____

Capacity _____

O/A Dimensions _____

Country of Origin _____

5.29.15 INTERFACE PANEL (VACUUM PUMPS)

Manufacturer _____

Model _____

Type _____

O/A Dimensions _____

Country of Origin _____

5.29.16 CYLINDER MANIFOLDS & AUTO CHANGE OVER EQUIPMENT

Manufacturer _____

5.29.17 PRESSURE GUAGES

Manufacturer _____

Range _____

Dimensions _____

Country of Origin _____

5.29. 18 LOW PRESSURE GAS FILTERS

Manufacturer _____

Duty / Mesh size _____

Type/Model _____

Country of Origin _____

5.29.19 AUTOMATIC CHANGE OVER DEVICE

Manufacturer _____

Material of Construction _____

Country of Origin _____

5.29.20 PRESSURE RELIEF VALVE

Manufacturer _____

Model _____

Material of Construction _____

Type _____

Country of Origin _____

5.29.21 MAIN GAS ALARM PANEL (& SLAVES)

Manufacturer _____

Gases Monitored _____

Material of Construction _____

Finish _____

O/A Dimensions _____

Country of Origin _____

5.29.22 LOCAL GAS ALARM PANEL

Manufacturer _____

Material of Construction _____

Finish _____

O/A Dimensions _____

5.29.23 PRESSURE SWITCHES FOR ALARMS

Manufacturer _____

Model _____

Type _____

Material of Construction _____

5.29.24 SERVICE OUTLET VALVES
O2, Vac & LPA

Manufacturer _____

Standard _____

Material of Construction _____

Country of Origin _____

5.29.25 ISOLATING VALVES (GAS)

Manufacturer _____

Model / Type _____

Material of Construction _____

Country of Origin _____

5.29.26 ISOLATING VALVES (VACUUM)

Manufacturer _____

Model /Type _____

Material of Construction _____

Country of Origin _____

5.29.27 VALVE BOXES

Manufacturer _____

Material of Construction _____

Finish _____

Country of Origin _____

5.29.29 COPPER TUBE

Manufacturer _____

Specification _____

Country of Origin _____

5.29.30	COPPER FITTINGS	
	Manufacturer	_____
	Specification	_____
	Country of Origin	_____
5.29.31	SOLDER	
	Manufacturer	_____
	Specification	_____
	Country of Origin	_____
5.29.32	FLUX	
	Manufacturer	_____
	Specification	_____
	Country of Origin	_____
5.29.33	HANGERS & PIPE CLAMPS	
	Manufacturer	_____
	Material of Construction	_____
	Type / Model	_____
	Country of Origin	_____



FLOOR LAYOUT PLAN
Scale 1 : 100

GENERAL NOTES

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-ALL SPECIFIED MATERIALS TO BE IN STRICT ACCORDANCE WITH THEIR RESPECTIVE MANUFACTURERS SPECIFICATIONS AND GUIDLINES
-SHOP DRAWINGS TO BE SUBMITTED TO ARCHITECTS FOR APPROVAL BEFORE ANY SPECIALIST MANUFACTURE OR INSTALLATION CAN COMMENCE-INCLUDING ALL JOINERY.
-EXPANSION JOINTS, CONSTRUCTION JOINTS AND SETTING OUT ALL IN STRICT ACCORDANCE WITH THE STRUCTURAL ENGINEERS SPECIFICATIONS AND DETAILS
-SEQUENCE AND PROGRAM OF INSTALLATIONS TO BE SUBMITTED TO ARCHITECT FOR COMMENT
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ISSUED FOR TENDER

LEGEND TO FINISHES

Finish of Ceiling — C
Finish of Floor — F
Finish of Wall — R
Finish of Skirting — S

REFER TO THE FINISHES SCHEDULE PROVIDED ON SEPARATE BOOKLET

Rev	Date	Description

DEPARTMENT OF HEALTH

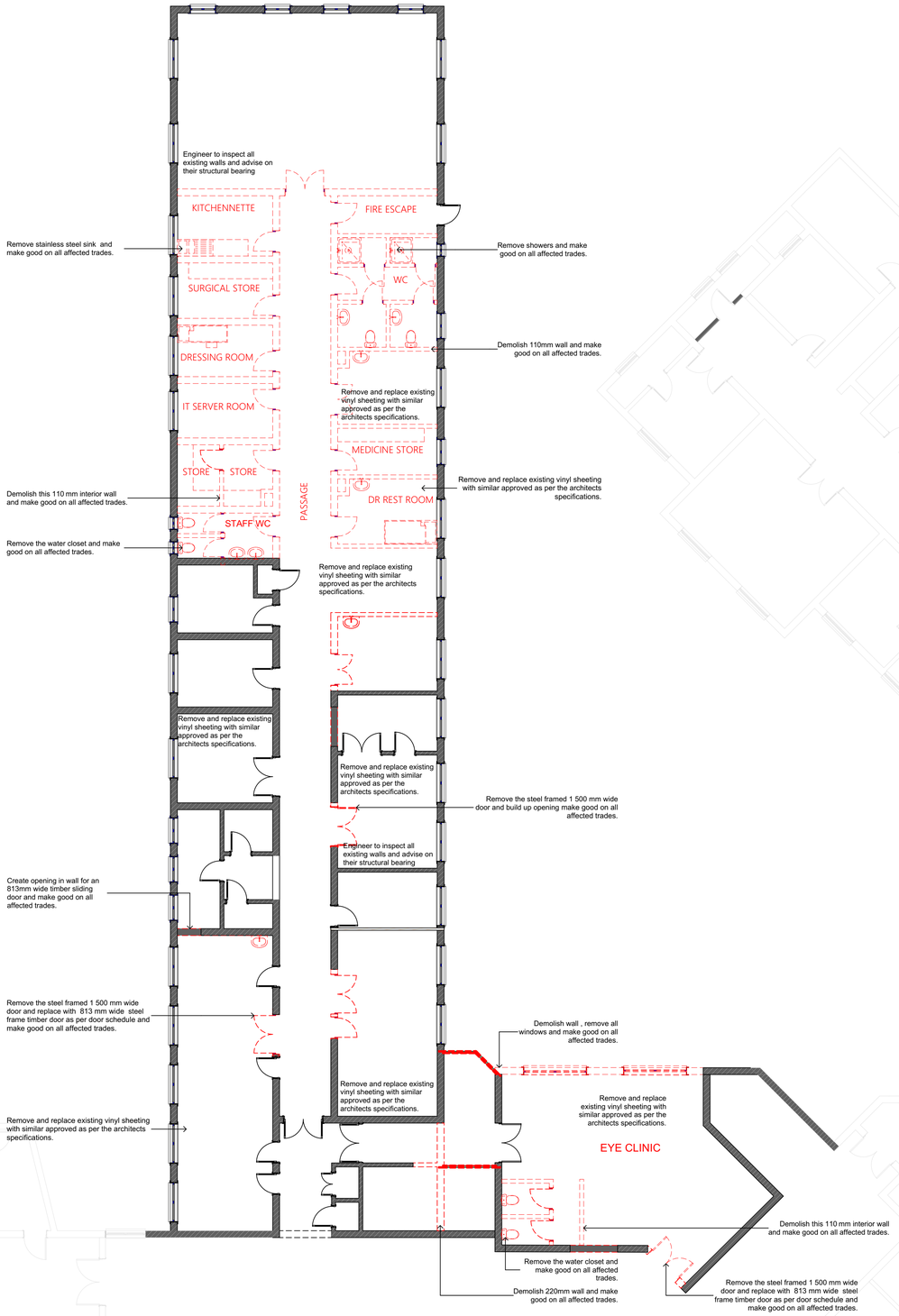
Project:
PROPOSED NEW MATERNITY WARD AND UPGRADES AT JST HOSPITAL, RUSTENBURG

Master plan reference:

Drawing:
CONVERSION OF WARD 13 INTO ICU-FPLN

Status:
STAGE 2

Drawn by :		
Designed by :		
Checked by :		Drawing No. :
signature		ICU-A 1002
Scale:		Revision No.
Date:	MARCH 2026	
Project No:		Paper Size: A1



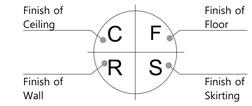
DEMOLITION LAYOUT PLAN
Scale 1 : 100

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ISSUED FOR TENDER

LEGEND TO FINISHES



REFER TO THE FINISHES SCHEDULE PROVIDED ON SEPARATE BOOKLET

Rev	Date	Description

DEPARTMENT OF HEALTH

Project:
PROPOSED NEW MATERNITY WARD AND UPGRADES AT JST HOSPITAL, RUSTENBURG

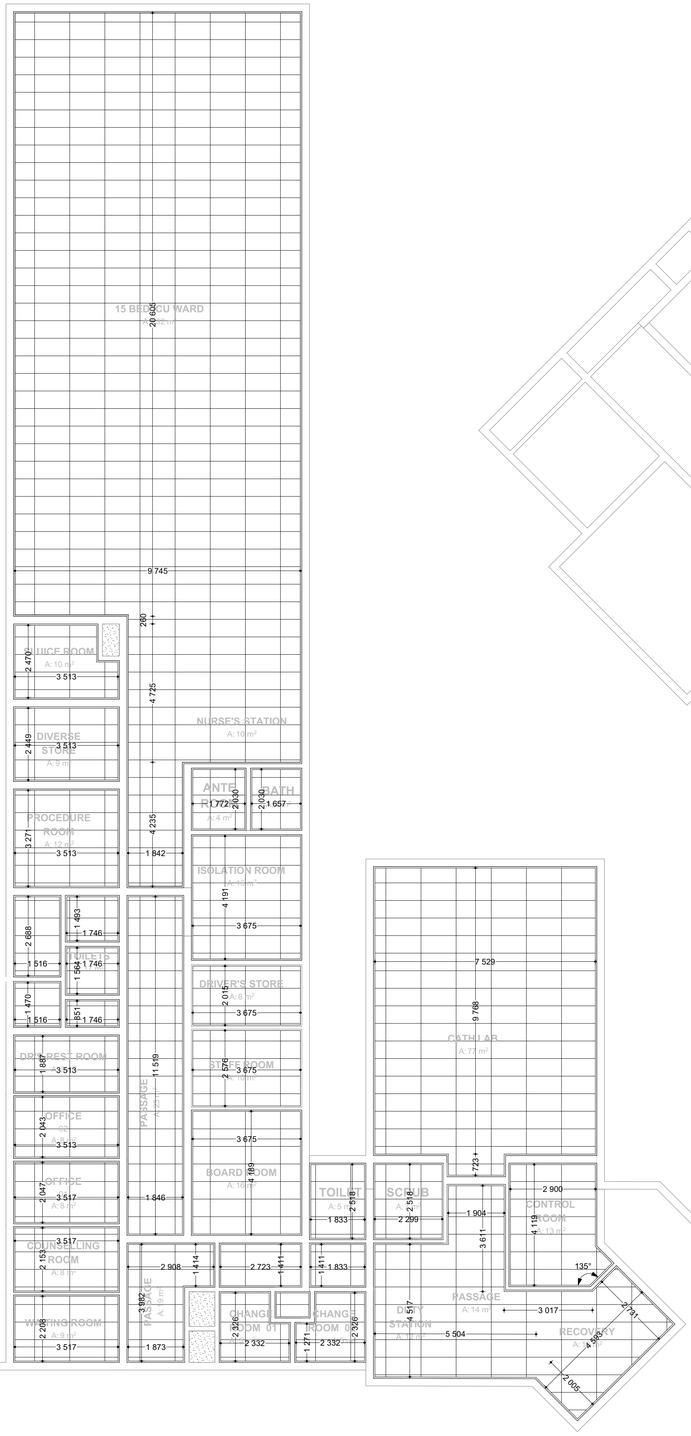
Master plan reference:

Drawing:
CONVERSION OF WARD 13 INTO ICU-FPLN

Status:
STAGE 2

Drawn by :		
Designed by :		
Checked by : signature		Drawing No. : **ICU- A- 1003**
Scale:		Revision No.
Date:	MARCH 2026	
Project No:		Paper Size: A1

	C1 PATENT ACOUSTIC CEILING PANELS
	600mm x 1200mm x 15mm thick mineral fibre acoustic ceiling tiles to comply with SABS 803 or later revision laid in tee fixing on appropriate pre-painted 24mm T-grid suspension system, including all necessary accessories and installed in strict compliance to manufacturer's specifications.
	1200 x 600 x12 mm Nutec fibre cement ceiling board



CEILING LAYOUT PLAN
Scale 1 : 100

GENERAL NOTES

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ISSUED FOR TENDER

LEGEND TO FINISHES

Finish of Ceiling — C
Finish of Floor — F
Finish of Wall — R
Finish of Skirting — S

REFER TO THE FINISHES SCHEDULE PROVIDED ON SEPARATE BOOKLET

Rev	Date	Description

DEPARTMENT OF HEALTH

Project:
PROPOSED NEW MATERNITY WARD AND UPGRADES AT JST HOSPITAL, RUSTENBURG

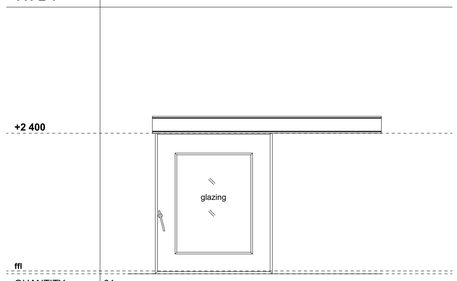
Master plan reference:

Drawing:
CONVERSION OF WARD 13 INTO ICU-FPLN

Status:
STAGE 2

Drawn by :			
Designed by :			
Checked by :		Drawing No. :	
signature		ICU- A 1004 -	
Scale:		Revision No.	
Date:	MARCH 2026		
Project No:		Paper Size:	A1

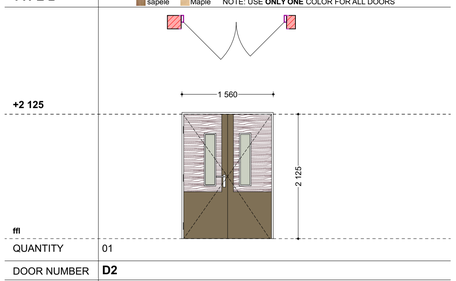
TYPE-1



QUANTITY	01
DOOR NUMBER	**D1**
DOOR HANDING	1500 mm Sliding open to the left or right as per the floor plan. Confirm this with architect before purchase.
LOCATION	ANTE ROOM
FRAME FINISH	Mid Blue as per "Dortek" colors
LEAF	
LEAF FINISH	
LOCKSET	
PUSH-PLATES	
KICK-PLATES	As per ironmongery schedule
BOLTS	-
KEEPS	-
HINGES	As per ironmongery schedule
HANDLES/PULLS	As per ironmongery schedule
LOUVRES :	As per ironmongery schedule
GLAZING :	Minimum 8.76mm HPR (high penetration resistance) laminated safety glass .
SILLS:	As per manufacturer's specifications
SIGNAGE:	All signage on doors to be indicated on signage drawings and to be fixed as per signage detail elsewhere.
DOOR STOPS	As per ironmongery schedule
COATHOOKS	As per ironmongery schedule
MASTER-KEY	-
DOOR CLOSER	-

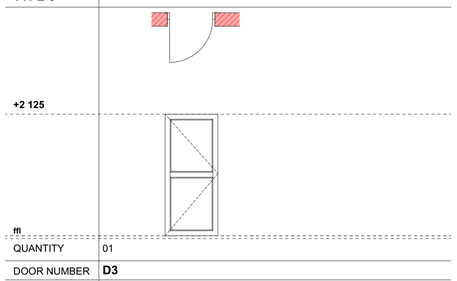
TYPE-2

sapele Maple NOTE: USE **ONLY ONE** COLOR FOR ALL DOORS



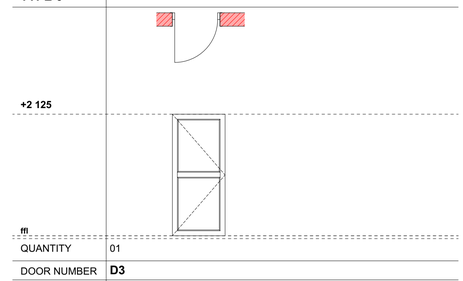
QUANTITY	01
DOOR NUMBER	**D2**
DOOR HANDING	DOUBLE DOOR
LOCATION	PASSAGE
FRAME	1.6mm thick double rebated pressed steel metal frame complying to SANS 1129 complete with lugs, three hinges, adjustable striking plate, and rubber buffers to lock jamb. Frame profiles to suit wall thickness (115mm and 230mm wall thicknesses) as per floor plans.
FRAME FINISH	Prepare frame and apply - Primer for mild steel. Under coat for all surfaces and finished in gloss enamel paint - all to manufacturers specifications. Final Frame Colour to Architect's specification.
LEAF	1 500 x 2125 x 40mm thick Internal solid laminated door with hardboard facing finished as below in "door finish" description. If door is to be fire rated (refer to fire drawings provided) applicable fire rating period to be provided for.
LEAF FINISH	Door to be finished with either a sapele or Maple hardwood veneer laminate all to manufacturers specifications. Only one colour for whole project. Contractor to provide samples for architects approval.
LOCKSET	As per iron mongery schedule
PUSH-PLATES	
KICK-PLATES	Kick plates to be 1.6mm thick brushed stainless steel to dimensions and pattern as indicated in the illustration to the right. Kick plates to be provided on both sides of the door leaf
BOLTS	As per iron mongery schedule
KEEPS	As per iron mongery schedule
HINGES	3No. pressed steel heavy duty Steel Ball bearing butt hinges per leaf
HANDLES/PULLS	As per iron mongery schedule
LOUVRES :	
GLAZING :	200mm x 900mm x 6.38mm laminated safety glass to suit door thickness and size indicated in illustration to the right, in natural anodised aluminium panels.
SILLS:	
SIGNAGE:	All signage on doors to be indicated on signage drawings and to be fixed as per signage detail elsewhere.
DOOR STOPS	DDS-NP-018, Door Stop, Floor Mounted, Hooded, 24mm (l) x 45mm (Ø), Nickel, DORMAKABA
COATHOOKS	
MASTER-KEY	Allow for a master keying system as provided for in the ironmongery schedule
DOOR CLOSER	Door Closer Standard Interior 60-80Kg Silver

TYPE-3



QUANTITY	01
DOOR NUMBER	**D3**
DOOR HANDING	RH
LOCATION	STAFF ROOM
FRAME	60mm Powder Coated, shiny bronze Aluminium Framing NKCASA Casement Type for 16mm Combinations as supplied by HBS Systems or equally approved and to be fixed as per manufactuer's specifications
FRAME FINISH	powder coated shiny bronze finish
LEAF	900x2 400x60mm Powder Coated, shiny bronze Aluminium Framing NKCASA Casement Type for 16mm Combinations as supplied by HBS Systems or equally approved and to be fixed as per manufactuer's specifications
LEAF FINISH	powder coated shiny bronze finish
LOCKSET	As per iron mongery schedule
PUSH-PLATES	
KICK-PLATES	Kick plates to be 1.6mm thick brushed stainless steel to dimensions and pattern as indicated in the illustration to the right. Kick plates to be provided on both sides of the door leaf
BOLTS	As per iron mongery schedule
KEEPS	As per iron mongery schedule
HINGES	3No. pressed steel heavy duty Steel Ball bearing butt hinges per leaf
HANDLES/PULLS	As per iron mongery schedule
LOUVRES :	
GLAZING :	
SILLS:	
SIGNAGE:	All signage on doors to be indicated on signage drawings and to be fixed as per signage detail elsewhere.
DOOR STOPS	DDS-NP-018, Door Stop, Floor Mounted, Hooded, 24mm (l) x 45mm (Ø), Nickel, DORMAKABA
COATHOOKS	
MASTER-KEY	Allow for a master keying system as provided for in the ironmongery schedule
DOOR CLOSER	Door Closer Standard Interior 60-80Kg Silver

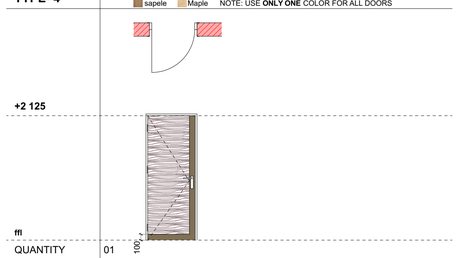
TYPE-3



QUANTITY	01
DOOR NUMBER	**D3**
DOOR HANDING	RH
LOCATION	BOARD ROOM
FRAME	60mm Powder Coated, shiny bronze Aluminium Framing NKCASA Casement Type for 16mm Combinations as supplied by HBS Systems or equally approved and to be fixed as per manufactuer's specifications
FRAME FINISH	powder coated shiny bronze finish
LEAF	900x2 400x60mm Powder Coated, shiny bronze Aluminium Framing NKCASA Casement Type for 16mm Combinations as supplied by HBS Systems or equally approved and to be fixed as per manufactuer's specifications
LEAF FINISH	powder coated shiny bronze finish
LOCKSET	As per iron mongery schedule
PUSH-PLATES	
KICK-PLATES	Kick plates to be 1.6mm thick brushed stainless steel to dimensions and pattern as indicated in the illustration to the right. Kick plates to be provided on both sides of the door leaf
BOLTS	As per iron mongery schedule
KEEPS	As per iron mongery schedule
HINGES	3No. pressed steel heavy duty Steel Ball bearing butt hinges per leaf
HANDLES/PULLS	As per iron mongery schedule
LOUVRES :	
GLAZING :	
SILLS:	
SIGNAGE:	All signage on doors to be indicated on signage drawings and to be fixed as per signage detail elsewhere.
DOOR STOPS	DDS-NP-018, Door Stop, Floor Mounted, Hooded, 24mm (l) x 45mm (Ø), Nickel, DORMAKABA
COATHOOKS	
MASTER-KEY	Allow for a master keying system as provided for in the ironmongery schedule
DOOR CLOSER	Door Closer Standard Interior 60-80Kg Silver

TYPE- 4

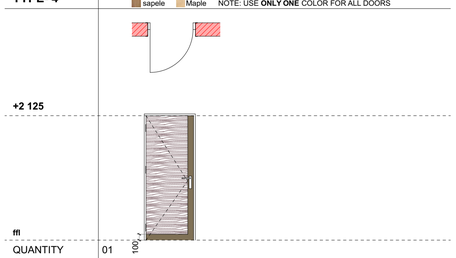
sapele Maple NOTE: USE **ONLY ONE** COLOR FOR ALL DOORS



QUANTITY	01
DOOR NUMBER	**D4**
DOOR HANDING	LH
LOCATION	OFFICE
FRAME	1.6mm thick double rebated pressed steel metal frame complying to SANS 1129 complete with lugs, three hinges, adjustable striking plate, and rubber buffers to lock jamb. Frame profiles to suit wall thickness (115mm, 230mm and 345mm wall thicknesses) as per floor plans.
FRAME FINISH	Prepare frame and apply - Primer for mild steel. Under coat for all surfaces and finished in gloss enamel paint - all to manufacturers specifications. Final Frame Colour to Architect's specification.
LEAF	813 x 2032 x 40mm thick Internal solid laminated door with hardboard facing finished as below in "door finish" description. If door is to be fire rated (refer to fire drawings provided) applicable fire rating period to be provided for.
LEAF FINISH	Door to be finished with either a sapele or Maple hardwood veneer laminate all to manufacturers specifications. Only one colour for whole project. Contractor to provide samples for architects approval.
LOCKSET	As per iron mongery schedule
PUSH-PLATES	
KICK-PLATES	Kick plates to be 1.6mm thick brushed stainless steel to dimensions and pattern as indicated in the illustration to the right. Kick plates to be provided on both sides of the door leaf
BOLTS	As per iron mongery schedule
KEEPS	As per iron mongery schedule
HINGES	3No. pressed steel heavy duty Steel Ball bearing butt hinges per leaf
HANDLES/PULLS	As per iron mongery schedule
LOUVRES :	
GLAZING :	
SILLS:	
SIGNAGE:	All signage on doors to be indicated on signage drawings and to be fixed as per signage detail elsewhere.
DOOR STOPS	DDS-NP-018, Door Stop, Floor Mounted, Hooded, 24mm (l) x 45mm (Ø), Nickel, DORMAKABA
COATHOOKS	
MASTER-KEY	Allow for a master keying system as provided for in the ironmongery schedule
DOOR CLOSER	Door Closer Standard Interior 60-80Kg Silver

TYPE- 4

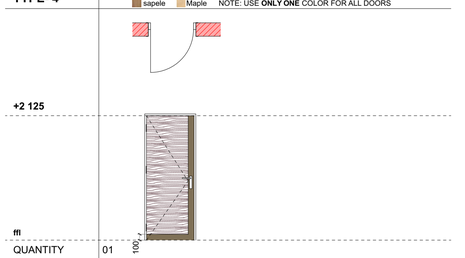
sapele Maple NOTE: USE **ONLY ONE** COLOR FOR ALL DOORS



QUANTITY	01
DOOR NUMBER	**D4**
DOOR HANDING	LH
LOCATION	OFFICE
FRAME	1.6mm thick double rebated pressed steel metal frame complying to SANS 1129 complete with lugs, three hinges, adjustable striking plate, and rubber buffers to lock jamb. Frame profiles to suit wall thickness (115mm, 230mm and 345mm wall thicknesses) as per floor plans.
FRAME FINISH	Prepare frame and apply - Primer for mild steel. Under coat for all surfaces and finished in gloss enamel paint - all to manufacturers specifications. Final Frame Colour to Architect's specification.
LEAF	813 x 2032 x 40mm thick Internal solid laminated door with hardboard facing finished as below in "door finish" description. If door is to be fire rated (refer to fire drawings provided) applicable fire rating period to be provided for.
LEAF FINISH	Door to be finished with either a sapele or Maple hardwood veneer laminate all to manufacturers specifications. Only one colour for whole project. Contractor to provide samples for architects approval.
LOCKSET	As per iron mongery schedule
PUSH-PLATES	
KICK-PLATES	Kick plates to be 1.6mm thick brushed stainless steel to dimensions and pattern as indicated in the illustration to the right. Kick plates to be provided on both sides of the door leaf
BOLTS	As per iron mongery schedule
KEEPS	As per iron mongery schedule
HINGES	3No. pressed steel heavy duty Steel Ball bearing butt hinges per leaf
HANDLES/PULLS	As per iron mongery schedule
LOUVRES :	
GLAZING :	
SILLS:	
SIGNAGE:	All signage on doors to be indicated on signage drawings and to be fixed as per signage detail elsewhere.
DOOR STOPS	DDS-NP-018, Door Stop, Floor Mounted, Hooded, 24mm (l) x 45mm (Ø), Nickel, DORMAKABA
COATHOOKS	
MASTER-KEY	Allow for a master keying system as provided for in the ironmongery schedule
DOOR CLOSER	Door Closer Standard Interior 60-80Kg Silver

TYPE- 4

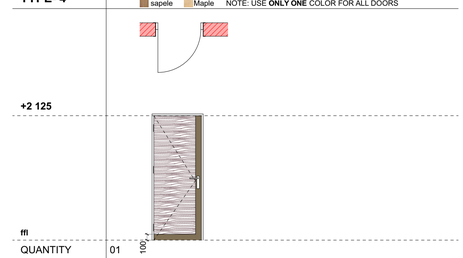
sapele Maple NOTE: USE **ONLY ONE** COLOR FOR ALL DOORS



QUANTITY	01
DOOR NUMBER	**D5**
DOOR HANDING	LH
LOCATION	CHANGE ROOM
FRAME	1.6mm thick double rebated pressed steel metal frame complying to SANS 1129 complete with lugs, three hinges, adjustable striking plate, and rubber buffers to lock jamb. Frame profiles to suit wall thickness (115mm, 230mm and 345mm wall thicknesses) as per floor plans.
FRAME FINISH	Prepare frame and apply - Primer for mild steel. Under coat for all surfaces and finished in gloss enamel paint - all to manufacturers specifications. Final Frame Colour to Architect's specification.
LEAF	813 x 2032 x 40mm thick Internal solid laminated door with hardboard facing finished as below in "door finish" description. If door is to be fire rated (refer to fire drawings provided) applicable fire rating period to be provided for.
LEAF FINISH	Door to be finished with either a sapele or Maple hardwood veneer laminate all to manufacturers specifications. Only one colour for whole project. Contractor to provide samples for architects approval.
LOCKSET	As per iron mongery schedule
PUSH-PLATES	
KICK-PLATES	Kick plates to be 1.6mm thick brushed stainless steel to dimensions and pattern as indicated in the illustration to the right. Kick plates to be provided on both sides of the door leaf
BOLTS	As per iron mongery schedule
KEEPS	As per iron mongery schedule
HINGES	3No. pressed steel heavy duty Steel Ball bearing butt hinges per leaf
HANDLES/PULLS	As per iron mongery schedule
LOUVRES :	
GLAZING :	
SILLS:	
SIGNAGE:	All signage on doors to be indicated on signage drawings and to be fixed as per signage detail elsewhere.
DOOR STOPS	DDS-NP-018, Door Stop, Floor Mounted, Hooded, 24mm (l) x 45mm (Ø), Nickel, DORMAKABA
COATHOOKS	
MASTER-KEY	Allow for a master keying system as provided for in the ironmongery schedule
DOOR CLOSER	Door Closer Standard Interior 60-80Kg Silver

TYPE- 4

sapele Maple NOTE: USE **ONLY ONE** COLOR FOR ALL DOORS



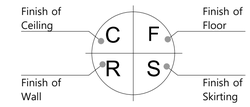
QUANTITY	01
DOOR NUMBER	**D5**
DOOR HANDING	LH
LOCATION	CHANGE ROOM
FRAME	1.6mm thick double rebated pressed steel metal frame complying to SANS 1129 complete with lugs, three hinges, adjustable striking plate, and rubber buffers to lock jamb. Frame profiles to suit wall thickness (115mm, 230mm and 345mm wall thicknesses) as per floor plans.
FRAME FINISH	Prepare frame and apply - Primer for mild steel. Under coat for all surfaces and finished in gloss enamel paint - all to manufacturers specifications. Final Frame Colour to Architect's specification.
LEAF	813 x 2032 x 40mm thick Internal solid laminated door with hardboard facing finished as below in "door finish" description. If door is to be fire rated (refer to fire drawings provided) applicable fire rating period to be provided for.
LEAF FINISH	Door to be finished with either a sapele or Maple hardwood veneer laminate all to manufacturers specifications. Only one colour for whole project. Contractor to provide samples for architects approval.
LOCKSET	As per iron mongery schedule
PUSH-PLATES	
KICK-PLATES	Kick plates to be 1.6mm thick brushed stainless steel to dimensions and pattern as indicated in the illustration to the right. Kick plates to be provided on both sides of the door leaf
BOLTS	As per iron mongery schedule
KEEPS	As per iron mongery schedule
HINGES	3No. pressed steel heavy duty Steel Ball bearing butt hinges per leaf
HANDLES/PULLS	As per iron mongery schedule
LOUVRES :	
GLAZING :	
SILLS:	
SIGNAGE:	All signage on doors to be indicated on signage drawings and to be fixed as per signage detail elsewhere.
DOOR STOPS	DDS-NP-018, Door Stop, Floor Mounted, Hooded, 24mm (l) x 45mm (Ø), Nickel, DORMAKABA
COATHOOKS	
MASTER-KEY	Allow for a master keying system as provided for in the ironmongery schedule
DOOR CLOSER	Door Closer Standard Interior 60-80Kg Silver

GENERAL NOTES

-ALL DIMENSIONS TO BE CHECKED ON SITE BEFORE WORK COMMENCES.
-DO NOT SCALE FROM DRAWINGS
-FOUNDATIONS NOT TO ENCROACH ANY STAND BOUNDARIES
-ALL SETTING OUT INFORMATION TO BE OBTAINED FROM CIVIL ENGINEER
-ALL SPECIFIED MATERIALS TO BE IN STRICT ACCORDANCE WITH THEIR RESPECTIVE MANUFACTURERS SPECIFICATIONS AND GUIDLINES
-SHOP DRAWINGS TO BE SUBMITTED TO ARCHITECTS FOR APPROVAL BEFORE ANY SPECIALIST MANUFACTURE OR INSTALLATION CAN COMMENCE-INCLUDING ALL JOINERY.
-EXPANSION JOINTS, CONSTRUCTION JOINTS AND SETTING OUT ALL IN STRICT ACCORDANCE WITH THE STRUCTURAL ENGINEERS SPECIFICATIONS AND DETAILS
-SEQUENCE AND PROGRAM OF INSTALLATIONS TO BE SUBMITTED TO ARCHITECT FOR COMMENT
-ALL WORKS AND TRADES TO BE PROTECTED DURING CONSTRUCTION UP TO WORKS COMPLETION, DAMAGED WORK WILL BE CONDEMNED AND MADE GOOD AT THE COST OF THE CONTRACTOR
-FOR ALL ELECTRICAL SPECIFICATIONS, CONTRACTOR TO REFER TO DRAWINGS PROVIDED BY THE ELECTRICAL ENGINEER
-ALL SANITARY AND GENERAL FITTINGS TO THE ARCHITECTS SPECIFICATIONS
-ALL INTERNAL PLUMBING AND FIRE RETICULATION TO THE MECHANICAL ENGINEERS DRAWINGS
-ALL STRUCTURAL DRAWINGS TO BE OBTAINED FROM THE PROJECT STRUCTURAL ENGINEER
-ALL PLATFORMS AND FINISHED FLOOR LEVELS TO BE READ FROM THE STRUCTURAL ENGINEERS DRAWINGS
-ALL BULK SEWER AND WATER RETICULATION TO THE CIVIL ENGINEERS SPECIFICATION
-CONTRACTOR TO SUBMIT SAMPLES OF EVERY FITTING OR MATERIAL OR FINISH TO THE PROJECT ARCHITECT
-INSTRUCTIONS ON BUILDING WORK MAY ONLY BE ISSUED BY THE PROJECT ARCHITECT. ANY INSTRUCTIONS UNDERTAKEN FROM ANYONE ELSE TO BE AT THE COST OF THE CONTRACTOR.
-ALL DISCREPANCIES IN THE DRAWING TO BE REPORTED TO THE PROJECT ARCHITECT. ANY DECISIONS TAKEN BY CONTRACTOR WITHOUT CONSULTATION AND WRITTEN INSTRUCTION TO BE BEARED BY THE CONTRACTOR; INCLUDING COSTS TO REMEDY THE WORKS

ISSUED FOR TENDER

LEGEND TO FINISHES



REFER TO THE FINISHES SCHEDULE PROVIDED ON SEPARATE BOOKLET

Rev	Date	Description

DEPARTMENT OF HEALTH

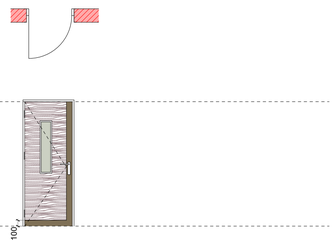
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PROPOSED NEW MATERNITY WARD AND UPGRADES AT JST HOSPITAL, RUSTENBURG

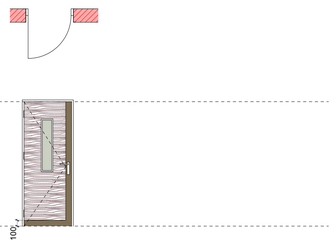
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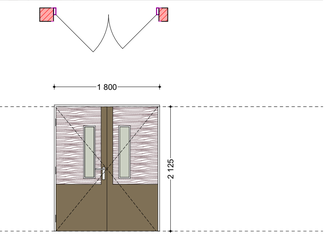
Drawing:
CONVERSION OF WARD 13 INTO ICU-FPLN

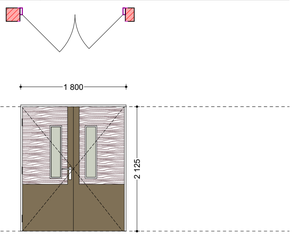
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STAGE 2

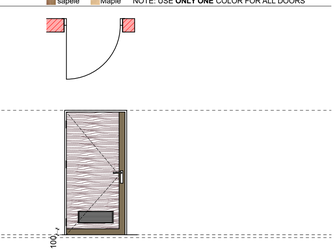
Drawn by :		
Designed by :		
Checked by :		Drawing No. :
signature		**ICU- A 6001-**
Scale:		Revision No.
Date:	MARCH 2026	
Project No:		Paper Size: A1

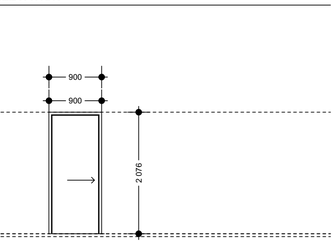
TYPE- 6	sapele Maple NOTE: USE **ONLY ONE** COLOR FOR ALL DOORS
	
QUANTITY	01
DOOR NUMBER	**D6**
DOOR HANDING	LH
LOCATION	SCRUB
FRAME	1.6mm thick double rebated pressed steel metal frame complying to SANS 1129 complete with lugs, three hinges, adjustable striking plate, and rubber buffers to lock jamb. Frame profiles to suit wall thickness (115mm, 230mm and 345mm wall thicknesses) as per floor plans.
FRAME FINISH	Prepare frame and apply - Primer for mild steel. Under coat for all surfaces and finished in gloss enamel paint - all to manufacturers specifications. Final Frame Colour to Architect's specification.
LEAF	813 x 2032 x 40mm thick Internal solid laminated door with hardboard facing finished as below in "door finish" description. If door is to be fire rated (refer to fire drawings provided) applicable fire rating period to be provided for.
LEAF FINISH	Door to be finished with either a sapele or Maple hardwood veneer laminate all to manufacturers specifications. Only one colour for whole project. Contractor to provide samples for architects approval.
LOCKSET	As per iron mongery schedule
PUSH-PLATES	
KICK-PLATES	Kick plates to be 1.6mm thick brushed stainless steel to dimensions and pattern as indicated in the illustration to the right. Kick plates to be provided on both sides of the door leaf
BOLTS	As per iron mongery schedule
KEEPS	As per iron mongery schedule
HINGES	3No. pressed steel heavy duty Steel Ball bearing butt hinges per leaf
HANDLES/PULLS	As per iron mongery schedule
LOUVRES :	
GLAZING :	
SILLS:	
SIGNAGE:	All signage on doors to be indicated on signage drawings and to be fixed as per signage detail elsewhere.
DOOR STOPS	DDS-NP-018, Door Stop, Floor Mounted, Hooded, 24mm (l) x 45mm (Ø), Nickel, DORMAKABA
COATHOOKS	
MASTER-KEY	Allow for a master keying system as provided for in the ironmongery schedule
DOOR CLOSER	Door Closer Standard Interior 60-80Kg Silver

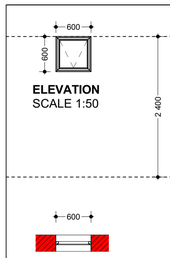
TYPE- 6	sapele Maple NOTE: USE **ONLY ONE** COLOR FOR ALL DOORS
	
QUANTITY	01
DOOR NUMBER	**D6**
DOOR HANDING	LH
LOCATION	SCRUB
FRAME	1.6mm thick double rebated pressed steel metal frame complying to SANS 1129 complete with lugs, three hinges, adjustable striking plate, and rubber buffers to lock jamb. Frame profiles to suit wall thickness (115mm, 230mm and 345mm wall thicknesses) as per floor plans.
FRAME FINISH	Prepare frame and apply - Primer for mild steel. Under coat for all surfaces and finished in gloss enamel paint - all to manufacturers specifications. Final Frame Colour to Architect's specification.
LEAF	813 x 2032 x 40mm thick Internal solid laminated door with hardboard facing finished as below in "door finish" description. If door is to be fire rated (refer to fire drawings provided) applicable fire rating period to be provided for.
LEAF FINISH	Door to be finished with either a sapele or Maple hardwood veneer laminate all to manufacturers specifications. Only one colour for whole project. Contractor to provide samples for architects approval.
LOCKSET	As per iron mongery schedule
PUSH-PLATES	
KICK-PLATES	Kick plates to be 1.6mm thick brushed stainless steel to dimensions and pattern as indicated in the illustration to the right. Kick plates to be provided on both sides of the door leaf
BOLTS	As per iron mongery schedule
KEEPS	As per iron mongery schedule
HINGES	3No. pressed steel heavy duty Steel Ball bearing butt hinges per leaf
HANDLES/PULLS	As per iron mongery schedule
LOUVRES :	
GLAZING :	
SILLS:	
SIGNAGE:	All signage on doors to be indicated on signage drawings and to be fixed as per signage detail elsewhere.
DOOR STOPS	DDS-NP-018, Door Stop, Floor Mounted, Hooded, 24mm (l) x 45mm (Ø), Nickel, DORMAKABA
COATHOOKS	
MASTER-KEY	Allow for a master keying system as provided for in the ironmongery schedule
DOOR CLOSER	Door Closer Standard Interior 60-80Kg Silver

TYPE-7	sapele Maple NOTE: USE **ONLY ONE** COLOR FOR ALL DOORS
	
QUANTITY	01
DOOR NUMBER	**D7**
DOOR HANDING	DOUBLE DOOR
LOCATION	PASSAGE
FRAME	1.6mm thick double rebated pressed steel metal frame complying to SANS 1129 complete with lugs, three hinges, adjustable striking plate, and rubber buffers to lock jamb. Frame profiles to suit wall thickness (115mm and 230mm wall thicknesses) as per floor plans.
FRAME FINISH	Prepare frame and apply - Primer for mild steel. Under coat for all surfaces and finished in gloss enamel paint - all to manufacturers specifications. Final Frame Colour to Architect's specification.
LEAF	1 800 x 2125 x 40mm thick Internal solid laminated door with hardboard facing finished as below in "door finish" description. If door is to be fire rated (refer to fire drawings provided) applicable fire rating period to be provided for.
LEAF FINISH	Door to be finished with either a sapele or Maple hardwood veneer laminate all to manufacturers specifications. Only one colour for whole project. Contractor to provide samples for architects approval.
LOCKSET	As per iron mongery schedule
PUSH-PLATES	
KICK-PLATES	Kick plates to be 1.6mm thick brushed stainless steel to dimensions and pattern as indicated in the illustration to the right. Kick plates to be provided on both sides of the door leaf
BOLTS	As per iron mongery schedule
KEEPS	As per iron mongery schedule
HINGES	3No. pressed steel heavy duty Steel Ball bearing butt hinges per leaf
HANDLES/PULLS	As per iron mongery schedule
LOUVRES :	
GLAZING :	200mm x 900mm x 6.38mm laminated safety glass to suit door thickness and size indicated in illustration to the right, in natural anodised aluminium panels.
SILLS:	
SIGNAGE:	All signage on doors to be indicated on signage drawings and to be fixed as per signage detail elsewhere.
DOOR STOPS	DDS-NP-018, Door Stop, Floor Mounted, Hooded, 24mm (l) x 45mm (Ø), Nickel, DORMAKABA
COATHOOKS	
MASTER-KEY	Allow for a master keying system as provided for in the ironmongery schedule
DOOR CLOSER	Door Closer Standard Interior 60-80Kg Silver

TYPE-8	sapele Maple NOTE: USE **ONLY ONE** COLOR FOR ALL DOORS
	
QUANTITY	01
DOOR NUMBER	**D8**
DOOR HANDING	DOUBLE DOOR
LOCATION	CATH-LAB
FRAME	1.6mm thick double rebated pressed steel metal frame complying to SANS 1129 complete with lugs, three hinges, adjustable striking plate, and rubber buffers to lock jamb. Frame profiles to suit wall thickness (115mm and 230mm wall thicknesses) as per floor plans.
FRAME FINISH	Prepare frame and apply - Primer for mild steel. Under coat for all surfaces and finished in gloss enamel paint - all to manufacturers specifications. Final Frame Colour to Architect's specification.
LEAF	1 800 x 2125 x 40mm thick Internal solid laminated door with hardboard facing finished as below in "door finish" description. If door is to be fire rated (refer to fire drawings provided) applicable fire rating period to be provided for.
LEAF FINISH	Door to be finished with either a sapele or Maple hardwood veneer laminate all to manufacturers specifications. Only one colour for whole project. Contractor to provide samples for architects approval.
LOCKSET	As per iron mongery schedule
PUSH-PLATES	
KICK-PLATES	Kick plates to be 1.6mm thick brushed stainless steel to dimensions and pattern as indicated in the illustration to the right. Kick plates to be provided on both sides of the door leaf
BOLTS	As per iron mongery schedule
KEEPS	As per iron mongery schedule
HINGES	3No. pressed steel heavy duty Steel Ball bearing butt hinges per leaf
HANDLES/PULLS	As per iron mongery schedule
LOUVRES :	
GLAZING :	200mm x 900mm x 6.38mm laminated safety glass to suit door thickness and size indicated in illustration to the right, in natural anodised aluminium panels.
SILLS:	
SIGNAGE:	All signage on doors to be indicated on signage drawings and to be fixed as per signage detail elsewhere.
DOOR STOPS	DDS-NP-018, Door Stop, Floor Mounted, Hooded, 24mm (l) x 45mm (Ø), Nickel, DORMAKABA
COATHOOKS	
MASTER-KEY	Allow for a master keying system as provided for in the ironmongery schedule
DOOR CLOSER	Door Closer Standard Interior 60-80Kg Silver

TYPE-9	sapele Maple NOTE: USE **ONLY ONE** COLOR FOR ALL DOORS
	
QUANTITY	01
DOOR NUMBER	**DV10**
DOOR HANDING	RH
LOCATION	TOILET
FRAME	1.6mm thick double rebated pressed steel metal frame complying to SANS 1129 complete with lugs, three hinges, adjustable striking plate, and rubber buffers to lock jamb. Frame profiles to suit wall thickness (115mm, 230mm and 345mm wall thicknesses) as per floor plans.
FRAME FINISH	Prepare frame and apply - Primer for mild steel. Under coat for all surfaces and finished in gloss enamel paint - all to manufacturers specifications. Final Frame Colour to Architect's specification.
LEAF	1 000 x 2 125 x 40mm thick Internal solid laminated door with hardboard facing finished as below in "door finish" description. If door is to be fire rated (refer to fire drawings provided) applicable fire rating period to be provided for.
LEAF FINISH	Door to be finished with either a sapele or Maple hardwood veneer laminate all to manufacturers specifications. Only one colour for whole project. Contractor to provide samples for architects approval.
LOCKSET	As per iron mongery schedule
PUSH-PLATES	
KICK-PLATES	Kick plates to be 1.6mm thick brushed stainless steel to dimensions and pattern as indicated in the illustration to the right. Kick plates to be provided on both sides of the door leaf
BOLTS	As per iron mongery schedule
KEEPS	
HINGES	3No. pressed steel heavy duty Steel Ball bearing butt hinges per leaf
HANDLES/PULLS	As per iron mongery schedule
LOUVRES :	600 X 200 mm Natural anodised Aluminium vents to size indicated on door leaf in an aluminium frame to suit door leaf thickness. Colour to architects specification.
GLAZING :	
SILLS:	
SIGNAGE:	All signage on doors to be indicated on signage drawings and to be fixed as per signage detail elsewhere.
DOOR STOPS	DDS-NP-018, Door Stop, Floor Mounted, Hooded, 24mm (l) x 45mm (Ø), Nickel
COATHOOKS	
MASTER-KEY	Allow for a master keying system as provided for in the ironmongery schedule
DOOR CLOSER	Door Closer Standard Interior 60-80Kg Silver

TYPE-10	ELEVATION
	
QUANTITY	01
DOOR NUMBER	**D10**
DOOR HANDING	SLIDING DOOR
LOCATION	**TOILET**
FRAME	Interior Sliding Door kit with sliding mechanism Cottage Barn style
FRAME FINISH	
LEAF	45mm door size 813x2032mm solid core flush door as AMDOOR or equally approved.
LEAF FINISH	1-coat wood primer & 2-coats of eggshell enamel applied as per manufcatuer's specifications. Colour as per architect specifications
LOCKSET	As per ironmongery schedule
PUSH-PLATES	As per ironmongery schedule
KICK-PLATES	-
BOLTS	As per ironmongery schedule
KEEPS	As per ironmongery schedule
HINGES	As per ironmongery schedule
HANDLES/PULLS	As per ironmongery schedule
LOUVRES :	-
GLAZING :	-
SILLS:	-
SIGNAGE:	As per signage schedule
DOOR STOPS	As per ironmongery schedule
COATHOOKS	-
MASTER-KEY	-
DOOR CLOSER	-



ELEVATION
SCALE 1:50

FLOOR PLAN
SCALE 1:50

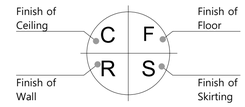
WINDOW No.		No. REQUIRED:	01
LOCATION	TOILET		
DESCRIPTION	600x `600 x60mm Powder Coated, Bronze Aluminium Framing NKCASA Casement Type for 16mm Combinations as supplied by HBS Systems or equally approved and to be fixed as per manufacturer's specifications		
GLAZING	6.38mm Clear Glass Safety glazing		
FINISH	Powder coated with natural shiny bronze colour. To be approved by Architect.		
IRONMONGERY	As per manufaturer's specifications		
WINDOW CILLS NOTES	INTERNAL : 15x150mm wide Everite Cement Fibre window cills EXTERNAL : 106x220x73 Plastred Single Cunt Brick on edge window cill		
GENERAL NOTES	Window frame to be firmly screwed around the window perimeter and pointed with approved silicon sealant as per Architect's Approval. Allow 10mm overtolerance over all around widow frame and structure Aluminium profiles, shopfronts and finishes to be approved by architect prior to manufacturer. All window openings to be measured on site prior to manufacturing.		

GENERAL NOTES

-ALL DIMENSIONS TO BE CHECKED ON SITE BEFORE WORK COMMENCES.
-DO NOT SCALE FROM DRAWINGS
-FOUNDATIONS NOT TO ENCROACH ANY STAND BOUNDARIES
-ALL SETTING OUT INFORMATION TO BE OBTAINED FROM CIVIL ENGINEER
-ALL SPECIFIED MATERIALS TO BE IN STRICT ACCORDANCE WITH THEIR RESPECTIVE MANUFACTURERS SPECIFICATIONS AND GUIDLINES
-SHOP DRAWINGS TO BE SUBMITTED TO ARCHITECTS FOR APPROVAL BEFORE ANY SPECIALIST MANUFACTURE OR INSTALLATION CAN COMMENCE-INCLUDING ALL JOINERY.
-EXPANSION JOINTS, CONSTRUCTION JOINTS AND SETTING OUT ALL IN STRICT ACCORDANCE WITH THE STRUCTURAL ENGINEERS SPECIFICATIONS AND DETAILS
-SEQUENCE AND PROGRAM OF INSTALLATIONS TO BE SUBMITTED TO ARCHITECT FOR COMMENT
-ALL WORKS AND TRADES TO BE PROTECTED DURING CONSTRUCTION UP TO WORKS COMPLETION, DAMAGED WORK WILL BE CONDEMNED AND MADE GOOD AT THE COST OF THE CONTRACTOR
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ISSUED FOR TENDER

LEGEND TO FINISHES



REFER TO THE FINISHES SCHEDULE PROVIDED ON SEPARATE BOOKLET

Rev	Date	Description

DEPARTMENT OF HEALTH

Project:
PROPOSED NEW MATERNITY WARD AND UPGRADES AT JST HOSPITAL, RUSTENBURG

Master plan reference:

Drawing:
CONVERSION OF WARD 13 INTO ICU-FPLN

Status:
STAGE 2

Drawn by :		
Designed by :		
Checked by : signature		Drawing No. : **ICU- A- 6002-**
Scale:		Revision No.
Date:	MARCH 2026	
Project No:		Paper Size: A1

GROUND FLOOR

WARD 13 FINISHES SCHEDULE

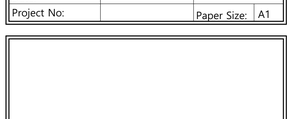
SPECIFICATION	CODE	LOCATION: AREA	232	23	10	10	09	12	04	04	16	17	08	07	10	08	08	16	08	09	01	01	19	05	05	05	07	12	14	18	13	77
			15 BED ICU WARD	PASSAGE	SLUICE ROOM	NURSE'S STATION	DIVERSE STORE	PROCEDURE ROOM	ANTE-ROOM	BATH	ISOLATION WARD	TOILETS	DIVERSE STORE	DR'S REST	STAFF ROOM	OFFICE O2	OFFICE 01	BOARD ROOM	COUNSELLING ROOM	WAITING ROOM	DUCT	DUCT	PASSAGE	CHANGE ROOM 01	CHANGE ROOM 02	TOILET	SCRUB	DUTY STATION	PASSAGE	RECOVERY ROOM	CONTROL ROOM	CATH LAB
1.0 FLOORS	**RM No.**		**RM-01**	**RM-02**	**RM-03**	**RM-04**	**RM-05**	**RM-06**	**RM-07**	**RM-08**	**RM-09**	**RM-10**	**RM-11**	**RM-12**	**RM-13**	**RM-14**	**RM-15**	**RM-16**	**RM-16**	**RM-17**	**RM-18**	**RM-19**	**RM-20**	**RM-21**	**RM-22**	**RM-23**	**RM-24**	**RM-25**	**RM-26**	**RM-26**	**RM-27**	**RM-28**
1.1 PORCELAIN TILES 500x500x10mm UNION Glazed Porcelain tiles **(Code : ELEOCH30x60)** laid on 40mm thick smooth screed backing. Tiles to run in both directions jointed and flush pointed with 5mm tile grouting joints as per Architect's approval.	F1																															
1.2 F2-VINYL SHEET FLOORING Supply and fix FloorworX Elite 2.0mm thick x 2m wide fully flexible single layered vinyl floor sheeting manufactured to specification EN 649 laid in FloorworX No. 62 Plus acrylic adhesive spread with a A24F at a rate of between 5.5m² and 6.5m² per litre, depending on sub-floor porosity, on a previously prepared sub-floor by builder as described above and elsewhere measured including all cutting and waste. It is essential that the flooring be rolled in both directions with an articulated 68kg three-sectional roller immediately after it has been laid into the adhesive. Vinyl sheet to be welded with joins and coved with (Cove fillet MCF54) to form 300mm high skirting.	F2		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			●	●	●	●	●	●	●	●	●	●
1.3 SMOOTH FINISHED GRANO FLOOR 40mm thick smooth finished grano floor	F3																				●	●										
2.0 INTERIOR WALLS																																
2.1 WALL TILES 152X 152X5mm white glazed ceramic tiles laid on 20mm plaster backing . Tiles to run in both directions jointed and flush pointed with 5mm tile grouting joints as per Architect's approval. Tiles to be laid to the underside of the ceiling.	WF1									●		●												●	●	●						
2.2 WALL PAINT Plaster sand should comply with SABS 1090 requirements. Plaster mix must be applied at a minimum thickness of 10mm, curing to a hard and sound finish,free of soft and friable material. MPA strength must comply with SABS 0164-1 (10MPA=2,6:1 and 5MPA=4:1). The substrates to be coated must be handed over to the painting contractor in a good condition. Should crack repairs be necessary, please contact Manufacturer for a crack repair specification guideline. Where necessary, waterproofing should be carried out by a waterproofing specialist.Manufacturer Preferred Applicators must be used on this project in order to facilitate the Manufactueer's Guarantee. **All the products mentioned in these specifications must be applied strictly in accordance with the relevant Product Data Sheets.** A site inspection must be carried out by a Plascon consultant prior to painting of the substrates to ensure that the scope of work is correct. Where necessary, scrub entire area with a Sugar Soap solution to remove dirt, chalked material and any other contaminants. Rinse thoroughly with fresh water and allow drying.Repair cracks and/or plaster defects as per 'Crack Repair/Plaster Finish' guideline available from manufacturer.All surfaces must be clean, sound and dry before painting. The moisture content of thecement plaster surfaces must be below 8% when measured on a Doser Hygrometer BD2 scale (or equivalent). Apply first coat as Plascon or equally approved Professional Gypsum and Plaster Primer (Code:PP 700), allow 16hours to dry, apply second coat as Plascon Professional Eggshell Enamel (PSB 700/TEG tint range), allow for 16hours to dry and apply finishing caot Professional Eggshell Enamel (PSB 700/TEG tint range). Colour as architect's specification.	WF2		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
2.3 SPLASHBACKS splashbacks of 152X 152X5mm white glazed ceramic tiles laid on 20mm plaster backing . Tiles to run in both directions jointed and flush pointed with 5mm tile grouting joints as per Architect's approval. Tiles to be laid upto window lintol level.	WF3		●		●			●	●	●		●		●	●									●	●	●	●	●		●		
2.3 FACEBRICK ; FB01 Facebrick : Blue Barley Travertin FBS Travertine	WF4																															
3.0 DOORS																																
3.1 TIMBER DOORS Ensure all timber is smooth.Knots should be washed with Lacquer Thinners then sealed with Plascon Woodcare Knotseal.The wood must be sound, clean and totally dry before painting. Using a Doser BD2 Scale set on A2 (soft wood) or A4 (hard wood) or equivalent, the moisture content must not be higher than 14%.Sections ofnew woodwork which are to be built into brickwork and plastered areas, such asbacks of timber door and window frames, or which will be concealedwhen fixed to walls, should be sealed with two coats of Wood Primer (or the applicable primer),before installation to prevent the penetration of moisture from the mortar bedding in. Special attention should be givento sealing the end grain. Ensure that all nails, pins and screws are embedded well below the surface. Fill with Mendall 90 or wood filler. Apply first coat as Plascon or equally approved Professional Wood Primer (Code:PP 800), allow 24hours to dry, apply second coat as Plascon Professional Eggshell Enamel (PSB 700/TEG tint range), allow for 16hours to dry and apply finishing caot Professional Eggshell Enamel (PSB 700/TEG tint range). Colour as architect's specification. Colour as per Architect's specification. REFER TO DOOR SCHEDULES.	DF1		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
3.2 STEEL DOOR FRAMES Where necessary, thouroughly sanded down to remove rust. Steel door frames to be suppy coated with industrial red oxide primer. Apply 1-coat universal undercoat and finish with 2-coats of gloss enamel paint. REFER TO DOOR SCHEDULES.	DF2		●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
3.3 STEEL DOORS Where necessary, thouroughly sanded down to remove rust. Steel door frames to be suppy coated with industrial red oxide primer. Apply 1-coat universal undercoat and finish with 2-coats of gloss enamel paint. REFER TO DOOR SCHEDULES.	DF3																															
3.4 ALUMINIUM DOORS 60mm Powder Coated, shiny bronze Aluminium Framing NKCASA Casement Type for 16mm Combinations as supplied by HBS Systems or equally approved and to be fixed as per manufactuer's specifications REFER TO DOOR SCHEDULES.																																
3.5 ALUMINIUM DOOR FRAMES 60mm Powder Coated, shiny bronze Aluminium Framed NKCASA Casement Type door for 16mm Combinations as supplied by HBS Systems or equally approved and to be fixed as per manufactuer's specifications. REFER TO DOOR SCHEDULES.																																
4.0 CEILINGS																																
4.1 SUSPENDED CEILING PANELS 600mm x 1200mm x 15mm thick mineral fibre acoustic ceiling tiles to compy with SABS 803 or later revision laid in tee fixing on appropriate pre-painted 24mm T-grid suspension system, including all necessary accessories and installed in strict compliance to manufacturer's specifications.	C1		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			●	●	●	●	●	●	●	●	●	●
4.2 NUTECH CEILING BOARDS:CF02 Ceilings to be 12mm thick NUTECH ceiling boards fixed on 38x38mm h/d brandering running in both direction. Ceiling baords to firmly abbut strctural walls on all edges. Cornice to be 75x12mm thick gyspsum plaster boards and to firmly abbut adjoining walls on all surfaces. Ensure ceilings and coirnices are free of dirty, cracks, chalked material and any other contaminants. Repair cracks and/or p defects as per 'Crack Repair Finish' guideline available from manufacturer.All surfaces must be clean, sound and dry before painting. The moisture content of the ceiling plaster surfaces must be below 8% when measured on a Doser Hygrometer BD2 scale (or equivalent). Apply first coat as Plascon or equally approved Professional Gypsum and Plaster Primer (Code:PP 700), allow 16hourstо dry, apply second coat as Plascon Professional Eggshell Enamel (PSB 700/TEG tint range), allow for16hours to dry and apply finishing caot Professional Eggshell Enamel (PSB 700/TEG tint range). Colour as architect's specification.	C2																				●	●										
4.3 SKIMMED CEMENT SLAB SOFFIT Cement paste backwash	C3																															
5.0 WINDOW CILLS																																
5.1 INTERIOR WINDOW CILLS : NUTECH FIBRE CEMENT 15X150mm NUTECH EVERITE cement fibre window cills fixed with fixing lugs as per manufacturer's specifications.	WCF1																									●						
5.2 INTERIOR WINDOW CILLS; CERAMIC TILE WINDOW CILLS 152X 152X5mm white glazed ceramic tiles or equally approved (Code :) laid on 20mm thick plaster backing. Tiles to run in both directions jointed and flush pointed with 5mm tile grouting joints as per Architect's approval.	WCF2																															
5.3 INTERIOR WINDOW CILLS; PLASTER & PAINTED WINDOW CILLS Plaster & painted window cills. Paint finishes to match wall paint finish as per wall paint specifications.	WCF3																															
6.0 FLOOR SKIRTINGS																																
6.1 TILE SKIRTING 150mm high glazed tile to match floor tiles.	SK1																															
6.2 VINYL SKIRTING 300mm high vinyl coved skirting as per vynil flooring specifications	SK2		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			●	●	●	●	●	●	●	●	●	●
6.3 MERANTI SKIRTING 19x76mm meranti supplied with19x14xmm meranti quadrant skirting finished with 2-coats of clear varnish applied as per manufacturer's specs and recoemmndations.	SK3																															

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REFER TO THE FINISHES SCHEDULE PROVIDED ON SEPARATE BOOKLET

Rev	Date	Description

DEPARTMENT OF HEALTH

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PROPOSED NEW MATERNITY WARD AND UPGRADES AT JST HOSPITAL, RUSTENBURG

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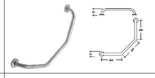
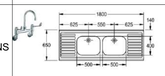
Drawing:
CONVERSION OF WARD 13 INTO ICU-FPLN

Status:
STAGE 2

Drawn by :		
Designed by :		
Checked by : _____ signature		Drawing No. : **ICU- A- 6003-**
Scale:		Revision No.
Date:	MARCH 2026	
Project No:		Paper Size: A1

2.0 WARD 13 SANITARY SCHEDULE
1 of 1

LOCATION

SPECIFICATION		AREA	232	23	10	10	09	12	04	04	16	17	08	07	10	08	08	08	16	08	09	01	01	19	05	05	05	07	12	14	18	13	77
		CODE	15 BED ICU WARD	PASSAGE	SLUICE ROOM	NURSE'S STATION	DIVERSE STORE	PROCEDURE ROOM	ANTE-ROOM	BATH	ISOLATION WARD	TOILETS	DIVERSE STORE	DR'S REST	STAFF ROOM	OFFICE 02	OFFICE 01	BOARD ROOM	COUNSELLING ROOM	WAITING ROOM	DUCT	DUCT	PASSAGE	CHANGE ROOM 01	CHANGE ROOM 02	TOILET	SCRUB	DUTY STATION	PASSAGE	RECOVERY ROOM	CONTROL ROOM	CATH LAB
		RM No.	RM-01	RM-02	RM-03	RM-04	RM-05	RM-06	RM-07	RM-08	RM-09	RM-10	RM-11	RM-12	RM-13	RM-14	RM-15	RM-16	RM-16	RM-16	RM-17	RM-18	RM-19	RM-20	RM-21	RM-22	RM-23	RM-24	RM-25	RM-26	RM-26	RM-27	RM-28
1. WASH HAND BASIN SPOUT The Blutide Neo Chrome Wall Type Basin Mixer with Spout in Chrome has 1/2" female connections. The centres are 115mm and the length of the spout is 205mm. The overall size of the cover plate is 220mm																																	
2. WATER CLOSET Wall-hung Washdown WC ,Rimless WC ceramic appliance featuring TurboFlush flush technology Easy fastening with Easy Fast Fixing (type EFF3) Type 1, full flush volume 6 / 5 / 4 l, in accordance with EN 997 Quick-release hinges, lockable ,4 l flush Shrouded Hidden fastening,WC seat made of Duroplast Overlapping WC lid ,WC seat with EasyMount hinges																																	
3. ACTUATOR PLATE Geberit Sigma 20 Actuator Plate for Dual Flush Cistern | Geberit | Stainless Steel Polished																																	
4. PARAPLEGIC WATER CLOSET Orchid Paraplegic Wall hung pan (439016WH)																																	
5.GRAB RAIL Side wall grab rail																																	
6.GRAB RAIL Pearl paraplegic grab rail 750 x 250 x 32mm																																	
7. WASH HAND BASIN Vaal 580x410mm Undermount basin with integrated overflow. No provision for tapholes.																																	
8.STAINLESS STEEL SINK Double bowl, double drainer, sink manufactured from 1.2mm thick, grade 1.4301 (304) stainless steel, satin polish finish with a radiused front edge together with a radiused internal corner at the base of the upstand. All sink bowls are prepared for a 38mm waste outlet which can be supplied as an extra.Elbow action ¼ turn wall type mixer with a swivel outlet.½"BSP male inlet. SANS 226 TYPE 2 515/055-21																																	
9. WASH HAND BASIN SPOUT Bib Tap 1/4 Inch Turn Ceramic Disc Headpart 15mm BSP Male Iron Connection End																																	
10. SOAP DISPENSER Rodan Soap Dispenser-Electronic Sensor RODX625 .Touch free soap dispenser for wall mounting, manufactured from 0.8 mm Stainless Steel, satin finished. Folded front cover, cylinder lock with Franke standard key and inspection window on front. Infrared sensor activity for non-touch operation. - LED-light shows battery status - Integrated refillable 0.8 litre soap tank suitable for liquid soaps and lotions - Mounting height >300 mm above wash basin or table top - Betw. 0.6 and 1.1 ml is dispensed																																	
11. TOILET ROLL HOLDER Rodan Dbl Toilet Roll Holder with Spindle RODX672 Double toilet roll holder with spindle system for wall mounting, Stainless Steel, surface satin finished, folded front cover, cylinder lock with Franke standard key. For 2 rolls with max. Ø 120 mm, second roll will be released after consumption of first roll, with spindles, reserve roll not visible. Includes Stainless Steel screws and dowels.																																	
12. SANITARY TOWEL WASTE BIN Rodan Sanitary Towel and Waste Bin RODX611 Sanitary towel disposal and waste bin for wall mounting, stainless steel, surface satin finished, material thickness 0.8mm, flat front cover, approx. 3.7 litre capacity, removable plastic container inside, incl. stainless steel screws and dowels.																																	
13. PAPER TOWEL DISPENSER Rodan Paper Towel Dispenser RODX600 Paper towel dispenser for wall mounting, 0.8 mm Stainless Steel, surface satin finished, folded front cover, cylinder lock with Franke standard key, inspection windows on sides, loading capacity 500 - 800 pcs. of paper depending on convolution, incl. Stainless Steel screws and dowels.																																	
14. HYGIENE BAG DISPENSER Rodan Hygiene Bag Dispenser RODX191 Hygiene bag dispenser for wall mounting, manufactured from 0.8 mm Stainless Steel, surface satin finished, edges not welded, inboard lug to hold package, withdrawal from front, incl. pre-mounted double side self-adhesive tape and stainless-steel screws and dowels, includes cleaning rag to clean bonding surface.																																	
15.HAND DRYER Sensor operated hand dryer for wall mounting manufactured from Grade 304 1,2mm Stainless Steel, brushed finish.																																	
16.MIRROR 450mm width x 600mm depth x 4mm thick mirror above wash-hand basin @ 1,010mm above ffl, to be fixed to wall by means of adhesive. concealed thief resistant fixings, plugged and screwed to the wall with stainless steel screws. NB: To be @ 1,010mm above ffl																																	
16.URINAL GEBERIT 116.074.00.1 Preda urinal with intergrated control.																																	

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ISSUED FOR TENDER

LEGEND TO FINISHES

Finish of Ceiling — C
Finish of Floor — F
Finish of Wall — R
Finish of Skirting — S

REFER TO THE FINISHES SCHEDULE PROVIDED ON SEPARATE BOOKLET

Rev.	Date	Description

DEPARTMENT OF HEALTH

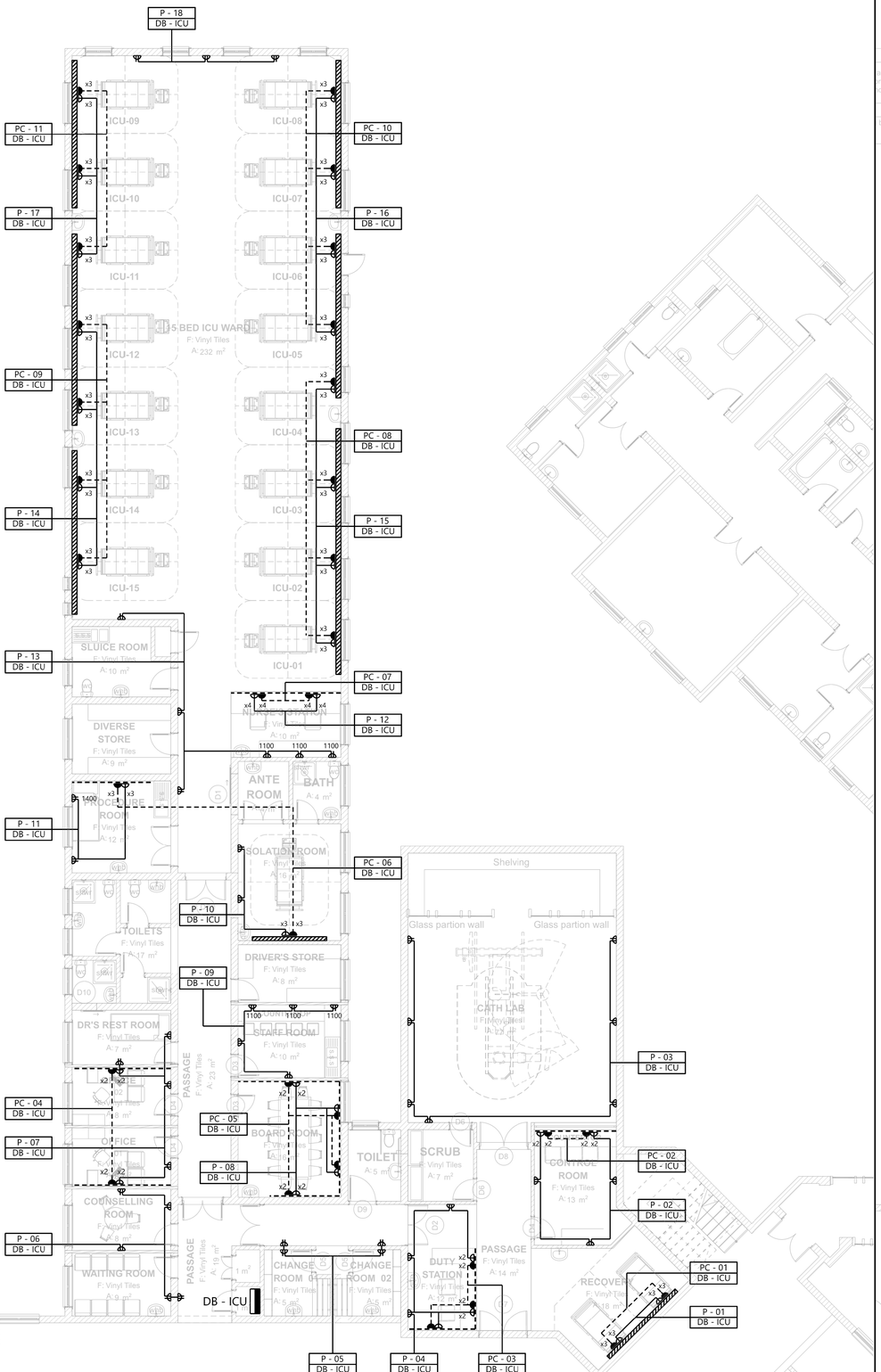
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PROPOSED NEW MATERNITY WARD AND UPGRADES AT JST HOSPITAL, RUSTENBURG

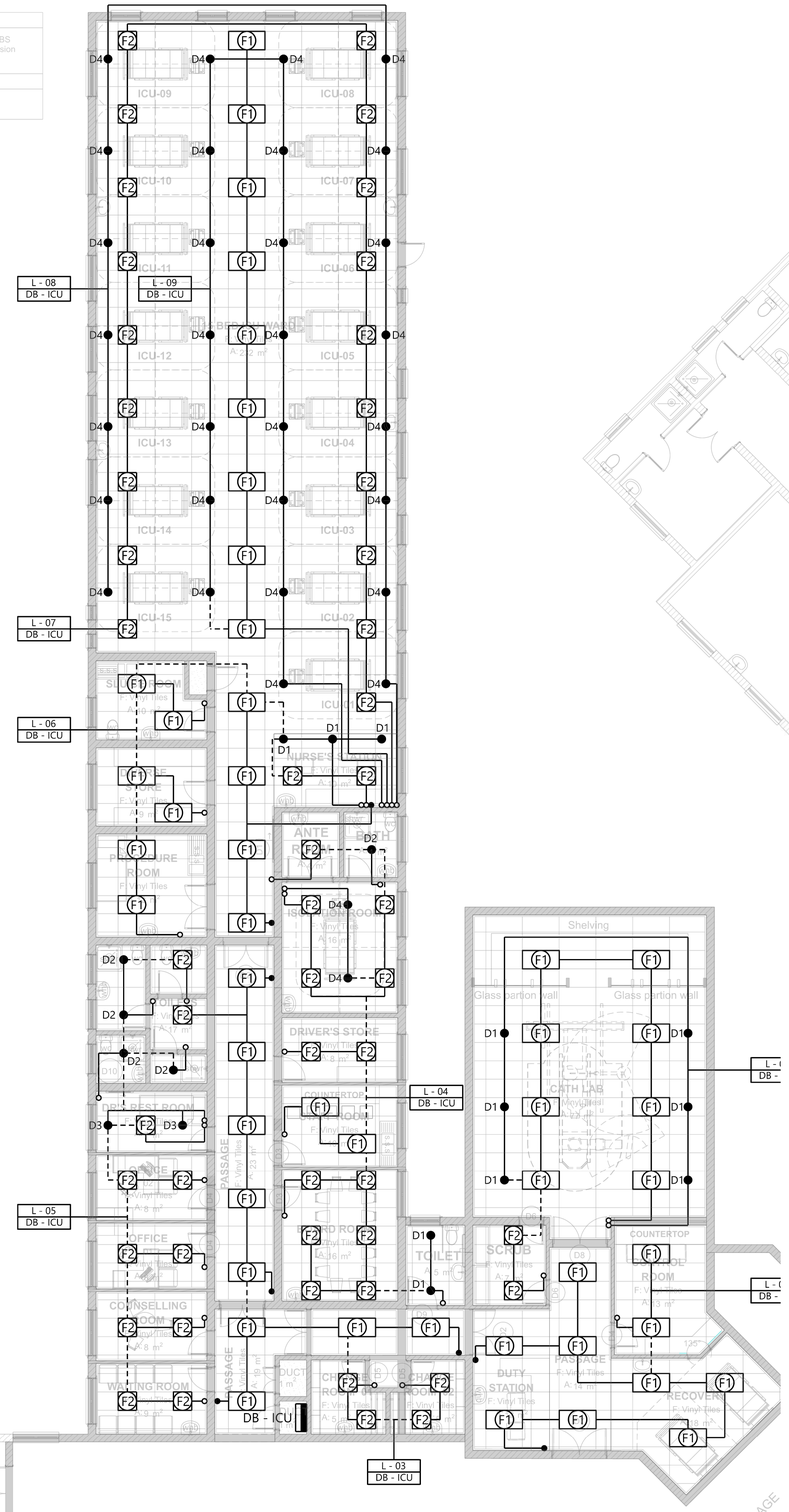
Master plan reference:

Drawing:
CONVERSION OF WARD 13 INTO ICU-FPLN

Status:
STAGE 2

Drawn by :		
Designed by :		
Checked by : _____ signature		Drawing No. : **ICU-A 6004-**
Scale:		Revision No.
Date:	MARCH 2026	
Project No:		Paper Size: A1





LEGEND:

- ELECTRICAL DISTRIBUTION BOARD
- 16A SINGLE SWITCHED SOCKET OUTLET ON POWER-SKIRTING OR WALL-MOUNTED (300mm AFFL OR STATED/INDICATED)
- 16A SINGLE SHAVED EARTH SOCKET OUTLET ON POWER-SKIRTING OR WALL-MOUNTED (300mm AFFL OR STATED/INDICATED)
- x2 INSTALL 2x 16A SINGLE SWITCHED SOCKETS OUTLET ON POWER-SKIRTING
- x2 INSTALL 2x 16A SHAVED EARTH SOCKET OUTLETS ON POWER-SKIRTING
- 16A DOUBLE SWITCHED SOCKET OUTLET, WALL MOUNTED AT 300mm AFFL OR STATED/INDICATED
- 16A DOUBLE SHAVED EARTH SOCKET OUTLET, WALL MOUNTED AT 300mm AFFL OR STATED/INDICATED
- COMBINED DATA & TELEPHONE OUTLETS (RJ-11 & RJ-45 OUTLETS) MOUNTED ON POWER-SKIRTING/FLOOR-BOX/WALL BOX
- DOUBLE COMPARTMENT POWER-SKIRTING
- HORIZONTAL BEDHEAD TRUNKING UNIT WITH SERVICES AS INDICATED
- D1 TYPE D1 LUMINAIRE - RECESSED 15W LED COOL-WHITE DOWNLIGHT, WHITE TRIM WITH 5A PLUG TOP AND 3M CABLE LEAD;
  TYPE D1(E) TO HAVE EMERGENCY BATTERY BACK-UP
- D2 TYPE D2 LUMINAIRE - RECESSED MOISTURE-PROOF 15W LED COOL-WHITE DOWNLIGHT, WHITE TRIM WITH 5A PLUG TOP AND 3M CABLE LEAD; IP-65
  TYPE D2(E) TO HAVE EMERGENCY BATTERY BACK-UP
- D3 TYPE D3 LUMINAIRE - RECESSED 10W LED COOL-WHITE DOWNLIGHT, WHITE TRIM WITH 5A PLUG TOP AND 3M CABLE LEAD;
- D4 TYPE D4 LUMINAIRE - RECESSED 18W LED COOL-WHITE DOWNLIGHT, WHITE TRIM
- (F1) TYPE F1 LUMINAIRE - RECESSED 1200 x 600, 60W LED PANEL WITH 5A PLUG TOP AND 3M CABLE LEAD;
  TYPE F1(E) TO HAVE EMERGENCY BATTERY BACK-UP
- F2 TYPE F2 LUMINAIRE - RECESSED 600 x 600, 40W LED PANEL WITH 5A PLUG TOP AND 3M CABLE LEAD;
  TYPE F4(E) TO HAVE EMERGENCY BATTERY BACK-UP
- ONE-WAY LIGHT SWITCH
- TWO-WAY LIGHT SWITCH
- PH DAY/NIGHT LIGHT SWITCH (PHOTOCELL)

NOTES

NO.	DESCRIPTION

REVISION:

NO.	DESCRIPTION	NAME	DATE

CLIENT:

DEPARTMENT OF HEALTH AND SOCIAL DEVELOPMENT



LEGEND:

- SURFACE MOUNTED NURSE CALL CONTROL PANEL - TO BE POSITIONED AT THE NURSE DUTY STATION
- HORIZONTAL BEDHEAD TRUNKING UNIT WITH 1x NURSE CALL POINT AND 1x INLINE SOCKET FOR NURSE CALL HANDHELD UNIT
- WALL-MOUNTED NURSE CALL PUSH CALL UNIT IN THE PATIENT ABLUTION FOR EMERGENCY CALL-OUTS
- CEILING MOUNTED BATHROOM PULL CALL UNIT IN A STANDARD 100mm x 50mm ELECTRICAL BOX WITH A MICRO-SWITCH ATTACHED TO A 2.2m NYLON STRING
- CEILING MOUNTED OVERDOOR RED LIGHT MOUNTED IN A 100mm x 100mm ELECTRIC BOX
- 300mm WIDE CABLE TRAY IN CEILING VOID
- DOUBLE COMPARTMENT POWER-SKIRTING
- D — DATA OUTLET MOUNTED ON POWER-SKIRTING/FLOOR-BOX /WALL BOX - AS INDICATED
- T — TELEPHONE OUTLET(S) MOUNTED ON POWER-SKIRTING/FLOOR-BOX/WALL BOX
- D — CEILING OR SLAB MOUNTED CCTV CAMERA
- WAP — CEILING MOUNTED WIFI ACCESS POINT
- DOOR MAGLOCK
- 1400 — WALL-MOUNTED BIOMETRIC / CARD READER AT 1400AFFL
- 1400 — WALL-MOUNTED GREEN BREAKGLASS UNIT AT 1400AFFL
- 1400 — WALL-MOUNTED NO-TOUCH BUTTON AT 1400AFFL

NOTES

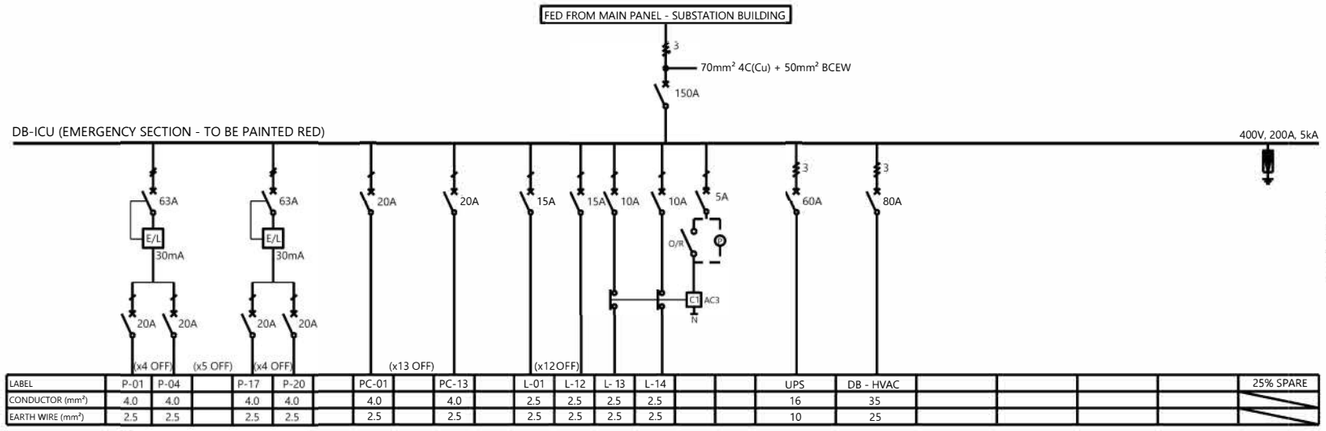
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REVISION:

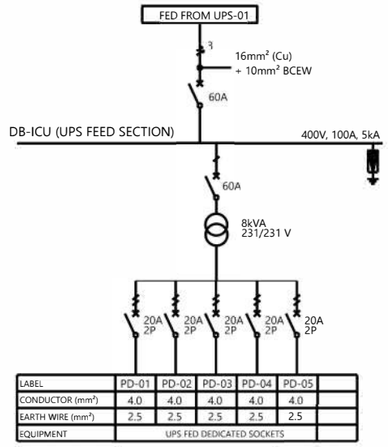
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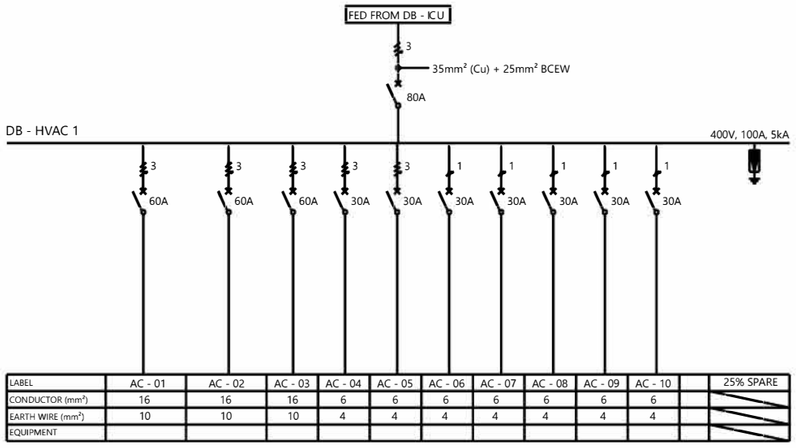
CLIENT:

DEPARTMENT OF HEALTH AND SOCIAL DEVELOPMENT



METAL BARRIER





LEGEND:

	EARTH LEAKAGE CIRCUIT BREAKER, 63A, 2-POLE 30mA
	SINGLE POLE CIRCUIT BREAKER
	THREE POLE CIRCUIT BREAKER
	CLASS 1 & 2 SURGE ARRESTOR
P	220-240V, 50Hz DAYLIGHT SWITCH, ON/OFF MUST BE ADJUSTABLE FROM 5 TO 100 LUX, WEATHERPROOF AND MUST HAVE A BUILT-IN DELAY OF 40 SECONDS
C1 N	ELECTRICAL CONTACTOR

NOTES

NO.	DESCRIPTION

REVISION:

NO.	DESCRIPTION	NAME	DATE

CLIENT:
DEPARTMENT OF HEALTH AND SOCIAL DEVELOPMENT

CONSULTANT:

PROJECT:
PROPOSED UPGRADES & REFURBISHMENTS AT THE JOB SHIMANKANA TABANE (JST) HOSPITAL, RUSTENBURG

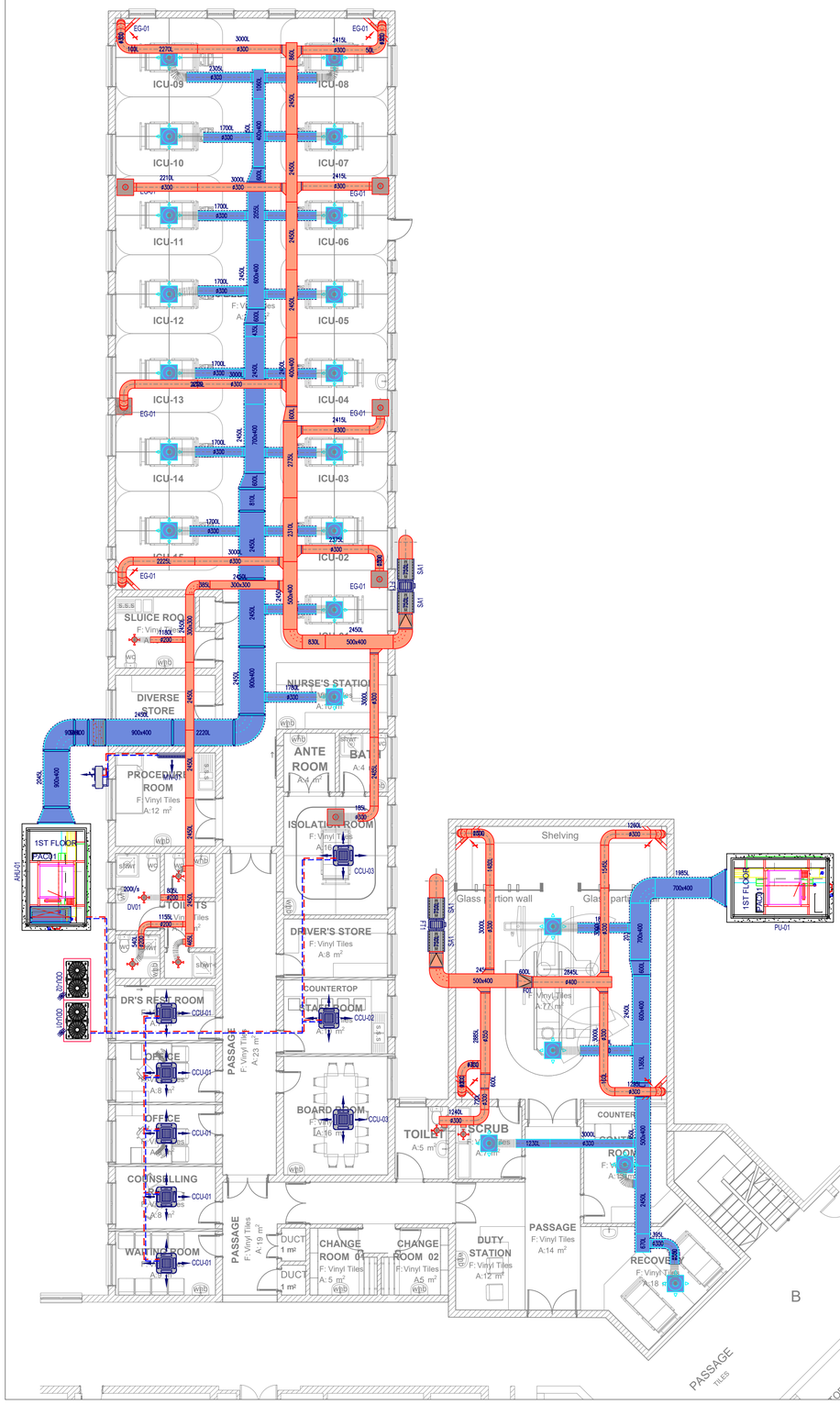
SERVICE:
PROPOSED INTENSIVE CARE UNIT (ICU) - ELECTRICAL INSTALLATION

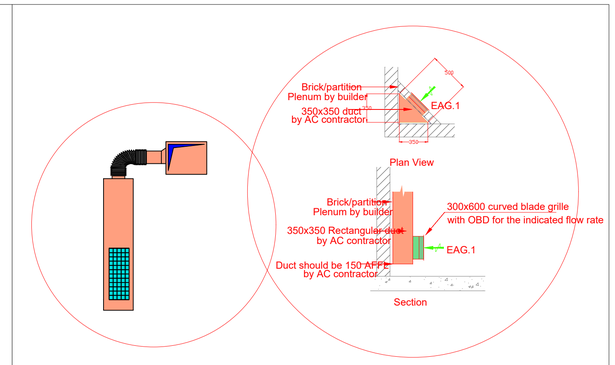
DRAWING TITLE:
SINGLE LINE DIAGRAM - DISTRIBUTION BOARD

SCALE: 1:100 (A1)	DRAWN:
DATE: MAY 2025	DESIGN:
CHECKED:	APPROVED:

CAD REFERENCE: G42-JST-ICU-E-300.dgn

DRAWING NO.: G42-JST-ICU-E-300





Notes:

This drawing is not to be used as a construction/installation drawing.

Routes and zones have been allocated to this service, location dimensions are indicative of these.

To prepare his construction/installation drawing, the subcontractor must adhere to this co-ordination principle and must inspect all the architect's drawings, including structural and other services' design drawings pertaining to the works shall acquaint himself with the general arrangement of all other services and ensure that in fixing his work it will not obstruct the fixing of future maintenance of other services.

The subcontractor is responsible for correct field dimensions; clearances and heights, quantities, fabrication processes and techniques of construction co-ordination of his work with that of all other trades, providing all devices necessary for safe and satisfactory operation. Detailed drawings, typical sections, typical weight including all typical details as well as the legend can be read off drawing number MA -100

1. All installation should be carried out as per Part IV of the tender specification.
2. Duct sizes shown are sheet metal sizes.
3. All ducting to be manufactured & installed in accordance with the SANS standards.
4. All A/C shaft to be fitted with mentis grid platform on floors with access door.
5. All exposed ducting to be painted to an approved colour.
7. All take-offs from supply & exhaust air ducting to be 45° boots.
8. AC equipment to be fitted with anti-vibration mountings as per specification.
9. HVAC contractor to ensure that all condensate drains are trapped and slope adequately. All drains to be tested for leaks and operation.
10. All ducting to be flat on top and installed hard-up to the underside of the slab above.
11. HVAC Contractor is responsible for connecting the condensate drains to the drain stack or the nearest drain. The connection must be a solid connection to prevent leakage.
12. Thermostat positions are provisional. Final positions shall be determined on site in conjunction with Client/Engineer. Where full height partitioning is not available for mounting the thermostat, it must be mounted on the brick wall.
13. All refrigerant piping, electrical and control wiring between indoor and units must run in trunking/on cable trays with cover plate securely fitted against wall.
14. Condenser must be mounted on galvanised cantilever frame.
15. All supply air ducting must be externally insulated.
16. All BMS wiring must be installed in PVC conduit by BMS controller.

DIVISION OF WORK

Work by Main Contractor

- Openings in doors for door grilles.
- Openings in ceiling for air terminals and/or fans.
- Openings in structure complete with timber frames (in non-fire walls) and making good after installation of HVAC equipment.
- Concrete bases for fan sets, etc.
- Enclosures around HVAC openings
- Mentis grid platform in AC shafts.
- Building in and sealing of fire dampers.

Work by Electrical Subcontractor

- Power supply terminating in Distribution boards.
- Heater interfacing safeties with the air pressure switch.
- Stop/Start interfacing of toilet exhaust fans.
- Fire interfacing signal to each AHU.

Work by Plumbing Subcontractor

- Fullbore outlets on roof.
- Water outlet points for Chiller Units

Legend

- Externally insulated supply ducting
- Externally insulated return ducting
- Uninsulated extract ducting
- Cladded extract ducting
- CV01 — 600x600 Constant Volume Supply Air diffuser with flow rate.
- A32 galvanised condensate/drain piping
- Refrigerant piping
- SE — Duct stop end
- Single phase isolator by electrician
- Three phase isolator by electrician
- 4 Way Blow Ceiling Cassette with Cooling Capacity
- FD — Fire Damper with fusible link
- UC(25mm) — Under Cut door (25mm)
- DG01(600x350) — Door Grille with size and flow rate
- DV01 — Disc valve with flow rate
- Return Air Grille (600x600) with flow rate
- VRF-01 — Variable Refrigerant Flow Condensers
- Mid Wall unit
- Hide Away (Concealed) Unit
- Axial Fan
- SA — Sound Attenuator (1.5D)
- WL03(800x450) — Weather Louvre with size and flow rate
- Condenser

EQUIPMENT SCHEDULE - VRF (Variable Refrigerant Flow Units - Heat Recovery - 4 Way Blow Cassette Units)

Symbols MCA: Minimum Circuit Amps; FLA: Full Load Amps; IFM: Indoor Fan Motor; Output: Fan Motor Rated Output

ITEM	DESCRIPTION	AREA / LOCATION	QTY	COOLING CAPACITY (kW)	POWER SUPPLY	SIZE - Indoor Unit (HWD) (mm)	WEIGHT (kg)	NOTES
CCU-01	4 Way Blow Cassette Unit		6	2.2 kW	220-240V / 50Hz, Max 264V & Min 198V; MCA = 0.29A; IFM: Output = 0.011kW; FLA = 0.23A	280x570x570	15	
CCU-02	4 Way Blow Cassette Unit		2	2.8 kW	220-240V / 50Hz, Max 264V & Min 198V; MCA = 0.29A; IFM: Output = 0.015kW; FLA = 0.23A	280x570x570	15,5	

SCHEDULE OF EQUIPMENT

ITERM	DESCRIPTION	AREA / LOCATION	QTY	COOLING CAPACITY (kW)	POWER SUPPLY	SIZE	WEIGHT
PAU-01	PACKAGE UNIT	CATH - LAB	1	22kW	-	1.695 x 1.284 x 2.212	720kg
AHU-01	AIR HANDLING UNIT	ICU	1	66kW @ 5825L/S	-	-	-

EQUIPMENT SCHEDULE - VRF (Variable Refrigerant Flow Units - Heat Recovery)

Symbols MCA: Minimum Circuit Amps; FLA: Full Load Amps; IFM: Indoor Fan Motor; Output: Fan Motor Rated Output

ITEM	DESCRIPTION	AREA / LOCATION	QTY	COOLING CAPACITY (kW)	POWER SUPPLY	SIZE - Indoor Unit (HWD) (mm)	WEIGHT (kg)	NOTES
VRF - HR 09	Variable Refrigerant Flow, Heat Recovery Condenser Unit		1	75 kW	380/400/415V; 50/60Hz; Max:456V; Min:342V; MCA: 54.92 A; Compressor Output: 10.3kW&8.2kW; SC: 8A; Fan Output: 0.92kW&0.92kW; RLA Cooling: 38.4/36.5/35.2 A; RLA Heating: 38.0/36.1/34.8 A	(1710x920x760) & (1710x1220x760)	240 & 265kg	

EQUIPMENT SCHEDULE - MID WALL UNIT

Symbols MCA: Minimum Circuit Amps; FLA: Full Load Amps; IFM: Indoor Fan Motor; Output: Fan Motor Rated Output

ITEM	DESCRIPTION	AREA / LOCATION	QTY	COOLING CAPACITY (kW)	POWER SUPPLY	SIZE - Indoor Unit (HWD) (mm)	WEIGHT (kg)	NOTES
MW-01	Mid Wall Unit (Wall Mounted)			2.2 kW	220-240V / 50Hz, Max 264V & Min 198V; MCA = 0.25A; IFM: Output = 0.017kW; FLA = 0.20A	295x815x225	23	

REVISIONS

Rev No.	DATE	DESCRIPTION
TD	19.05.25	ISSUED FOR TENDER

DEPARTMENT OF HEALTH AND SOCIAL DEVELOPMENT

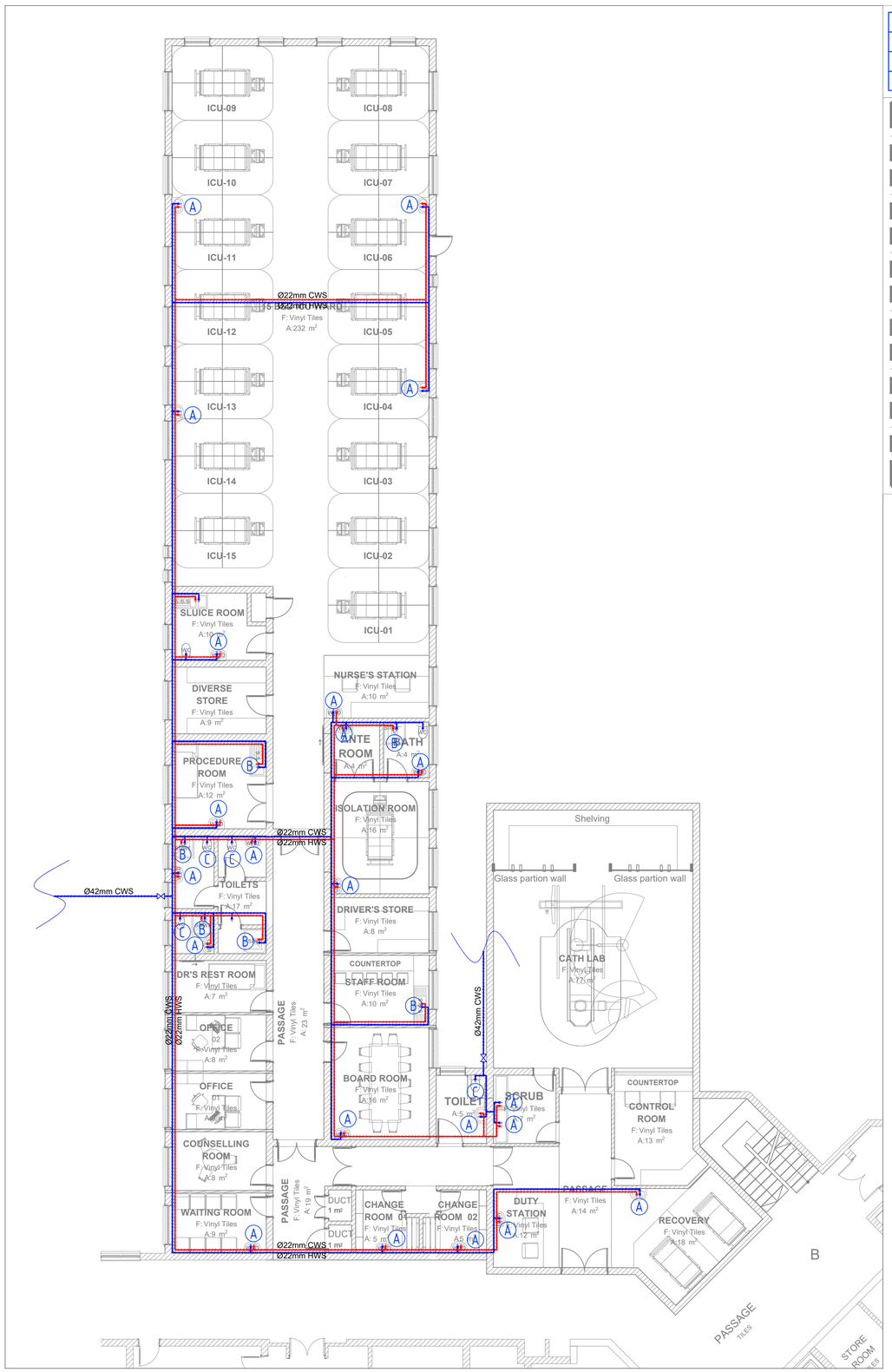
Project:
RENOVATIONS, EXTENSIONS & NEW BUILDINGS AT JST HOSPITAL

Master plan reference:
ICU WARD 13 FIRST FLOOR

Drawing:
HVAC LAYOUT

Status:
TENDER

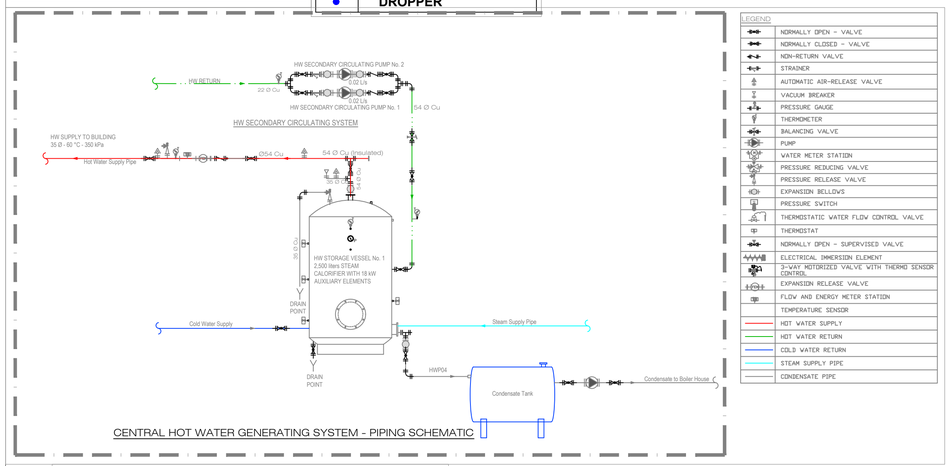
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Designed by:		
Checked by:		Project No.: -
Signature	Date	
Scale:	1:100	Revision No.: TD
Date:	MAY-2025	
Drawing No:	NWDOH-JST-MA-101	



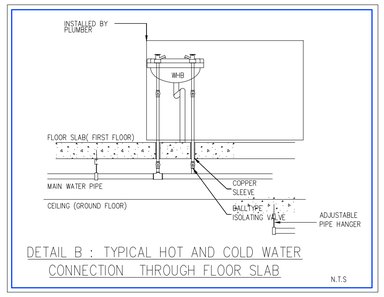
Ⓐ	Ø15 HOT & COLD TO WHB
Ⓑ	Ø15 HOT & COLD TO SINK OR SHOWER
Ⓒ	Ø15 COLD TO TOILET
Ⓓ	Ø15 COLD TO URINAL

LEGEND

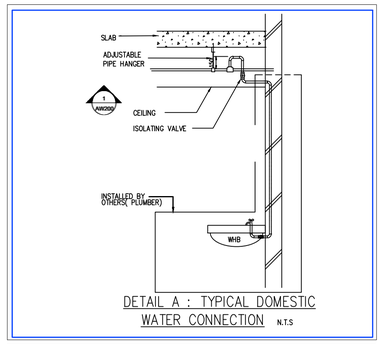
	COLD DOMESTIC WATER
	VALVED OUTLET
	HOT DOMESTIC WATER
	DROPPER



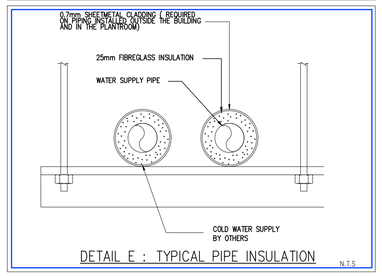
CENTRAL HOT WATER GENERATING SYSTEM - PIPING SCHEMATIC



DETAIL B : TYPICAL HOT AND COLD WATER CONNECTION THROUGH FLOOR SLAB N.T.S



DETAIL A : TYPICAL DOMESTIC WATER CONNECTION N.T.S



DETAIL E : TYPICAL PIPE INSULATION N.T.S

GENERAL NOTES:

1. Piping larger than 22mm **may not** be chased into walls. Horizontal chased piping installations must be avoided
2. The domestic water must be reticulated on the site with a 100mm plastic ring main so place to ensure the shortest possible run without compromising supply runs to blocks
3. Area isolation is not required however any connection point to a block must be valved
4. Electric geysers must conform to the “Standard Design” and solar geysers to the “Solar Design” criteria as defined in SANS 151.
5. Hot water geysers must be placed in the ceiling space above wet areas. Under no circumstances will geysers be allowed in teaching area ceiling spaces.
6. Underground piping should be color coded by either using an artic blue pipe or applying a 10mm artic blue line to the top of the pipe
7. All supplies to fittings should terminate in valved ends
8. No hot water supply may exceed 55°C however the supplies to the Grade R ablutions and sick rooms may not exceed 40°C
9. On electric units the thermostats must be set to 55°C and on solar units to 40°C
10. Solar absorption units must be flat panel units mounted flat on the roof pitch as close as possible to the geyser. These should face due north with an allowed deflection of 45° to east or west
11. Panel placements must be of such to mitigate risks related to theft, vandalism and injury
12. 15mm Tamper proof garden tap
13. Cold water to comply with DID standard specification

REVISIONS

Rev No.	DATE	DESCRIPTION
TD	19.05.25	ISSUED FOR TENDER

DEPARTMENT OF HEALTH AND SOCIAL DEVELOPMENT

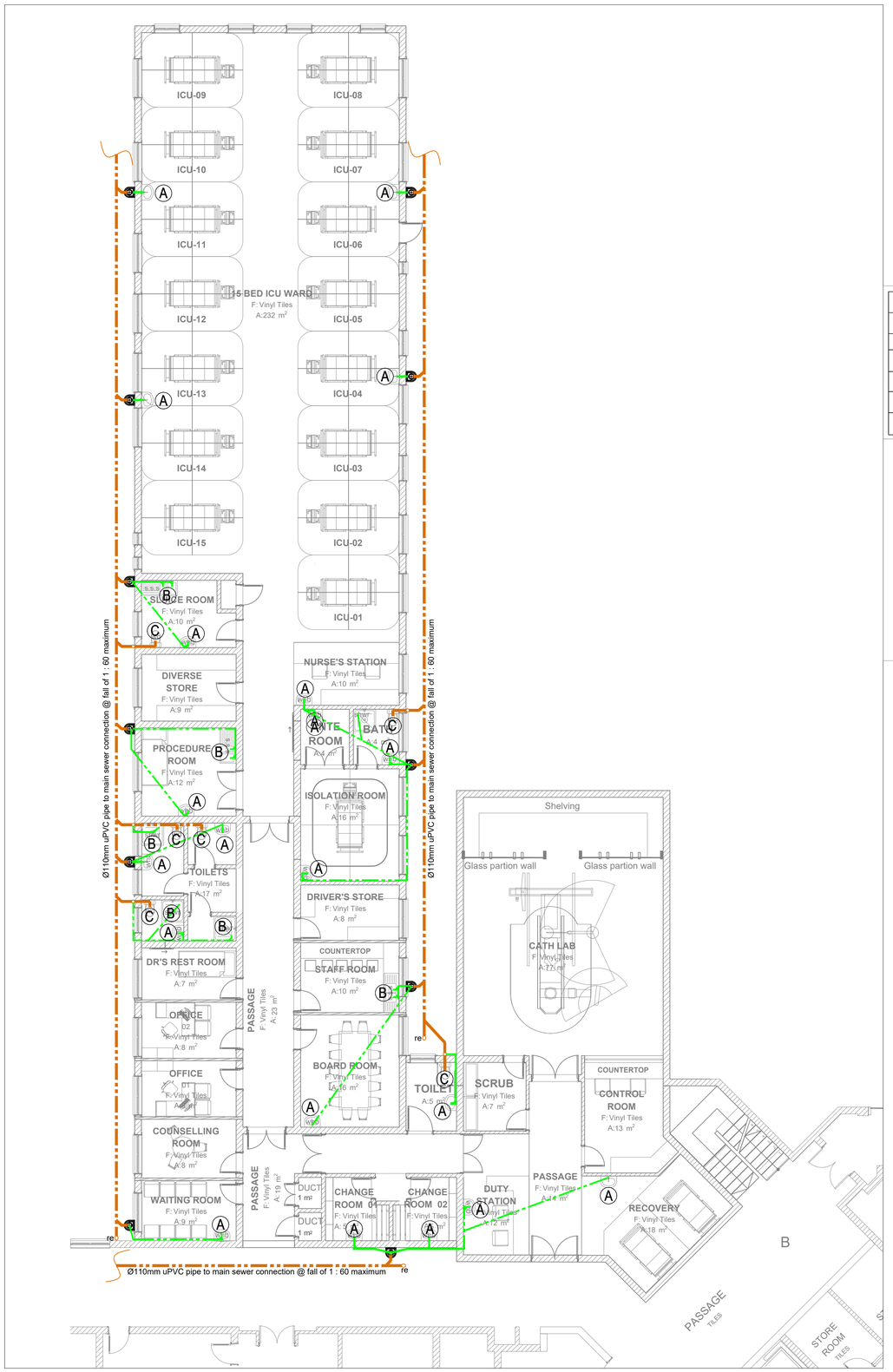
Project:
RENOVATIONS, EXTENSIONS & NEW BUILDINGS AT JST HOSPITAL

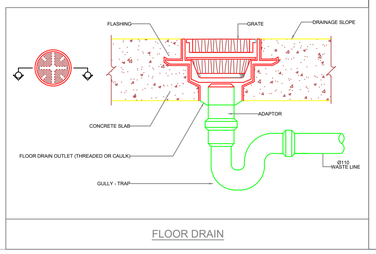
Master plan reference:
ICU WARD 13 FIRST FLOOR

Drawing: WATER SUPPLY LAYOUT

Status: TENDER

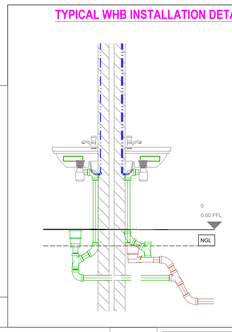
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Designed by:		
Checked by:		Project No.: -
Signature	Date	
Scale:	1:100	Revision No.: TD
Date:	MAY-2025	
Drawing No:	NWDOH-JST-M2-201	



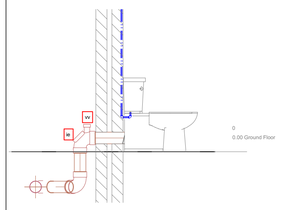


FLOOR DRAIN

TYPICAL WHB INSTALLATION DETAIL



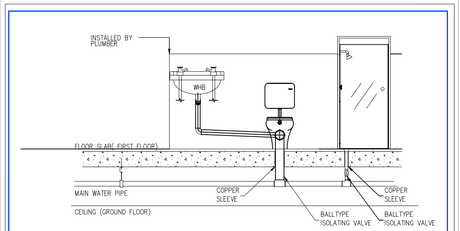
TYPICAL WC INSTALLATION DETAIL



(A)	Ø50 WHB WASTE PIPE DROP C/W BOTTLE TRAP
(B)	Ø50 SINK OR SHOWER WASTE PIPE DROP C/W BOTTLE TRAP/SHOWER TRAP
(C)	Ø110 WC (where applicable) WASTE
(D)	Ø50 URINAL OR TAP WASTE PIPE C/W BOTTLE TRAP
(E)	Ø50 BATH WASTE PIPE C/W WITH S-TRAP
(F)	Ø110 SLUICEMACHINE WASTE PIPE C/W WITH P-TRAP
(G)	Ø110 FLOOR DRAIN WASTE PIPE C/W WITH P-TRAP

LEGEND

	SOIL PIPE
	WASTE PIPE
	WASTE PIPE UNDER THE SLAB
	SOIL PIPE UNDER THE SLAB
	MAIN SEWER PIPE



DETAIL B : TYPICAL DRAINAGE CONNECTION THROUGH FLOOR SLAB

N.T.S

GENERAL NOTES:

1. A drainage installation shall be provided with one G for each municipal sewer connection, storage or disposal system
2. The surface level of the water in the G shall be not more than 500 mm below the overflow level of the G where the G is a dished G

trapped floor drain may be installed within a building as a waste-water outlet in any floor
which shall slope at a gradient of not less than 1 in 200 from all sides towards the floor drain,
provided that the floor drain shall
be so located that it is accessible,

3. b) be made of non-absorbent and corrosion-resistant material
4. A waste pipe which discharges into a G shall discharge at a point above the surface of the water seal of the G trap but not more than 100 mm above the level of the grating\

The channel fitted to any slab or stall-type urinal shall be graded with a fall of not less than
1 in 100 and the outlet to this channel shall
a) serve not more than 4,8 m of slab urinal, or eight stall units, and
b) be provided with a trap, which shall be provided with a corrosion-resistant grating designed to
retain solid matter without obstructing the flow of liquids; provided that any such grating shall not be installed in the case of any trap which serves any siphonic urinal

REVISIONS

Rev No.	DATE	DESCRIPTION
TD	19.05.25	ISSUED FOR TENDER

DEPARTMENT OF HEALTH AND SOCIAL DEVELOPMENT

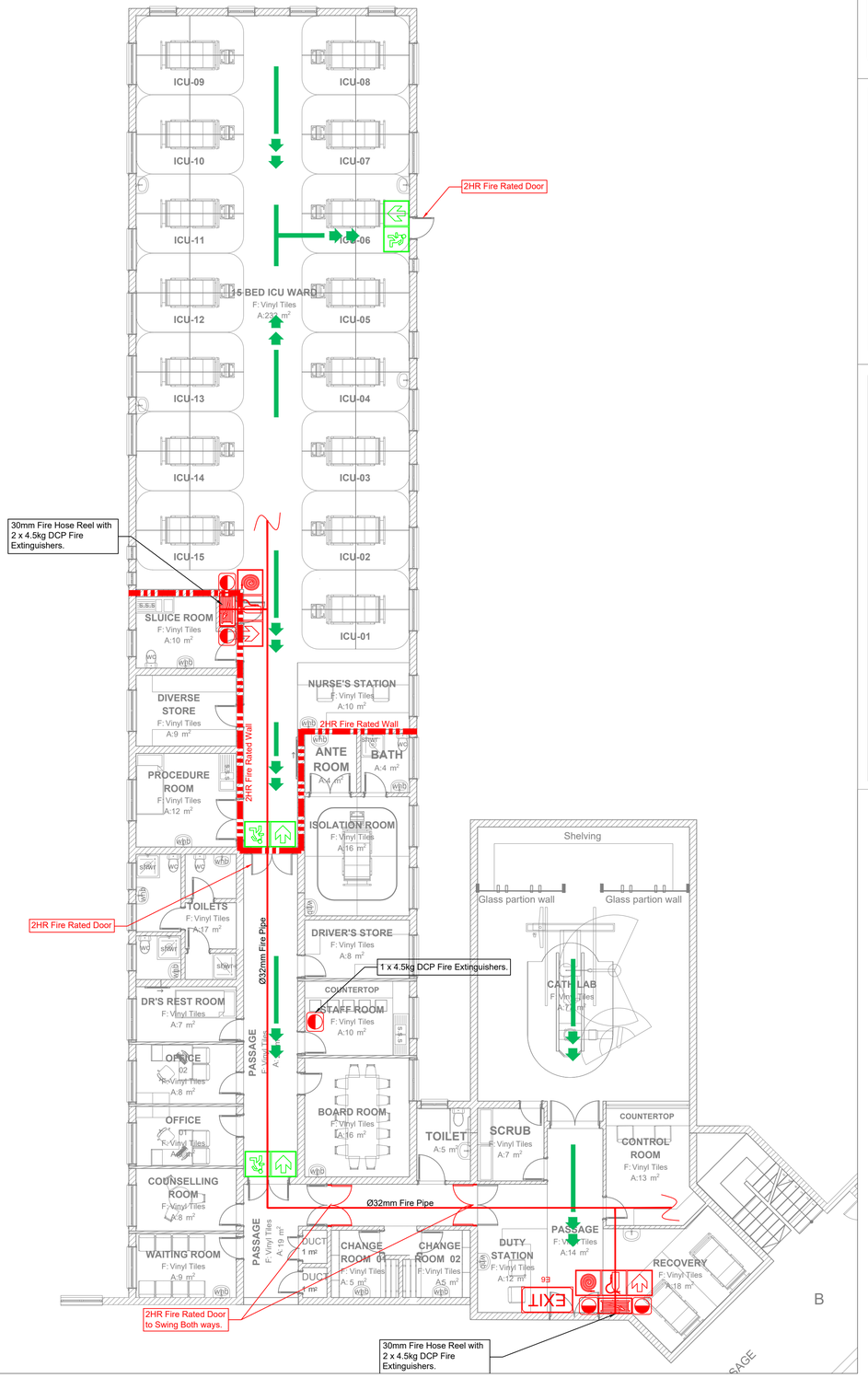
Project:
RENOVATIONS, EXTENSIONS & NEW BUILDINGS AT JST HOSPITAL

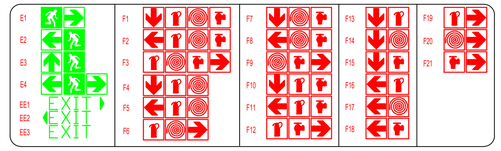
Master plan reference:
ICU WARD 13 FIRST FLOOR

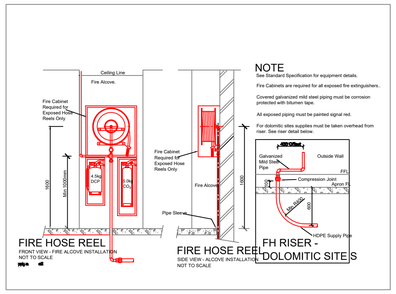
Drawing:
DRAINAGE LAYOUT

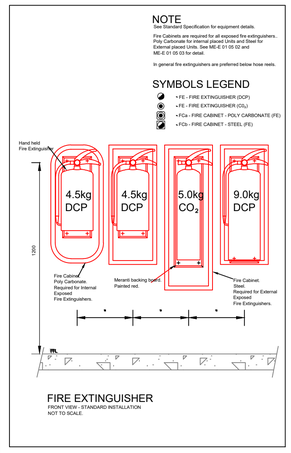
Status:
TENDER

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Signature	Date	
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Date:	MAY-2025	
Drawing No:	NWDOH-JST-M3-301	



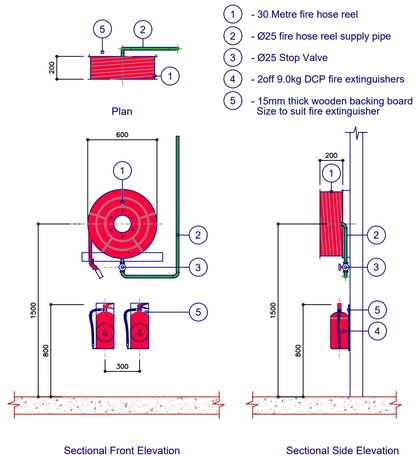






FIRE LEGEND

SYMBOL	NAME	DESCRIPTION	QTY
	FHR	Fire Hose Reel	2
	FE - DCP	Fire Extinguisher - Dry Chemical Powder	
	FE - CO2	Fire Extinguisher - Carbon Dioxide	
	FE - DCP	Fire Cabinet -Steel	
	FE - DCP 4.5kg	Fire Cabinet -Poly Carbonate	5
	FE - CO2	Fire Cabinet -Steel	
	FE - CO2	Fire Cabinet -Poly Carbonate	
	FE - CO2 9kg	Fire Cabinet -Poly Carbonate	
		2hour Fire Rated Wall	



TYPICAL FIRE HOSE REEL DETAIL

GENERAL NOTES:

FIRE PROTECTION NOTES

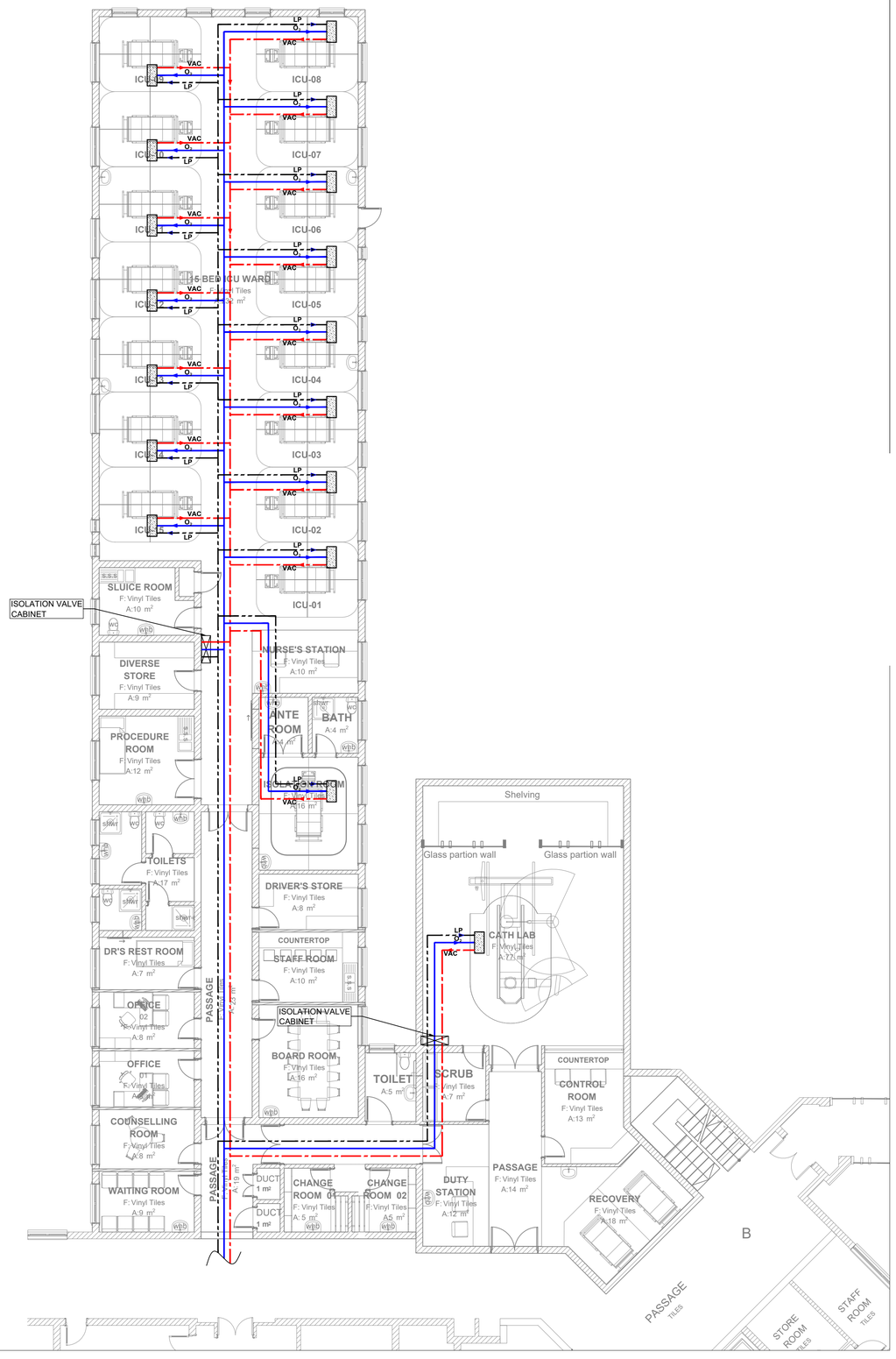
1. All work to comply with Act 103 of 1977 and SANS 10400 Part T-2024.
2. Occupancy Classification: E2 as per SANS 10400-A clause 20.
3. a) 1 x 4.5Kg Extinguishers, per 200m² or part thereof, to be installed in accordance with SANS 10105 and clause 4.38.
   b) 1 x 30 m Hose reels, per 500m² or part thereof, to be installed in accordance with SANS 543 and Clause 4.34
   c)Hydrants to be installed in accordance with SANS 1128: Part 1 and Clause 4.35
4. Water supply to the fire fighting equipment to comply with SANS 10400 - 2011 Part W with Municipal Water By-Laws.
5. Portable fire extinguishers to be hung on purpose made boards, as indicated on plan.
6. Doors in escape routes may only be fitted with approved locking devices and shall comply with clause 4.16, 4.17, 4.19.
7. Doors in feeder routers shall be double swing type and shall not be lockable as per clause 4.18.
8. 'B' Class fire door to comply with SANS 1253 and to be fitted with approved locking devices.
9. Floor coverings to be Class: 4 or better as per clause 4.14.
10. Wall coverings to be Class: 3 or better as per clause 4.15.
11. Emergency lighting to be installed and designed in accordance with SANS 10400 - Part T and SANS 10114-2 and SANS 1464-22, as per clause 4.30.
12. Fire detection and emergency evacuation communication system, complying with SANS 10139, to be installed, as per clause 4.31.
13. Photoluminescent escape signs to be provided and to comply with SANS 1186 Part 1 and 5, as per 4.29.
14. Photoluminescent symbolic signs, indicating fire equipment, to be provided and to comply with SANS 1186 Part 1 and 5 as per 4.32.
15. Ventilation to be designed and installed in accordance with EN 12101 as per 4.42.
16. Roof void subdivided with non combustible fire stops, with a stability and integrity rating of at least 20 minutes, into areas not exceeding 500m².
17. Suspended ceiling and its supporting members shall be of non combustible material.
18. Ceiling void subdivided with non-combustible fire stops, with a stability and integrity rating of at least 20 minutes, into areas not exceeding 500m².
19. Structural elements and components shall have a minimum stability rating of 120 minutes.
20. Fire walls will extend to the underside of the roof covering and no combustible roof element will penetrate such wall.
21. Insulation material to comply with SANS 428: 2006.
22. Stacking height to comply with clause 4.4.b of SANS 10400-2020 Part T.
23. Correct street number of the premises shall be displayed clearly on the street boundary of the premises in numbers at least 75mm high.
24. No dangerous goods will be stored in excess of the exempt quantities as per SANS 10263-0 Annex A.

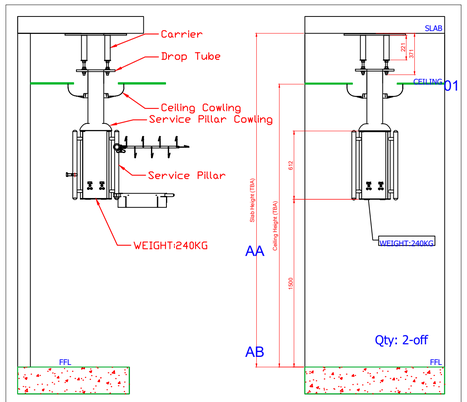
REVISIONS

Rev No.	DATE	DESCRIPTION
TD	19.05.25	ISSUED FOR TENDER

DEPARTMENT OF HEALTH AND SOCIAL DEVELOPMENT

Project:	RENOVATIONS, EXTENSIONS & NEW BUILDINGS AT JST HOSPITAL	
Master plan reference:	ICU WARD 13 FIRST FLOOR	
Drawing:	FIRE PROTECTION LAYOUT	
Status:	TENDER	
Drawn by:		
Designed by:		
Checked by:		Project No.: -
Signature	Date	
Scale:	1:100	Revision No.: TD
Date:	MAY-2025	
Drawing No:	NWDOH-JST-M4-401	





ISOLATION ROOM PENDENT
SCALE:N.T.S AC



MEDICAL GAS LEGEND

- Medical (LP) air line
- Medical (HP) air line
- Nitrous oxide (N2O) line
- Oxygen (O2) line
- Vacuum (Vac) line
- Scavenger
- V — Vacuum outlet point
- O2 — Oxygen outlet point
- MA — Medical (LP) air outlet point
- HP — Medical (HP) air outlet point
- Vacuum trap
- Medical gas alarm panel
- Isolation valve cabinet
- Verticle bedhead unit

REVISIONS

NOTES:

1. MEDICAL GAS AND VACUUM CONTRACTOR SHALL BE RESPONSIBLE FOR THE INSTALLATION OF ALL PIPING AND OUTLET POINTS IN BEDHEAD DUCTING.
2. MEDICAL GAS AND VACUUM POINTS AS INDICATED ON THE DRAWINGS TO BE INSTALLED IN THE FOLLOWING ORDER WHEN FACING THE WALL ON WHICH THEY ARE POSITIONED FROM LEFT TO RIGHT:
   OXYGEN (O2), VACUUM (Vac), NITROUS OXIDE (N2O), COMPRESSED AIR (LP Air).
3. PIPE DROPPERS IN WALLS SHALL BE RUN IN CONDUITING TERMINATING IN 80 X 100 TERMINAL BOXES IN WHICH THE BODIES OF THE OUTLET POINTS ARE FIXED.
4. OUTLET POINTS SHALL BE FITTED AT 1500mm AFFL.
5. REFERENCE SHALL BE MADE TO BOTH THE STANDARD AND DETAILED TECHNICAL SPECIFICATIONS.

Rev No.	DATE	DESCRIPTION
TD	22.02.24	ISSUED FOR TENDER

DEPARTMENT OF HEALTH AND SOCIAL DEVELOPMENT

Project:
RENOVATIONS, EXTENSIONS & NEW BUILDINGS AT JST HOSPITAL

Master plan reference:
ICU WARD 13 FIRST FLOOR

Drawing: MEDICAL GAS LAYOUT

Status: TENDER

Drawn by:		
Designed by:		
Checked by:		Project No.: -
Signature	Date	
Scale:	1:100	Revision No.: TD
Date:	MAY-2025	
Drawing No:	NWDOH-JST-M5-501	