



*Expression of Interest
For
Framework Agreements for Mechanical
Works for various Infrastructure Projects
throughout South Africa*

Contract N^o

CDC/292/24

Rev. 0

Classification: Public

CLOSING DATE OF BID

Wed, 06 November 2024

NAME OF BIDDER:

DOCUMENT CONTROL SHEET

PROJECT NAME : Expression of Interest - Framework Agreements for Mechanical Works for Various Infrastructure Projects throughout South Africa

DOCUMENT TITLE : Expression of Interest for Framework Agreements for Mechanical Works

DOCUMENT No. : CDC-CD-EoI-003-24

SIGNING OF THE ORIGINAL DOCUMENT

We, the undersigned, accept this document as a stable work product to be placed under formal change control as described by the Change Control Procedure document

ORIGINAL	Prepared by	Reviewed by	Approved by
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 Philisa Ndzamela e802c845-263c-4e46-a992-bde462869661 2024/10/08 12:18:5	Signature:	 Digitally Signed by: Andile Sebezo Senior Quantity Surveyor f0f5e221-0f9e-4c6f-ba0e-108abebf2419 IP Address: 10.0.56.228 Date: 2024/10/08 12:47:39 PM	 Zine Mtanda f4116535-cc76-477b-bc21-15b6f1816944 2024/10/09 1:53:18 PM

Distribution:	CDC, Prospective Bidders.
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REVISION CHART

REVISION 1	Name:	Name:	Name:
Date:	Signature:	Signature:	Signature:

REVISION 2	Name:	Name:	Name:
Date:	Signature:	Signature:	Signature:

REVISION 3	Name:	Name:	Name:
Date:	Signature:	Signature:	Signature:

INVITATION TO BID

The CDC is inviting capable and competent Contractors with proven experience and track-record to submit their bids for Mechanical works. The CIDB Grading of 3ME and higher is required. The purpose of this bid is to create a Framework Agreements of pre-qualified contractors who can be appointed in respect of a particular project/programme procurement as and when required. Respondents are required to have relevant experience and knowledge of infrastructure projects, particularly Mechanical Works.

The Contractors who comply with CDC requirements as stated in this Expression of Interest (EoI) document will be added to the CDC Framework Agreement system, which will be used to select bidders for the various projects that will require the provision of Mechanical works with related infrastructure services.

The scope of work will include equipment, materials, installation, testing, commissioning and maintenance of mechanical installations (which may include HVAC, Fire Services, Wet Services, Lift Installations and Medical Gas installations amongst other and not limited). Construction Works that are primarily concerned with the installation, extension, repairs and refurbishment of mechanical installations in or on any premises used from a point of control to a point of consumption, including any article forming part of such an installation. This will include all mechanical equipment forming an integral and permanent part of buildings and/or structures, including any pipe reticulation.

These projects are spread throughout the various Provinces. The CDC will reserve the right to allocate work to short-listed entities in an effort to distribute work and thereby reduce CDC's and the Client Departments' commercial risks.

NB: Period for the Framework Agreement will be valid for 36 months with an option to extend for an additional 24 months.

CONDITIONS

- (a) Bidders must be registered with the Construction Industry Development Board (CIDB) and must have an active CIDB Contractor Grading of 3ME and Higher.
- (b) Contractors with a CIDB grading of 2ME PE or lower are not eligible and will not be considered.
- (c) Bidders are required to have a valid and current CIDB registration on the date of closing and are required to maintain this registration throughout the Tender Evaluation period. Failure to do so will invalidate the tender.
- (d) The CDC Procurement Policy Shall apply.
- (e) The following legislation shall apply:
 - (i) Public Finance Management Act (PFMA);

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- (ii) Preferential Procurement Policy Framework Act, (5 of 2000) (PPPFA)
 - (iii) The Preferential Procurement Regulations 2022;
 - (iv) The Construction Industry Development Board Act, (38 of 2000)
 - (v) National Treasury Regulations;
 - (vi) National Building Regulations and Building Standards Act (103 of 1977);
 - (vii) South African National Standards (SANS) 10400 & XA;
 - (viii) The National Qualifications Framework Amendment Act, (12 of 2019);
 - (ix) The Skills Development Act, (97 of 1998)
 - (x) Disaster Management Act, (57 of 2002);
 - (xi) Occupational Health and Safety Act and Regulations, Act (85 of 1993);
 - (xii) Compensation for Occupational injuries and disease Act (130 of 1993);
 - (xiii) Broad Base Black Economic Empowerment -BBBEE Act Number 53 of 2003 (as amended by Act number 46 of 2013);
 - (xiv) NEMA National Environmental Management Act (107 of 1998);
 - (xv) National Heritage Resources Act, NHRA (Act No. 25 of 1999);
 - (xvi) National Water Act, NWA (Act No. 36 of 1998); and
 - (xvii) Any other applicable legislation in the built environment and including all Municipal Bylaws.
- (f) Joint Ventures (JV) or Consortiums are not permitted to bid for this Framework Agreement.
- (g) The 80/20 or 90/10 preference point system in terms of Price and Specific goals scoring will be applicable at the time of allocating work. The lowest acceptable tender will be used to determine the applicable preference point system, through the established framework upon receipt and requests of new projects.
- (h) Bidders must price the Pricing schedule of rates, under Annexure N exclusive of VAT, however bidders must be VAT registered. Non-VAT vendors who submit bids for contracts that would, if successful, take their annual turnover above the threshold of R 1 million are obliged to include VAT in the prices quoted and must therefore immediately upon award of the contract register with the South African Revenue Services (SARS) as VAT vendors. The award of contract would be conditional pending the successful bidder submitting proof of registration as a VAT vendor with SARS.
- (i) Bidders must provide proof of registration on the National Treasury's Central Supplier Database (CSD) or provide a Treasury CSD registration number e.g. MAAA0.
- (j) CDC will only award the tender to a bidder who is tax compliant. The tax compliance status of the bidders will be verified through CSD and South African Revenue Services (SARS) website.
- (k) The CIDB B.U.I.L.D. Programme shall apply to contracts that satisfy the minimum requirements at Award Stage. In such instances, the CIDB Standard for Indirect Targeting for Enterprise Development Through Construction Works Contracts, and the CIDB Standard for Developing Skills Through Infrastructure Contracts shall apply.

- (l) As per the amended construction codes, companies with less than 51% black shareholding (QSEs & Generics) are to submit a valid SANAS Accredited B-BBEE Verification Certificate (with the full applicable B-BBEE elements). QSEs with at least a 40% or 100% black shareholding and EMEs with an annual turnover of above R3 Million are required to submit a B-BBEE verification certificate from a SANAS accredited verification agency as they have to comply with the 40% sub-minimum requirement on the QSE Skills Scorecard to avoid being discounted a level. EMEs with a turnover of less than R3 million are exempt from complying with the subminimum requirement and may submit an affidavit or a certificate issued by CIPC, confirming their ownership and annual turnover.
- (m) A Sworn Affidavit must be completed only if a bidder does not have a BBBEE Accredited Certificate and is a SMME. If a bidder uses a generic Affidavit, a score of zero will be allocated under quantitative assessment. The Amended Construction codes affidavit MUST be the one completed to obtain points.
- (n) Bidders must confirm their company registration with Companies and Intellectual Property Commission (CIPC) (formerly CIPRO) as CDC will not award any bid to any business that appears on the CIPC List of de-registered businesses. The CDC may verify company registration with CIPC through BizPortal.
- (o) Bidders must complete and sign the POPI Act consent form.
- (p) Bidders carrying a CIDB grading 7 ME or higher will be encouraged to fully comply with the CDC SMME 33% Target on work apportioning should they be successful.
- (q) CDC will not award more than two (2) active projects to one bidder unless one project has reached 80% completion stage and beyond. A capacity assessment may be conducted in an event that the recommended service provider is the only responsive bidder and has already been awarded two contracts so as to be considered for a third contract at the sole discretion of the CDC and subject to their performance on the active two contracts.
- (r) The performance of the bidders on projects they have been awarded shall be reviewed and evaluated on an on-going basis by the CDC Project Manager. Poor performance on awarded projects may result in a bidder not being awarded future projects by the CDC.
- (s) The successful bidder will be required to comply with the National Environmental Management Act, (107 of 1998), National Heritage Resources Act, (25 of 1999), Occupational Health and Safety Act and Regulations, Act (85 of 1993), Compensation for Occupational Injuries and Disease Act, Act (130 of 1993), Disaster Management Act, Act (57 of 2002) and, all relevant and applicable legislations throughout the duration of the contract. Upon appointment, the successful bidder, will be required to develop Occupational Health, Safety and Environmental Management Systems in compliance to the CDC Norms and Standards.
- (t) A successful Bidder (Contractor/s) will be required to provide valid proof of registration of the Construction Health and Safety Officer (CHSO) or Construction Health and Safety Manager (CHSM) with SACPCMP upon award, who must have necessary competencies and resources to execute his

or her duties. No candidate registration will be accepted. The CHSO/M must have proven record of years of experience as follows:

- ✓ CIDB grading (3 - 6) = minimum of 2 years or more
- ✓ CIDB grading 7 = minimum of 5 years or more
- ✓ CIDB grading 8 = minimum of 8 years or more
- ✓ CIDB grading 9 = minimum of 10 years or more

“NB” this means that the above key personnel (CHSO/CHSM) will not be part of mandatory requirements and only tested upon allocation of work, and it is therefore the responsibility of the Successful Bidder to provide this information upon the receipt and acceptance of letter of appointment within specified timeframe by SCM and BU/Programme.

- (u) A successful Bidder (Contractor/s) will be required to provide full details or profile of Construction Environmental Officer (CEO) upon award, who must have necessary competencies and resources to execute his or her duties with requirements by the environmental legislations and its conditions, when applicable.
- (v) No priced quotation or competitive bids will be awarded to a person or entities who fail to provide proof of tax compliance status within the timeframe given to do so.
- (w) The Bidders must nominate a person who will be their designated person for this EoI. The overall designated person:
 - (i) Should have delegated authority to sign: The bid submissions, any correspondence with the CDC during the bidding process and any correspondence during the Contract Execution Phase. It is imperative that the duly authorised person conducts quality control on all the documentation to be submitted to the CDC as part of this EoI and signs the submission as a correct and sound document that the CDC could put its reliance on.
 - (ii) Would be conferred the authority to be the duly Authorised Signatory as would be provided in the **Certificate of Authority of Signatory** that should be included in the Tender Document.
 - (iii) Will be the sole point of contact between the CDC and the bidding during this Tendering process, and during contract execution.
 - (iv) Would be required to review and sign off all the deliverables to the CDC during the execution of the contract, confirming their quality and professional soundness.
- (x) Public servants are prohibited from doing any form of business with organs of state, whether in their own capacity as individuals or through companies in which they are directors. Verification will be done, and bidders will be disqualified should they be found to be in contravention with the regulations.
- (y) It is incumbent upon and the responsibility of the Prospective Bidders to submit their full and correct contact details when they download the EoI Document to enable any communication that the CDC might need to issue to all the Prospective Bidders during the bidding process to be realised. The CDC will not be accountable for any such omission or failure by the Prospective Bidders.

- (z) Any misrepresentation of information will lead to immediate disqualification of the Bidder's Submission.
- (aa) The successful bidders would be placed in the CDC's Framework System of pre-qualified Contractors for various provinces for a period of 36 months.
- (bb) The successful Service Providers will be appointed based on the competitive rates they tendered in response to this EoI process. **The Rates tendered will be fixed for 12 months from closing date of the EoI and will be adjusted annually after 12 months based on the Haylett formula workgroup 170.**
- (cc) Respondents or their representatives (including the courier services) must ensure that they register their submissions in the Register for Submissions form that will be provided at the CDC Document Control Office on the Ground Floor, wherein they will indicate the name of the person delivering the submission, the number of copies submitted, the time and date of submission and attach their signatures.
- (dd) Submission of a bid and its subsequent receipt by the CDC does not represent a commitment on the part of the CDC to proceed further with any Respondent or any contract;
- (ee) The CDC reserves the right not to accept any submission. If the CDC does not accept any submission, it will declare this EoI process to be closed.
- (ff) The tender validity period for this project is twenty-four (24) weeks from closing date.

Bid documents will be available for download from the CDC Website (www.coega.co.za) and the National Treasury e-Tender Portal from **Friday, 11 October 2024 from 10h00**, at no cost. Potential bidders will be required to provide their email addresses in the system before downloading the documentation for correspondence purposes. Potential bidders must therefore ensure that the email addresses are correct.

A Non-compulsory Briefing Meeting will be held via Teams on **Wednesday, 23 October 2024 at 14h00**.

Please join the meeting by using the following link: [Join the meeting now](#) or use following

Meeting ID: 325 564 729 976

Passcode: bEi9BM

Queries related to this bid must be addressed strictly to Ms Zine Mtanda via email: frameworktenders@coega.co.za. No telephonic or any other form of communication with any other CDC member of staff, other than the named individual below, relating to this request for bid will be permitted. Briefing Minutes will be uploaded on the CDC website within 48 hours after the Briefing Meeting. No queries will be responded to after the **30 October 2024**.

One original completed bid document shall be placed in a sealed envelope clearly marked:

“Contract No: CDC/292/24: EoI- Framework Agreements for Mechanical Works for Various Infrastructure Projects throughout South Africa”

The closing date and time for the receipt of completed bids is **Wednesday, 06 November 2024 at 12h00** at the CDC Head Office, **Corner Alcyon Road & Zibuko Street, Zone 1, Coega SEZ, Gqeberha (Port Elizabeth)**. Bids must be deposited in the tender box at the **Document Control Office** on the **Ground Floor**.

Bids will not be opened in public and no late submission will be considered.

Failure to provide mandatory information required in this bid will result in the submissions being deemed null and void and shall be considered non-responsive. Telegraphic, telexed, tippexed, facsimiled or e-mail submissions will not be accepted.

The CDC reserves the right not to accept the lowest proposal in part or in whole or any proposal.

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1 INTRODUCTION

The Coega Development Corporation (Pty) Ltd (CDC) attracts local and foreign investment into the Coega Special Economic Zone (SEZ) and the Nelson Mandela Bay Logistics Park (NMBLP); conceptualizes and develops complex, multi-disciplinary projects; and provides programme management; strategic advisory, economic research and human capital services. It also provides Implementing Agency services to various Government Departments and State-Owned Entities throughout South Africa and other African countries.

The Contractors who comply with CDC requirements as stated in this Expression of Interest (EoI) document will be added to the CDC Framework Agreement system, which will be used to select bidders for the various projects that will require the provision of general building works with related infrastructure services.

This EoI is aimed at creating jobs, developing and transferring skills, and fighting poverty. The CDC manages the entire development and service provision through innovative approaches that combine multi-disciplinary skills.

The infrastructure projects include, but are not limited to, health care facilities, education facilities, warehouses/factories, retail facilities, administration buildings and related bulk Infrastructure services. These infrastructure facilities will be designed and constructed to suit the identified sites in compliance with all mandated and legislated requirements and conditions for physical infrastructure as stipulated nationally, provincially, by any relevant government Department(s) and/or any other regulatory bodies.

These projects are spread throughout the various Provinces. The CDC will reserve the right to allocate work to short-listed entities in an effort to distribute work and thereby reduce CDC's and the Client Departments' commercial risks. The objective of this framework is to increase procurement efficiency, deliver value for money, ensure competitive prices for clients and distribute work equitably in the provision of mechanical works and related services at various sites in South Africa where the need is required. The infrastructure required is of an urgent nature and is of high importance to the clients and the communities that it serves. The successful bidders would therefore be required to meet stringent deadlines.

2 PROJECT SCOPE

2.1 The Scope of Work

The scope of work will include equipment, materials, installation, testing, commissioning and maintenance of mechanical installations (which may include HVAC, Fire Services, Wet Services,

Lift Installations and Medical Gas installations amongst other and not limited). Construction Works that are primarily concerned with the installation, extension, repairs and refurbishment of mechanical installations in or on any premises used from a point of control to a point of consumption, including any article forming part of such an installation. This will include all mechanical equipment forming an integral and permanent part of buildings and/or structures, including any pipe reticulation.

The CDC will appoint Professional Consultancy Service Providers to undertake Designs, Contracts Management, Construction Monitoring and Supervision of Contractors. Mechanical Contractors are expected to comply and meet the CDC's Standard Mechanical **Specification attached to the EoI as Annexure A.**

2.2 Pricing schedule Requirements

The **Pricing Schedule of Rates** were drawn up in accordance with the South African National Standards for Mechanical Works and attached to the EoI Document as **Annexure N. The Rates tendered will be fixed for 12 months from closing date of the EoI and will be adjusted annually after 12 months based on the "Haylett formula workgroup 170"**. Bidders must note that the final construction cost of the project will be agreed with the CDC and the Client; following the site investigations, detailed design and documentation. Where the extent of the work is unknown, a provisional allowance will be inserted in the pricing schedule during implementation, where applicable. The provisional allowance will be used in accordance to the determined scope at the time of the request. **The CDC reserves the right to negotiate rates at any time with the bidders.**

Bidders are to note the following:

- (a) The bidders are to complete all sections requiring pricing.
- (b) All prices in the schedule are exclusive of Vat.
- (c) The schedule must be clearly filled in and legible.
- (d) Mistakes must be neatly crossed out with one (1) line and the corrected rate written above it and initialized by the bidder.
- (e) Preliminaries and General (P &G's) are to be priced as a percentage. Bidders who provide P&G's in value will be disqualified. The percentage must include Occupational Health and Safety (OHS) requirements and the minimum requirements for OHS are tabled under Annexure N1 of the EoI document. ***Note: Bidder must not price Annexure O, as it serves as a guide for what should be included as part of the OHS expectation within the P&G percentage***
- (f) The Metric system of measurement will be used.

(g) The abbreviations in the "Unit" columns are depicted as follows:

- (i) m = meter
- (ii) No = number
- (iii) Prov Sum = Provisional Sum
- (iv) Sum = complete item sum
- (v) % = Percent/Percentage
- (vi) hr = hour
- (vii) km= kilometer

Bidders are to provide one Pricing Schedule per region selected should the rates be different, e.g if tendering for all 9 provinces with different rates, the bidder shall make a duplicate of the Pricing Schedule and reference per region. If the rates are the same, one document can be submitted and **Annexure G- District/ Metro Municipality Selection Form** must be clearly marked.

3 ADJUDICATION CRITERIA

All bids received by the CDC before the closing time will be evaluated on two stages, namely, Responsiveness Assessment and Qualitative Assessment.

3.1 Stage 1 – Responsiveness Assessment

The following criteria will be used in assessing the responsiveness of tenders.

Table 1: *Mandatory Requirements to be submitted (Annexures are as per EoI Document)*

1	Completed and Signed SBD 1 FORM: Invitations to Bid. (Annexure C)
2	Completed and Signed SBD 4 FORM: Bidder's Disclosures. (Annexure D).
3	Completed and Signed Certificate of Authority of Signatory (Annexure E) . Proof of authority to sign may be submitted in a form of company resolution.
4	Proof of an active CIDB grading of 3ME or higher. Emerging contractors with CIDB grading designation of 2ME PE are not eligible to make submission and will not be considered. (Annexure F)
5	The Municipality Selection Form must be completed (Bidder to select all municipalities in which it elects to tender for). <i>Should a bidder fail to make a selection and not meet this requirement, it will be considered as non-responsive. (Annexure G)</i>

6	Record of at least two or more previous projects that have been completed in the last 5 – 8 years of similar nature (i.e. Mechanical Works). Details of two (2) contactable references of previous Clients/Consultants for each project listed are to be included. The completion certificates or performance reports or reference letters must have completion date, summary of scope, contract value and project description. Assessment will be as per the construction values of the minimum required CIDB grading contractor, below: Grade 3ME- R 450 000 and above Grade 4ME- R 900 000 and above Grade 5ME- R 1,5m and above Grade 6ME- R 3m and above Grade 7ME- R 9m and above Grade 8ME- R 30m and above Grade 9ME- R 90m and above (Annexure H -serves as an example of how the report should be structured. You can either use it as a reference or provide your own letter.)
7	Fully Completed and signed Pricing Schedule of Rates. <i>Should a bidder fail to price even one item in the Pricing Schedule, it will be considered as non-responsive. (Annexure N)</i>

NB: Failure to complete all mandatory information will result in submissions being deemed null and void and shall be considered “non-responsive”.

Table 2: Additional requirements

ITEM	DESCRIPTION
1	Completed and signed Form SBD 6.1 preference points claim form in terms of the Preferential Procurement Regulations 2022. (Annexure I)
2	As per the amended construction codes, companies with less than 51% black shareholding (QSEs & Generics) are to submit a valid SANAS Accredited B-BBEE Verification Certificate (with the full applicable B-BBEE elements). QSEs with at least a 51% and EMEs with an annual turnover of above R3 Million are required to submit a B-BBEE verification certificate from a SANAS accredited verification agency as they have to comply with the 40% sub-minimum requirement on the QSE Skills Scorecard to avoid being discounted a level. EMEs with a turnover of less than R3 Million are exempt from complying with the subminimum requirement and may submit an affidavit or a certificate issued by CIPC, confirming their ownership and annual turnover. In the case of a JV or Consortium, a consolidated B-BBEE certificate must be submitted as well as individual B-BBEE Certificates/affidavit of the member entities to confirm the type of enterprise. (Annexure J)

3	Company Registration documents (Biz Portal).
4	Company Profile, CVs and qualifications of the identified key personnel.
5	The Contractor is required to put forward the names and CV's of the site management teams and are required to duplicate the Nominated Team members for different regions (Provide under Annexure K) (a) Contracts Manager (b) Site Agent; (c) Foreman; (d) Construction Health and Safety officer/ Manager. The key personnel proposed above shall not be nominated for two (2) or more competing bidders as this constitutes a Conflict of Interest.
6	Completed and signed POPIA Consent Form. (Annexure L)

3.2 Functionality Assessment

Bids will not be subjected to a Functionality assessment.

3.3 Quantitative Assessment

Price and Specific goals scoring will be applicable at the time of allocating work according to the Preferential Procurement Policy Framework Act No. 5 of 2000 and the Preferential Procurement Regulations of 2022. This stage of evaluation will be applicable on a specific project as per rates tendered for under **Annexure N- Pricing Schedule of Rates** in the EoI Document. However, bidders are required to submit their BBBEE Certificate or Affidavits. Verification of Specific goals will be confirmed prior award.

3.4 Stage 2 - Qualitative Assessment

- (a) All bidders who pass stage 1 (Responsiveness Assessment) of the evaluation will be carried through to the Qualitative Assessment and should also pass Stage 2 to be successful, as outlined below.
- (b) The main thrust of this assessment is not to second-guess the shortlisted bidders but to address the question around potential capacity and commercial risks.
- (c) The performance of the bidder on previous projects that have been completed or awarded will be considered during this Stage and those bidders with negative performance reports may not be recommended for appointment.
- (d) The main question to be addressed under this Stage would be if there are any reasons, the bidder/s would not be considered to enter into framework agreements with the CDC even though they have passed the responsiveness assessment stage. This would be in line with the provisions of Regulation 9 of the PPPFA Regulations.
- (e) Compliance of tax will be verified through CSD and declaration of directors' interest will be verified through Lexis Nexis comparing what has also been disclosed under SBD 4.

3.5 Criteria for Selection of Successful Bidders

- (a) The framework agreements of pre-qualified mechanical contractors arising from this EoI process will enable the CDC to procure entities as and when required over a term upon CDC receiving budget allocation to carry out the work and CIDB grading will determine the value of projects awarded.
- (b) Service Providers (SP's) that are considered for inclusion in the Framework Contract will be those contractors that have been evaluated and passed Stages 1 and 2. Bidders will be selected from the framework system based on locality, the most economic rates and specific goals.
- (c) Successful Service Providers will be grouped according to their CIDB grade and province in the framework agreements system;
- (d) The successful Service Providers will be appointed based on competitive rates they tendered in response to this EoI process;
- (e) The framework agreements will be used on a competitive basis, whereby quantities will be populated against the rates accepted for all eligible SPs from the targeted region and grading. The lowest acceptable tender will be used to determine the applicable preference point system and the highest ranked bidder will be recommended for award;
- (f) **The Rates tendered will be fixed for 12 months from closing date of the EoI and will be adjusted annually after 12 months based on the Haylett formula workgroup 170.**
- (g) The CDC reserves the right to negotiate rates at any time with the bidders.
- (h) CDC will award projects to the highest scoring SP up to a point they have reached the maximum

- of two (2) active projects and the number of projects awarded to one entity in excess of the maximum allowable projects will be determined by the capacity and performance on previous awarded contracts;
- (i) Projects might be clustered comprising of multiple projects when CDC considers it to create value for the client;
 - (j) The final cost of the project will be agreed with the CDC and the client; following the site investigations, detailed design and documentation;
 - (k) All Service Providers on the framework agreement would be considered based on the rates they submitted, which would be informed by the estimated value of the project;
 - (l) Final project values can only be determined when the scope is finalized and will be measured against the approved schedule of rates;
 - (m) The 80/20 or 90/10 preference point system in terms of Price and Specific goals scoring will be applicable at the time of allocating work. The lowest acceptable tender will be used to determine the applicable preference point system, through the established framework agreements upon receipt and requests of new projects.
 - (n) The intended purpose for the Framework agreements system is to:
 - i. Increase procurement efficiencies,
 - ii. Provide value for money, ensure competitive prices for clients, and
 - iii. Distribute work on an equitable basis.
 - (o) For each request, Supply Chain Management and the relevant Business Unit/ Programme will compute a tender value based on the EoI rates the Bidder submitted at the time the tender closed.
 - (p) The approval of award of a successful SP will be delegated to the CFO and /or the Unit Head of SCM as would be determined by the EXMA. This would ensure that the efficiency this framework agreement seeks to achieve is realized.
 - (q) The successful Service Providers will be placed in the CDC's Framework agreement system for a period of **36** months with an option to extend for further additional **24** months.
 - (r) The onus is on the bidder to be compliant throughout the 36 months plus 24 months with Tax, CIDB, CSD and BBBEE.
 - (s) The successful bidders would be required to compete for projects per the identified district(s) but preference will be given to Service Providers whose offices are closest to the point of delivery in that particular district, and should there be an inadequate number of bidders in that district, additional Service Providers would be sourced from neighbouring districts;
 - (t) Should there be items not considered or catered for by CDC in the Pricing Schedule, the CDC may request bidders to price the additional items, as and when required and specific per project.
 - (u) Work **may** be distributed for a specific grade depending on the scope of work and value of the project and **may** be locked within that particular grade. However, if there are no competitive

bidders within such a grade and location, the higher grading will be considered.

4 CONDITIONS OF TENDER

- (a) Bidders must be registered with the Construction Industry Development Board (CIDB) and must have an active CIDB Contractor of Grading 3ME and Higher.
- (b) Contractors with a CIDB Contractor grading designation of 2ME PE or lower are not eligible to bid and will not be considered.
- (c) Bidders are required to have a valid and current CIDB registration on the date of closing and are required to maintain this registration throughout the Tender Evaluation period. Failure to do so will invalidate the tender.
- (d) The CDC's Procurement Policy and Procedures shall apply.
- (e) The following legislation shall apply:
 - (i) Public Finance Management Act (PFMA);
 - (ii) Preferential Procurement Policy Framework Act, (5 of 2000) (PPFPA)
 - (iii) The Preferential Procurement Regulations 2022;
 - (iv) The Construction Industry Development Board Act, (38 of 2000)
 - (v) National Treasury Regulations;
 - (vi) National Building Regulations and Building Standards Act (103 of 1977);
 - (vii) South African National Standards (SANS) 10400 & XA;
 - (viii) The National Qualifications Framework Amendment Act, (12 of 2019);
 - (ix) The Skills Development Act, (97 of 1998)
 - (x) Disaster Management Act, (57 of 2002);
 - (xi) Occupational Health and Safety Act and Regulations, Act (85 of 1993);
 - (xii) Compensation for Occupational injuries and disease Act (130 of 1993);
 - (xiii) Broad Base Black Economic Empowerment -BBBEE Act Number 53 of 2003 (as amended by Act number 46 of 2013);
 - (xiv) NEMA National Environmental Management Act (107 of 1998);
 - (xv) National Heritage Resources Act, NHRA (Act No. 25 of 1999);
 - (xvi) National Water Act, NWA (Act No. 36 of 1998); and
 - (xvii) Any other applicable legislation in the built environment and including all Municipal Bylaws.
- (f) **No Joint Ventures (JV) or Consortiums** are permitted to bid for this Framework Agreement.
- (g) The 80/20 or 90/10 preference point system in terms of Price and Specific goals scoring will be applicable at the time of allocating work. The lowest acceptable tender will be used to determine the applicable preference point system, through the established framework upon receipt and requests of new projects.
- (h) Bidders must price the Pricing schedule of rates exclusive of VAT, however bidders must be VAT registered. Non-VAT vendors who submit bids for contracts that would, if successful, take their

annual turnover above the threshold of R 1 million are obliged to include VAT in the prices quoted and must therefore immediately upon award of the contract register with the South African Revenue Services (SARS) as VAT vendors. The award of contract would be conditional pending the successful bidder submitting proof of registration as a VAT vendor with SARS.

- (i) Bidders must provide proof of registration on the National Treasury's Central Supplier Database (CSD) or provide a Treasury CSD registration number e.g. MAAA0.
- (j) CDC will only award the tender to a bidder who is tax compliant. The tax compliance status of the bidders will be verified through CSD and South African Revenue Services (SARS) website.
- (k) The CIDB B.U.I.L.D. Programme shall apply to contracts that satisfy the minimum requirements at Award Stage. In such instances, the CIDB Standard for Indirect Targeting for Enterprise Development Through Construction Works Contracts, and the CIDB Standard for Developing Skills Through Infrastructure Contracts shall apply.
- (l) As per the amended construction codes, companies with less than 51% black shareholding (QSEs & Generics) are to submit a valid SANAS Accredited B-BBEE Verification Certificate (with the full applicable B-BBEE elements). QSEs with at least a 40% or 100% black shareholding and EMEs with an annual turnover of above R3 Million are required to submit a B-BBEE verification certificate from a SANAS accredited verification agency as they have to comply with the 40% sub-minimum requirement on the QSE Skills Scorecard to avoid being discounted a level. EMEs with a turnover of less than R3 million are exempt from complying with the subminimum requirement and may submit an affidavit or a certificate issued by CIPC, confirming their ownership and annual turnover.
- (m) A Sworn Affidavit must be completed only if a bidder does not have a BBEE Accredited Certificate and is a SMME. If a bidder uses a generic Affidavit, a score of zero will be allocated under quantitative assessment. The Amended Construction codes affidavit MUST be the one completed to obtain points.
- (n) Bidders must confirm their company registration with Companies and Intellectual Property Commission (CIPC) (formerly CIPRO) as CDC will not award any bid to any business that appears on the CIPC List of de-registered businesses. The CDC may verify company registration with CIPC through BizPortal.
- (o) Bidders must complete and sign the POPI Act consent form.
- (p) Bidders carrying a CIDB grading of 7EB and higher will be encouraged to fully comply with CDC SMME 33% Target on work apportioning should they be successful.
- (q) CDC will not award more than two (2) active projects to one bidder, unless one project has reached 80% completion stage and beyond. A capacity assessment may be conducted in an event that the recommended service provider is the only responsive bidder and has already been awarded two contracts so as to be considered for a third contract at the sole discretion of the CDC and subject to their performance on the active two contracts.

-
- (r) The performance of the bidders on projects they have been awarded shall be reviewed and evaluated on an on-going basis by the CDC Project Manager. Poor performance on awarded projects may result in a bidder not being awarded future projects by the CDC.
- (s) The successful bidder will be required to comply with the National Environmental Management Act, (107 of 1998), National Heritage Resources Act, (25 of 1999), Occupational Health and Safety Act and Regulations, Act (85 of 1993), Compensation for Occupational Injuries and Disease Act, Act (130 of 1993), Disaster Management Act, Act (57 of 2002) and, all relevant and applicable legislations throughout the duration of the contract. Upon appointment, the successful bidder, will be required to develop Occupational Health, Safety and Environmental Management Systems in compliance to the CDC Norms and Standards.
- (t) No priced quotation or competitive bids will be awarded to a person or entities who fail to provide proof of tax compliance status within the timeframe given to do so.
- (u) A successful Bidder (Contractor/s) will be required to provide valid proof of registration of the Construction Health and Safety Officer (CHSO) or Construction Health and Safety Manager (CHSM) with SACPCMP upon award, who must have necessary competencies and resources to execute his or her duties. No candidate registration will be accepted. The CHSO/M must have proven record of years of experience as follows:
- | | |
|-------------------------|-------------------------------|
| i. CIDB grading (3 - 6) | = minimum of 2 years or more |
| ii. CIDB grading 7 | = minimum of 5 years or more |
| iii. CIDB grading 8 | = minimum of 8 years or more |
| iv. CIDB grading 9 | = minimum of 10 years or more |
- “NB” this means that the above key personnel (CHSO/CHSM) will not be part of mandatory requirements and only tested upon allocation of work, and it is therefore the responsibility of the Successful Bidder to provide this information upon the receipt and acceptance of letter of appointment within specified timeframe by SCM.
- (v) A successful Bidder (Contractor/s) will be required to provide full details or profile of Construction Environmental Officer (CEO) upon award, who must have necessary competencies and resources to execute his or her duties with requirements by the environmental legislations and its conditions, where applicable.
- (w) The Bidders must nominate a person who will be their designated person for this EoI. The overall designated Person:
- (i) Should have delegated authority to sign: The bid submissions, any correspondence with the CDC during the bidding process and any correspondence during the Contract Execution Phase. It is imperative that the duly authorised person conducts quality control on all the documentation to be submitted to the CDC as part of this EoI and signs the submission as a correct and sound document that the CDC could put its reliance on.
- (ii) Would be conferred the authority to be the duly Authorised Signatory as would be provided in the Certificate of Authority of Signatory that should be included in the Tender Document.

-
- (iii) Will be the sole point of contact between the CDC and the bidding entity during this Tendering process, and during contract execution.
 - (iv) Would be required to review and sign off all the deliverables to the CDC during the execution of the contract, confirming their quality and professional soundness.
 - (x) Public servants are prohibited from doing any form of business with organs of state, whether in their own capacity as individuals or through companies in which they are directors. Verification will be done, and bidders will be disqualified should they be found to be in contravention with the regulations.
 - (y) It is incumbent upon and the responsibility of the Prospective Bidders to submit their full and correct contact details when they download the EoI Document to enable any communication that the CDC might need to issue to all the Prospective Bidders during the bidding process to be realised. The CDC will not be accountable for any such omission or failure by the Prospective Bidders.
 - (z) Any misrepresentation of information will lead to immediate disqualification of the Bidder's Submission.
 - (aa) The successful bidders would be placed in the CDC's Framework Agreement System of pre-qualified Contractors for various provinces for a period of 36 months with an option to extend for an additional 24 months.
 - (bb) The successful Service Providers will be appointed based on the competitive rates they tendered in response to this EoI process. **The Rates tendered will be fixed for 12 months from closing date of the EoI and will be adjusted annually after 12 months based on the Haylett formula workgroup 170.**
 - (cc) Respondents or their representatives (including the courier services) must ensure that they register their submissions in the Register for Submissions form that will be provided at the CDC Document Control Office on the Ground Floor, wherein they will indicate the name of the person delivering the submission, the number of copies submitted, the time and date of submission and attach their signatures.
 - (dd) Submission of a bid and its subsequent receipt by the CDC does not represent a commitment on the part of the CDC to proceed further with any Respondent or any contract;
 - (ee) The CDC reserves the right not to accept any submission. If the CDC does not accept any submission, it will declare this EoI process to be closed.
 - (ff) The tender validity period for this project is twenty-four (24) weeks from closing date.

5 CONDITIONS UPON AWARD

Bidders are required to note the following terms but not limited to the list below:

- (a) Bidders will be limited to two projects under this Framework Agreements with a rotation system in place and capacity assessment will be conducted should there be a need to award a third or more contracts.

-
- (b) Rates and Prices will be accepted as they are, however, clarification will be conducted should there be a need to balance rates.
 - (c) Form of Offer and Acceptance will be provided on an agreed scope of the project.
 - (d) Form of Contract will be determined based on the type of project and scope. This could include JBCC, FIDIC, NEC, GCC etc.
 - (e) Guarantees will be required in accordance with the value of works.
 - (f) Resource Plan and Programme of work to be discussed prior acceptance of offer.
 - (g) The following will apply based on the project;
 - (i) CDC's Planning Specification for Contractors
 - (ii) CDC's Standard Mechanical Specification;
 - (iii) South African National Standards;
 - (iv) South African Bureau of Standards;
 - (v) International electrotechnical commission;
 - (vi) Occupational Health and Safety Specification including Baseline Hazard Identification and Risk Assessment;
 - (vii) Standard Environmental Specification;
 - (viii) Social, Economic and Wage Deliverables;
 - (ix) HIV and AIDS Specification;
 - (x) SMME Specification;
 - (h) Some projects will be subjected to Construction Industry Development Board Contract Skills Development Goal (CSDG) programme, and the successful Bidder will be required to adhere to the requirements of:
 - (i) The CIDB Standard for Developing Skills Through Infrastructure Contracts (March 2023).
 - (ii) The Standard for Indirect Targeting for Enterprise Development Through Construction Works Contract.
 - (i) An applicable Form of Contract shall be used for all work related to this framework agreement.
 - (j) Performance Guarantees will be required prior award "for specific project".
 - (k) In the case of a Fire Detection and Suppression Subcontractor, the contractor is to have an SAQCC Certificate for both Fire Detection and Gas Suppression and have a CIDB Grading of 3SF or higher for Fire Protection and Detection Systems.
 - (l) In the case of Fire Protection (where Sprinkler Installations are required), the fire contractor is to be ASIB Accredited and have a CIDB Grading of 3SF or higher for Lifts, escalators, & travellers (installation, commissioning, & maintenance).

6 DISQUALIFICATION

Bidders will be disqualified immediately during the tendering stage or during the tender evaluation and adjudication stage or after the contract has been awarded if they are found to have conducted or committed any of the following:

- (a) Bidders, bidder's representatives, associates, or shareholders that sought to influence adjudication process of this tender, or outcomes of the adjudication process, directly or indirectly;
- (b) Bidder that failed to follow or observe the lines of communication that are prescribed in the Advert;
- (c) Collusion among bidders;
- (d) Misrepresentation of information;
- (e) Any Bidder or its principals or both who have engaged in corrupt and fraudulent practices, not only with the CDC but anywhere else;
- (f) Bidders who have pending liquidation, in receivership, bankrupt/insolvent (actually and commercially);
- (g) Bidder or discipline partner appearing on National Treasury List of Restricted Suppliers; and
- (h) Bidders who have poor or negative performance reports on previous projects.

7 COPYRIGHT

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8 CONFIDENTIALITY AND MEDIA PROTOCOL

Any information relating to the submissions, through the process or otherwise shall be treated in strict confidence. The CDC reserves the right to announce the names of Bidders in the media.

In submitting the bid, a Bidder shall not be entitled to any information disclosed by another applicant to the CDC, which the CDC has determined to be confidential. The content and details of the evaluation of submissions will remain confidential to the CDC.

9 APPENDICES- RETURNABLE DOCUMENTS

ANNEXURE A: CDC's Mechanical Specification
ANNEXURE B: CDC's Planning Specification for Contractors
ANNEXURE C: SBD 1 – Invitation to Bid
ANNEXURE D: SBD 4- Bidder's Disclosure
ANNEXURE E: Authority of Signatory
ANNEXURE F: Proof of CIDB Grading
ANNEXURE G: District Municipality Location
ANNEXURE H: Reference Letters or Past Performance Reports
ANNEXURE I: SBD 6.1 Preference points claim
ANNEXURE J: BBBEE Certificate or valid (construction sector) Affidavit,
ANNEXURE K: Proposed Key Personnel
ANNEXURE L: Protection of personal Information form
ANNEXURE M: Schedule of Current Contracts
ANNEXURE N: Pricing Schedule of Rates
ANNEXURE O: Safety, Health and Environment (P&G) requirements guide

ANNEXURE A: CDC's Mechanical Specification

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Planning Document:

**GENERAL SPECIFICATIONS AND DESIGN GUIDELINES FOR
MECHANICAL WORKS**

Template N^o

CDC-CoE-TEM-022-13

19 March 2022

DOCUMENT INFORMATION SHEET

Title of Document : *General Specifications and Design Guidelines for
Mechanical Works*

Type of Document : *Planning Document*

Document Number : *CDC-CoE-TEM-022-13*

Prepared by : *Gundo Ramaphuma*

Reviewed by : *Xolisa Ncoyo*

Business Unit : *Central Technical Support Unit (CTSU)*

Prepared for : *CDC*

Date of Issue : *19 March 2022*

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DOCUMENT CONTROL SHEET

The purpose of this form is to ensure that documents are reviewed and approved prior to issue. The form is to be bound into the front of all documents released by the CDC.

PROJECT NAME : *General Mechanical Specifications*
DOCUMENT TITLE : *General Specifications and Design Guidelines for Mechanical Works*
DOCUMENT No. : *CDC-CoE-TEM-022-13*

SIGNING OF THE ORIGINAL DOCUMENT

We, the undersigned, accept this document as a stable work product to be placed under formal change control as described by the Change Control Procedure document.

ORIGINAL	Prepared by	Reviewed by	Approved by
Date: 19 March 2022	Name: Gundo Ramaphuma	Name: Xolisa Ncoyo	Name: Mpumi Mabula
	Signature:	Signature:	Signature:

Distribution:	CDC
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REVISION CHART

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Date:	Signature:	Signature:	Signature:

REVISION 2	Name:	Name:	Name:
Date:	Signature:	Signature:	Signature:

REVISION 3	Name:	Name:	Name:
Date:	Signature:	Signature:	Signature:

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DEFINITIONS AND ABBREVIATIONS

Definitions of terms used in these documents shall mean:

"Approved" /

"Satisfactory" /

"Accepted": As approved, satisfactory, and accepted by the Employer or his agent.

"Tenderer": The contractor or Tenderer is the party, persons or company successful in their bid return as part of this contract.

"Commissioning": Work necessary to place the installation and work covered by this specification into normal operating conditions to the satisfaction of the Employer or his agent.

"Indicated": As indicated, shown or noted on drawings and/or specifications

"Install": To erect, mount, fix and connect complete with all related accessories to enable the desired function.

"Provided": To supply, install, connect up and commission into regular and safe operation of particular item referred to.

"Testing": Work and checks necessary to determine quantitative performance of equipment installation and workmanship.

"NFPA": National Fire Prevention Association

"SANS": South African National Standards

"FM Global": Factory Mutual Insurance Company

"ASIB": Automatic Sprinkler Inspection Bureau

"CDC": Coega Development Corporation

"HVAC" Heating, Ventilation, and Air Conditioning

SECTION A – GENERAL REQUIREMENTS

1.1 INTRODUCTION

1.1.1 The purpose of this document is to describe the general technical specifications that pertains to the supply, delivery, installation, testing and commissioning, and 12 months free maintenance for the following Mechanical Installations at various facilities (schools, factories, warehouses, hospitals, office parks, prisons, etc.):

- Air Conditioning & Ventilation Systems (HVAC)
- Ducting
- Canopies and Grease Eliminators
- Domestic Hot Water Installation
- Liquefied Petroleum Gas (LPG) Installation
- Cold Rooms and Freezer Installation
- Fire Services
- Medical Gas Installations
- Lifts and Stairlifts

1.1.2 This document outlines the minimum requirements, but do not cover all the details of design and construction of such installations. Such details will be included in the Detailed Project Specification as well as Rationale/Detailed Designs/Drawings for a specific project.

1.1.3 Where reference is made to "Contractor" or "Sub-Contractor", it shall be read to mean the successful Tenderer appointed to execute the contract specified in the supplementary specification.

1.2 STANDARD MEASURES

1.2.1 The dimensions, weight, etc., shown on the drawings and mentioned in the specifications shall be taken as the Republic of South Africa's legal standard weights and measures.

1.3 MATERIALS AND WORKMANSHIP

1.3.1 All work is to be executed with materials of the best quality and in the most substantial manner under the inspection and to the entire satisfaction of the CDC.

1.3.2 The entire installation shall be in accordance with the following:

- (a) The National Building Regulations and Building Standards Act No. 103 of 1977 as amended in 1984 and all amendments thereafter.
- (b) The latest revision of SABS 0400: The Applications of the National Building Regulations, as amended.
- (c) SABS Code of Practice for the Wiring of Premises No. 0142 of 1981, as amended.

- (d) The Machinery and Occupational Health and Safety Act No. 85 of 1993.
- (e) Any other relevant by-laws of local or other authorities.

- 1.3.3 All apparatus, components parts, fittings and materials supplied and/or installed whether especially specified herein or not shall conform in respect of quality, manufacture, tests and performance with the requirements of the appropriate current South African (SABS) or British Standard Specifications (BS) and Addenda thereto, except where otherwise required by this specification or permitted by approval of the Engineer for the project, in writing.
- 1.3.4 All materials and workmanship which may, in the opinion of the CDC, be inferior to that specified for the work will be condemned. All condemned material and workmanship must be replaced or rectified, to the satisfaction of the CDC. No secondhand equipment of any description may be offered for supply or installation.
- 1.3.5 If so required, the Engineer, Principal Agent and/or Clerk of Works may call for samples of material and equipment for approval. Such samples shall be submitted within 14 days of the request and if judged necessary by the Engineer may only be returned after completion of the installation to ensure that the quality of the installed product is the same as that of the approved sample.
- 1.3.6 Any fitting or item of equipment not specifically mentioned but obviously necessary for the successful completion of the installation is to be included to form a complete working installation.

1.4 **DRAWINGS**

- 1.4.1 The tender drawings issued with the supplementary Technical Specification are schematic and do not necessarily purport to show the exact position, size, or details of construction of equipment.
- 1.4.2 Tenderers must satisfy themselves that the equipment offered by them can be accommodated in the available space and positioned in such a way that access for maintenance, repairs or removal is not obstructed.
- 1.4.3 Where indicated in the Supplementary Specification these drawings are to be prepared by the Contractor at his expense in accordance with tender document.

These drawings shall at least consist of:

- (a) Builder's work drawings

These shall indicate all work to be done by others (bases, foundations, holes in concrete and masonry, etc.) as well as the sizes, capacities, and positions of service connections (electrical, water, drainage, etc.) to be provided by others, all in accordance with the supplementary specification.

- (b) General arrangement drawings

These shall indicate all equipment, distribution systems, testing, and inspection requirements as well as instrumentation positions and access requirements.

During their preparation, the Contractor shall take cognizance of all relevant architectural, structural, electrical, and other services drawings to properly co-ordinate his layout. These drawings can be obtained via the Principal Agent. The drawings shall be amended as required during the contract period, and up to date copies kept on site for reference purposes.

- 1.4.4 Positions and sizes of air grilles, louvred openings through reinforced concrete beams and slabs, etc., as indicated on the tender drawings shall be adhered to as far as possible. Amendments will only be considered if unavoidable.

(a) Shop drawings

These shall be based on the General Arrangement drawings and shall show in detail the construction of all the parts of the works, method of assembly where applicable, erection and construction, materials and connections, welds, gaskets, sealants, fastenings, reinforcing and all other necessary detail.

(b) Electrical drawings

Electrical drawings shall comprise complete control and power wiring diagrams, as well as front and side elevations giving major dimensions of control panels as well as instrumentation and switch position layouts.

(c) As-Built drawings and wiring diagrams

These are up-to-date approved drawings at the completion of the contract. Tenderers shall allow in their price for submitting a set of each of the up-to-date general arrangement drawings, shop drawings, as well as electrical drawings together with the O&M manuals specified herein.

1.4.5 Submission of Contractor's drawings

1.4.5.1 Drawings shall be submitted in orderly fashion commencing within the following time limits or as determined by the Main Contract Programme (where applicable):

Builder's work drawings :	within 2 weeks of tender acceptance.
General layout drawings:	within 4 weeks of tender acceptance.
Shop drawings :	within 6 weeks of tender acceptance.
Electrical drawings :	within 6 weeks of tender acceptance.
As-built drawings :	at completion before first hand-over.

1.4.5.2 By submitting drawings, the Contractor/Tenderer represents that he has determined and verified all site measurements, site instruction criteria, materials, catalogue numbers and similar data, or will do so, and that he has checked and coordinated each of his drawings with the requirements of the works and the contract documents, considering drawings of all other relevant disciplines.

1.4.5.3 At the time of submission, the Contractor shall inform the CDC or Mechanical PSP in writing of any deviation in the Contractor's drawings from the requirements of the supplementary documents.

1.4.5.4 After scrutiny the CDC and/or the Mechanical PSP may at its discretion and depending on the number of discrepancies, require amendment and resubmission prior to approval. Drawings shall be resubmitted until approved prior to any portion of the works related to the drawings being commenced.

1.4.5.5 Should the Contractor, during drawing amendment, alter any portion of his drawings not specifically required by the CDC/Mechanical PSP, he shall point this out in writing when resubmitting the drawing.

1.4.5.6 Approval of the Contractor's drawings in no way indemnifies him from being responsible for the correctness of the drawings and satisfactory operation of the installation.

1.4.6 If the Tenderer wishes to submit alternative proposals, differing from the Mechanical PSP's design, drawings indicating such proposals comprehensively shall be submitted with his tender and the correct approval process will be followed.

1.5 SITE CONDITIONS

1.5.1 It is the responsibility of the Tenderer to visit the site during the tender phase and to familiarize himself with conditions related to it.

1.5.2 If the location of the site is not indicated in the Supplementary Specification, it can be obtained from the CDC.

1.5.3 No claim for additional payment related to ignorance of site conditions will be accepted. By submitting a tender, it is accepted that the Tenderer is fully aware of all site conditions as well as the access to it and has allowed for this in his tender price.

1.6 DEVIATIONS FROM TENDER DOCUMENTS

1.6.1 No deviations or alterations from that of the specification, schedules or drawings shall be made without first obtaining the written approval of the CDC.

1.7 PROGRAMMING OF WORK

- 1.7.1 The contract works shall proceed concurrently with the building construction or in accordance with an approved Programme in all respects.
- 1.7.2 It is essential that the Contractor Programmes his construction and all other work in conjunction with the Main Programme to avoid possible delays or clashes of trades.
- 1.7.3 For direct contracts the Contractor shall submit a detailed Programme based on the contract period and the various activities and components of the installation. This Programme shall be submitted to the CDC/Mechanical PSP within two weeks off site hand-over.

1.8 MANUFACTURER'S RATINGS

- 1.8.1 All equipment such as fans, compressors, cooling towers, pumps, etc., shall be selected to be operated well within the manufacturer's ratings.
- 1.8.2 Equipment offered for use beyond these limits will not be considered.
- 1.8.2 Tenderers must submit manufacturer's ratings of all equipment offered. Ratings shall be given in the SI system.

1.9 NOTICES

- 1.9.1 The Contractor shall supply and install all notices and warning signs that are required by the appropriate laws or regulations and by these documents.

1.10 GUARANTEE

- 1.10.1 The 12-month guarantee called for in the Supplementary Specification, shall apply to all items of plant such as chillers, etc., delivered to site and/or erected.
- 1.10.2 It is the responsibility of the Contractor to negotiate with his suppliers to secure their equipment guarantee on this basis.
- 1.10.3 The date of acceptance shall be that appearing in the acceptance certificate issued by the CDC and shall define the start of the guarantee period and free maintenance period (where applicable).
- 1.10.4 No Claims for extended guarantee or otherwise from Suppliers, Principals etc., will be considered even if equipment is required on site long before acceptance date.

1.11 COMMISSIONING AND TESTING

1.11.1 Commissioning Engineers

The Tenderer shall allow in his tender price for the services of approved and expert Commissioning Engineers, as may be appropriate for the individual specialized sections of his contract, as well as competent Engineer in overall control of the installation. Testing and commissioning shall be carried out by these Engineers. Should undue problems be encountered at any time, the Contractor may be requested by the CDC to obtain the services of a representative of the manufacturer of specified items of equipment, at no cost to the CDC.

1.11.2 Notice of Testing and Commissioning

The CDC/Mechanical PSP shall receive not less than two weeks advance notice of any tests to be witnessed by the Mechanical PSP.

1.11.3 Failure of Works, Site or Commissioning Tests

Should the CDC be notified to attend official tests as laid down, and should the equipment fail the test for any reason whatsoever, such that the CDC is required to re-witness the test, the time, transport and disbursement by the CDC in so doing will be for the Contractor's account, which amount may be deducted, at the option of the CDC, from monies due to the Contractor.

1.11.4 Quality Testing of Equipment

The CDC reserves the right to arrange for testing of any piece of equipment at will, to check on compliance with the relevant specifications. Should the particular piece of equipment pass the test, the cost of such testing will be borne by the CDC. However, should it fail the test, the cost of the test, rectification of the shortcomings, re-testing, and repetition of the same test on the remaining like items will be for the Contractor's account.

1.11.5 Inspection during Manufacture

The Contractor will advise the CDC when the items to be supplied are in the course of manufacture. The CDC reserves the right to inspect any items during the course of manufacture and witness any performance tests that may be required thereon. The Contractor shall give the CDC at least two weeks advance notice of works tests.

1.11.6 Testing

The Contractor shall be responsible for carrying out all tests laid down in the specific sections elsewhere in this document, in addition to those listed hereafter and in the Supplementary Specification.

Testing and balancing shall not begin until the system has been completed and is in full working order.

The plant shall be tested and operated to meet the performance figures and duties specified. All safety features and interlocks will be tested.

The Contractor will be responsible for all costs incurred in the testing, including the supply, calibration and use of all instruments and tools, but not the supply of water or power on site.

All instruments and test equipment used shall be provided by the Contractor and shall be accurately calibrated and maintained in good working order.

All test instruments used for tests to be witnessed by the CDC's or Mechanical Engineer's Representative shall be provided with calibration certificates, which must be available to the Department's Representative.

Should the CDC wish to verify the calibration of any instruments, the Contractor shall make the necessary arrangements for the instrument to be re-calibrated by a recognised authority. Should the instrument prove to be correctly calibrated, the cost of the re-calibration test will be borne by the CDC. Should the instrument prove to be in error, the cost of the tests will be borne by the Contractor.

Two copies of the complete test reports shall be submitted to the CDC, prior to the first delivery of the project. Reports shall cover all tests carried out on individual sections, including such works tests as may have been conducted. All reports shall be neatly typed.

1.11.7 Commissioning

The Contractor shall carry out all tests and commissioning of the systems installed by him, in a co-ordinated and properly organized manner.

Should the tests be carried out over an area outside the range of normal speech, it is required that the Contractor make available at least four battery powered, two-way radio sets, to facilitate communications.

The testing procedures shall be sufficiently comprehensive to prove the correct functioning of each and every piece of equipment, and its suitability for the application.

After all systems and equipment have been tested and commissioned to the satisfaction of the CDC, a detailed demonstration of all functions of the system shall be carried out in the presence of the CDC's Representative, so as to allow him to become fully acquainted with the operation of the system.

The commissioning tests shall include the tests laid down under the specific sections hereafter, and a full operational test of all pumps, compressors, fans and control gear in all modes of operation.

The Contractor shall allow for the replacement and cost of any materials and fuel used for testing purposes, as part of the contract.

The demonstration to the users shall include a repeat of the operational tests above. The planning of this demonstration shall take place in collaboration with the CDC.

A certificate of completion will not be issued until all tests have been satisfactorily completed, and the plant has operated successfully, to the complete satisfaction of the CDC.

1.12 PERFORMANCE TOLERANCE

- 1.12.1 All performance figures obtained during testing and commissioning must be within -5% and +5% of the specified performance figures given in the supplementary specification.
- 1.12.2 Should the plant fail to comply with these figures after it has been tested and operated for a period of seven days, then the Contractor shall have a further four weeks to meet the requirements of the specification, after which the CDC shall have the right to reject the plant and recover all monies paid to the Contractor for the rejected plant.

1.13 TEST CERTIFICATES

- 1.13.1 The Contractor shall ensure that copies of all relevant test certificates, inspection reports, materials analysis certificates and similar data as may be required under various sections of this specification, or by Government Licensing and Inspection Authorities or Local Authorities, shall be provided before handing over the plant.
- 1.13.2 Acceptance of the plant will be delayed if such certificates are not available. In particular, attention is drawn to pressure vessel and boiler construction and materials test certificates.

1.14 APPLICATION FOR INSTALLATION

- 1.14.1 The Contractor shall allow for the submission of the necessary forms, fees and drawings to the Inspector of Machinery or other relevant Authorities to obtain permission to install equipment where this is required.
- 1.14.2 He shall also, in co-operation with the Department make any arrangements that may be required for Government Inspectors or other relevant Inspectors to carry out prescribed tests.

1.15 POWER, WATER, AND DRAIN CONNECTIONS

- 1.15.1 All plumbing between equipment and water and drain points shall form part of the contract.
- 1.15.2 The exact details of terminal points will be set out in the Supplementary Specification.

1.16 QUALITY OF MATERIALS

- 1.16.1 Only new materials of high quality shall be used throughout and shall be subject to the approval of the CDC.
- 1.16.2 All materials, where applicable, shall conform in respect of quality, manufacture, tests and performance, with the requirements of the SABS standards or, where no such standards exist, they shall conform with the appropriate current specification of the British Standard Institution. Materials manufactured in South Africa shall be used wherever possible.
- 1.16.3 Imported materials shall comply with the requirements of the relevant SABS or British Standard Specifications, although these materials need not necessarily bear the SABS mark.
- 1.16.4 All materials shall be suitable for the particular site conditions. These conditions shall include weather conditions as well as prevailing conditions during installation and subsequent permanent use.
- 1.16.5 Should the materials or components not be suitable for use under temporary site conditions, where applicable, the Contractor shall provide at his own cost, suitable protection until these unfavourable site conditions cease to exist.

1.17 SERVICE ACCESS

- 1.17.1 Where equipment such as fans, dampers, etc. are installed above ceiling the Contractor shall ensure that access will be possible for maintenance purposes after installation.

1.18 MONTREAL PROTOCOL

- 1.18.1 Tenders for equipment utilizing chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs) or hydrofluorocarbons (HFCs), to be supplied and installed shall be within the constraints and schedules of the Montreal Protocol and the Copenhagen Agreement and such amendments thereto as may be made by the international community.
- 1.18.2 Where tenders are submitted for equipment not complying with this Protocol it shall be clearly indicated, in writing, in the tender submission.

SECTION B – MAINTENANCE AND SERVICING

2.1 MAINTENANCE AND SERVICING

2.1.1 Unless otherwise specified in the Supplementary Specification, the Contractor shall be responsible for all maintenance and servicing of the installation for the full 12-month guarantee period. During this period, the Contractor shall make good any defect due to inferior materials or workmanship and maintain all plant and equipment in perfect operating condition.

2.1.2 The Contractor shall be entirely responsible for carrying out regular inspections at intervals not greater than 1 month, unless otherwise specified, and for full servicing of all components of the installation in accordance with the manufacturer's instructions. For this purpose, the Contractor shall prepare a detailed inspection and service report in the form a checklist and log sheet showing all functions to be carried out at each inspection and service. Copies of these service reports shall be regularly submitted to the CDC after each service.

The Contractor shall also maintain a plant logbook on site in which he shall record, sign and date all work carried out at each inspection as well as log all temperatures and pressure readings etc.

2.1.3 The Contractor shall allow for all expendable materials necessary for servicing such as lubricating oils, grease, refrigerant, and cleaning materials.

2.2 MAINTENANCE INSTRUCTION OF OWNER'S STAFF

2.2.1 Tenderers shall make proper allowance in their tender price for instruction of the CDC's staff (Facilities Managers) in the maintenance, repair and adjustment of all the equipment.

2.2.2 Allowance must be made for the proper hands-on tuition of the owner's personnel at the appropriate time to enable them to take over operational duties.

2.3 OPERATING, MAINTENANCE INSTRUCTIONS, WIRING AND CONTROL DIAGRAMS

2.3.1 The Contractor shall prepare and supply comprehensive manuals for the successful operation and maintenance of the installation. A draft of the manual shall be submitted to the CDC after commissioning, for approval. The draft shall then be corrected, if required, and THREE sets of the manual shall be submitted before first acceptance of the plant will be considered.

2.3.2 Manuals shall be prepared in the same language as the contract document unless otherwise required by the CDC. These manuals shall be bound in hard file covers with clear titles and indices and shall contain the following information as a minimum, in the sections indicated:

SECTION 1: System Description

A comprehensive description of the system, including schematic diagrams.

SECTION 2: Commissioning Data

The results of all checks and measurements as recorded during the commissioning period, shall be compiled in such a manner that every check and measurement is clearly defined.

SECTION 3: Operating Instructions

Plant running checklist and frequency of servicing.

Safety precautions to be taken.

Manual and automatic operation.

Operator's duties.

Lubricating oils and service instructions.

Pre-start checklist for each system.

Starting and stopping procedures.

SECTION 4: Mechanical Equipment

Description of all major items of equipment with the make, model number, names, addresses and telephone numbers of the Supplier, Manufacturer or their Agents.

Design capacities of all equipment including selection parameters, selection curves, capacity tables, etc.

Manufacturer's brochures and pamphlets.

Schedule of spares with part numbers recommended to be held in stock by the CDC or Client.

SECTION 5: Maintenance Instructions

Schedule of maintenance particulars, frequency of service and replacements.

Troubleshooting guide.

Part number of all replacement items and spares.

Capacity curves of pumps, fans and compressors.

Serial number of main items of equipment.

SECTION 6: Electrical Equipment

Schedule of equipment indicating manufacturer, type, model number, capacity and address and telephone number of supplier.

Maintenance instructions.

Manufacturer's brochures and pamphlets.

Complete "as-built" circuit diagrams and diagrammatic representation of inter-connections of electrical equipment.

SECTION 7: Instrumentation and Control

Description of each control system.

Schedule of control equipment indicating make, type, model number, rating, capacity and name, address and telephone number of supplier.

Maintenance instructions.

Manufacturer's brochures and pamphlets.

SECTION 8: Drawings

Paper prints (reduced if so desired) of all "as-built" mechanical and electrical Contractor's drawings.

Wiring diagrams, framed behind glass shall be mounted adjacent to each relevant control panel.

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SECTION C – TECHNICAL REQUIREMENTS

3.0 TECHNICAL REQUIREMENTS - GENERAL

3.1 ERECTION OF EQUIPMENT

- 3.1.1 Tenderers shall allow for a complete installation, including the provision of mobile cranes, air compressors, lifting tackle, measuring equipment, precision levels, and all other special or regular tools and equipment that may be needed to complete the entire installation in accordance with the specification, and to the satisfaction, of the CDC.
- 3.1.2 The Contractor will be responsible for any damage caused to buildings, equipment, etc. during the course of the erection of his equipment.

3.2 EQUIPMENT PLINTHS

- 3.2.1 Plinths as specified hereunder shall not be confused with any form of inertia or anti-vibration base. Unless otherwise specified in the Supplementary Specification, equipment plinths shall form part of the air conditioning and ventilation contract.
- 3.2.2 Plinths shall be provided for all mechanical and electrical equipment. Plinths cast on concrete surfaces shall protrude at least 100mm above floor levels and depending on the position of the vibration mountings, shall be at least 300mm wider or longer than the inertia bases mounted on top. (Where applicable)
- 3.2.3 Plinths for equipment which do not need inertia bases or plinths for inertia bases with recessed vibration mountings, shall be of the same size as the equipment or bases mounted on top. Plinths shall consist of 1,6mm thick channel or angle iron formers with 10mm thick reinforcing bars located at 150mm pitch in each direction and filled with concrete. The top surface of the concrete shall be floated to an even and smooth finish to allow for not less than 25mm and not more than 50mm of suitable cement or epoxy grout under the equipment base frame. A 25mm 45° chamfer shall finish off all grout corners.
- 3.2.4 Plinths as specified above shall also be provided for field assembled plenum chambers and other equipment.
- 3.2.5 Where cooling towers are on the same floor level as condenser water pumps, the towers shall be mounted on concrete or masonry walls high enough to ensure a flooded suction at all times.

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3.3 HOLDING DOWN BOLTS AND BOLTS FOR EQUIPMENT

- 3.3.1 The Contractor shall be responsible for the supply of all necessary holding down bolts for the machines supplied by him. He shall also supply all bolts necessary for assembling all the equipmentsupplied by him.
- 3.3.2 Holding down bolts shall preferably be cast into concrete bases when the bases are being cast. All bolts shall, in this instance, be provided with galvanised sheet metal sleeves approximately three times the diameter of the bolt and projecting a minimum of four-bolt diameters below the surface of the concrete. This sleeve must be kept free of concrete until the final grouting takes place. Under exceptional circumstances, the provision of suitably sized pockets for the holding down boltswill be permitted.
- 3.3.3 Where galvanised bolts are called for, they shall be fully galvanised all over. No re-cutting of threadswill be permitted after galvanizing. All nuts must run freely on the threads.

3.4 BEDPLATES

- 3.4.1 All bedplates shall be of fabricated mild steel with surfaces on which the pump, motor, gearbox, fan etc. is mounted.
- 3.4.2 All bedplates shall be stress relieved after welding but before machining. Each bedplate shall be provided with approximately eight horizontal jacking screws with locknuts for each unit mounted thereon to assist in aligning the pumps and motors, etc.
- 3.4.3 All bedplates shall be thoroughly cleaned, prepared and painted with one coat of Anodite red oxide primer to finishing coats being applied.
- 3.4.4 It will not be necessary to dowel equipment in place, provided the jacking screws specified aboveare fixed and locked.

3.5 WELDING

- 3.5.1 Welding shall be carried out in accordance with the current edition of SABS 044 Parts I to VII where applicable.
- 3.5.2 All welded filler or butt joints shall be free from porosity, cavities and entrapped slag. Joints shall be ground smooth, if required for aesthetic reasons only, without effecting weld strength.
- 3.5.3 The joints in the weld run, where welding has been recommended, shall be as smooth as possible and shall show no pronounced hump or crater in the weld surface.

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- 3.5.4 The profile of the weld shall be uniform, of approximately equal leg length and free from overlap at the toe of the weld. Unless otherwise specified the surface shall be either flat or slightly convex in the case of fillet welds and with reinforcement of not more than 3mm in the case of butt welds. The weld face shall be uniform in appearance throughout its length.
- 3.5.5 Filler metal electrodes shall be of an approved type for the material being used and shall be kept in a dry condition. All electrodes shall conform to SABS 455.
- 3.5.6 Only welders in possession of a valid approved competence certificate shall be employed.
- 3.5.7 All welds must show proper fusion.
- 3.5.8 Where welding is contemplated in pipework systems, Tenderers shall allow for the removal and testing by an approved body of 5% of the welded joints in the system. Should faulty welding be discovered, all other joints shall be X-ray tested by the SABS or an approved body, all at the expense of the Contractor.

3.6 GALVANISING

- 3.6.1 Unless otherwise specified in the Supplementary Specification the following items shall always be galvanised:
 - Fabricated mild steel sections exposed to the weather.
 - Steel grilles and louvres exposed to the weather.
- 3.6.2 Where hot dip galvanizing is called for, items to be galvanised shall be entirely pre-fabricated and then dismantled in sections for galvanizing. No cutting of threads or welding will be accepted after galvanizing.
- 3.6.3 All hot dip galvanizing shall be carried out in accordance with SABS 934 and SABS 763 where applicable, including preparation for galvanizing.
- 3.6.4 Mild steel plate and sections shall be of good commercial quality, or higher grades, best suited for galvanising. The materials shall be free from slag or coarse laminations, fine fissures and rolled-in impurities.
- 3.6.5 Castings shall be sound, dense and clean, and free from distortion, porosity, carbon and slag enclosures, blowholes, and other injurious conditions.
- 3.6.6 Welding flux shall be chipped away and all welds wire brushed before galvanising.
- 3.6.7 The surface to be galvanised shall be free from paint, oil, grease and similar impurities.

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- 3.6.8 All exposed surfaces including welds shall be thoroughly sand blasted prior to galvanising.
- 3.6.9 The galvanising coating shall be smooth, adherent, continuous and free from black spots or flux stains.
- 3.6.10 Globular extra-heavy deposits of zinc, which interfere with the intended use of the material, will not be acceptable. Excessively protuberant lumps and nodules shall be removed by hot wiping or by the skillful application of mechanical means, however there shall remain a sufficient minimum thickness of unbroken zinc coating. Flaws on small parts and working surfaces shall be repaired only by stripping and re-dipping.
- 3.6.11 Repairs to galvanised coatings will not be accepted. Items damaged will need to be re-galvanised.
- 3.6.12 Coating thickness shall be as per table 1 of SABS 763 unless otherwise specified in the supplementary specification.
- 3.6.13 The SABS requirement for uniformity shall apply.
- 3.6.14 Galvanised surfaces specified with paint finishing shall not be passivated.

3.7 PAINTING

- 3.7.1 Painted items shall include plantroom floors, equipment plinths, and bases.
- 3.7.2 Before any painting is applied, the surfaces shall be prepared according to SABS 064, Code for Preparation of Steel Surfaces for Painting. All surfaces shall be moisture free, clean and properly prepared.
- 3.7.3 During painting, the Contractor shall ensure that all the necessary fire prevention and fire-fighting precautions have been taken.
- 3.7.4
- 3.7.5 Name plates, labels and notices on equipment shall not be painted.
- 3.7.6 Items which do not require painting such as diffusers and grilles, shall only be installed after the paintwork on the plant, ceiling or walls have been completed.
- 3.7.7 Painted surfaces on proprietary manufactured items shall be adequately protected. Equipment on which the paintwork has been damaged during installation shall be repainted before first delivery of the plant will be considered.
- 3.7.8 Unless otherwise specified in the Supplementary Specification the installation shall be painted in accordance with SABS colour coding where applicable. Colour code bands and arrow indicators

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shall be as per SABS 0140 of 1978, and the basic colour shall cover the full length and circumference of pipes and ducts.

- 3.7.9 Plastered surfaces inside plenums shall be painted with a suitable alkali resistant primer to SABS 1414-1987 followed by a universal undercoat with a final coat of high gloss enamel paint to SABS 630, Grade I. The colour of the final coat shall be white.
- 3.7.10 Lagged and plastered ductwork and plastered surfaces outside plenums shall be painted with a suitable alkali resistant primer to SABS 1414 of 1987 followed by one undercoat to SABS 681, type II and one coat high gloss enamel paint to SABS 630, Grade 1 or PVA exterior type emulsion paint to SABS 634 of 1974 as top coat.
- 3.7.11 Ferrous casings of cooling towers, evaporative condensers and sprayed coils including galvanised iron casings, sumps, fans and ductwork connected to outlets of cooling towers or evaporative condensers, shall be internally painted with two coats of epoxy-tar paint to SABS 801, type II.
- 3.7.12 Angle iron framework shall be similarly painted with epoxy paint before side covers are fitted. All steel surfaces shall be cleaned and painted with a wash primer or zinc chromate primer (un-galvanised iron) before the epoxy paint is supplied.
- 3.7.13 Exposed and unlagged galvanised piping shall be painted with one coat wash primer (self etch primer) to SABS 723 followed by one undercoat to SABS 681, type II and one coat gloss enamel paint to SABS 630, Grade 1 as top coat.
- 3.7.14 Unlagged black piping, flat iron, angle iron, rods, etc, for supports, brackets, frames, duct stiffeners, etc, shall be painted on all sides with a zinc chromate primer to SABS 679 type 1, followed by one coat universal undercoat and one finishing coat of enamel paint to SABS 630 Grade 1.
- 3.7.15 Where specified in the supplementary specification, aluminium shall be painted with a wash primer to SABS 723 followed by a zinc chromate primer to SABS 679, type I and one coat universal undercoat to SABS 681-1972 type II and one final coat of enamel paint to SABS 630, Grade 1.
- 3.7.16 Where specified in the supplementary specification, steel surfaces shall be cleaned and then treated with the hot phosphate process to a minimum weight of 1,6 g/m² coating followed by two coats of backing enamel to SABS 783 type I.
- 3.7.17 All galvanised surfaces requiring painting other than those covered in 3.13.17 below shall be thoroughly degreased. In case a detergent is used, the surface shall be well rinsed and dried. It shall then be painted with one coat wash primer (self etch primer) to SABS 723. When dry, the

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surface shall be painted with one undercoat to SABS 681 type II and one coat universal undercoat and one coat high gloss enamel paint to SABS 630 Grade 1 as top coat.

- 3.7.18 All galvanised surfaces inside air handling plenums and external within 50km of the coast, or as specified in the supplementary specification, shall be cleaned with a galvanised iron cleaner until a water break free surface is achieved. After drying one primer coat of "Galvo-Grip" or approved paint shall be applied followed by one coat of universal undercoat paint. A final coat of gloss enamel to SABS 630, Grade I shall then be applied.
- 3.7.19 For air handling units the entire air-conditioning unit casings, including galvanised iron eliminators, sumps, drip pans, fans etc., shall be painted internally with two coats of epoxy-tar paint to SABS 801, type II. The white rust preventative compound on galvanised iron shall be removed as specified above before the paint is applied. Angle iron framework shall be similarly painted with epoxy paint before side covers are fitted.
- 3.7.20 Exposed piping with canvas covered insulation shall be painted two coats of bitumen aluminium paint to SABS 802 followed by the colour coding basic colour as per table 1.

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1. AIR-CONDITIONING UNITS AND REFRIGERATION

1.1 Scope of Works

The provision and installation of air-conditioning system scope of works consists of and is not limited to the following areas within facilities:

- (a) Office Parks
- (b) Office annex in warehouses/factories
- (c) Consultation rooms and other rooms requiring AC in Health Facilities
- (d) Server rooms
- (e) Schools and staff rooms

1.2 Applicable Standards and Codes

The Air-Conditioning installations, in general, shall be in accordance with, amongst others, the following standards and codes:

No.	Standard / Code	Description
1	SANS 10400	The Application of National Building Regulations Part O: Lighting and Ventilation
2	SANS 10400	The Application of National Building Regulations Part XA: Energy usage in buildings
3	SANS 10147	Refrigerating systems including plants associated with air-conditioning systems
4	SANS 1125	Room air conditioners and heat pumps
5	SANS 1424	Filters for air-conditioning and general ventilation
6	SANS 1238	Air conditioning ductwork
7	SANS 193	Fire Dampers
8	SANS 460	Copper and copper alloy tubing
9	SANS 1186-1	Symbolic safety signs: Standard signs and General Requirements
10	SABS 763	Hot-dip galvanized Zink coating
11	SANS 1453	Copper tubes for medical gas and vacuum services
12	IUSS	Health Facility Guides: Building Engineering Services
13	SANS 10142	The wiring of premises Part 1: Low-voltage installations
14	SANS 60335	Household and similar electrical appliances – Safety. Part 2-40: Particular requirements for electrical heat pumps, air conditioners and dehumidifiers
15	ACT 103	National Building Regulations and Building Standard Act, 1977 (Act No 103 of 1977) as amended.

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16	STD.PWD.VIII	Department of Public Works - Standard specification for refrigeration services (Issue VII 1995) Standard Specification for Air Conditioning and Ventilation Installations.
17	Municipality by-laws	All municipal regulations, laws, by-laws and special requirements of the Local Authority shall be adhered to unless otherwise specified.

1.3 Design Criteria

1.3.1 Design Temperature

The Air-Conditioning design is to be based on ambient conditions as per Table 1 below:

Table 1: Air-conditioning design criteria

DESIGN DATA	
Outdoor summer temperature	°C Db / °C Wb
Outdoor winter temperature	°C Db / °C Wb
Indoor conditions	°C Db / %RH
Indoor noise levels (NC)	
Site Altitude (Altitude above sea level)	m
Condenser Coil Selection Temperature	°C Db

1.3.2 People Densities

The people density will be based on the space layouts as indicated on the drawings. Where not shown the SANS 10400 Occupancy criteria will be referred to.

1.3.3 Ventilation Rates

Fresh air requirements will be provided in accordance with the National Building Regulations as indicated in the SANS 10400- Part O. SANS 10400-Part O Table 2 provides the air requirements for different types of occupancies. The rates are provided in two columns, Air Changes per hour (Column 2) and L/s/person (Column 3). The higher of the two flows will be utilized. In the case of a hospital or Medical Centre, reference can be made to Table 4 (Ventilation Rates) of the IUSS Health Facility Guides. However, SANS 10400-Part O takes precedence over the IUSS guidelines.

1.3.4 Equipment Heat Loads

All office desks are assumed to be equipped with laptops and an allowance of 250 W/laptop can be included in the heat load calculation.

1.3.5 Lighting Loads

Lighting heat emissions shall be determined once the lighting layouts are available, however, during detail design stage an allowance of 25 W/m² is allowed for.

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1.3.6 Building Walls and Glass

The building's wall composition as well as roof insulation to be constructed as per SANS 204 and this will be used in the heat load calculations.

1.4 General AC Units Requirements

- (a) The air conditioners shall be in accordance with the latest version or amendment of SANS 1125.
- (b) The air-conditioning system shall be provided by means of split units in the various areas.
- (c) The split unit's indoor fittings are mid-wall units, cassette units, and hideaway ducted units.
 - i. Mid-wall units are to be mounted on the wall, at the centre of the of the mounted wall from a horizontal perspective and at a high enough level such that it does not clash with windows. Mid-wall units shall consist of a direct expansion, indoor unit and a separate (remote) externally located, air-cooled, condensing unit.
 - ii. Cassette units shall be mounted in the centre of the room or equidistantly in a room with more than one unit.
- (d) The air conditioning units shall be of the inverter heat recovery type.
- (e) The air conditioning units shall be standard factory assembled, piped and wired. All units shall be of approved make. "Approved" means approved by the Engineer. These units shall be thoroughly tested for all operating conditions. Spares shall be freely available in South Africa. The HVAC sub-contractor must provide the Engineer with performance certificates for the air conditioning units.
- (f) The air-conditioning units and installation in general shall be in accordance with the unit supplier's recommendations. Any discrepancies between this specification and the supplier's recommendations that may influence the unit's performance or guarantee should be clarified with the Engineer during tender stage.
- (g) The electrical power requirements to the condensing units shall be:
 - i. Single-phase when the cooling capacity of the unit is less than 10 kW.
 - ii. Three-phase when the colling capacity of the unit is more or equal to 10kW.
- (h) The indoor unit and condensing unit shall be interconnected with refrigerant piping, electrical wiring and interlocking control cabling. The pipe and cable connections shall be made in accordance with the unit supplier's recommendations. The refrigerant shall be of the R410A type or R32 for newer units.
- (i) The indoor unit shall be of the mid-wall type unit. The stainless-steel drip tray shall be externally insulated that the surface temperature does not fall below the dew-point as that would lead to condensation.
- (j) Indoor units shall have factory fitted, electrically operated condensate pumps with a drainpipe connection. Integral safety switches shall be provided to prevent the pump from running dry, and to prevent the unit from operating when the condensate pump has failed. The indoor unit shall be fitted with fresh air connection knockout panel.

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- (k) Each condensing unit with connected evaporator unit shall be clearly labelled to identify different units.
- (l) The outdoor unit (condensing unit) shall be treated for corrosion with Bly gold, Techni-coat, corium or any other method as approved by the Engineer.
- (m) Piping between the indoor unit and outdoor condenser shall be with SABS 460, Class 2 Copper Pipe. The pipe shall fit together by capillary fittings and shall be further insulated.
- (n) With respect to mid-wall units, they should be mounted back-to-back as much as possible. If this is not possible, the piping must be placed on cable trays and these trays should be mounted to the soffit or roof truss, with threaded bar and nut/bolt combination.
- (o) The same method shall be applied for piping related to the cassette units as well.
- (p) All piping shall be visually inspected for quality before a hydrostatic pressure test is conducted on the piping. This must be witnessed by the engineer or site representative.
- (q) Heating shall be by means of heat recovery action by the reversal of the cooling cycle. All the necessary control equipment, valves and piping required to perform this function shall be supplied as part of this work.
- (r) A defrosting system that will defrost the condensing coil during the winter months when heating is required, should be provided. The defrosting system shall be a proven system that functions automatically without affecting the room temperature.
- (s) The evaporator unit shall be equipped with an easily accessible washable, long-life filter, a 3-speed adjustable fan driven by a squirrel-cage induction motor and evaporator coils manufactured from seamless copper tubing mechanically bonded to aluminium fins.
- (t) The mid-wall unit shall have an auto-swing vane function that allows the vanes of the unit to swing up and down automatically. An auto-flap shutter shall close automatically when the unit is turned off.
- (u) The compressor unit shall be of hermetic scroll type, powered by an induction motor, and installed with anti-vibration mounts such as rubber or spring isolators. The compressor shall be equipped with crankcase heater.
- (v) The condenser cooling fan shall be of the direct driven multi-wing, dynamically balanced propeller type axial flow fans. The outdoor unit shall be of the horizontal blow type.
- (w) For reverse cycle units, a proper galvanised steel drip pan with drainage piping or drain piping connected to the integral drain pan shall be provided for the condensing units.
- (x) The control system shall be such that the unit will automatically change from heating to cooling and vice versa. A time delay relay shall prevent the compressor from restarting immediately when changing from heating to cooling and vice versa.
- (y) The “auto restart after power failure” option shall be available on all units’ settings. The units shall also be able to operate in a “fan only” mode. Electrical interlocking shall be provided to ensure that:
 - i. The compressor cannot run without both evaporator and condenser fans running.
 - ii. It shall not be possible to switch cooling and heating simultaneously.

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1.5 Performance Specification

- (a) Cooling and heating capacities are room conditions, and all equipment shall be de-rated to meet these requirements.
- (b) De-rating shall be done to compensate the following:
 - i. Altitude above sea level.
 - ii. Refrigerant pipe lengths.
 - iii. Design conditions specified.
- (c) All units shall be capable of meeting total and sensible cooling requirements. Tenderers shall provide proof of de-rated capacities with their tender. All capacities specified are to be achievable at medium evaporator fan speed.
- (d) The grouping of the sizes of the Air Conditioning system is done to avoid any confusion for the contractor when purchasing the units.

1.6 Safety and Protection Devices

- (a) Thermal Protection shall be provided for the compressor, indoor and outdoor fan motors. Over current relay shall be provided for the compressor, indoor and outdoor fan motors to ensure over-current protection.
- (b) Reverse phase, three-phase overload, overload during startup, phase imbalance, phase loss and low voltage protection shall be provided for all three-phase motors.
- (c) Protection fuses shall be provided for all control circuits.
- (d) The compressor shall have high and low refrigerant pressure protection.
- (e) The indoor and outdoor units shall comply with the safety requirements as set out in SANS 60335-2-40.

1.7 Electrical

- (a) Generally, the power to mid-wall units shall be provided by the Electrical Contractor in a weatherproof isolator mounted within 1m from the condensing unit. The Mechanical Sub-contractor shall do the entire electrical installation from the isolator to the condensing unit and the indoor unit.
- (b) Where the Electrical Contractor provides a cable only to a distribution board that serves a group of air-conditioning units, the Mechanical Sub-Contractor shall provide the distribution board, connect the incoming power cable and shall do all the electrical wiring from the distribution board to the condensing units and the indoor units.
- (c) In all instances the Mechanical Sub-contractor shall provide isolators as required for the air conditioning units. All electrical and control cables shall be neatly strapped with the refrigeration piping in a galvanised cable tray.

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- (d) The entire electrical installation shall comply with SANS 10142-1.
- (e) On completion, the Sub-Contractor shall issue a compliance certificate for the entire electrical installation.
- (f) Electrical and control cables mounted between indoor and outdoor units shall be installed without joints in the cable and shall be of the Ultraviolet (UV) protected type.

1.8 Controls

- (a) The control for mid-walls shall be done by wireless remote control.
- (b) Cassette units shall be controlled by wired remote control.
- (c) Cassette unit remote control shall be located below the light switch. Care must be taken when running the control wire and conduits should be shared if possible. Chasing of conduits must be confirmed with structural engineer before breaking.
- (d) Controls shall be of a hard wired, wall mounted electronic type.
- (e) Controls shall be of the same manufacture as the air-conditioner.
- (f) Remote control panels shall be fully labelled.
- (g) Controls shall be mounted over a flush mounted 100mm x 50mm electrical box. Control wiring shall be installed in a 20mm electrical conduit from the controller to the air conditioning unit. The conduit and outlet box shall be chased into the wall by the Electrical Contractor. The Electrical Contractor shall install the conduit from the outlet box to 100mm above ceiling level directly above the controller.
- (h) Controls shall have the following minimum functionality:
 - i. Manual ON/OFF.
 - ii. ON/OFF by seven-day timer.
 - iii. Room temperature display.
 - iv. Room temperature adjustment.
 - v. Cooling / heating / Ventilation selection
 - vi. Automatic change-over between cooling and heating.

1.9 Refrigerant Circuits

- (a) Refrigerant piping shall be in accordance with the following standards:
 - i. SABS 1453: *Copper tubes for medical gas and vacuum services.*
 - ii. SABS 0147: *Refrigerating systems including plants associated with air-conditioning systems.*
- (b) Fittings shall be copper-based capillary solder fittings in accordance with SABS 1067. All soldered joints on proprietary manufactured units shall be carefully checked and remade if found damaged in transit.

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- (c) Pipe size selections shall be such as to produce moderately low velocities whilst:
 - i. Ensuring proper oil return to the compressor and minimizing lubricant oil trapped in the system.
 - ii. Ensuring practical lines without excessive pressure drops and with proper feed to evaporators.
 - iii. Preventing liquid refrigerant from entering the compressor during operation and at shutdown.
- (d) Refrigerant piping shall be sized and fitted with the necessary oil traps strictly in accordance with the unit manufacturer's requirements.
- (e) All refrigerant pipelines shall be insulated with the "Armaflex" type, lightweight, elastomeric nitrile rubber insulation. Insulation thickness shall be 13mm.
- (f) Suction and liquid pipelines shall be insulated separately and joints on insulation shall be glued with the insulation manufacturer's recommended adhesive to create a vapour barrier.
- (g) The installation of trunking and trays shall form part of this mechanical contract.

1.10 Installation Requirements

- (a) Indoor and outdoor units
 - i. During installation, care shall be taken to ensure that no vibrations are carried over to structures to which the indoor and outdoor units are fixed.
 - ii. Outdoor condensing units shall be installed on wall mounted brackets and / or a concrete slab as indicated on the project drawings. The latter must be mounted on anti-vibration mounts.
 - iii. Where installed on wall-mounted brackets, the condensing unit shall be properly bolted to the mounting bracket with adequately sized fasteners.
 - iv. Where installed on a concrete slab, the condensing unit shall be fitted on top of neoprene vibration isolating pads and 450mm square concrete paving slabs.
 - v. Units must be stored safely before installation and covered if building work is continuing in an area.
 - vi. Openings through the wall for piping must be closed and made good after installation by the HVAC contractor.
- (b) Condensate pipes
 - i. If an outdoor unit (heat pump type) is mounted against a wall more than 1m above ground / floor level, the unit shall be fitted with an uPVC drainpipe neatly saddled to the wall. Drainpipe sizes for outdoor units shall be to the supplier's recommendation.
 - ii. Condensate drainpipes shall always run together with refrigerant pipes and shall always be installed in the same trunking and on the same cable trays for as far as the installation permits. Surface mounted drain piping shall only be allowed where condensate drainpipes

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- run in a different direction to either a service duct, waste water pipe or any other location as indicated on the project drawings. Surface mounted drain piping shall be secured to the wall by means of galvanised steel saddles at no more than 1m intervals.
- iii. Drainpipes shall run and connect to wastewater pipes as indicated on the project drawings. The connection between the drainpipe and wastewater pipe shall be an airtight sealed connection that allows positive drainage of condensate.
 - iv. All condensate pipes running from indoor units to wastewater pipes, outlet gullies or open wastewater points shall be fitted with a U-trap or HEPVO self-sealing waste valve as a location as indicated on the project drawings.
 - v. uPVC pipes shall be used for drain piping from indoor units. Drainpipe sizes for indoor units shall be Ø25mm for all unit sizes and will connect to a main line of Ø50mm.
 - vi. The first 5m of drain piping shall be insulated with “Armaflex” type, lightweight, elastomeric nitrile rubber tube insulation. Insulation thickness shall be 13mm.
 - vii. In ceiling voids, drainpipes shall be installed in galvanised cable trays. Where drain piping does not run with refrigeration piping in the same cable trays, 76mm of vibration to the building, galvanised “Cabstrut” light duty cable tray shall be used. Drain piping shall be fixed to the cable tray with suitably sized cable ties installed at 500mm intervals. Drain piping shall be fixed to the cable tray with suitable sized cable ties installed at 500mm intervals.
 - viii. Horizontal mounted drainpipes shall be installed at a slope of 20mm per 1m, ensuring positive drainage.
 - ix. Where drainage piping or control cabling is required to be installed flush-mounted, positioning and chasing shall be done in good time to meet construction program.
 - x. Condensate drains from the mid-wall units must be piped to the nearest drain and allowing for a fall of 1:100.
 - xi. The HVAC contractor shall be responsible for the u-trap before the drain connection.
 - xii. Drain piping shall be uPVC conduit type and surface mounted.
 - xiii. Exposed piping shall be placed within trunking. The trunking must be painted to suit wall colour and must be approved by the architect.

(c) Refrigerant piping

- i. Refrigerant piping shall be arranged so that normal inspection and servicing of the compressor and other equipment is not hindered. Locations where copper tubing will be exposed to mechanical damage shall be avoided. Hangers and supports where piping goes through walls shall be installed to prevent transmission of vibration to the building.
- ii. Refrigerant piping in ceiling voids and mounted internally against walls shall be installed in 101mm wide galvanised steel Cabstrut light duty cable trays (per unit). Pipes shall be strapped over insulation to cable trays at 500mm intervals with suitably sized cable ties.

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Cable trays shall be 152mm wide where drainpipes run together with refrigerant piping (per unit).

- iii. Externally mounted refrigeration pipes and drainpipes shall be mounted in Cabstrut cable trunking. Cable trunking shall be complete with clip on covers. Pipes and cables shall be strapped together every 500mm with suitably sized cable ties and loosely fitted in the trunking. The trunking shall be manufactured from galvanised steel and epoxy powder-coated to a colour as specified by the Engineer.
- iv. Any insulation material not covered by the trunking and exposed to the elements shall be neatly strapped with cable ties to minimize the possibility of dirt and water entering between the insulation and refrigeration pipes.

1.11 Air Handling Unit

- (a) Air Handling Units shall be of Them-O-Pack or equal and approved manufacture and shall be supplied complete with fans, filters, chilled water-cooling coils, electric heating coils, mixing boxes, fresh and return air dampers, copper or stainless-steel drain pans, etc.
- (b) A dedicated name plate shall be included on the air handling units with design air flow rates, fan speed, cooling and heating capacities, filter data, etc. Similar details shall be given on the drawings and in the schedule of capacities.
- (c) The units must be of double skinned construction with particular care being taken to avoid cold or cool surfaces on which condensation of moisture can occur.
- (d) Hinged access doors are required to give access to fans, coils, and filters and these doors shall be clearly labelled.
- (e) Air filters shall be installed before the coils in the air handling units. Primary filters shall be situated at the fresh air intake opening and secondary filters shall be situated after the supply air fan in a blow through configuration where clean air supplied to the Hepa Filters will be optimized.
- (f) Air filters shall be equal to **FIBATRON WP77**, minimum 50mm thick, high performance washable, pleated panel type, housed in adequate holding frames, and fitted with gaskets to ensure a positive airtight seal around them.
- (g) Fresh air filters shall be of the same make, type and size as the return air filters fitted in the units and shall be fitted into the holding frames installed on the rear of the outside air intake weather louvre, to be easily removable from inside the plant room area or building.
- (h) Fans shall be of the backward curved centrifugal type sized to cope with the pressure losses imposed by the unit components and ducting.
- (i) Fan assemblies shall be so mounted within the air handling unit 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.

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- (j) Supply air 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 a rotational speed not exceeding 1500 rpm. The motor shall drive the fans by means of a V-belt drive having not less than two V-belts.
- (k) Condensate drip trays shall be stainless steel and so installed to prevent the build-up of condensate. Condensate drains are to be installed in the floor slab and directed to a sewer connection.
- (l) PVC drop stop eliminators in grade 304 stainless steel frames shall be employed, if fin spacing is less than 20 fins per inch, after the cooling coils in areas with high humidity levels. This includes all coastal areas for off coil temperatures of 10°C and less.
- (m) Copper to copper coils shall be employed and the coil supporting frames shall be Grade 304 stainless steel fitted with a 1,2mm thick grade 304 stainless steel condensate pan, so sized and located to prevent entrainment of moisture into the air stream, whilst also ensuring positive drainage of condensate. Cooling coil sizes shall be selected so that the face velocity does exceed 2,5 m/s.
- (n) Direct expansion cooling coils shall consist of at least two separate refrigerant circuits.
- (o) The chilled water flow through the cooling coil shall be counter flow to the airflow across the cooling coil. The chilled water connections shall be supplied at the bottom and return at the top.
- (p) Refrigeration pipework shall be carried out in seamless refrigeration quality copper tubing.
- (q) Refrigerant circuits shall incorporate replaceable core type filter-driers, sight glasses, thermostatic expansion valves and vapour proof insulation on the suction lines.
- (r) Internal wiring shall comply fully with wiring regulations as relevant and shall be adequately secured. Adequate earthing shall be allowed.
- (s) Air handling units shall be provided with electronic variable speed with direct drives to maintain design airflow for all filter conditions.
- (t) The air handling units shall have separate electrical distribution boards (Essential and Non-essential). The coils shall be protected by means of ultraviolet light with a consistent minimum average of Circa 800 Micro Joule per centimeter squared at any point of the coil facing.
- (u) A fire damper to SABS specification is required for each air handling unit.
- (v) Maintenance and servicing of the unit during the 12-month guarantee period shall be included in the cost of the unit. After the expiry of the guarantee period maintenance and servicing shall be carried out by the client's FM.

1.12 Packaged Air Conditioning Unit - Air Cooled and Evaporative Condenser Cooled

- (a) The packaged air conditioning units shall be suitable in all respects for outdoor location and shall be equal to GUNTNER Roof Mounted Packaged Air Conditioners.
- (b) Unit Casings shall be constructed of not less than 1.2mm thick mild steel panels suitably braced and framed to prevent drumming, whilst at the same time being arranged in easily removable panels to facilitate access to any portion of the internal components.

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- (c) Units shall contain a minimum of two refrigeration compressors. These shall be of the hermetic or the accessible hermetic type, direct driven by integral suction gas cooled squirrel cage motors, at a rotational speed not exceeding 1500 rpm. Each compressor shall have at least one stage of capacity modulation than full load and shall be arranged to start unloaded.
- (d) Condenser coils shall consist of copper tubes with mechanically bonded aluminium plate fins, all housed in a robust galvanised steel frame and protected with a suitable galvanised wire mesh screen. Suitable space shall be provided at the coil ends in order that tube bends are easily accessible in the event of possible refrigerant leaks.
- (e) Condenser fans shall be of the slow-running propeller type, direct driven by squirrel cage electric motors. The units shall be provided with a minimum of two propeller fans, which shall be arranged, preferably for vertical discharge through suitable weatherproofed protective wire guards. The fan and motor bearings shall be of the permanently lubricated sealed type, and the motor shall be resiliently mounted so as not to transmit vibration to the unit casing.
- (f) Condenser air intake and discharge arrangements shall be such that no short-circuited discharge air can be drawn back into the air intake.
- (g) Refrigerant circuits shall incorporate replaceable core type filter-driers, sight glasses, thermostatic expansion valves and vapour proof insulation on the suction lines.
- (h) Automatic safety controls within the units shall include a dual pressure switch with manual reset on the high-pressure side, and an oil pressure switch with manual reset. Provision shall be made for pressure relief of the high side refrigerant piping in accordance with government regulations. Provision shall also be made for cycling the condenser fans so that the units may be capable of operating down to an ambient temperature of 10°C db.
- (i) Direct expansion cooling coils shall consist of at least two separate refrigerant circuits. Cooling coils shall comprise copper tubes with mechanically bonded aluminium fins. The coils shall be encased in a heavy gauge grade 304 stainless steel casing fitted with a 1,2mm thick grade 304 stainless steel condensate pan, so sized and located to prevent entrainment of moisture into the air stream, whilst also ensuring positive drainage of condensate. Cooling coil sizes shall be selected so that the face velocity does exceed 2,5 m/s.
- (j) The chilled water flow through the cooling coil shall be counter flow to the airflow across the cooling coil. The chilled water connections shall be supplied at the bottom and return at the top.
- (k) Refrigeration pipework shall be carried out in seamless refrigeration quality copper tubing.
- (l) Refrigerant circuits shall incorporate replaceable core type filter-driers, sight glasses, thermostatic expansion valves and vapour proof insulation on the suction lines.
- (m) Supply air fans shall be of the double inlet, forward curved centrifugal type, with impellers running in sealed, permanently lubricated ball-bearings incorporating pillow blocks located in the suction eye on both sides of each fan.

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- (n) Fan impellers shall be statically and dynamically balanced and run well below critical speed. Fan assemblies shall be so mounted within the air handling unit 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.
- (o) Supply air 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 a rotational speed not exceeding 1500 rpm. The motor shall drive the fans by means of a V-belt drive having not less than two V-belts.
- (p) Air filters shall be installed before the coils in the air handling units and packaged air conditioning units. Air filters shall be equal to **FIBATRON WP77**, minimum 50mm thick, high performance washable, pleated panel type, housed in adequate holding frames, and fitted with gaskets to ensure a positive airtight seal around them.
- (q) Fresh air filters shall be of the same make, type and size as the return air filters fitted in the units and shall be fitted into the holding frames installed on the rear of the outside air intake weather louvre, so as to be easily removable from inside the plant room area or building.
- (r) The return air and fresh air mixing plenum shall be factory installed and shall be of similar construction to the rest of the cabinet. The mixing plenum shall be complete with return air and maximum fresh air volume control dampers.
- (s) Internal wiring shall comply fully with wiring regulations as relevant and shall be adequately secured. Adequate earthing shall be allowed.

1.13 Chilled Water Generators

- (a) Chillers shall be of standard, factory assembled packaged type and the design, material and finish shall be equivalent to a well-known make approved by the Engineer.
- (b) The refrigerant to be used shall be R134a unless otherwise specified.
- (c) Packaged, pre-piped water-cooled screw chilled water generators to provide chilled water to the air handling units and fan coil units.
- (d) The units must be complete with chilled water pumps and all its controls and accessories, galvanised sheet metal casing, epoxy powder coated after manufacture, with full access to all operating components, stainless steel plate heat exchanger, screw compressor, cooling water pumps, cooling towers and all other items of equipment, including controls to result in a fully operational unit.
- (e) Raw water connections shall be provided by the main contractor in close proximity to the chillers.
- (f) The hydronic unit must provide primary chilled water circulation through the chiller into the chilled water reticulation and must contain as a minimum the following: Strainer, expansion tank, safety valve, dual pumps, purge valve, pressure gauges over plate heat exchanger, air vent, flow switch (one per pump) and flow control valve.

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- (g) Compressors must be screw type, employing refrigerant R134A or R407C. Capacity control must be stepless (screw compressor).
- (h) Controls must be microprocessor based, and incorporate head pressure control, hot gas injection capacity control, recycle timers and low and high temperature safety controls. The facility for linking the unit to a BMS at a later stage must also be provided.
- (i) The control systems shall include for low temperature safety switches, low oil pressure, high head pressure protection, no flow protection in both the evaporator and condenser circuits.
- (j) Unit capacity must be at least 1600 kW cooling at 35°C ambient temperature with water entering/leaving temperatures of 12°C/7°C.
- (k) The units shall be mounted on anti-vibration pads in the required position.

1.14 Refrigerants

- (a) No CFC refrigerant shall be used in new installations.
- (b) Equipment still running on CFC shall be maintained until such time that a leak occurs or the system has to be decanted. The system shall then be converted to a compatible HCFC or HFC as described in the Montreal Protocol and recommended by the compressor manufacturer.
- (c) Any CFC refrigerant that has to be discharged, shall be decanted by means of an approved reclaiming system, and not discharged to the atmosphere. Should the Contractor not comply with this requirement, full statutory action shall be taken against him.

1.15 REFRIGERATION CHILLERS

1.15.1 Indoor Units

Indoor units shall be carefully selected with due regard to vibration transmission to pipework and the surrounding structure and airborne noise transmitted to the plantroom. Where the airborne noise inside the plantroom exceeds the limits laid down, provisions shall be made in the tender for the total enclosure of the chiller with acoustic paneling to ensure acceptable noise levels.

Spring mounting of compressors only on the basic chiller framework as supplied ex-factory will not be sufficient. In addition, (unless otherwise specified in the supplementary specification) the complete chiller unit shall be installed on spring mountings of the correct deflection characteristic.

For critical areas, the standard spring mounting of the chillers will not be sufficient. In addition, inertia mass will be required with the chiller unit as a whole mounted on correctly selected spring mounts. Deflection in excess of 40mm can be expected.

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Indoor air cooled chillers shall in all cases be fitted with centrifugal fans for the condenser section. The complete unit with fan/s, ducting grilles etc. shall comply with the requirements laid down in this specification.

1.15.2 Outdoor Chillers

Where outdoor type air-cooled chillers are specified in critical areas, in addition to the laid down requirements, condenser-cooling fans shall be of the centrifugal type and provided with attenuation.

Centrifugal fans and attenuation shall be provided where necessary to meet the laid down noise criteria for other areas.

Acoustic paneling to the chiller housing shall similarly be provided for equipment where necessary to comply with the laid down criteria.

SABS 0103 has reference.

1.16 COOLING TOWERS

1.16.1 Indoor Applications

Anti-vibration requirements and noise transmission to surrounding areas shall comply with requirements as laid down (unless otherwise specified in the supplementary specification). No cooling tower shall be installed indoors unless it is mounted on anti-vibration spring mountings and should it be necessary, the required inertia mass.

1.16.2 Outdoor Applications

Cooling towers installed outdoors shall similarly comply with the laid down noise criteria for this application, particular care being paid to the selection of the fans and where applicable, the pumps for critical areas.

1.16.3 Cooling Tower Fans

Centrifugal fans shall generally be required for indoor application of cooling towers and for outdoor applications in critical areas.

In critical areas it will possibly be required that proper attenuation be applied to air inlets and air discharge of cooling towers and, where so specified in the supplementary specification, the total cooling tower shall be installed inside acoustic panelling to prevent noise breakout.

Alternatively, ejector type cooling towers may be offered, subject to the requirements of this specification.

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1.17 PUMPS

1.17.1 All pumps with their motors shall be mounted on a base frame, which shall be installed on concrete plinths.

1.17.2 In addition it is required that pumps installed indoors and in critical areas shall be installed on anti-vibration mountings with inertia mass bases with mountings selected for correct static deflection.

1.17.3 Bases for pumps in non-critical areas shall be installed on rubber in sheer mounts as a minimum, depending on the pump selection and locality of the pump.

1.17.4 Where required in the supplementary specification, pumps shall be totally enclosed in acoustic panelling to reduce noise breakout to the immediate vicinity and surrounding areas.

1.18 PIPING

1.18.1 General

1.18.1.1 Under no circumstances may any piping be directly connected to noise generating equipment such as pumps, chillers, cooling towers etc.

1.18.1.2 Connections to such equipment shall be made with correctly selected flexible rubber type connectors of the spherical type.

1.18.1.3 In critical areas double spherical rubber type isolators immediately adjacent to the noise generating machine will be required.

1.18.2 Pipe Penetrations Through Walls

1.18.2.1 Under no circumstances will pipe penetrations through walls be permitted where the pipe comes in direct contact with the surrounding wall or structure.

1.18.2.2 At such penetrations it is required that a sleeve of 25mm thick, soft neoprene, or other approved material, be provided around the piping at the penetration and, where plastering is applied, plastering shall be cut back to the outer edge of this sleeve.

1.18.2.3 Rubber links similar to the LINK-SEAL bolted type are preferred.

1.18.3 Pipe Supports

1.18.3.1 In all critical applications and within the first ten meters of all equipment, it is required that pipe supports shall be of the flexible type, correctly selected for the application and with the correct static deflection.

1.18.3.2 Depending on the application spring mounting will in all probability be required.

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1.18.3.3 Any other areas and applications at risk of noise or vibration transmission to the surrounding structure similarly require pipe mountings isolated from the structure.

1.18.3.4 Pipe supports fixed to sensitive building elements will not be permitted.

1.18.4 Refrigeration Piping

1.18.4.1 Refrigerant piping in critical applications shall similarly be supported on anti-vibration mountings and in addition, delivery and suction piping at compressors and air handling units shall be provided with at least two braided flexible connections installed at 90° to each other and in close proximity of each other.

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2 VENTILATION SYSTEMS

2.1 Scope

The ventilation system scope of works consists of and is not limited to the following:

- (a) Natural Ventilation application and requirements
- (b) Fresh air supply requirements to air-conditioned rooms (with no openable windows)
- (c) Extract and make-up air for rooms with high heat loads and exhaust fumes.
- (d) Extract and make up air for toilets, changerooms and showers/bathrooms.
- (e) Extract air fans for manufacturing workshops
- (f) Extract air fans over Kitchen Canopies
- (g) Extract hoods over machinery/equipment with exhaust fumes and heat.
- (h) Extract and make-up air for paint booths.

2.2 Design Criteria

- (a) Design Temperature

The Ventilation System design is to be based on ambient conditions as per Table 2 below:

Table 2: Air-conditioning design criteria

DESIGN DATA	
Outdoor summer temperature	°C Db / °C Wb
Outdoor winter temperature	°C Db / °C Wb
Indoor conditions	°C Db / %RH
Indoor noise levels (NC)	
Site Altitude (Altitude above sea level)	m

- (b) Ventilation Rates

Fresh air requirements will be provided in accordance with the National Building Regulations as indicated in the SANS 10400- Part O. SANS 10400-Part O Table 2 provides the air requirements for different types of occupancies. The rates are provided in two columns, Air Changes per hour (Column 2) and L/s/person (Column 3). The higher of the two flows will be utilized. In the case of a hospital or Medical Centre, reference can be made to Table 4 (Ventilation Rates) of the IUSS Health Facility Guides. However, SANS 10400-Part O takes precedence over the IUSS guidelines.

2.3 Applicable Standards and Codes

The Heating, Ventilation and Air-Conditioning installations, in general, shall be in accordance with, amongst others, the following standards and codes:

[Type here]

No.	Standard / Code	Description
1	SANS 10400	The Application of National Building Regulations Part O: Lighting and Ventilation
2	SANS 10400	The Application of National Building Regulations Part XA: Energy usage in buildings
3	IUSS	Health Facility Guides: Building Engineering Services
4	SANS 1424	Filters for use in air-conditioning and general ventilation.
5	SANS 1238	Air-conditioning ductwork
6	SANS 10173	The installation, testing and balancing of air-conditioning ductwork.
7	SANS 60335	Household and similar electrical appliances – Safety Part 2-80: Particular requirements for fans.
8	SANS 10108	The classification of hazardous locations and the selection of apparatus for use in such locations.
9	SMANCA	HVAC duct construction standards metal and flexible: Section 233113 - Low pressure ductwork

2.4 General Ventilation System Requirements

- (a) All rooms shall be ventilated in accordance with and as required by the National Building Regulations.
- (b) Building to be designed for optimum natural ventilation and lighting.
- (c) In the case of artificial ventilation, the minimum air changes and fresh air requirements shall apply in accordance with SANS 10400-Part O (Table 2) or IUSS Table 4 (Ventilation rates).
- (d) In the case of a Health Facility ventilation, ventilation requirements shall make reference of the guidelines on the Infrastructure Unit Support System (IUSS).
- (e) Single ablution facilities serving private wards or staff do not require extract ventilation, provided there are openable windows.
- (f) Extract ventilation shall be provided by either ceiling extract grilles connected to an in-line ducted fan with outside discharge air grilles by means of galvanised mild steel or PVC tubular ducting or Odour extraction systems. The ventilation ducting route is to be confirmed with the engineer.
- (g) Extract grilles may be of the PVC type with adjustable disc valves or white powder coated or anodized aluminium type with adjustable dampers.
- (h) Where two or more ablution areas may be ventilated by one extract system, such extract fan shall be connected to an isolator within 1.5 meters from the extract fan.
- (i) All multiple toilets shall be provided with ducted ventilation system.
- (j) Single toilet facilities serving private wards or staff do not require extract ventilation, provided there are openable windows.
- (k) In the case of a fire, all active ventilation shall switch off.

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- (l) Air-Conditioning and Ventilation Installations shall be commissioned in accordance with the following Codes, or such other recognised commissioning procedure or code approved by the Department:

- Air Distribution Systems:

SABS 0173: Code of Practice for the Installation, Testing and Balancing of Air Conditioning Ductwork.

- Refrigeration Systems:

CIBS: Commissioning Code: Series R: Refrigeration Systems.

- Control Systems:

CIBS: Commissioning Code: Series C: Automatic Controls.

- Hot Water and Steam Boilers:

CIBS: Commissioning Code: Series B : Boiler Plant.

- Water Distribution Systems:

CIBS: Commissioning Code : Series W : Water Distribution Systems.

2.5 Ventilation Fans

2.5.1 General

- (a) All ventilation fans are to be installed in accordance with the manufacturer's requirements and recommendations.
- (b) Selected fans shall be such that the operating point is as close as possible to maximum efficiency. Fan efficiencies shall under no circumstances be less than 60 %.
- (c) Fan motors selected must be capable of supplying not less than 10 % above the specified air quantity without overloading.
- (d) The system resistance must be calculated, and the fan selected to meet the required static pressure, taking into consideration the site altitude, system air temperature and air density at which the system duty shall be met. The selection must be submitted to the Engineer for approval before ordering the equipment.
- (e) In the case where filters are included in the system, the static pressure losses through filters shall be estimated at 200 Pa through each stage of filtration.
- (f) Filtered fresh air supply systems with air flows in excess of 150 L/s shall be complete with washable primary air filters equivalent to Peter McLeod Macs Pleat WP6 600.
- (g) Filter medium (25 mm thick) type filters, complete with galvanised sheet metal holding frame and wire mesh support may be provided in filtered fresh air supply systems with air flows lower than 150 L/s.

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- (h) In systems where filters are provided, the face velocity over the filters shall not exceed 2.5 m/s and the fan duties shall be met with filters at 70% of their final resistance. It is also to be noted that pressure/flow characteristics of fans shall be reasonably steep in their operating range.
- (i) Ventilation and extraction fan duties as specified on tender drawings supplied by the Engineer shall be checked against the respective system's design resistance once all information on the selected system is available.
- (j) Ventilation fans shall be fitted with the manufacturer's nameplates permanently fixed to the casing in a prominent position, clearly indicating manufacturer, model number, size, speed, maximum operating speed, maximum absorbed power and serial number.
- (k) Ventilation fans air inlet or outlets not connected to ducting or equipment shall be protected with safety wire mesh screens, which can easily be removed.
- (l) Fan casings shall include indicating arrows for both direction of rotation and direction of airflow.
- (m) All fans are to be mounted in anti-vibration mountings or supported from anti-vibration hangers.
- (n) The combination of fan and sound attenuators shall be such that the specified noise levels are achieved.
- (o) Sound attenuators shall be mounted directly onto the fan casing with flexible connections between the ducts and attenuators.
- (p) Belt drives shall be designed for a minimum overload of 25 % and not less than two matched belts may be used. Belts shall be selected and installed according to **BS 790**.
- (q) Pulleys shall be of the adjustable speed taper-lock type and shall be accurately keyed to the shafts and aligned before the system is put into operation.
- (r) Belt guards shall be supplied in accordance with Occupational Health and Safety Act, No 85 of 1993. The guards shall have an expanded metal front and shall allow oiling and the use of a tachometer without removal of the guard.
- (s) Bearings shall be of the ball or roller type and shall be quiet in operation.
- (t) Bearings shall be selected for a minimum life expectancy of 200 000 hours at the given duty.
- (u) Lubrication points shall be readily accessible and shall be extended to the outside to permit lubrication without removal of the fan. Fan shafts shall be suitably protected from rust and corrosion.

2.5.2 Axial Flow Fans

- (a) Axial flow fans shall be in-line direct-driven type with the motor mounted inside the fan housing.
- (b) In-line axial flow fans shall be of approved make. "Approved" means approved by the Engineer. They shall be of the size and type as indicated on the project drawings and shall be capable of the duties specified.
- (c) Fans shall be of the multi-bladed aerofoil type of a non-ferrous construction.
- (d) The number of blades will vary according to the application.

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- (e) The fans shall be provided with adjustable blade pitch indexed to permit field adjustment.
- (f) Axial flow fans shall operate at the highest possible efficiency at the lowest possible blade tip speed
- (g) Axial flow fans shall be of the non-overloading, with peak power requirements occurring at normal operating pressure range. The fan motor shall have a rating exceeding this requirement.
- (h) Fan impeller blades shall be manufactured from a die-cast aluminium alloy clamped in a split steel or aluminium cast hub. These shall be accurately balanced to ensure vibrationless running.
- (i) Hubs on larger fans shall be manufactured from hot-dip galvanised steel. Cast steel hubs shall be electro-coated.
- (j) Fan casings shall be constructed of hot dip galvanized mild steel with a minimum thickness of 3 mm and mild steel galvanized flanges on each side drilled for connections to matching flanges on ducting. An access panel of ample size shall be provided in the fan casing. All fasteners shall be zinc plated.
- (k) All ferrous parts of fan components shall be corrosion free.
- (l) Fan motors shall be totally enclosed in the fan housing. Fan motors shall be of the squirrel cage induction type with protection of IP 55 standard. An external weatherproof terminal box forming part of the casing shall be included in the design for motor connections.
- (m) Axial flow fans shall be statically and dynamically balanced in accordance with ISO 1940-1973 within Grade G6.3.
- (n) Axial flow fans shall be mounted on or suspended from strong angle iron brackets by means of suitable anti-vibration mountings, to prevent carry-over of vibration to the structure to which the unit is fixed.
- (o) Axial flow fans shall be installed with sound attenuators.
- (p) Fan rotational speeds specified in the supplementary specification shall not be exceeded.
- (q) Others shall provide maintenance isolators 1 m from the relevant fans. Tenderers shall allow for wiring the fans from these maintenance isolators.

2.5.3 Centrifugal Flow Fans

- (a) Centrifugal fans shall be equal to DONKIN, WOODS, LUFT or ZIEHL manufacture, and have capacities as called for in the project drawings and shall be installed in the positions as indicated on the project drawings.
- (b) Centrifugal fans shall be of the multi-vane type with forward or backward curved vanes, shall be of single or double inlet as indicated on the drawings.
- (c) Fan shafts shall be of steel and shall be properly protected against corrosion by means of suitable wrappings, and protective grease coatings.
- (d) All ferrous parts of fan components shall be corrosion free.
- (e) All fan casings shall be fitted with removable airtight access panels, to ensure maintenance inspections of fan internal casings.

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- (f) No centrifugal fan shall be selected in a class range other than Class 1 or 2 and the rotating speed of the fan at duty point shall not exceed 1 440 r/min.
- (g) Centrifugal fans in critical areas and fans above 7,5kW shall in all cases be mounted together with the drive motor on anti-vibration mountings together with the correct inertia mass.

2.5.4 Wall Fans

- (a) Wall fans shall be suitable for the movement of medium air volumes against low pressures for installation in walls.
- (b) The fans shall be of the high efficiency type capable of meeting the noise criteria.
- (c) Impeller blades shall be manufactured from polypropylene reinforced with glass fibre or cast aluminium.
- (d) Impellers shall be dynamically balanced in compliance with ISO 1940 standard.
- (e) The frame shall be fabricated from aluminium, steel or glass reinforced plastic materials with external surfaces permanently colour impregnated to SANS 1091.
- (f) All steel surfaces shall have epoxy resin powder anti-corrosive finish, zinc phosphate treated and over baked.
- (g) Fasteners shall be zinc plated and passivated.
- (h) Fan motors shall be of the squirrel cage induction type, SANS approved and complete with Class F insulation.
- (i) Fans shall be totally enclosed with IP54 protection.
- (j) All exhaust fans shall be equipped with protection guards. Protection guards shall have a spirally wound steel construction sturdily fixed with screws to the mounting plate. Guards shall provide protection for both the suction and discharge of the fan.
- (k) Wall fans shall have asynchronous squirrel cage induction motors with self-aligning, permanently lubricated and sealed long life ball bearings.
- (l) Wall fans shall be of the approved manufacturer. "Approved" means approved by the Engineer.

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3 DUCTING

3.1 General

- (a) Duct work shall be manufactured from galvanised sheet metal in accordance with the standard specification and requirements for low pressure ducts as per SANS 10147 and SANS 1238, as amended, and installed, balanced and tested as per SANS 10173, as amended. Where the SANS standards are silent, or unclear on a particular aspect, the SMANCA Standard for low pressure ducts shall be applicable.
- (b) Duct work shall be erected in accordance with the code of practice for the installation, testing and balancing of duct work, **SABS 0173**.
- (c) Fittings such as elbows, parallel flow branches, branch connections, off-sets and transitions shall be manufactured and installed in accordance with the **SMACNA standards**.
- (d) 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 standard** with suitable non-combustible filler compound.
- (e) The Sub-contractor shall provide all hangers, brackets and supports which are to be hot-dip galvanized after fabrication in accordance to **SABS 193**. No explosive fasteners to the building structure shall be allowed, only approved expanding bolts or clamps are permissible. Where the galvanised finish is damaged by cutting, drilling, etc., it shall immediately be painted with cold galvanizing.
- (f) All external ducts shall be joined by means of transverse flanged duct joints, such as the MEZZ flange system. Flanged joints shall be sealed by means of a gasket or non- hardening mastic sealant applied between the flanges.
- (g) Internal ducts may be joined by means of transverse flanged duct joints, such as the MEZZ flange system, or slip (S and Drive) type joints. All internal duct joints shall be sealed with non-hardening mastic sealant, gaskets or external tape.
- (h) The top surfaces of external ducts shall be sloped to ensure water runoff. Under no circumstances shall water be allowed to pool on top of the ducts, especially at the flanges.
- (i) The duct work shall be connected to the air terminals by means of flexible ducting.
 - i. Flexible ducting shall be coated fiberglass fabric with a mineral base.
 - ii. Flexible ducting shall be installed with "easy" bends of not less than one duct diameter centre line and shall be supported to SMACNA specification to ensure that the ducting does not kink.
 - iii. The length of the flexible duct shall be kept to a minimum and shall not exceed lengths of 1200 mm.
- (j) Supply and return air ducting shall be double skin insulated in the plantrooms, and where exposed to the weather and externally insulated in roof and ceiling spaces.

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- (k) Ducting shall be externally lined with 25mm Sonic Liner or equal. Duct dimensions given on the drawings are sheet metal dimensions and take internal insulation into account.
- (l) Exhaust and fresh air ducting shall be uninsulated.
- (m) Kitchen exhaust ducting must be from grade 304 stainless steel.
- (n) Ducting will in all instances be left unpainted.
- (o) Where necessary, in order to balance air flows, duct mounted flow control dampers shall be provided, whether shown on the drawings or not. Balancing of air flows in branch ducts by means of throttling Opposed Blade Dampers on supply grilles will not be accepted. Air flow dampers may be of the opposed blade type (rectangular ducts) or butterfly type (round ducts).

3.2 Rigid Rectangular Duct work

- (a) Rectangular ductwork shall be regarded as low velocity, low pressure ductwork, suitable for pressures up to 500 Pa and velocities up to 10 m/s.
- (b) It shall be manufactured and installed to comply with the above requirements and SABS 1238-1979.
- (c) All supply air ducting shall be pressure tested with a maximum permissible leakage of 5% at a test pressure of twice the working pressure.
- (d) The maximum permissible leakage rate for return and ventilation air systems shall not exceed 5%.

3.3 Circular Duct work

- (a) Circular flexible ducting connected to supply air diffusers shall not exceed 1,5 meters in lengths.
- (b) Longitudinal seams and transverse joints for circular ductwork shall be according to SANS 1238, Section 7.

3.4 Flexible Duct work

- (a) Flexible ducting shall comply with the requirements as set out in SANS 10173, Section 5.7.
- (b) Flexible round ducts shall only be used for connecting diffusers and grilles to the supply, return and extract air ducts.
- (c) Flexible ducting to outlets served by the air-conditioning systems shall be insulated and of the attenuating type similar or equal to Europair Sonodec Type 25 A, with aluminium inner and outer skin, to achieve the necessary fire rating in terms of SANS 10400 with both inside and outside membranes must be fire rated aluminium skin.

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- (d) Flexible extract air ductwork on all extraction systems must be sound-attenuating and both inside and outside membranes must be fire rated aluminium skin. In order to achieve sound attenuation, these connections must be at least 2 meters long.
- (e) The flexible ducting shall have an adequate working pressure and temperature range to suit the application of the installation.
- (f) Flexible ducting shall at all times be kept to a length not exceeding 1.5m.
- (g) Flexible ducting shall not have more than the equivalent of one 90° bend and bends shall be of maximum possible radius which is 200 mm and not be less than the minimum which is 150mm.
- (h) Flexible ducting shall be supported with sufficient and correct brackets that will ensure maintenance of shape.
- (i) Flexible ducting shall be provided between air terminals, diffusers and all locations as indicated on project drawings.
- (j) Flexible ducts shall be joined to the sheet metal duct and diffusers with suitable clamps and duct sealant.
- (k) The inner core shall be of aluminium laminate with a heavy-duty steel helix core.

3.5 Testing of Duct work

- (a) All supply air ducting shall be pressure tested with a maximum permissible leakage of 5% at a test pressure of twice the working pressure.
- (b) All ducting shall be leak tested in accordance with SANS 10173, Section 4.3.
- (c) No ducting shall have leakage rates in excess of 5% of the required air flow rate in any section of ductwork or in excess of the SANS permissible leakage rates, whichever is the smallest.

3.6 Air Terminals and Dampers

3.6.1 Air Terminals / Supply Air Diffuser

- (a) Air distribution shall be effected by means of the supply air grilles.
- (b) The finish of the grilles shall be epoxy powder-coated, the colour of which shall be advised and approved by the Engineer.
- (c) Supply air grilles shall be of the double deflection type, consisting of two rows of individually adjustable aerofoil section vanes, front vanes horizontal rear vanes vertical, all vanes housed in a surrounding fixing flange with neat, mitered joints in the corner.
- (d) Supply air grilles shall be of steel construction and shall be provided with burglar bars. The inner section will be only accessible from above and the face plate of the grille is fixed from above. No screws or fixing devices are accessible from below.

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- (e) Supply grilles are supplied with a plenum box with spigot and connected to the spigot on the ducting by means of flexible ducting.
- (f) Transfer grilles shall be of steel construction and be provided with burglar bars. Standard door grilles may be installed with a burglar bar assembly in between.
- (g) Supply air diffusers to variable air volume systems shall be of the constant volume type suited in installation within a drop-in or plasterboard ceiling.
- (h) General ceiling diffusers grilles shall have white baked enamel finish.

3.6.2 Disc Valves

- (a) Fresh air to occupied areas etc. must be via PVC disc valves with screw type volume control, and suited to connection to sound attenuating, fire-rated flexible ducting.
- (b) Extract from Sluice Rooms, Toilets, Change Rooms etc. must be via PVC disc valves with screw type volume control, and suited to connection to sound attenuating, fire-rated flexible ducting.

3.6.3 Weather Louvres

- (a) Weather louvres should be provided with dimensions as shown on the drawings.
- (b) Weather louvres must be manufactured from steel or aluminium, naturally anodized or, with epoxy powder coated finish as per the Architect's requirement.
- (c) All weather louvers must be provided with wire mesh screens or galvanised expanded metal fitted behind the blades of each weather louver.
- (d) Weather louvres shall be of the approved make.
- (e) Weather louvres shall be watertight and shall prevent the entrainment of raindrops at a face velocity of up to 3m/s.
- (f) The free area through the louver available for airflow shall be a minimum of 65% of the nominal area of the louver.
- (g) In the case where the weather louver is connected to the fresh air supply system, it shall be of the hinged weather louver type allowing for the installation of a 50mm pleated filter behind it thus enabling replacement of the filter without disruption of normal services inside the building.
- (h) Fresh air intake shall be weatherproof, be more than 500mm off any floors, roofs or outside ground levels, and shall be complete with galvanised bird-proof wire mesh.

3.6.4 Return Air Grilles

- (a) Return air grilles to the areas served by ducted central air conditioning systems must be of the fixed ceiling mounted aluminium return air grille type, suited to installation in a drop-in or plasterboard ceiling.
- (b) Return air grilles shall comprise return air plenums with grilles of the single deflection type, of dimensions such that they can be installed in a drop-in ceiling.
- (c) Return air grilles must be fitted with sheet metal plenum boxes with spigot connections for flexible ducting.

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- (d) Return air grilles serving hideaway unit shall comprise return air plenums with grille/filter combinations of the egg crate type, of dimensions such that they can be installed in a plasterboard ceiling. The filter must be housed in a hinged section of the grille with unobstructive fastenings, suited to easy removal of the filter for cleaning purposes.
- (e) Return air plenums shall connect to the return of the hideaway units via flexible ducting as per drawings.
- (f) Return air grilles shall have white baked enamel finish unless otherwise specified by the architect.

3.6.5 Exhaust Grilles

- (a) Exhaust air grilles to the areas served by ducted extraction systems must be of the fixed ceiling mounted aluminium eggcrate type, suited to installation in a drop-in or plasterboard ceiling.
- (b) In the case where type SD or DD grilles are specified on the project drawings, these shall be manufactured of extruded type 50S anodizing grade aluminium and shall be provided with opposed blade volume control dampers, unless specified otherwise on the drawings. Volume control dampers fitted with air grilles shall conform to SANS 1238, Section 6.5 requirements. The blades shall be adjustable from the front of the grille.
- (c) The Sub-contractor shall install insulated flexible ducting of length not exceeding 1.5m and of the same diameter as the grille, extending from the duct to the grille. Spigots shall be attached to the ducting and sealed with silicon sealer around the outer perimeter of the joint. Flexible ducting shall be strapped to the grille and spigots with steel straps to form an airtight connection.
- (d) In other cases, diffusers/grilles shall be “hard” connected to ducting with rivets or taper screws and sealed with silicone sealer to form an airtight connection. All diffusers/grilles shall be capable of meeting the discharge pattern and throw requirement as set out on the project drawings.

3.6.6 Sound Attenuators

- (a) Sound attenuators shall be installed in the positions indicated on the drawings and shall be selected to provide the noise criteria levels as specified.
- (b) Where required and to comply with the noise and vibration criteria, sound attenuators shall be provided for ventilation, air conditioning, all other plant (Duct mounted and/or as applicable).
- (c) All sound attenuators shall be products of an accredited manufacturer who publishes selection data on these products. Data shall be submitted to the Engineer for approval before ordering.
- (d) Rectangular sound attenuators must be suited to outdoor installation and must match the dimensions of the ducting that they reside in.
- (e) Metalwork shall be galvanised steel and acoustic insulation shall be non-combustible material, properly bonded and covered so as not to permit particles to be eroded by air moving over it.

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- (f) Sound absorbing lining material shall have a density of not less than 48 kg/m³ and thickness of not less than 50 mm.
- (g) Sound attenuators should be at least 1.5 times the fan diameter.
- (h) Primary sound attenuators shall be installed near or in the plantroom.
- (i) The attenuators selected shall match the specific fan or plant characteristics to ensure the correct insertion loss to meet the sound criteria laid down.
- (j) Unless otherwise specified, sound attenuators shall be installed with flexible connections at the inlet and outlet connections.
- (k) The sound attenuators shall in addition be selected to produce the minimum pressure loss across the attenuator coupled to the least re-generated noise level produced by the flow through the attenuator.
- (l) Unless otherwise specified, air path sound attenuators shall be manufactured from galvanised sheet steel with the sound absorption material moisture repellent and erosion resistant up to 20 m/s air speed, and preferable flange connected.
- (m) Wherever possible attenuators shall be proprietary type supplied by the same manufacturer as the plant manufacturer to ensure complete compatibility.
- (n) Where not clearly indicated on the drawings, attenuators shall in all cases be provided at points where supply and return air ducting leaves the plantroom and shall be installed to prevent noise breakout from the plantroom via the ductwork.
- (o) Where specified in the supplementary specification and indicated on the drawings, additional cross talk attenuators shall be installed in the air conditioning or ventilation ductwork.
- (p) The internal free area of sound absorbers shall be not less than the cross-sectional area of the connecting duct as indicated on the drawings.
- (q) Field fabricated type sound absorbers shall be made as follows: -

All sides of rectangular ducting shall be double walled with the inner walls perforated with 10mm holes at 25mm centres. The space between the two sidewalls shall be divided into 3 unequal sections by means of 25mm thick cement fibre panel strips and filled with glass wool. The lining thickness shall be at least 80mm.

Circular ducts shall be lined as specified above except that the lining thickness shall not be less than 100mm.

3.6.7 Fire Dampers

- (a) A fire damper shall be provided in an air duct in any position where such duct passes through a required division or occupancy separating (fire walls or other fire barriers), as indicated on the drawings.
- (b) Fire dampers shall comply with the requirements of SANS 193 and NFPA bulletin 90A and have a fire rating of not less than two hours.
- (c) Trip mechanisms or actuation may be of the fusible link or the bi-metallic strip type.

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- (d) Fire dampers shall be complete with butterfly type damper blades, which shall remain locked in the closed positions after tripping.
- (e) Dampers shall be of the manual reset type, resettable from outside the damper casing without the use of access doors or panels.
- (f) Each fire damper shall be clearly marked, and the Open/Closed status of the damper shall be indicated outside the damper casing.
- (g) Dampers shall be sized to ensure that their nominal free area in the Open position is the same as the connected duct free area.
- (h) The dampers shall be installed to allow easy access to their manual reset mechanism.
- (i) Where a damper cannot be installed immediately adjacent to the relevant fire partition, the section of duct between the damper and the fire partition shall be of the same thickness and fire rating as the damper casing. Any treatment to the ducting to ensure the fire rating shall be applied by the subcontractor.
- (j) Bearings to be free of maintenance made of stainless steel or sintered bronze.
- (k) Contractor to include pressure drop figures in submissions
- (l) In the case of a hospital hvac installation, pressure relief dampers must be provided to each of the Theatres.

3.6.8 Exhaust Grilles

3.6.8.1 General

- (a) Provide and install air filters in the positions as indicated on the drawings.
- (b) Filters shall be standard products 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 authority and that they meet the minimum arrestance, efficiency and dust holding capacity.
- (c) Filters shall be tested in accordance with **ASHRAE test standard 52 - 76**.
- (d) A Magnehelic gauge calibrated from zero to 500 Pa shall be installed, connected with copper tubing to static pressure taps complete with isolating valves.

3.6.8.2 Primary filters

- (a) Primary filters shall, unless otherwise stated, be washable on woven polyester material, pleated to provide an extended surface with a dust spot efficiency of minimum 95% at a particle size of 5 microns and an arrestance of 85 % (or the equivalent ASHRAE specification). The filter media shall be of a glass or synthetic fibre material. The filter material shall be at least 50 mm thick.
- (b) Media shall be firmly held in place by rustproof wire screens to maintain pleat strength and spacing.
- (c) Media and support screens shall be continuously bonded into aluminium support.

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- (d) Frames shall be folded to form a robust media support frame. The bonding between media and frame shall be continuous to prevent leakage.
- (e) Each filter shall be provided with a factory-made holding frame, constructed of not less than 1,0 mm thick galvanized mild steel provided with suitable seals and quick release spring type clips to securely hold the filter cell in place without permitting leakage of air.
- (f) The holding frames of multiple cell filter banks shall be suitably joined and sealed so as to prevent leakage of air between the frames.
- (g) Where air filters of the washable type are specified in the particular specification, a suitable galvanised sheet steel wash tank with water feed line, overflow and drain shall be provided in each plant room.

3.6.8.3 Secondary Filters

- (a) Secondary filters shall have an efficiency of not less than 99,9% based on the removal of dust particles down to and including 5 microns in size (or the equivalent ASHRAE specification).
- (b) Filters shall be of AAF "Varicel" manufacture (or similar, equal and approved) and of a front withdrawal configuration. Note that slide in type filter arrangements are generally not acceptable and to be discouraged.
- (c) The face velocity across the filter bank may not exceed the manufacturer's rating.
- (d) A pressure differential gauge (manometer) as described in clause 21.2.4 shall be fitted across each filter bank. Note, though, that the pressure range shall exceed the maximum pressure drop as specified by the manufacturer of the filters by 40 - 50%.
- (e) The pressure drops when the filters are clean and when they are due for renewal must be clearly and indelibly marked on the manometer.
- (f) A pressure switch and warning light shall be installed to indicate when the air resistance over the secondary filters only reaches 200 Pa.

3.6.8.4 Automatic Filters

- (a) The filters shall be of the single stage automatic, renewable media type in which the filtering curtain is a thick blanket of bonded and coated glass fibre or other approved material supplied in rolls. The supply roll shall be at the top, and the re-wind spool at the bottom of the curtain.
- (b) A media run-out warning indicator shall be provided with each filter. Power to the re-wind motor shall be cut off when the end of the roll is reached. A differential pressure controller shall be provided to actuate the curtain re-wind motor when the air resistance over the filter reaches a pre-set level of between 90 and 130 Pa. The pressure differential shall be 25 Pa.
- (c) The control shall be set up in such a way that a complete clean face of filter material is exposed each time the re-wind motor is actuated by the pressure differential switch.

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- (d) In addition, a push button shall be provided which will activate the re-wind motor for as long as the button is depressed.
- (e) The filter efficiency shall be not less than 36% on the NBS (Atmospheric) type test or as specified in clause.
- (f) A differential pressure gauge shall be provided to check the function of the differential pressure controller. It shall be similar or equal to the "Dwyer Magnehelic" pressure gauge with a scale range of 0-250 Pa.
- (g) The filter face velocity shall not exceed 2,5 m/s.

3.7 Fixing of Equipment

- (a) The Subcontractor shall identify the location of hangers and/or other support points of all equipment with a mass more than 25 kg to the Structural Engineer. Approval of the proposed hanging and fixing shall be obtained from the Structural Engineer, prior to carrying out the work.
- (b) All lightweight fixing to brick or concrete shall be made with steel screws and "Fischer" or other approved plugs. Holes of the required size for the plugs, which shall suit the screws used, are to be neatly drilled in the concrete or brickwork (not in the joints between bricks) to a depth excluding plaster or soft wall finish equal to at least the length of the plugs. The plug lengths shall be such that all the threaded length of the screws are in the plugs.
- (c) Fixings to timber shall be made with greased brass wooden screws. For fixing to hollow tiles, etc., screw anchor type fixings shall be used, fitted as above as far as possible. Fixing to soft or hard fibre boards, etc., which are inaccessible to the back, shall be made with sherardized self-tapping screws of appropriate sizes.
- (d) All heavy weight fixings to brick or concrete shall be by means of appropriately sized grouted galvanised bolts or by one of the various types of suitable expanding bolt fixings. After erection of equipment all exposed metalwork of fixings shall be treated with two coats of paint to match the finish of the equipment. Bolts shall in all instances be secured by means of a washer on the bolt head side and a lock washer on the nut side of the items being bolted.
- (e) Where the Subcontractor is in any way uncertain of the method of fixing of any plant or material, the proposed fixing and loading involved shall be cleared with the Engineer prior to carrying out the work on site.

3.8 Labelling and Identification

- (a) All equipment shall be labelled and identified using black Traffolyte labels with 10 mm high white lettering on the labels. Labels will be secured using epoxy base glue.

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- (b) The identification number used on these labels shall correspond with the equipment number on the complete inventory list.

3.9 Noise and Vibration

- (a) Particular care shall be taken in the selection, application and installation of all equipment used to ensure that the equipment will operate below the required noise level for public areas of NC 35 and with the least vibration possible, all to the satisfaction of the Engineer.
- (b) Equipment shall be mounted on vibration isolators of the correct type and selection depending on deflection requirement and vibrating frequency.
- (c) Anti-vibration connections shall be used on duct work where it joins vibrating equipment such as fans and air-conditioning units.
- (d) Suitable sound attenuating devices shall be incorporated within the duct work to reduce airborne noise to acceptable levels as specified.
- (e) The subcontractor shall provide sound level data to the Engineer on the completion of the installation detailing the noise levels in NC level for each separate area. No measurement shall be taken closer than 1 m from any outlet.

3.10 Painting and Cleaning

- (a) No untreated metal surfaces shall be allowed on the project. Items which are not galvanized or similarly protected against rust and corrosion shall be painted as detailed below. No equipment, hangers, brackets, etc., shall be delivered to site in unprotected condition; they shall be factory coated with an approved zinc-rich prime coat before being dispatched.
- (b) Painting shall comprise the following consecutive processes. Thoroughly clean, descale and degrease all surfaces, apply one coat of approved zinc-rich primer and one coat of universal undercoat, and finish off with two coats of quality high-gloss enamel. Final finish shall be to the full approval of the Engineer.
- (c) Items with galvanized finish, such as cable trays, need not be painted but shall be properly cleaned with suitable galvanized iron cleaning fluid. Where galvanized finish is painted, it shall be primed with a calcium plumbate primer.
- (d) It is not a requirement to paint duct work, conduits or pipework installed in roof voids and shafts, where they are not visible, if they are galvanized. Items as mentioned above shall be properly cleaned and painted as specified above.
- (e) Visible sections of the inside of ducting through grilles shall be painted matt black after degreasing and priming as specified above.
- (f) Plant and equipment shall be painted with the relevant colour in accordance with SABS.

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4 CANOPIES AND GREASE ELIMINATORS

4.1 Scope

- (a) The current scope of work applies to the provision of canopy systems and grease eliminators, in the:
- i. Industrial kitchens
 - ii. Kitchen at schools and boarding facilities
 - iii. Kitchen in the staff quarters
 - iv. Kitchens at prisons and health facilities

4.2 General

- (a) The extract canopy must be provided over the cooking island in the main kitchen as shown on the drawings.
- (b) The canopy shall be of the exhaust air type with dimensions suiting the oven as specified on the drawings, with one roof type extract fan, ducting, fire dampers, attenuators and filters. The kitchen canopy shall be of an approved type of canopy. "Approved" means approved by the Engineer.
- (c) The canopy shall be manufactured entirely from 1,2 mm thick grade 304 stainless steel, with finish and shall be to the dimensions as given on the drawing. The hood shall be of welded construction.
- (d) All panels shall be properly stiffened to prevent vibration.
- (e) If required, in order to fit into the building, the canopy shall be made up in sections, and assembled on site.
- (f) 50mm Wide x 50mm Deep gutters shall be provided on all bottom sides of the canopies with drain points, piped to floor drains via service columns, to be provided as part of the canopy installation, as shown on the drawings.
- (g) All sheet metal edges on the canopy and drain channels shall be turned and neatly smoothed off to prevent injury to cleaners.
- (h) The canopies shall be suspended from 4 off 85x40x5mm channel iron sections, laid on the roof trusses.
- (i) Cladding of the space between the top of the canopies and the ceiling, shall be carried out in 0.8mm thick satin finish grade 304 stainless steel, as part of the canopy installation.
- (j) Sections of the canopy where extract fan flue ducts are to be connected shall have additional reinforcing. The extract ducts shall be of rectangular stainless-steel sheet metal and shall be manufactured to SABS 1238-1979.
- (k) The canopies shall be served by axial flow extract fans rated to run continuously and shall be controlled via a start stop station located within the kitchen adjacent the light switch. Fan capacities will be as shown on the drawings. The fan shall be provided with a cleaning access door, as well as a drain point at the bottom.
- (l) The exhaust fan shall be able to extract the required airflow against the system resistance. The noise level created by the canopy shall not exceed NC 40.

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- (m) Two sound attenuators, internally lined with melinex membranes, with outer casings from galvanised steel sheet shall be provided for each system.
- (n) Noise levels inside the kitchen resulting from the ventilation system shall not exceed that specified above. Attenuators and fans shall be selected to achieve this. Prior to ordering any equipment, a detailed noise analysis, prepared by an expert in the field, shall be submitted to the Engineer for approval. Failure to comply with the specified sound level will result in the installation being rejected.
- (o) Easily removable grease eliminators shall be provided to each canopy, with closure pieces in between, as shown on the drawings. 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.
- (p) Eliminators shall have drain holes underneath them, discharging over an open channel, which shall join the lip channels in the position from where copper drain piping will run to a floor drain.
- (q) The canopies must be provided with flush mounted fluorescent light fittings. Each canopy must contain at least two light fittings. Lights shall be fitted into the canopy by the manufacturer. Access to the tube for tube replacement shall be through the face of the fittings without the use of tools.
- (r) Fittings shall be twin 36-Watt tube type 1310mm long, with housings to suit slide-in-slide-out brackets, such that the fittings can be removed as a whole from inside the canopy.
- (s) Clear diffusers from toughened heat resistant glass shall be fixed and sealed to the canopy, as shown.
- (t) Access to light fittings shall be via hinged stainless steel grilles with clip fastenings, and suitable hinges.
- (u) All extract ducting from the canopy up to the air discharge canopies after the fan assemblies, shall be from grade 304 stainless steel sheet metal.
- (v) Kitchen extract canopies must be provided with automatic fire suppression in accordance with SANS 1850.
- (w) Fire dampers, operated with fusible links, shall be provided in each air outlet connection and shall form an integral part of the canopy construction.

4.3 Electrical

- (a) Power supply to each light fitting shall be via high temperature flexible conductors, long enough to allow removal of the fittings, plugged into 5A socket outlets. The socket outlets shall be linked via conduit to two draw boxes, from where the electrical contractor will link the wiring to the lighting circuits and light switches.
- (b) Power will be brought to within 1 metre of the fan in the roof space by means of a three-pole weatherproof lockable isolator by the Electrical Contractor on site. All electrical work between these

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points and the stop-start stations forms part of this contract, i.e., the Mechanical Sub-Contractor shall do the entire electrical installation from the isolator to the fans.

- (c) Where ventilation fans are required to be interlocked with air conditioning units, the Mechanical Sub-contractor shall provide a control DB-board as indicated on the project drawings. The Electrical Contractor shall do all wiring to the control DB-board. The DB-board shall be complete with all switching and safety equipment. The Mechanical Sub-contractor shall do the entire electrical installation from DB-board to the corresponding AC units and ventilation fans.
- (d) The complete electrical installation for the fans must be carried out by an accredited person in terms of the *Occupational Health and Safety Act, Act 85 of 1993*, as amended.

4.4 Control

- (a) Ventilation fans shall be supplied with a 24-hour, 7day timer or shall be switched on/off with the light switch. Whichever the case, the Mechanical Sub-contractor shall be responsible for the supply and wiring of the necessary equipment.
- (b) In the case where fans are required to be interlocked with air conditioning units, the Mechanical Sub-contractor shall provide the control DB with the necessary relays and control equipment. The ventilation fan shall switch on and off with the corresponding air conditioning unit. The control panel shall be labelled as indicated on the project drawings.

4.5 Operation in the Event of Fire

- (a) All ventilation fans shall, upon receiving a signal from the fire detection system, switch-off. The Mechanical Sub-contractor shall allow for this function in the interlocking control DB boards.

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5 DOMESTIC HOT WATER

5.1 Scope

(a) The scope pertains to the installation and provision of hot water systems in the following areas:

- i. Factory/Warehouse Showers, Ablutions, Kitchens/Canteen.
- ii. Hospital Kitchens, Showers/Toilets
- iii. Prison Facilities
- iv. School facilities – kitchens, kitchenettes, bathrooms
- v. Laundry rooms in any facility
- vi. Bathrooms in Living areas

5.2 Applicable Standards and Codes

The installation and provision of hot water system to the different facilities shall conform to amongst others, the following standards and codes:

No.	Standard / Code	Description
1	SANS 10252	Water supply and drainage for buildings (Part 1 & 2).
2	SANS 10400	The application of National Building Regulations.
3	ASHRAE	Chapter 48: Hot Water Supply Demands.
4	SANS 10400	Part XA: Energy usage in buildings (4.1 Hot water Supply).
5	SANS 1307	Domestic storage solar water heating systems.
6	SANS 10106	The installation, maintenance, repair and replacement of domestic solar water heating systems.
7	SANS 10254	The installation, maintenance, replacement and repair of fixed electric storage water heating systems.
8	SANS 1352	The installation, maintenance, replacement and repair of domestic air source water heating heat pump systems.
9	SANS 151	Fixed electric storage water heaters.

5.3 General

- (a) In line with SANS 10400-Part XA, all hot water services will be so designed and installed in a manner that economizes the installation and maintenance costs, whilst still providing an appropriate level of comfort to the occupants.
- (b) All materials, plant or equipment shall be installed with appropriate access for ease of operation, maintenance and replacement.
- (c) Preference should be made to procure locally produced products which are SABS approval.

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- (d) The Civil Engineer will be responsible for providing a metered mains cold water supply within 1 metre of the building at the locations specified by the Mechanical Contractor, who will connect the buildings water reticulations pipework to this new supply.
- (e) The Mechanical Contractor shall supply and install a new boosted cold-water service to serve all required outlets, the hot water service.
- (f) The hot water generation and storage system is based on the following design conditions:
 - i. Water temperature as per SANS 10252-1 Table I.5
 - ii. Design flow rate per fitting as per Table 3 of SANS 10252-1.
 - iii. Water temperatures to be as per item 7.5.1.1 of SANS 10252-1
 - iv. Recovery period of 120 minutes.
 - v. 13 W/m of heat dissipating from a 13mm fibre insulation from an insulated copper tubing.
- (g) The secondary source of water heating shall be by air-to-water heat pumps, solar water heaters, and/or a back-up heating by electrical power
- (h) The pipe network system flow and pressure shall be designed taking reference of the sanitary schedule provided by the project architect.
- (i) Pipes are to be of a material made of copper class 0 or 1 or equal and to be SABS approved. The installation in accordance with the SANS regulations with regards to installation of water pipework.

5.4 Solar Water Heaters

- (a) Solar water heaters shall be supplied and installed, as listed in the schedule and as shown on the tender drawings.
- (b) These units shall be a standard catalogue product and documentation shall include certified performance data, physical data, installation, operating and maintenance instructions.
- (c) When transporting, delivering and storing the unit on site, sufficient care shall be taken to ensure that the unit remains in its "as new" condition at date of take-over.
- (d) The solar water heater units shall come complete with ALL its components.
- (e) The Solar Water Heater system shall comply with SANS 1307, be SABS approved and shall be either a closed-coupled system or a split system.
- (f) The solar water heater shall be designed for a working pressure of zero (open type system), 100kPa, 200kPa, 300kPa, 400kPa or 600kPa, as required.
- (g) All material, including surface protection materials, that are intended to be in contact with potable water, shall be non-toxic, shall not cause the water to become toxic, and shall not impart any colour or objectionable odour to the water. The material(s) for waterways shall be intrinsically corrosion resistant.

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5.5 Solar Water Heaters Installation Requirements

- (a) The installation of solar water heaters shall be in accordance with SANS 10106 Specification and must be provided complete with:
- i. **Temperature and Pressure Relief Valves** – installed in parts of the system which can be isolated and contain a heat source
 - ii. **Drain Cock** – supplied with the solar water heater
 - iii. **Multi Pressure Control Valve** – to reduce the incoming water pressure wither to the working pressure of the system or to the maximum permissible pressure allowed in the installation.
 - iv. **Drip Tray** – for systems with a storage tank installed under the roof
 - v. **Vacuum Breakers** – on the cold-water supply and hot water supply
 - vi. **Mixing Valve** – where stored water is not set at 60°C.
- (b) In the case where a solar water heater is installed on a roof, the following minimum installation clearance must be allowed for on each side of the solar water heater in order to remove the element or thermostat and the anode/s from the opposite end:
- i. 300 L – 900mm
 - ii. 150 L – 450mm
- (c) Furthermore, in the case where a solar water heater is installed on a roof, careful inspection must be carried out to ensure that the roof can support the weight of the entire installation system once it is filled with water. Care must be taken where the front feet of the solar water heater are located. The feet should be located over a tile batten, purlin or similar for maximum strength.

5.6 Solar Collector Panel

- (a) Solar collector panels must be manufactured with:
- i. Aluminium frame
 - ii. 4mm toughened prismatic
 - iii. Non-reflective
 - iv. Anti-hail tempered glass
- (b) Solar collector panels must have durable waterway tubes.
- (c) Rubber seals ensure durability and reliability in extreme climatic conditions.
- (d) Semi-selective black chrome surface on copper substrate offering maximum absorption efficiency.
- (e) Working pressure up to 400kPa.
- (f) Must have a total and useful energy rating of 3.84kWh/m².

5.7 Geyser Installation

- (a) The hot water for the building shall be generated via hot water geyser that is going to serve bathtubs, showers, wash hand basins, and the sinks.
- (b) The building's hot water generation shall be met by the system as follows

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- i. The geyser is to be located on the roof of the building, ceiling void or outside the building.
- ii. The geyser will be sized to provide hot water requirements for the building for a 24 hour period and shall be sized based on the shower requirements of the building.
- iii. The water service design and requirements for water installations in buildings shall be in accordance with SANS 241, SANS 10252-1 and SANS 10254.
- iv. Hot water usage should be minimized, and the system maintained in accordance with the requirements given in SANS 10252-1.
- v. The hot water storage shall be designed to satisfy the hot water demand and shall comply with the requirements of SANS 10252-Part 1 water supply installations for buildings.
- vi. Hot water tank shall be insulated with a material achieving a minimum R-value of 2,0.

5.8 Internal Domestic Water Distribution Installation

- (a) The cold-water line will tap off and feed directly into the geyser.
- (b) Hot water from the geyser shall reticulate, via the service duct, corridors and roof voids, to the various sanitary fittings within the facility.
- (c) The Wet Services Contractor shall provide isolation valves to each sanitary and catering outlet to allow maintenance to be carried out individually to that fitting without disturbing the distribution elsewhere.
- (d) In order to prevent air locks in the system, air release valves shall be installed at high points.
- (e) The Wet Services Contractor shall supply and install pressure reducing valves at floor levels, as indicated on project drawings, in order to ensure correct flow to outlets.
- (f) The contractor shall supply and install flow restriction valves where require ensuring excessive water consumption through fittings in prevented.
- (g) All control valves and safety valves associated with the cold and hot water distribution shall conform to SANS 198:2010.
- (h) All hot water piping shall be insulated to limit heat gain and/or loss to not more than 5% from source to furthest point of delivery on a system.
- (i) Pipework layouts shall be installed by the contractor to allow for thermal expansion.
- (j) The routing of the cold-water service pipes shall be such that separation from any adjacent hot water service is achieved to avoid heat gain to the cold water service causing its temperature to rise.
- (k) The distribution pipework shall be installed to minimize dead-legs, and this the risk of stagnant water occurring within pipework.
- (l) The insulation shall be protected from mechanical damage using finishes suitable for the location in which it has been installed. All pipework within plant rooms and regularly accessed areas, such as but not limited to, risers, cleaners' cupboards and regularly accessed areas.
- (m) Insulating materials shall meet Green Guide rating A, with a Global Warning Potential (GWP) of zero, and an Ozone Depletion Potential (ODP) of zero.

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- (n) The use of flexible connections as the final connection between the distribution pipework and the sanitary outlet shall not be permitted due to the risks they present for growth of Legionella.
- (o) All exposed pipes to and from the hot water cylinders shall be insulated with pipe insulation material with an R-value as follows:
 - i. Pipe diameter <80mm = R-value of 1 W/m²K
 - ii. Pipe diameter ≥80mm = R-value of 1.50 W/m²K
- (p) The piping insulation requirements do not apply to water piping, encased within a concrete floor slab or in masonry.
- (q) These pipes shall comply with SANS 10252-1. All internal domestic services pipework to be copper.
- (r) The geysers should have electrical timers on them so they can automatically switch off/on at set times.

5.9 Heat Pumps coupled to Electric Geyser

- (a) The provision and installation of the heat pumps shall be in accordance with SANS 1352.
- (b) Where a heat pump is to be used as main power source for providing hot water to the facility, the heat pump shall be coupled to an electric geyser with a heating element, as back up.
- (c) The electrical requirements for geysers and heat pumps and their isolator positions must be coordinated with the Electrical Contractor on site.
- (d) All the components used in the system shall be of an approved type and matched in terms of the pressure rating of the system. Heat pump installed shall be an approved product (SABS).
- (e) All plastic components in direct sunlight must be UV Protected.
- (f) Pipe and fittings shall comply in terms of SANS 10252-1.
- (g) Where an integrated heat pump is installed, the unit shall comply to SANS 151.
- (h) The pressure rating of the system shall not exceed 600kPa.
- (i) The drain valve installed shall comply with SANS 1808-53.
- (j) The pressure control valve, temperature pressure valve, vacuum breakers shall all comply to SANS 198.
- (k) The heat pump and components should be located and installed in accordance with the manufacturer's specification in such a manner and position that ensures:
 - i. Safe and effective operation of the system.
 - ii. Safe and effective removal of components or spare parts.
 - iii. To ensure discharge of condensation water from heat pump unit.
 - iv. Adequate provision for airflow and ventilation are sufficient to ensure performance of the heat pump.
 - v. Installed to ensure no buildup of water/ice/debris/dirt.
 - vi. Noise transmission is kept below 45 decibels, especially during evenings.
 - vii. Pipe design and installation minimizes length and directional changes are minimal.
 - viii. Heat pump electrical supply is effective and safe.

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- ix. Heat pump is orientated correctly and should be installed in order to absorb maximum radiation (true north).
 - x. Installation cannot be adversely affected by high winds/heavy rains/excessive water discharges onto heat pump which can affect the heat pump and its efficiency negatively.
 - xi. In the event of the heat pump being installed above the HWC, provision is made to ensure that heat pump cannot be drained.
- (l) The heat pump should be mounted using correct brackets and fixtures as specified by the manufacturer.
- (m) Heat pump shall be mounted level to prevent vibration.
- (n) Anti-vibration mountings should be installed and secured to ensure no noise transmission occurs.

5.10 Hydroboil Units

- (a) The Hydroboil unit/appliance is intended to be used in commercial application such as:
- i. Staff kitchens, shops, offices and other working environments.
 - ii. Small hotels and bed and breakfast type environments
 - iii. Catering and similar non-retail applications
- (b) The Hydroboil units shall be supplied and installed in positions as indicated in the Project Drawings.
- (c) The unit shall be of Zip or Kwikot Hydroboil make, similar approved make, or be a standard catalogue product. "Approved" means approved by the Engineer. Documentation shall include certified performance data, physical data, installation, operating and maintenance manual.
- (d) The unit shall comply with all the relevant SANS and SABS requirements/specifications including, but not limited to, SANS 60335-1/2.
- (e) The units shall be installed in accordance with the manufacturers requirements. Any discrepancy between the supplier recommendation and this general specification shall be brought to the attention of the engineer during the tender phase.
- (f) Care must be taken when transporting, delivering and storing the unit on site, this, to ensure that the unit is in "as new" condition at the date of take-over.
- (g) The hydroboil unit shall be supplied complete with all accessories required to ensure a fully functioning system.
- (h) Supply temperature shall be automatically controlled by a thermostat with adjustable set-point, between 50°C and 75°C.
- (i) The unit shall have a glass lined inner cylinder with insulation fitted around it to ensure as little as possible heat loss during storage.
- (j) All unit components shall be automatically controlled and protected against abnormal running conditions.
- (k) Sufficient access panels/doors shall be provided for inspection and maintenance purposes.
- (l) All units shall be suitable selected to receive electrical supply from an isolator (provided by Electrical Contractor) not more than 3m away from the unit as shown on project drawings.

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- (m) The unit shall be supplied with a single-phase isolator and it shall be the responsibility of the Contractor to make connections between the isolator and the hydroboil unit and any other electrical and control connections.
- (n) The hydroboil should have an on/off switch to be able to switch when not in use.

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6 LIQUEFIED PETROLEUM GAS CYLINDERS

6.1 Scope

(a) The current scope of work pertains to the installation or provision of Liquefied Petroleum Gas (LPG) in the following facilities:

- i. Warehouses or Manufacturing Facilities
- ii. Hospitals and Prison Facilities
- iii. Kitchens at schools and Boarding Facilities
- iv. Staff Quarters, etc.,

6.2 Applicable Standards and Codes

The following standards and regulations apply to the LPG installation:

No.	Standard / Code	Description
1	SANS 10087	The handling, storage, distribution and maintenance of liquefied petroleum gas in domestic, commercial and industrial installations: Part 1 to 7
2	SANS 10019	Transportable Pressure Receptacles for Compressed, Dissolved and Liquefied Gases – Basic Design, Manufacture, Use and Maintenance.
3	SANS 347	Categorization and conformity assessment criteria for all pressure equipment.
4	SANS 199	Shut-off valves for refillable liquefied petroleum gas cylinders.
5	SANS 1156-2	Hose for liquefied petroleum gas (LPG) Part 2: Hose and tubing for use in LPG vapour phase and LPG air installations.
6	SANS 1237	Single-stage regulators for LPG.
7	SANS 1539	Appliances operating on LPG – safety aspects.

6.3 Specification and Installation

(a) The handling, storage, distribution and maintenance of liquefied petroleum gas in domestic, commercial and industrial installations shall conform to SANS 10087.

(b) LPG cylinders shall conform to SANS 10019.

(c) The LPG storage containers shall be at least:

- i. 1 m away from any opening (into a building) that is below the level of the container valve, i.e., doors, windows and airbricks.
- ii. 2 m away from any drain, pit or manhole, where the gas can gather if the bottle leaks.
- iii. 3 m away from the property boundary, unless the boundary has a firewall, in which case the containers could be next to the firewall, and where there are only two containers, the boundary distance can be reduced to 1 m, and

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- iv. 3 m away from any opening (or window) directly above the containers. The 3 m distance from the top of the cylinder, valve connection or the manifold whichever is the higher, to the bottom of the window (s) may be reduced to a minimum of 300 mm.
 - v. 5m away from a switchable electrical point, i.e., plug socket, inline power isolator, aircon units, pool pumps, water pumps, etc. Note, a wall light only needs to be 1.5m to the left/right of the bottles, or 1.5m above the bottles.
 - vi. 1m away from the side of a window unless there is at least 300mm between the bottom of the window and the top of the bottle and a noncombustible roof has been placed between the window and the storage container.
- (d) Only a registered LP Gas Installer may work on a gas system. Every installation must be signed off by the installer with a valid certificate.
 - (e) Only class 1 or 2 copper pipes or other approved gas piping may be used. (This is not the same copper piping as used by plumbers).
 - (f) Copper pipes going through or embedded in a wall, cement, or ground, must be protected with a protective sleeve.
 - (g) Approved flexible gas hose or reinforced “orange” hose connecting appliances may not be more than 2m long, cannot have any joins, and may not go through any partition at all (including wood, dry wall, cupboard, wall, etc.).
 - (h) The cylinders shall be properly secured in a lockable gas cage. All connections to the gas cylinders must be properly checked for leaks.
 - (i) Damaged cylinders will not be accepted.
 - (j) The gas connections to the cylinders shall be universal and shall fit on all manufacturer's cylinders.
 - (k) After the installation and testing has been done, the contractor needs to issue a gas certificate to the end user to show that all is in order and also as part of the OHS requirement.

6.4 Isolating Valves

- (a) Isolating valves shall be of the ball valves type with stainless steel body and ball, PTFE seals, and capable of withstanding temperatures in excess of 200°C and approved for use on LPG installations.
- (b) The isolating valves shall be fitted with union connections and come complete with operating levers that is positioned 90° to the direction of the pipe when the valve is closed.
- (c) Flimsy, aluminium, puter and handles less than 90mm long will not be accepted.

6.5 Pressure Regulating Valves

- (a) Pressure regulating valves shall be approved for use with LPG, and shall be complete with safety relief valve, large size threaded vent for the relief valve, shield over the vent opening, and mounting brackets and shall be approved according to SANS 1237.

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- (b) The regulator shall be specific for LPG and shall be calibrated and adjusted to ensure an operating pressure less than or equal to 150 kPa for first stage regulation and less than or equal to 5kPa for second stage regulation.
- (c) Where the pipe length to the equipment is less than 9m, single stage regulation shall be used with a regulating pressure less than or equal to 5kPa.
- (d) The type of regulation shall be determined by the gas flow requirement.

6.6 High Pressure Piping

- (a) The high-pressure piping between the regulating valve and gas cylinder shall be a minimum 8mm diameter and of the braided flex type, brass couplings, with hand wheel bull nose connection and shall be approved for use with LPG.
- (b) The connection pipes shall be at least 600mm long but shall not exceed 1m in length and shall be certified to withstand a minimum test pressure of 3000 kPa.
- (c) The manifold shall be manufactured from seamless steel pipe, at least schedule 80, conforming to API Specification 5L. All pipe threads and fittings shall be NPT. Taper NPT and BSP threads shall under no circumstances be interchanged. The fittings shall be solid forged and the same schedule or better as the pipe. All fittings and pipes shall be with material certificates confirming to the relevant specifications. These material certificates shall be included in the data book for the installation.
- (d) Where the manifold is a welded construction, all welding and weld procedures shall be according to ASME IX. All welding shall be done by a certified welder qualified for the relevant weld procedure. Copies of the weld procedure and welder qualification for the procedure shall be included in the data book.
- (e) The manufacturing of the manifold shall conform to SANS 10087; each leg shall be clearly marked with a serial number, allowable working pressure, test pressure and all other identification as required by SANS 10087.
- (f) The manifold shall be fitted with a pressure regulator with built in relief valve before the changeover valve.
- (g) The manifold shall be mounted with approved fire-proof brackets against the supporting structure. One bracket shall be used for each gas cylinder connected and a minimum of four brackets shall be used.
- (h) The mounting height of the manifold shall be at least 150mm above the highest point of a 48kg gas cylinder.
- (i) The manifold should be inside the gas cage, where the height (150mm) of the cage should be raised to accommodate it.

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6.7 Low Pressure Piping

- (a) All piping must be done with class II phosphorous deoxidized copper as per SANS 26460 or SABS certified multilayer pipe. The diameter shall be based on the required flow to the equipment but shall not be less than 15 mm.
- (b) All joints shall be swaged at least one diameter deep and brazed with a Bag series self-fluxing brazing filler as per AWS A5.8.
- (c) Where necessary to dismount equipment union joints shall be installed only in strategic, safe and easily accessible locations. Compression fittings will not be allowed.
- (d) Piping shall be surface mounted with galvanised brackets with insulation rings to prevent the copper tube touching the bracket thus preventing galvanic corrosion. The material of the insulation rings shall not deteriorate due to UV light, ozone other elements generally associated with external installations. The brackets shall be fixed with zinc plated masonry anchors with a minimum hole size of 6mm. wooden wall plugs will not be accepted.
- (e) The pipe support bracket spacing shall be as specified in SANS 10087. All holes into building structures shall be core drilled, sleeved and sealed. All sleeves shall be as per SANS 10087. The copper tube shall be centralised and sealed in the sleeve with a non-corrosive material that have a fire rating better or equal to the wall through which it is installed.
- (f) Pipe joints shall not be allowed inside sleeves.

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7 COLD ROOMS AND FREEZERS INSTALLATIONS

7.1 Scope

- (a) The current scope of work pertains to the installation Cold Rooms and Freezers in the following facilities:
- i. Warehouse Facilities
 - ii. Hospitals or Health Centre Facility
 - iii. Main Kitchens at schools, boarding facilities, or Industrial Parks

7.2 Applicable Standards and Codes

The installation of cold rooms and freezers shall comply with the following standards:

No.	Standard / Code	Description
1	SANS 10147	Refrigeration systems including plants associated with air-conditioning systems.
2	SABS 1530	Part 1: Panels with two impervious facing sheets
3	SANS 10237	Roof and side cladding
4	SANS 1508	Expanded polystyrene thermal insulation boards
5	ASTM C612-14	Standard Specification for Mineral Fiber Block and Board Thermal Insulation
6	ASTM C726-17	Standard Specification for Mineral Wool Roof Insulation Board
7	SANS 10156	The handling of chilled and frozen foods

7.3 General Requirements

- (a) The cold and freezer rooms generally are of the prefabricated panel type.
- (b) The contractor shall be expected to install metal faced insulated wall panels in the designated areas as shown on the drawings.
- (c) The internal finish should be Chromadek.
- (d) Core insulation can be polystyrene, polyurethane, or Rockwool in accordance with the fire rating and insulation requirements.
- (e) Insulation shall also be installed within the screed layer of the floor as per manufacturer requirements and as indicated on the drawings.
- (f) The refrigeration units are of a split type with the blower units inside and the condensing units outside in a plant room.
- (g) The freezer rooms have time-controlled automatic defrost systems, using hot-gas bypass defrosting.
- (h) The subcontractor shall allow to complete the cold rooms and freezers installation as detailed hereinafter in its entirety, including the supply, delivery, installation, commissioning, testing, 12 months guarantee and maintenance, and leaving in perfect working order of the equipment specified.

[Type here]

- (i) The installation shall be completed to the satisfaction of the Client, Principal Agent and the Engineer.
- (j) The doors for the cold room facility shall be of a swinging type with heated edges to prevent frost build-up. A temperature gauge shall be mounted on the outside. An emergency buzzer and light shall be mounted outside with activation button in break glass unit inside.

7.4 Cold Rooms Installations

Cold rooms shall be supplied with lockable hinged doors and a refrigeration plant consisting of condensing units with matching evaporator (blower) units, refrigeration piping, controls and other ancillary equipment.

7.4.1 Condensing Unit

- (a) Air cooled condensing units shall be factory produced and shall consist of compressor(s) and air-cooled condenser mounted in one compact unit.
- (b) The unit shall be neat in appearance and shall be fully weatherproof and suitable for outdoor installation.
- (c) Balance curves for the condensing unit/evaporator combination which clearly indicates the operating point must be included with tenders. The unit shall be correctly rated for its duty, be quiet in operation, and shall comply in all respects with the Machinery and Occupational Safety Act of 1983 as amended.
- (d) The compressor(s) shall be of the hermetic or semi-hermetic type and preferably equipped with a force feed lubrication system.
- (e) The refrigerant used shall be of a suitable new generation, CFC free, environment friendly type.
- (f) Provision shall be made to prevent excessive accumulation of liquid refrigerant in the crankcase during off cycles.
- (g) Operating and safety controls shall be provided on either a control panel supplied with the unit or on the switchboard.
- (h) The condenser casings shall be rigidly constructed of epoxy powder coated steel. All steel parts internally and externally shall be adequately protected against corrosion. Access panels or doors shall be provided in the sides for repairs and maintenance.
- (i) The condensing coils shall be of seamless copper tubing with copper or aluminium fins treated with a protective corrosion protective finish. Inlet headers shall be designed for uniform gas distribution through all individual circuits. Headers shall be arranged to prevent trapping of oil. The coils shall be treated with a factory applied corrosion protection coating.
- (j) The fan shall be of the propeller type rated to handle the air flow required for the heat rejection capacity of the unit when operating at ambient temperatures of up to 35 deg C.
- (k) The successful tenderer and/or supplier will be required to carry in stock a complete line of spare parts which are subject to normal wear and tear. Tenderers must state in their tenders the extent of spares stocked by them and also where this stock of spares may be inspected.

[Type here]

- (l) The refrigerant piping shall be of seamless, cold drawn, copper tubing with silver soldered copper fittings. For small lines, under 15 mm outside diameter, soft copper tubing with flared fittings may be used. Ordinary soft solder shall not be used. All soldered joints on factory supplied equipment shall be checked carefully and remade if found damaged in transit. Silver solders shall be type 97/3 (tin/silver) in accordance with SABS 23.
- (m) Sizes of tubing shall match the existing piping. Tubing shall be so installed that oil return to the compressor is ensured at all times.
- (n) The refrigerant charging connection shall be between the receiver or condenser and the refrigerant drier in the liquid line.
- (o) Maintenance and servicing of the unit during the twelve-month guarantee period shall be included in the cost of the unit. After the expiry of the guarantee period maintenance and servicing shall be carried out as per clause PFG 06.

7.4.2 Evaporator (Blower Coils) Unit

- (a) The evaporator unit must be complete with an electric fan, drip tray large enough to collect drip from the cooling coils and expansion valves, heat exchanges and a thermostatic expansion valve.
- (b) Forced convection type air cooling units of (the number and capacity stated in the specification) shall be provided. They shall be matched to the condensing unit; balance curves shall be supplied.
- (c) The cooling units shall be suitable for continuous operation of the fan at the temperature stated in the particular specification.
- (d) The air-cooling units and drip trays in freezer rooms and freezer cabinets shall be provided with heater elements for defrosting.
- (e) Fin spacing of freezer room and freezer cabinet coils shall be suitable for and be selected for low temperatures. A minimum spacing of 2,5mm is required for units serving rooms at above 0°C. For rooms maintained below 0°C the minimum spacing shall be 5mm.
- (f) The system balance curves contained in the particular specification must be completed and included with tenders for each cold and freezer room. Failure to do so may result in a tender being rejected. All coils shall be treated with a factory applied corrosion protection coating.
- (g) Maintenance and servicing of the unit during the twelve-month guarantee period shall be included in the cost of the unit. After the expiry of the guarantee period maintenance and servicing shall be carried out as per M & O manual.

7.4.3 Ancillary Equipment

- (a) The insulation on walls, ceiling and doors shall be a fire-retardant expanded polystyrene of thickness 100mm at a density of at least 16kg/m³ as per "SABS 1508". Other type of insulation should first be approved by the engineer and accepted by the client before installation.
- (b) For panels, factory prefabricated modular panels securely fastened together must be used, consisting of Chromadek stressed inner and outer cladding pressure bonded to polystyrene insulation.
- (c) The type of cladding shall be Chromadek of frost white finish and 0.5mm thickness.

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- (d) Steel brackets supporting panel systems shall be designed to avoid excessive stress and movement as defined by the requirement of SANS 10162-2:1993 or SANS 2001:2005. The brackets shall be designed to avoid damage to the insulation panels and shall be corrosion resistant.
- (e) A smooth level floor area shall be provided by others to erect cold rooms. No special floor finish or insulation is required to concrete base.
- (f) The cold room should be fitted with an electronic temperature controller protected with low and high-pressure switches.
- (g) A Class 0 copper drain pipe of at least 22mm diameter must be carried from the drip-trays of cooling unit and routed to the almost in the mouth of the outside if the p-trap. The p-trap, 32mm diameter PVC drain pipe in the concrete surface bed, the floor trap and its 100mm diameter PVC drain line to be provided by others.
- (h) The floor trap, by others, to be constructed from 304 stainless steel and must be flush with the floor finish.
- (i) The insulation of the cold room doors should be comparable in value with the cold store wall insulation.
- (j) Where possible the door should be located on the external (warm side) of the cold store insulation. Suitable gaskets shall be provided to form a seal around the door opening.
- (k) Door handles shall be located so that their use does not distort the door.
- (l) Door reveals should be constructed in a manner, which avoids cold tracking and the consequent formation of moisture or ice.
- (m) Automatic doors shall open and close promptly.

7.5 Electrical Equipment and Wiring

- (a) Light fittings shall be 1200mm Vapour proof fluorescent light fittings type.
- (b) Tenderers must allow for complete electrical installation and wiring in accordance with the SANS 1042.
- (c) All wiring between the power points, controls, cold room equipment, recorders, etc. shall form part of this contract and must be included in the tender price. Wall boxes and conduits into the ceiling will be provided by the electrician on request. Visible electrical and control wiring inside the building shall not be allowed.

[Type here]

8 FIRE SERVICES

8.1 Introduction

- (a) This specification outlines the minimum requirements, but do not cover all the details of design and construction of the fire protection and detection systems. Such details will be included in the detailed specification as well as Rationale Fire Design for a specific project.

8.2 Scope of Works

- (a) This specification shall act only as a guideline and, in the event of any discrepancies between the General Specification and the Detailed Specification, the latter shall take precedence.
- (b) This scope of work is not based on a particular fire equipment supplier's brand offering but mainly on the design criteria.
- (c) This document contains the general technical specification for Fire Protection and Detection installation in the following facilities:
- i. Office Parks/Buildings
 - ii. Hotels and/or Housing Complexes
 - iii. Hospitals
 - iv. Warehouse or Storage Facilities
 - v. Factories or Manufacturing Facilities
 - vi. Malls or Shopping Complexes
 - vii. Schools, and
 - viii. Any other facility or property requiring Fire Protection
- (d) The scope of work for this report includes the minimum requirements and generic specification for the following Fire Services items:
- i. Fire Protection Systems and Equipment
 - ii. Fire Detection Systems
 - iii. Fire Escape
 - iv. Fire Signage

8.3 Applicable Standards and Codes

The fire protection and detection systems shall be designed and installed in accordance with the following standards:

No.	Standard / Code	Description
1	SANS 10400	The Application of the National Building Regulations, Part T for Fire Protection
2	SANS 1186	Symbolic Safety Signs Part I: Standard signs and General Requirements
3	SANS 10252	Water supply and drainage for buildings (Part 1 & 2)

[Type here]

4	ASIB	ASIB 12th Edition: Rules for Automatic Sprinkler Installations
5	OHS Act	The Occupational Health & Safety Act, Act No.85 of 1993, as amended
6	FM Global	Factory Mutual Insurance Company
7	SANS 460	Plumbing Code of Practice (2003)
8	SANS 62	Steel Pipes (2013)
9	SANS 1200	Standardized Specification for Civil Engineering Construction (1983)
10	SABS 558	Covers and Frames (1973)
11	EN1201	Smoke and heat control systems
12	SANS 10139	Code of practice for design, installation, commissioning, and maintenance of fire detection systems
13	SANS 1253	Fire Doors and Fire Shutters
14	SANS 1128	Part 1: Components of underground and above ground hydrants system
15	SANS 1128	Part 2: Fire Fighting Equipment
16	SANS 543	Fire Hose Reels (semi-rigid hose)
17	SANS 10105	The use and control of fire-fighting equipment, Part 1: Portable and wheeled (mobile) fire extinguishers.
18	SANS 10105	The use and control of fire-fighting equipment, Part 2: Fire hose reels and above-ground hydrants
18	NFPA 13	Standard for the Installation of Sprinkler Systems
19	SABS 10287	Automatic sprinkler installations for fire-fighting purposes
20	SANS 10139	Fire detection and alarm systems for buildings – System design, installation, and servicing
21	FMDS0302	Water Tanks for Fire Protection

8.4 General Fire Requirements

The following is a list of general requirements for fire protection as stipulated in **SANS 10400-Part T “T1 GENERAL REQUIREMENTS”**:

- (a) Any building or facility as highlighted in Section 2 (c) above, shall be so designed, constructed, and equipped that in case of fire:
- The protection of occupants or users, including persons with disabilities, therein is ensured and that provision is made for the safe evacuation of such occupants or users.
 - The spread and intensity of such fire within such building and the spread of fire to any other building will be minimized.
 - Sufficient stability will be retained to ensure that such building will not endanger any other building: Provided that in the case of any multi-storey building no major failure of the structural system shall occur.

[Type here]

- iv. The generation and spread of smoke will be minimized or controlled to the greatest extent reasonably practicable; and
- v. Adequate means of access, and equipment for detecting, fighting, controlling, and extinguishing such fire, is provided.”

8.5 Fire Protection Systems and Equipment

The fire protection installations, testing and commissioning contained within this scope will consist of:

- (a) Suction Tanks and Fire Pumps
- (b) Water Reticulation Ring Main
- (c) New fire twin booster connection and suction hydrant to the fire water pipe reticulation.
- (d) Installation Control Valve (ICV) Chamber
- (e) Hose reels, fire hydrants, fire extinguishers, fire signage and other equipment that completes the installation
- (f) Wet type sprinkler system in accordance with FM Global accepted standards.

8.5.1 Suction Tanks and Fire Pump House

The fire pumps and water storage shall be so designed to be sufficient for the fire water requirements (sprinklers, hose reels and fire hydrants) of the facility.

8.5.1.1 Suction Tanks

(a) The Water Tanks for Fire Protection should be designed, constructed, and maintained in accordance with **FMDS0302 and ASIB 12th Edition Rules**.

(b) Allowance is made for three types of suction tanks, namely:

- i. Concrete and galvanised sectional tanks
- ii. Welded circular steel tanks, and
- iii. Bladder tanks

(c) The following are some of the water suction tanks requirements:

- i. The suction tanks should be fed from the Municipality main line.
- ii. The suction tanks should be subdivided into two equal divisions so that 50% of the required supply shall be available during maintenance.
- iii. There must be a means available to refill the tank automatically when the water level is a maximum of 150 mm below the overflow level. In order to measure the inflow, a direct reading flow measuring device shall be fitted to the water inlet pipe.

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- iv. Where the tanks are located within 10 meters of the protected premises, the tank shall be capable of withstanding the effects of a structural fire for 30 minutes without any major deleterious effects.
- v. Flow control valves for tank in-fill shall be readily accessible for exercising, testing and maintenance.
- vi. Where the pressure characteristic of the town main is not capable of operating a flow control valve, ball valves will be permitted for tank in-fill.
- vii. All steelwork, including any roof steel of a suction tank shall be protected against corrosion.
- viii. Content gauges must be provided which shall show the depth of water therein.
- ix. Adequately sized overflow pipes and drainage facilities must be provided and taken to a suitable drainage point.
- x. Tanks must be completely enclosed with a roof and the roof sheets shall overhang the tank walls by 100mm nominally. An easily accessible hinged roof hatch that can be locked with a minimum dimension of 750mm by 750mm shall be provided for the roof.
- xi. Outside steel ladders, fitted with a suitable cage, must be provided and these shall comply with the relevant safety provisions.
- xii. Where inspection hatches are installed, they shall not be less than 750mm in diameter.
- xiii. Suction tanks must be constructed in such a way and from such materials as to obviate the need of emptying, cleaning, maintenance, or repair to the fabric of the tank for a period of not less than 15 years.
- xiv. The pump suction tanks must be fitted with a suitable vortex inhibitor.
- xv. Provision must be made for the pumps to draw from either tank so that when one tank is rendered inoperative for cleaning or maintenance, the other is available for all pumps.

8.5.1.2 Fire Pump House

The fire pump house will consist of the following equipment:

- (a) 1 x Electric Motor Driven Pump (Duty), and/or
- (b) 1 x Diesel Driven Pump (Standby)
- (c) Or in other cases 2 x Diesel Driven Pumps (Duty & Standby)
- (d) Jockey Pumps
- (e) Diesel Storage Tanks
- (f) Control Panels for the Pumps and
- (g) Auto-start arrangement

8.5.2 Water Reticulation for Fire Fighting Purposes

- (a) Fire-fighting water shall be supplied from the provided on-site pump and tank installation.

[Type here]

- (b) The Civil engineer will be responsible for providing a metered mains cold water supply to the site boundary.
- (c) The water supply shall enter the site boundary in the demarcated of the site.
- (d) The battery limit between the civil contractor and the fire contractor shall be defined as the last flange prior to the pipe exiting the ground.
- (e) A suitable adapter shall be installed to couple the underground HDPE/uPVC pipe to the GMS above ground pipe.

8.5.3 Twin Booster Connection

- (a) A twin booster connection shall be provided at the entrance to the site with external and internal 65mm instantaneous coupling fire hydrants.
- (b) The twin booster connection will be installed and positioned at the site connection point with a glycerin filled pressure gauge and fitted with a non-return valve in accordance with **SANS 1128-Part 1&2 and Clause 4.35 of SANS 10400-Part T: 2020**.

8.5.4 Suction Hydrants

- (a) The suction hydrant shall be the most upstream component of the buildings fire installation.
- (b) It shall be installed immediately after the take-off from the water mains.
- (c) The suction hydrant shall be of a 100mm Storz connection type, fitted onto a standpipe.

8.5.5 Non-Return Valve

- (a) 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.
- (b) The valve shall be suitable for a working pressure of 1 200 kPa and a temperature of up to 90°C.
- (c) All valves shall be installed as to be removable without extensive pipework removal.

8.5.6 Fire Hydrants

- (a) The fire hydrant system will be installed around the building for external firefighting, with internal 65 mm instantaneous coupling fire hydrants for internal firefighting purposes.
- (b) Fire hydrants shall be provided outside the building between 1.5m to 6m from the buildings outer wall and within 70m from a building entrance. These shall be positioned such that they serve the buildings and the parking areas.
- (c) The hydrants shall be fitted to the standpipe by means of a female thread of nominal diameter of 100 mm and that complies with the relevant requirements of **SANS 1109-1**.
- (d) The hydrant will be mounted not higher than 1500 mm from FFL to center of valve outlet.

[Type here]

- (e) The fire hydrants will be installed in accordance with **SANS 1128-Part 1** and **Clause 4.35 of SANS 10400-T: 2020**.
- (f) Hydrants will have black steel pipe in accordance with **SANS 2001-DP2** and **SANS 62-1** medium duty.
- (g) Other requirements regarding the installation of hydrants in and around a facility are as follows:
 - i. Hydrants are to be provided at a rate such that in no instance one would have to travel more than 90m to reach a fire hydrant (1 per 90m).
 - ii. Hydrants to be provided in any building that exceeds 12m in height, and in any building (Excluding buildings classified as H4) of any height with a total floor area that exceeds 1000m², that is, 1 per 1000m² (entire site) or part thereof or 1 per 90m.
 - iii. Any hydrant shall be provided at a rate of not fewer than one per storey located in the firemen's lift lobby in such building or occupancy.
 - iv. Any hydrant shall, where required by the local authority, be provided with an appropriate fire hose of 24m or 30m in length, together with couplings and a 116mm internal diameter nozzle, all of which shall comply with the requirements of **SANS 1128-Part 2**.
 - v. In any industrial park, permanent amusement park or exhibition ground, shopping centre or group housing, cluster housing, or townhouse complex, there shall be installed ground or raised hydrants so placed that no point shall be at a distance greater than 90 m from any hydrant.
 - vi. The design flow rate is 1200 l/min (20l/s) for each fire hydrant and the design pressure is 300 kPa.
 - vii. The design shall be such that only 2 fire hydrants shall operate at a time.
 - viii. The pumps should be capable of supplying water to two hydrants operating at the same. The system should function automatically with the opening of any fire hydrant.
 - ix. Hydrants will be fed from the pumped site main.

8.5.7 Fire Hose Reels

- (a) Any fire hose reel installed in any building shall comply with the requirements contained in **SANS 543** and **SANS 10400-Part T Clause 4.34**.
- (b) Fire hose reels shall be provided inside the buildings. Fire Hose reels will be provided at a rate such that all areas within the facility will be reachable with the 30m hose.
- (c) The minimum diameter of any pipe providing water to the fire hose reel will not be less than 25mm in diameter.
- (d) Fire hose reels shall be installed in any building of two or more storeys in height or in any single storey building of more than 250m² in floor area. The fire hose reel will be robustly constructed and with brackets that will fix the hose reel against a wall.
- (e) The standard dimensions and characteristics of a fire hose reel is as follows:
 - i. The fire hose reel drum is 850mm in diameter.

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- ii. A guide will prevent the fire hose reel from jamming. The hose reel rotates on a center pin that allows the user to unwind the fire hose reel unobstructed in case of a fire.
 - iii. The length of a fire hose reel is 30m.
 - iv. The diameter is 20mm.
 - v. Design flow rate is 30 L/min (0.5l/s) for each fire hose reel and design pressure is 300kPa.
- (f) Depending on the size of the Warehouse/Factory or Office and where no water supply is available, two 9kg or equivalent fire extinguishers that comply with the requirement of **SANS 10400-Part T Clause 4.37** shall be provided in place of each required hose reel.
- (g) Any hose reel installed in any building shall bear, in a prominent position on the reel disc facing the user, a certification mark from an accredited certification body.
- (h) Hose reels will be fed from the pumped site main.

8.5.8 Portable Fire Extinguishers

- (a) Portable fire extinguishers (FE) for the purpose of fire-fighting shall be installed in accordance with **SANS 10105**.
- (b) FE shall be supplied at a rate of 1 fire extinguisher per 200m² in floor area, in accordance with **SANS 10400-Part T, Clause 4.37 & 4.38, and Table 11 (Provision of portable fire extinguishers)**.
- (c) Furthermore, **Table 11** allows for the number of Fire Extinguishers based on the building occupancy type, for example, for D2 Classification (**1 per 100m² 9kg DCP**); G1 Classification (**1 per 200m² 4.5kg DCP for Offices**); J4 Classification (**1 per 400m² 9kg DCP for Factories/Warehouses**).
- (d) DCP (Dry Chemical Powder) FE are to be used in all parts of the building/facility except for the Server Rooms or Electrical or Plant Rooms which call for CO₂ fire extinguishers. Dry Chemical Powder FE is highly versatile Class 'A', 'B' and 'C' firefighting medium.
- (e) For dealing with electrical hazard, flammable liquids and gas fires, allowance should be made for 5kg CO₂ FE.
- (f) Fire Extinguishers to be installed on purpose made backing boards with mounting hooks.
- (g) In a warehouse/factory, each Fire Hose Reel will come with 2 x 9kg DCP Fire Extinguishers along it.
- (h) Two x 5kg CO₂ fire extinguishers (1 Duty, 1 Standby) will be provided for the server or electrical rooms along with the Gas Suppression system.
- (i) Any approved portable firefighting extinguisher shall comply with the requirements contained in **SABS 890, 889 or SABS 1151** and shall be installed, maintained, and serviced in accordance with **SANS 0105**.

8.5.9 Fire Sprinklers

- (a) The sprinkler system scope begins at the manifold inside the ICV Chamber which is to be supplied by the site fire main by the civil engineering contractor.

[Type here]

- (b) Fire sprinklers shall be designed and installed in accordance with **SANS 10400-Part T** regulations as well as **SANS 10287, FM Global** and the **ASIB 12th Edition rules**.
- (c) According to **SANS 10400-Part T and SABS0287**, Fire Sprinklers are required for the following reasons:
- Division Areas** - When a particular facility or warehouse is being divided into separate areas. Each area will require sprinklers.
 - Storage Heights** – If the storage of the product is in excess of the Ordinary Hazard Storage limitation as stated in **SABS 10287:2000**.
 - Interconnection of more than 2 floors.
 - Height of Building exceeding 30m
 - Basement level exceeding 500m²
 - Where the building had a J1 or J2 occupancy with an area in excess of 2500 m².
- (d) There are several types of sprinklers in use, and these include:
- Conventional Spray Pattern Sprinkler
 - Pendent Spray Pattern Sprinkler
 - Upright Spray Pattern Sprinklers
 - Semi-recessed Pendent Spray Sprinklers
 - Ceiling Flush Sprinkler
 - Early Suppression Fast Response Sprinklers (ESFR)

Table 3 provides the sprinkler operating/activation temperature which can be identified by the bulb colour.

Table 3: Fire Sprinklers Activation Temperature Ratings

Bulb Colour	Temperature rating
Orange	57°
Red	68°
Yellow	79°
Green	93°
Blue	141°
Mauve	182°
Black	204° and 260°

Note: Where sprinkler protection is required underneath platforms where goods may be stored, these sprinklers shall be similar to the ceiling level sprinklers. Low level sprinklers shall be fitted with approved metal guards.

- (e) Sprinkler sizes can also be identified by bulb diameters ranging from 3mm, 5mm, 8mm and 11mm. All sprinkler heads shall be of the sealed glass bulb type and bear the FM/UL approval.
- (f) The Sprinkler heads shall have the correct temperature rating (see Table 1 above) and response type for the application.

[Type here]

- (g) Sprinklers at roof level shall be early suppression fast response (ESFR) k-16 upright spray pattern with a temperature rating of 93-degrees to 141-degrees.
- (h) Sprinklers used for in-rack protection shall be k-11.5 68-degree pendent spray quick response and shall be fitted with an approved sprinkler guard.
- (i) Sprinklers used for all other areas (such as office annex) shall be standard response k=5.6 (68-degree) spray pattern type with a temperature rating relative to the maximum anticipated ambient plant conditions.

SPARE SPRINKLERS

- (j) Spare sprinklers shall be kept in a lockable spares' cabinet, along with an approved sprinkler wrench.
- (k) Spare Sprinkler Quantities should be as per NFPA-13 guideline.
- (l) The minimum number of spare sprinklers is based on the overall number of sprinklers on the sprinkler system as follows:

Table 4: Spare Sprinkler Quantities as per NFPA-13 Guideline

Total Sprinklers in System	Minimum Number of Spare Sprinklers
Less than 300	6
From 300 to 1000	12
More than 1000	24

- (m) The sprinklers that make up that minimum supply are required to correspond to the types and temperature ratings of the sprinklers in the property.

8.5.10 Installation Control Valve Assembly

- (a) The Fire Protection Contractor shall supply Installation Control Valves (ICV), including full trim, and install all pipework to and from the control valves and trim items.
- (b) A Flow Switch shall be installed on each new system riser main, downstream of the installation control valve assembly. Wiring and connection of the Flow Switches by others.
- (c) Where required, the Fire Protection Contractor shall provide all chains, straps and padlocks, block plan, and "Sprinkler Stop Valve Inside" signs.
- (d) Where required, all quarter-turn valves shall be of NTC make, 3-piece, lockable and rated for 1600 kPa operation.
- (e) Note that all discharge and drain piping downstream of the particular valve, shall be hot dipped galvanized after manufacture.

8.5.11 Flushing Connection

- (a) The Fire Protection Contractor shall supply and install a flushing connection, consisting of a ø80mm lockable ball valve and externally discharging pipe.

[Type here]

- (b) Flushing of the system will be part of the commissioning process as detailed in **NFPA-13**.

8.5.12 Inspectors Test Valves

- (a) The Fire Protection Contractor shall supply and install an external test point consisting of ø25mm galvanized pipework, ball valve and low-level drain orifice.
- (b) A weatherproof sign reading 'INSPECTORS TEST VALVE' must be fitted near the external valve.

8.6 Fire Detection Systems

- (a) The fire detection and alarm system shall be designed in accordance and complying with **SANS 10139** Code of Practice.
- (b) There are several fire detection categories under which a fire detection and alarm system can be designed and installed. These include the **Manual and Automatic System Types**.
- (c) The **Manual Detection System** relies on the building's occupants to detect a fire and provide a warning to others. This system contains no fire detectors and should be designed in accordance with **Clause 5.1.2 of SANS 10139**.
- (d) The **Automatic System** type consist of the **L and P Categories**. The L-Category is for protection of life within a building and the P-Category is for protection of property. The **L-Category** should be designed in accordance with **Clause 5.1.3** and the **P-Category** in accordance with **Clause 5.1.4, of SANS 10139**.
- (e) A fire detection system will include amongst others the following components:
 - i. Addressable Fire Control Panel
 - ii. Addressable Optical Smoke Detectors – on ceiling or closed areas
 - iii. Addressable Heat Detectors – Over heat emitting machines/equipment or industrial kitchens
 - iv. Addressable Remote Light Emitting Diode (LED)
 - v. Open Area Smoke Imaging Detection Imager – Beam Detector/Receiver
 - vi. Open Area Smoke Imaging Detection Emitter – Beam Transmitter
 - vii. Boxed Power Supply Unit
 - viii. Addressable Manual Call Points – to be installed at 23m spacing and at escape routes points/doors
 - ix. Addressable Siren with Built-in Flashing Strobe warning light and Smoke Detector
 - x. Addressable Flashing Strobe Warning Lift & Siren
 - xi. Intelligent Mains Switching Input/Output Unit
 - xii. Network Cable and Card
 - xiii. Remote Display Unit
 - xiv. Fireproof Cable
 - xv. Line Relay

[Type here]

- xvi. A3 Framed Fire Zone Panel
- xvii. PVC or Sprague Conduit

8.7 Fire Escape Requirements

With regards to provision of escapes, the following design requirements should be adhered to:

- (a) Occupants shall not travel further than 45m before exiting the building via an Escape Door.
- (b) There must always be a minimum of 2 paths for escape.
- (c) All escape doors shall be fitted with locking device approved by the Local Authority (Redlam Bolts or Thumb-Turn Locks only, with specific approval for alternatives).
- (d) All escape routes shall be maintained clear of obstructions throughout their length.
- (e) Escape routes shall be a minimum of 1.5m wide and not decrease in width in the direction of travel.
- (f) They shall at all times have a clear headroom of at least 2.1m throughout their length.
- (g) Walls and floors along escape routes shall be constructed of materials with relevant fire rating as per **SANS 10400-Part T: 2011**.
- (h) Fire walls will extend to the underside of the roof covering and no combustible roof element will penetrate such wall.
- (i) Access doors and escape doors in any emergency route may only be fitted with locking devices as approved by the Local Authority.
- (j) Fire doors should be at least 900mm wide to comply with **SANS 1253** and to be fitted with self-closing devices.
- (k) Doors in feeder routes shall be double swing type and shall not be lockable.
- (l) Any door which serves as an escape door shall be identified and clearly marked on all plans.
- (m) Floor coverings shall comply with **SANS 10400-Part T, Clause 4.14**.
- (n) Wall covering shall comply with **SANS 10400-Part T, Clause 4.15**.
- (o) Structural Elements and Components shall comply with **TT7**
- (p) Emergency lighting to be provided in accordance with **SANS 1186, Part 1 & 5 as per Clause 4.32**

8.8 Fire Signage and Equipment Labels

8.8.1 Fire Signage

- (a) Any building that has emergency routes or escape routes shall be clearly marked and signposted to indicate the direction of travel in the case of an emergency.
- (b) Pictorial signs indicating fire equipment and means of escape to be provided and to comply with **TT55.4**.
- (c) Sign placement will be such that that no point in the exit access is more than 30 meters from the nearest visible sign.

[Type here]

- (d) Every sign will be located and of such size, distinctive color and design as to be readily visible. All signage must stand out from the surroundings and be visible.
- (e) Such signs are to be minimum size of **390 x 390mm** in the warehouse and **190 x 190mm** in the office space.
- (f) All signs are to be in aluminum frames. They are to be SABS approved Photo Luminescent signs in the office areas and Chromadek in the warehouse and to be supported without the use of adhesive or combustible materials.
- (g) Signs to comply with **SANS 11861, 2 and 5**, as per **Clause 4.29** (Photo-luminescent escape signs), as per **Clause 4.32** (Photo-luminescent symbolic signs).
- (h) 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**.
- (i) All fire equipment to be provided with an approved sign, this must include the hydrants, hose reels and fire extinguishers.
- (j) A manually activated audible and visual alarm in accordance with **SANS 10139**, to be installed as per **Clause 4.31**.

8.8.2 Fire Equipment Labels

- (a) All major items or equipment shall be provided with labels.
- (b) Equipment to be labelled shall include Installation Control Valves, Fire Hydrants, Fire Hose Reels, Fire Extinguishers, and Fire Pumps.
- (c) Indoor labels shall be of the self-adhesive printed type.
- (d) Stencil painted labels shall be provided on Installation Control Valves.
- (e) In addition to Block Plans, the Fire Protection Contractor shall provide a name plate / aluminium tag for each sprinkler system.
- (f) The name plate shall be engraved and made from 100x70x1.6mm sheet, cable tied to I.C.V. Full details of required system information to be confirmed.

[Type here]

9 MEDICAL GAS INSTALLATION

9.1 Scope of Works

- (a) This document contains the general technical specification for Medical Gas installations at Hospitals and/or Health Care Facilities.
- (b) This general specification describes the usual material required, the general methods of constructing as well as installing of components and equipment associated with Medical Gas.

9.2 Applicable Standards and Codes

The medical gases installation which shall conform to amongst other, the following:

No.	Standard / Code	Description
1	SABS 0224	Medical Gas Pipelines Systems
2	SANS 051 PART III:	The handling and storage of medical gases
3	SANS 1409-1986	Medical Gas Outlet Points
4	SANS 10224	Non-flammable medical gas pipeline system
5	SANS 1453	Copper tubes for medical gas and vacuum systems
6	SABS 099-1974	The Construction of Air Receivers
7	SABS 1452-1988	Copper tubes for Medical Gas and Vacuum Systems
8	SABS 763-1977	Hot-dip (galvanised) zinc coatings.
9	SABS 1062-1986	Vacuum & Pressure Gauges
10	SABS 0142	Wiring of Premises
11	BS1710	Medical Gas Pipeline Colour Coding
12	CKS 64-1967	Compressed Air for Breathing
12	CKS 605-1987	Medical Gas Regulations
14	R158 Regulations	Hospital Norms
15	IUSS	Health Facility Guidelines: Building Engineering Services
16	SANS 10224	Section 6: Non-flammable Medical Gas Pipeline System
17	Occupational Health and Safety Act (Act No.85 of 1993) as amended.	
18	Standard Specification for Electrical Installations Pertaining to Mechanical Equipment.	
19	All self-generating oxygen plant must comply with ISO 10083	

9.3 General Requirements

- (a) Medical gas pipe work must be installed within the building, where possible, and via service ducts and ceiling void, and not be run on the outside of the building.
- (b) All medical gas outlet points shall be numbered and labelled. Numbers shall be allocated and available from the Department of Health Head Office.

[Type here]

- (c) Special reference to labelling and testing of medical gas systems as detailed in the Standard Specifications are to be adhered to. A minimum of two weeks' notice shall be given to the Health Technology Services.
- (d) All Service outlet valves shall be labelled with ivorene labels 35mm long x 15mm high x 1.5mm thick. Label colours match the corresponding service outlet points, which are per the standard colour code for piped services.
- (e) Main isolating valve boxes shall be provided at the entry to each ward block.
- (f) All medical gases shall be provided by piped systems.
- (g) All medical gas outlet points other than vacuum are to be equipped with self-isolating valves.
- (h) All medical gas plant shall be connected to the essential electrical supply.

9.4 Medical Gas Specific Requirements

9.4.1 Piping and Colour Coding

- (a) All piping shall comply with **SABS 460-1975**, as amended 1979, BSS2781/72-C106 and shall be similar or equal to Maksal Type MG tubes for the conveyance of medical gasses.
- (b) All medical gas piping shall be adequately supported to prevent sagging or distortion. Pipe supports shall be in accordance with the **Table 5** below:

Table 5: Medical Gas Pipe Support Spacing

PIPE SIZE (mm O.D)	MAXIMUM INTERVAL VERTICAL RUNS (m)	MAXIMUM INTERVAL 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

- (c) All visible piping shall be colour coded as further specified.
- (d) All medical gas pipelines should be colour coded in accordance with **BS1710** as indicated in **Table 6** below.

Table 6: Medical Gas Pipeline Colour Coding

MEDICAL GAS	COLOR CODE		
	BAND 1	BAND 2	BAND 3
Oxygen	White	-	-
Nitrous Oxide	Ultramarine Blue	-	-

[Type here]

Vacuum	Primrose Yellow	-	-
L.P. Air	Black	White	-
H.P. Air	Black	White	Black
Scavenging	Light Orange	-	-
Entonox	White	Ultramarine Blue	

NOTE: Each band to be not less than 50mm and to be continuous around the circumference of the pipe.

9.4.2 Isolating Valves

- (a) Isolating valves shall be installed wherever shown on the detailed drawings and should be carefully positioned to avoid shutdowns of major sections. They shall be of a size equal to that indicated for the pipeline in which they will be installed.
- (b) All valves except those in the gas-bank room and the plant room shall be housed in a metal tray.
- (c) They shall be suitable for a working pressure of 1000kPa gauge.

9.4.3 Isolating Valves Boxes

- (a) Isolating valve boxes shall be installed where shown/detailed on the drawings, i.e., at the various branch to the wards/sections or directly below ceiling level.
- (b) 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.
- (c) An engraved red on white 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

- (d) A notice indicating the room or ward fed shall be fixed inside the valve box.
- (e) Valve boxes shall be installed with their lower edge not less than 2m above floor level.

9.4.4 Medical Gas Outlet Points

- (a) Medical gas outlet points shall be installed in one of the following ways and shall be Afrox Heyer or equivalent, SABS approved:
 - Surface mounted
 - Flush mounted
 - Mounted in bedhead units
 - Mounted in medical gas pendant/boom arms
- (b) Medical gas outlets must conform to the **SABS 1409-1986**.

[Type here]

- (c) **Table 7** below provides the recommended minimum number of medical gas outlet points per hospital unit type:

Table 7: Minimum Number of Medical Gas Outlet Points

DESCRIPTION	O ₂	N ₂ O	Vac	LP Air	HP Air	Scav	COMMENTS
Operating Theatre	3	3	3	3	2	1	
NICU per cot	3		2	3			On bed head trunking
ICU per bed	3		2	3			On Pendant
HCU per bed	2		1	2			On bed head trunking
Delivery Room per bed	1		1	1			Same as above
Delivery Rescus	1		1	1			Same as above
Casualty per bed	1		1	1			Same as above
Medical equipment store (Theatres & ICU's only)	1		1				Same as above

- (d) All other patient areas: Oxygen and Vacuum to cover 50% of beds.
- (e) All medical gas outlet points shall be numbered and labelled. Numbers shall be allocated and available from the Department of Health Head Office.

9.4.5 Strainers

- (a) Strainers shall be fitted before all automatic control valves, traps and pressure regulators unless a strainer is incorporated in the latter.

9.4.6 Non-Return Valves

- (a) 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.

9.4.7 Gas Cylinder Manifold Installation

- (a) Oxygen and Nitrous Oxide manifolds shall be provided to connect equal banks of gas cylinders to provide equal “duty” and “reserve” storage capacity.
- (b) The manifolds shall be provided with an automatic change-over from “duty”-to- “reserve” banks of cylinders.
- (c) Means shall be provided so that an emergency supply of gas is available in the event of manifold failure.

[Type here]

(d) The operating pressure for Medical Gases is provided in **Table 8** below:

Table 8: Medical Gas Operating Pressures

Gas Type	Description	Pressure
Oxygen	Line Pressure	400 kPa
Oxygen	Bulk changes to manifold at around	800 kPa
	Between the bulk and manifold	1000 kPa
Nitrous Oxide		400 kPa
Medical Air	High Pressure (power tools)	700 kPa
Medical Air	Low Pressure (respiratory purposes)	400 kPa
Vacuum		-40 to -60 kPa
Manifold changes left to right bank		300 kPa
Bulk low-level alarm threshold		25% of volume of tank
Cylinder Contents		15 000 kPa

9.4.8 Medical Gas Alarm Systems

- (a) 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 and that appropriate action should be taken.
- (b) Medical gas alarm systems should indicate that there has either been a complete failure or a failure on the system is imminent.
- (c) A master gas alarm system to be installed in the medical gas plant room. A line pressure monitoring gas alarm panel shall be connected to the medical gas lines after the isolation valve box into theatres, I.C.U.'s and H.C.U.'s. This alarm system shall be connected to the emergency power supply.
- (d) Auxiliary alarm signal at telephone switchboard, security or other 24-hour manned location.
- (e) Emergency alarm signal in OT, I.C.U and H.C.U. shall be visual and auditory. To indicate low and high mainline pressure.

9.4.9 Oxygen Supply

- (a) Oxygen shall be provided by means of 2 x bottle rack. The number of bottles on the left should equal those on the right.
- (b) The system shall be arranged to operate as duty and standby.
- (c) All equipment used in medical oxygen systems must be degreased for oxygen service.

9.4.10 Nitrous Oxide Supply

- (a) Nitrous oxide shall be provided by means of 2 x bottle racks.
- (b) The system shall be arranged to operate as duty and standby.

[Type here]

9.4.11 Compressed Air (Medical Air) Supply

- (a) Medical air (low pressure) for respiratory purposes (to wards and theatres) shall be provided at a fixed pipeline pressure of 400 kPa.
- (b) Medical air (high pressure) for driving power tools (pneumatic/surgical instruments) in operating theatres, shall be provided at a terminal usage pressure of 700 kPa to 800kPa.
- (c) Care shall be given to the location of the air intake taking into account the standard specification and the locatiion of other exhaust discharges.

9.4.12 Vacuum System

- (a) The vacuum installation shall comply with SANS 051 Part III.
- (b) Bacteria filters shall be installed prior to the vacuum reservoir and pumps.
- (c) Vacuum liquid bottle traps shall be installed to collect any blood/fluids that may be drawn into the pipeline.
- (d) There should be one bottle trap supplied per theatre, ICU, Ward block and other patient units.
- (e) 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.

9.4.13 Scavenging System

- (a) A scavenging system should be provided to remove exhaled anaesthetic gases from the patient circuit.
- (b) The scavenging system is a low-pressure suction system.
- (c) Each outlet point for the scavenging system shall have its own balancing valve in order to allow the system to be balanced from the furthest outlet point towards the fan motor.
- (d) The scavenging system shall be switched from the nurse's station in the theatre complex.

9.4.14 Scavenging System

- (a) LP gas installations in pathology laboratories and other buildings shall comply with **SANS 10087-3**.

9.4.15 Medical Gas Bedhead Pendants

- (a) Medical Gas Bedhead and Pendants are supplied by others with cut out for gas points and outlets.
- (b) The contractor shall supply and install the terminating point including outlet points to the bedhead or pendant units.
- (c) All bedhead ducting shall be supplied from the essential electrical distribution system.

[Type here]

10 LIFTS FOR PASSENGERS WITH DISABILITIES

10.1 Scope of Work

- (a) This document contains the general technical specification for Passenger Lifts installations in the following facilities:
- i. Office Parks/Buildings
 - ii. Hotels and/or Housing Complexes
 - iii. Hospitals
 - iv. Warehouse or Storage Facilities
 - v. Factories or Manufacturing Facilities
 - vi. Malls or Shopping Complexes
 - vii. Schools, and
 - viii. Any other facility or property requiring such lifts
- (b) The passenger lift shall be installed in multi-storey buildings or facilities, to be able to lift persons with disability from one floor to the next.
- (c) The chairlift shall be installed at the fire escape routes at facilities with multi-storey buildings where there are stairs to be able to lift persons with disability from one floor to the next.

10.2 Applicable Standards and Codes

The passenger lift installation shall comply with the following standards and codes:

No	Standard/Code	Description
1	SANS 1545	Safety rules for the construction and installation of lifts. Part 1: Electric Lifts
2	SANS 1545	Part 2: Lifts for persons with disabilities (Hydraulic Lifts)
2	SANS 1545	Part 3: Lifts for persons with disabilities (stairlifting platforms)
3	SANS 1545	Part 4: Lifts for persons with disabilities (Vertical lifting platforms)
4	SANS 1545	Part 5: Electric and hydraulic access, goods only lifts
5	SANS 1545	Part 10: Safety rules for the construction and installation of lifts
6	SABS 1543	Escalators and Passengers Conveyors
7	OSHACT	Act 85 of 1993: Lift, Escalator and Passenger Conveyor Regulations, 2009
8	BS EN 81	Safety rules for the construction and installation of lifts. Examination and tests. Design rules, calculations, examinations and test of lift components
9	SABS 0142	Code of practice for the wiring of premises
10	Ordinance 17 of 1939	The Local Government Ordinance 1939. Municipal by-laws and any special requirements of the local supply authority
11	The Fire Brigade Services Act 99 of 1987	
12	Act 103 of 1977	The National Building Regulations and Building Standards Act 1977

[Type here]

13	Act 44 of 1958	The Post Office Act 1958
14	Act 41 of 1984	The Electricity Act 1984
15	Act 103	National Building Regulations and Standards

10.3 General Lift Requirements

- (a) All equipment and materials shall be new, provided by the same manufacturer, and manufactured in accordance with the **BS EN-81** standards and approved by the local authorities.
- (b) The Lift Contractor shall submit all the necessary drawings and information to the Regional Director of the Department of Labour and shall submit the necessary application form (**Annexure 1**) for the erection and use of the lifts, access goods lift only and escalators.
- (c) The Lift Contractor shall carry out all the tests and checks required in terms of **SABS 1545-10 Annex A and/or B** and issue the necessary Certificate of Compliance prior to final completion.
- (d) Each lift shall be suitably counterbalanced for smooth and economical operation using counterweights. The counterweight shall be equal to the weight of complete lift car plus at least 40-50% of the rated load or duty mass load specified.
- (e) Each lift shall be fitted with guide rail fixings located in such positions that when the car is at any landing, the guide shoes on the car will be at a fixing bracket.
- (f) Each lift car shall be fitted with roller guides assembled and so mounted as to provide continuous contact of all wheels with the corresponding rail surface under all conditions of loading and operation.
- (g) If the speed and load nominated for a specific lift allows the use of guide shoes:
 - i. The lift shall be provided with car and counterweight spring loaded guide shoes.
 - ii. The spring tension shall be adjusted to maintain the lift in the centre of the rails and provide continuous contact with the corresponding rail surface under all conditions of loading and operation.
- (h) Hoist and governor ropes shall consist of at least six strands wound round a hemp core center and shall comply with **BS 329:1968**. Rope tension equalizers shall be provided and shall be so designed that each rope can be individually adjusted.
- (i) The lift car hoisting rope attachment/hitch shall be suitably vibration isolated to prevent rope noise from being transferred to the car enclosure.
- (j) Governor ropes shall be in accordance with **SANS 1545 (Parts 1 and 2)** and the steel rope shall be specially designed for lift service.
- (k) Travelling cables between the lift and the fixed lift shaft wiring shall be flexible and suitably suspended to relieve the strains in the individual conductors.
- (l) Suitable oil, heavy spring or polyurethane buffers shall be provided for the car and counterweight and shall be so adjusted that in the case of over-travel no parts of the car or counterweight will touch the shaft ceiling.

[Type here]

- (m) The lift shall be provided with a car operating panel which shall be flush mounted in the car enclosure.
The car operating panel shall be mounted on the side of the car at a height accessible to handicapped persons in wheelchairs.
- (n) The lift car and landing doors shall be interlocked by means of electro-mechanical locks so arranged that no landing door can be opened unless the car is opposite the landing.
- (o) The passenger lift shall be provided with an intercommunication system complete with talk-back speakers.
- (p) Floor indicator panels of the LED or electronic type, showing the position of the car in the shaft shall be provided on each floor. These panels shall be located centrally above the landing doors, at a height of not less than 2.1 m above the floor.
- (q) The call buttons shall be mounted at a height easily accessible to handicapped persons in wheelchairs.
- (r) The operation of the Passenger Lift shall be as follows:
 - i. *General*
 - The rest position of the lift shall be on the ground floor.
 - A fire emergency switch is required on the ground floor landing, arranged to cancel all previous calls, and immediately bring the car to the ground floor landing.
 - ii. *Normal operation*
 - The operation of the lift shall be fully automatic.
 - iii. *Operation in the event of a fire*
 - The lift shall automatically travel to the ground floor and be parked there with its door open, and lights switched off.
 - The parked lift shall not respond to any landing calls or the operation of buttons on the car operating panel.
 - iv. *Operation in the event of a power failure*
 - Each passenger lift shall be fitted with an Automatic Rescue Device (ARD).
 - This device shall have a battery back-up which will ensure that in the event of a power outage, the lift has power to go to the next landing instead of being stuck in between landing floors.

10.4 Passenger Lift Specification

(a) The passenger lift shall include safety features such as:

- i. Over-travel protection - to stop the car and prevent its normal operation should it travel beyond the zone of the normal stopping device at the upper and lower terminal floors.

[Type here]

- ii. Stop switch in pit - the pit switch shall interrupt the power supply and apply the brake to hold each car so as to permit safe access to the pit. One half of each brake must be capable of holding the car in event of failure of the other half.
- iii. Over-speed governor - to operate the safety gear fitted to the car when the speed of the lift car, due to any cause, exceeds its normal maximum speed by more than a predetermined value.
- iv. Safety device - the safety device shall be arranged to stop the car without excessive shock whenever the car over speeds downwards due to the breakage of all suspension ropes or other causes.
- v. Over-load protection - an overload device shall inform the passengers in the car that an overload of at least 10% exists. Doors will not close, and the car will not take off before some passengers have left it to restore a normal load.
- vi. Controller – to stop the lift car automatically in the event all other safety features are malfunctioning.
- vii. Automatic rescue device – to be operated in the event of Power Failure. This device shall have battery back-up and shall ensure that the lift goes to the next landing floor.

(b) The passenger lift should meet the following specifications in line with SANS 10400-Part S:

- i. Internal Dimensions – minimum internal dimension of 1.1m in width and 1.4m in depth.
- ii. Doorway Width – an unobstructed width of not less than 800mm is required.
- iii. Horizontal Handrails – to be installed the full length of the car at a height between 850mm and 1000mm above floor level of the lift.
- iv. Internal Mirror – on the top half of the rear wall equal to the width of the lift to enable wheelchair users to back out of the lift where the lift has internal dimensions less than 1.5m in width and 2.0m in depth.
- v. Clear Circulation Space – not less than 1.5m x 1.5m at the entrance of the lift on each floor.
- vi. Audible and Visible Warnings – in the lift lobby and lift car to indicate the lift car approaching, the arrival of the lift, the doors opening the lift doors closing, the floor requested, and at which floor the lift stops.
- vii. Control buttons including emergency control buttons – in accordance with **Clause 4.14 (SANS 10400-Part S)**.

1. All security controls and light switches shall be horizontally aligned with door handles and other fixtures and fittings (other than socket outlets) between 900mm and 1.2m above the finished floor level.
2. General-purpose socket outlets (power-points) shall be fixed at least 500mm above the finished floor level, 150mm above the worktop and at least 450mm from the corners.

[Type here]

- viii. Illuminance of the control panel – of not less than 150lx
 - ix. Stop level with the landing on each floor that they serve – with the landing on each floor that they serve.
- (c) In buildings with large building-user numbers and flow, the size and number of lifts should reflect the fact that a wheelchair user needs to be able to turn when entering or exiting the lift.
 - (d) Wheelchair users should not have to travel further than non-wheelchair users to find a means of vertical circulation accessible to them, and they should not have to cross roads or endanger their safety to reach such means.
 - (e) To aid persons with visual impairments to operate automatic lifts, tactile identification, both raised numbers on buttons, in contrasting light and dark colours, and braille lettering adjacent to the number, should be provided at the control panel within the lift car and external to it.
 - (f) The Passenger lift can either be a Traction or Hydraulic Type.
 - (g) The traction type can be a Geared or Gear-less type. The Geared traction can achieve speed of up to 2.54m/s reaching a maximum building height of 76m. The Gear-less traction can achieve speed of up to 10.16m/s, reaching a maximum building height of 610m.
 - (h) The design speed is as follows: minimum 1m/s for a passenger lift and 0.5m/s for a Hoist/Goods Lift.

ANNEXURE B: CDC's Planning Specification for Contractors



Planning Document:

**Planning Specifications For
Contractors.**

Report N°

CDC-CG-SPC-001-17

01 November 2017



DOCUMENT INFORMATION SHEET

Title of Document : *Planning Specifications for Contractors*
Type of Document : *Planning Document*
Report Number : *CDC-CG-SPC-001-17*
Prepared by : *Duaine Moroney*
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Prepared for : *CDC*
Date of Issue : *01 November 2017*

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DOCUMENT CONTROL SHEET

The purpose of this form is to ensure that documents are reviewed and approved prior to issue. The form is to be bound into the front of all documents released by the CDC.

PROJECT NAME : *CDC Planning Specifications*

DOCUMENT TITLE : *Planning Specifications for Contractors*

DOCUMENT No. : *CDC-CG-SPC-001-17*

SIGNING OF THE ORIGINAL DOCUMENT

We, the undersigned, accept this document as a stable work product to be placed under formal change control as described by the Change Control Procedure document.

ORIGINAL	Prepared by	Reviewed by	Approved by
Date: 13 October 2017	Name: Duaine Moroney	Name: Hennie van der Kolf	Name: Maria van Zyl
	Signature:	Signature:	Signature:

Distribution:	CDC
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Basis Of Schedule (Planning Document)

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1. CIDB Grading 1-3

1.1 Introduction

The Construction Programme and all associated documents as detailed in this Attachment, are an essential part of the Project control system used by the Employer's Representative in monitoring the progress of the work under the Contract. The information and data provided by the Contractor shall be reliable, accurate, timely in presentation, and in an agreed format and style that allows for ease of incorporation into the Employer's Representative's Project control system. If the contractor does not have a dedicated planner it is the responsibility of the contractor to then provide a selected individual from within their organisation which the Employer's Representative would help train in the planning field.

1.2 General

1.2.1 The Contractor shall comply with the requirements of this Attachment.

1.2.2 The following templates will be provided by the Employer and shall be used for the preparation of the construction Programme and reports:

1.2.2.1 Standard Schedule Layout

1.3 Planning and Construction Programme

1.3.1 Submission

1.3.1.1 The Construction Programme shall be a time scaled bar chart with fully continuous logic that clearly highlights the critical path(s) throughout the network.

1.3.1.2 Within the time specified in the Contract, the Contractor shall submit for the Employer's approval, a Construction Programme which represents the sequencing and methodology accepted by the Employer's Representative at the time of award and includes the milestones and key events detailed in the tender documents. The Construction Programme shall be generated using the Primavera Project Planner (P6) software package or an approved alternative and submitted in both hard copy and native (soft copy) file format.

1.3.2 Activities

1.3.2.1 The Construction Programme shall break up the work under the Contract into identifiable, structured items of work ("activities"). Each activity shall:

1.3.2.2 Be an activity of work, not a piece of equipment;

1.3.2.3 Be readily measurable for progress;

1.3.2.4 Express the logical progression of the work;

1.3.2.5 Be suitable for critical path and dependency networking;

- 1.3.2.6 Be continuous from start to finish;
- 1.3.2.7 Generally be of a single “trade” or work content;
- 1.3.2.8 The sum total of all activities shall equate the work under the Contract.

1.3.3 Logic and Sequencing

The Construction Programme shall clearly indicate the logic and sequence of activities necessary to complete the work under the Contract, including but not be limited to:

- 1.3.3.1 Duration of each activity;
- 1.3.3.2 Early start, early finish and total float of each activity;
- 1.3.3.3 Activities that lie on the critical path(s) as determined by the network;
- 1.3.3.4 Precedence relationships (logic) between activities;
- 1.3.3.5 Dates for submissions to the Employer of documents requiring review;
- 1.3.3.6 Subcontractor tendering, award and mobilisation processes;
- 1.3.3.7 Activities to be completed by others which may affect the timely completion of the Works including;
- 1.3.3.8 Issue of information, materials or equipment for use or incorporation in work;
- 1.3.3.9 Activities, dependent upon any other contractor engaged by the Employer; or
- 1.3.3.10 Review time for required documentation such as specifications, drawings, procedures and calculations.
- 1.3.3.11 Tie in activities to existing services and utilities;
- 1.3.3.12 Statutory approval dates;
- 1.3.3.13 Date for access to the Site;
- 1.3.3.14 Date for access to follow-on contractors;
- 1.3.3.15 Date for Key Events and Milestones;
- 1.3.3.16 Date for Practical Completion of the Works or each Separable Portion;
- 1.3.3.17 Manufacture and delivery durations for Contractor supplied equipment and materials, with ties to the respective installation activities, detailed into activities no longer than 2 weeks;
- 1.3.3.18 Delivery dates for Employer supplied equipment and materials, with ties to the respective installation activities, detailed into activities no longer than 2 weeks;
- 1.3.3.19 Activity durations shall be in working days, the programme calendar shall indicate public holidays, leisure days or other non-working days;

1.3.3.20 Off Site and on Site activities shall be clear and identifiable;

1.3.3.21 Calendar - the bar chart heading shall show the year, the month and the week. The bar chart shall commence on the date of Contract Award;

1.3.4 Equipment allocation

1.3.4.1 Special tools and mobile equipment shall be assigned to their respective activities

1.3.4.2 Shared equipment such as mobile equipment shall be allocated to level of effort activities within the Construction Programme.

1.3.5 Construction Programme Commodities

1.3.5.1 The Construction Programme site activities shall be loaded with applicable commodity quantities.

1.3.5.2 The Employer utilises the following commodities;

1.3.5.2.1 Concrete (m³)

1.3.5.2.2 Mechanical Equipment (t)

1.3.5.2.3 Platework (t)

1.3.5.2.4 Structural Steel (t)

1.3.5.2.5 Pipework (m) & Diameter Inch's (Inch)

1.3.5.2.6 Electrical and Communication Cables (m)

1.3.5.2.7 Electrical & Instrumentation Terminations (Qty)

1.3.6 Approval of Construction Programme

1.3.6.1 The Contractor shall submit the proposed baseline Construction Programme including a native (soft copy) copy of the programme.

1.3.6.2 Provided the Construction Programme is in accordance with this addendum A, it will be approved as the revision '0' Baseline Construction Programme. Against which the Contractors progress will be measured.

1.3.7 Revisions to the Construction Programme

1.3.7.1 The Contractor shall review the Construction Programme when any one of the following events occurs:

1.3.7.2 Progress of the work under the Contract falls significantly behind or otherwise materially departs from that shown in the Construction Programme;

1.3.7.3 A variation is issued which affects the Construction Programme;

-
- 1.3.7.4 There is a change in method of working adopted by the Contractor which affects the Construction Programme; or
- 1.3.7.5 The Employer's Representative directs that the Construction Programme be revised because in the opinion of the Employer's Representative the current Construction Programme does not reflect the actual work patterns of the Contractor.
- 1.3.7.6 If any of the events listed above occurs, the Contractor shall submit for approval, within seven (7) days of the event occurring, the revised Construction Programme. Upon approval, the revised Construction Programme will become the approved baseline for all future progress updates.
- 1.3.7.7 The Contractor shall address identified deviations from the Construction Programme by either:
- 1.3.7.8 Demonstrating that the deviation does not constitute a delay; or
- 1.3.7.9 Providing a course of action to remedy the deviation.
- 1.3.7.10 The revised Construction Programme shall clearly indicate the following:
- 1.3.7.11 The differences between the revised Construction Programme and the previously approved Construction Programme; and
- 1.3.7.12 The revision number and date of issue of the revised Construction Programme.
- 1.3.7.13 At any time additional detail may be inserted into the Construction Programme at the request of either the Contractor or Employer's Representative. In such cases, the overall start and finish dates of the detail activities shall not vary from the original summary activity(s) which were replaced.
- 1.3.7.14 All revisions to the Construction Programme shall be prepared by, and at the cost of the Contractor.
- 1.3.7.15 Supplementary Schedules and Programmes
- The Employer's Representative may at any time, and at the cost and expense of the Contractor, direct the Contractor to produce supplementary documents to highlight a particular aspect of the work under the Contract.

1.3.8 Cash Flow

The Contractor shall submit to the Employer detailed cash flow forecast charts based on the Construction Programme (and any revisions) showing the anticipated monthly cash flow as represented by expected payment claim submission, not by payments received.

1.4 Progress Reporting

The cut-off, and submission dates for monthly reports will be as required by the Employer to ensure appropriate and timely integration into the Employer's overall progress reporting systems. These dates are subject to change as per the status of the project or at the discretion of the employer.

1.4.1 Progress Reporting

- 1.4.1.1 To demonstrate the actual progress of the work under the Contract the Contractor shall, on a monthly basis, update and submit to the Employer;
- 1.4.1.2 The updated Construction Programme shall show two (2) separate bars for each activity:
 - 1.4.1.2.1 The Construction Programme "baseline" activity bar.
 - 1.4.1.2.2 The current schedule activity bar identifying the currently forecast start and finish dates of the activity.
- 1.4.1.3 Deviations from the 'baseline' Construction Programme will form the basis for assessing progress and performance. Where significant deviations from the scheduled progress are being tabled in the report, the Contractor shall provide sufficient detailed written analysis and data, to adequately demonstrate the primary areas of schedule concern with short term recovery plan.
- 1.4.1.4 Overall Schedule.

1.4.2 Progress Monitoring and Corrective Action

- 1.4.2.1 Monitoring and review of the progress of the work under the Contract shall consist of an assessment of all activities currently in progress. The following shall be determined:
 - 1.4.2.1.1 Percentage complete;
 - 1.4.2.1.2 Forecast completion date;
 - 1.4.2.1.3 Deviations from the baseline programme; and
 - 1.4.2.1.4 Actions required remedying any deviations.
- 1.4.2.2 Progress reviews may be conducted to assist control of the work under the Contract. The format, content, and structure of these reviews will be agreed between the Contractor and the Employer's Representative.

1.4.3 Monthly Status Report (Planning Aspects Only)

- 1.4.3.1 In addition to the formal monthly report, the Contractor shall provide the following.
- 1.4.3.2 The report shall include but not be limited too:
 - 1.4.3.2.1 The report shall summarise progress and problems encountered during that month in respect of all parts of the work under the Contract.

-
- 1.4.3.2.2 Progress against the approved Construction Programme;
 - 1.4.3.2.3 Deviations from the Construction Programme, and in particular, the forecast completion dates of activities which should have been completed;
 - 1.4.3.2.4 Status of approvals;
 - 1.4.3.2.5 Actual or anticipated problems with corresponding action plans to mitigate / minimise their risk or impact;
 - 1.4.3.2.6 Summary of work activities planned for the following period;
 - 1.4.3.2.7 Cash flow status versus the original forecast and;
 - 1.4.3.3 The Progress Report shall be submitted for review prior to the monthly progress meetings.

2. CIDB Grading 4-6

2.1 Introduction

The Construction Programme and all associated documents as detailed in this Attachment, are an essential part of the Project control system used by the Employer's Representative in monitoring the progress of the work under the Contract. The information and data provided by the Contractor shall be reliable, accurate, timely in presentation, and in an agreed format and style that allows for ease of incorporation into the Employer's Representative's Project control system. If the contractor does not have a dedicated planner it is the responsibility of the contractor to then provide a selected individual from within their organisation which the Employer's Representative would help train in the planning field.

2.2 General

2.2.1 The Contractor shall comply with the requirements of this Attachment.

2.2.2 The following templates will be provided by the Employer and shall be used for the preparation of the construction Programme and reports:

2.2.2.1 Standard Schedule Layout

2.2.2.2 S-Curve

2.3 Planning and Construction Programme

2.3.1 Submission

2.3.1.1 The Construction Programme shall be a time scaled bar chart with fully continuous logic that clearly highlights the critical path(s) throughout the network.

2.3.1.2 Within the time specified in the Contract, the Contractor shall submit for the Employer's approval, a Construction Programme which represents the sequencing and methodology accepted by the Employer's Representative at the time of award and includes the milestones and key events detailed in the. The Construction Programme shall be generated using the Primavera Project Planner (P6) software package or an approved alternative and submitted in both hard copy and native file format.

2.3.1.3 Activities

The Construction Programme shall break up the work under the Contract into identifiable, structured items of work ("activities"). Each activity shall:

2.3.1.4 Be an activity of work, not a piece of equipment;

2.3.1.5 Be readily measurable for progress;

2.3.1.6 Express the logical progression of the work;

- 2.3.1.7 Be suitable for critical path and dependency networking;
- 2.3.1.8 Be continuous from start to finish;
- 2.3.1.9 Generally be of a single “trade” or work content;
- 2.3.1.10 Be fully resourced; and
- 2.3.1.11 The sum total of all activities shall equate the work under the Contract.

2.3.2 Logic and Sequencing

- 2.2.1 The Construction Programme shall clearly indicate the logic and sequence of activities necessary to complete the work under the Contract, including but not be limited to:
 - 2.3.2.1 Duration of each activity;
 - 2.3.2.2 Early start, early finish and total float of each activity;
 - 2.3.2.3 Activities that lie on the critical path(s) as determined by the network;
 - 2.3.2.4 Precedence relationships (logic) between activities;
 - 2.3.2.5 Dates for submissions to the Employer of documents requiring review;
 - 2.3.2.6 Subcontractor tendering, award and mobilisation processes;
 - 2.3.2.7 Activities to be completed by others which may affect the timely completion of the Works including;
 - 2.3.2.8 Issue of information, materials or equipment for use or incorporation in work;
 - 2.3.2.9 Activities, dependent upon any other contractor engaged by the Employer; or
 - 2.3.2.10 Review time for required documentation such as specifications, drawings, procedures and calculations.
 - 2.3.2.11 Tie in activities to existing services and utilities;
 - 2.3.2.12 Statutory approval dates;
 - 2.3.2.13 Date for access to the Site;
 - 2.3.2.14 Date for access to follow-on contractors;
 - 2.3.2.15 Date for Key Events and Milestones;
 - 2.3.2.16 Date for Practical Completion of the Works or each Separable Portion;
 - 2.3.2.17 Manufacture and delivery durations for Contractor supplied equipment and materials, with ties to the respective installation activities
 - 2.3.2.18 Delivery dates for Employer supplied equipment and materials, with ties to the respective installation activities

- 2.3.2.19 Activity durations shall be in working days, the programme calendar shall indicate public holidays, leisure days or other non-working days;
- 2.3.2.20 Off Site and on Site activities shall be clear and identifiable;
- 2.3.2.21 Calendar - the bar chart heading shall show the year, the month and the week. The bar chart shall commence on the date of Contract Award;

2.3.3 Man-hour allocation

- 2.3.3.1 Scheduled Direct Labour Hours – Per Activity.

For each appropriate activity in the Construction Programme, the Contractor shall allocate the associated direct labour hours.

- 2.3.3.2 Direct Labour Hours – Total.

The total of the direct labour hours per week shall be calculated after activities have been resource levelled.

- 2.3.3.3 Direct Labour Workforce Histogram

The site workforce (direct labour only) scheduled per week shall be calculated from the direct labour hours and a histogram plotted.

2.3.4 Equipment allocation

- 2.3.4.1 Special tools and mobile equipment shall be assigned to their respective activities
- 2.3.4.2 Shared equipment such as mobile equipment shall be allocated to level of effort activities within the Construction Programme.

2.3.5 Contractor 'S-Curve'

- 2.3.5.1 The Contractor shall submit progress S-Curves for the overall Contract
- 2.3.5.2 The S-Curves shall be based upon the distribution of man-hours where attainable from within the approved Construction Programme.
- 2.3.5.3 The S-Curves shall be presented using the approved templates provided by the Employer.
- 2.3.5.4 To generate the overall Contract S-Curve each of the phases shall be weighted according to the monetary value of the phase.
- 2.3.5.5 The reporting of progress for each component shall be in the form of earned value (EV), which is the physical percent progress of the component of the work.

2.3.6 Construction Programme Commodities

The Construction Programme site activities shall be loaded with applicable commodity quantities. Offsite fabrication of structural steel, plate work and spooling of pipework shall also be reported.

2.3.6.1 The Employer utilises the following commodities;

2.3.6.1.1 Concrete (m³)

2.3.6.1.2 Mechanical Equipment (t)

2.3.6.1.3 Plate work (t)

2.3.6.1.4 Structural Steel (t)

2.3.6.1.5 Pipework (m) & Diameter Inch's (Inch)

2.3.6.1.6 Electrical and Communication Cables (m)

2.3.6.1.7 Electrical & Instrumentation Terminations (Qty)

2.3.6.2 Commodity Curves shall be presented in the same format as the S-Curves.

2.3.7 Approval of Construction Programme

2.3.7.1 The Contractor shall submit the proposed baseline Construction Programme including a native copy of the programme.

2.3.7.2 Provided the Construction Programme is in accordance with this addendum A, it will be approved as the revision '0' Baseline Construction Programme. Against which the Contractors progress will be measured.

2.3.8 Revisions to the Construction Programme

2.3.8.1 The Contractor shall review the Construction Programme when any one of the following events occurs:

2.3.8.2 Progress of the work under the Contract falls significantly behind or otherwise materially departs from that shown in the Construction Programme;

2.3.8.3 A variation is issued which affects the Construction Programme;

2.3.8.4 There is a change in method of working adopted by the Contractor which affects the Construction Programme; or

2.3.8.5 The Employer's Representative directs that the Construction Programme be revised because in the opinion of the Employer's Representative the current Construction Programme does not reflect the actual work patterns of the Contractor.

-
- 2.3.8.6 If any of the events listed above occurs, the Contractor shall submit for approval, within seven (7) days of the event occurring, the revised Construction Programme. Upon approval, the revised Construction Programme will become the approved baseline for all future progress updates.
- 2.3.8.7 The Contractor shall address identified deviations from the Construction Programme by either:
- 2.3.8.8 Demonstrating that the deviation does not constitute a delay; or
- 2.3.8.9 Providing a course of action to remedy the deviation.
- 2.3.8.10 The revised Construction Programme shall clearly indicate the following:
- 2.3.8.10.1 The differences between the revised Construction Programme and the previously approved Construction Programme; and
- 2.3.8.10.2 The revision number and date of issue of the revised Construction Programme.
- 2.3.8.11 The revised Construction Programme shall be accompanied by a revised S-Curve
- 2.3.8.12 At any time additional detail may be inserted into the Construction Programme at the request of either the Contractor or Employer's Representative. In such cases, the overall start and finish dates of the detail activities shall not vary from the original summary activity(s) which were replaced.
- 2.3.8.13 All revisions to the Construction Programme shall be prepared by, and at the cost of the Contractor.

2.3.9 Supplementary Schedules and Programmes

The Employer's Representative may at any time, and at the cost and expense of the Contractor, direct the Contractor to produce supplementary documents to highlight a particular aspect of the work under the Contract.

2.3.10 Cash Flow

The Contractor shall submit to the Employer detailed cash flow forecast charts based on the Construction Programme (and any revisions) showing the anticipated monthly cash flow as represented by expected payment claim submission, not by payments received.

2.4 Progress Reporting

The cut-off, and submission dates for monthly reports will be as required by the Employer to ensure appropriate and timely integration into the Employer's overall progress reporting systems. These dates are subject to change as per the status of the project or at the discretion of the employer.

2.4.1 Progress Reporting

- 2.4.1.1 To demonstrate the actual progress of the work under the Contract the Contractor shall, on a monthly basis, update and submit to the Employer;
- 2.4.1.2 The updated Construction Programme shall show two (2) separate bars for each activity:
 - 2.4.1.2.1 The Construction Programme “baseline” activity bar.
 - 2.4.1.2.2 The current schedule activity bar identifying the currently forecast start and finish dates of the activity.
- 2.4.1.3 The progress ‘S-Curves’;
- 2.4.1.4 Deviations from the ‘baseline’ Construction Programme together with the ‘S-Curves’ will form the basis for assessing progress and performance. Where significant deviations from the scheduled progress are being tabled in the report, the Contractor shall provide sufficient detailed written analysis and data, to adequately demonstrate the primary areas of schedule concern with short term recovery plan.
- 2.4.1.5 Overall Schedule.
- 2.4.1.6 2 week look ahead Schedule.

2.4.2 Progress Monitoring and Corrective Action

- 2.4.2.1 Monitoring and review of the progress of the work under the Contract shall consist of an assessment of all activities currently in progress. The following shall be determined:
 - 2.4.2.1.1 Percentage complete;
 - 2.4.2.1.2 Forecast completion date;
 - 2.4.2.1.3 Deviations from the baseline programme; and
 - 2.4.2.1.4 Actions required remedying any deviations.
- 2.4.2.2 Weekly progress reviews may be conducted to assist control of the work under the Contract. The format, content, and structure of these reviews will be agreed between the Contractor and the Employer’s Representative. The Contractor’s Weekly Progress Report will be used as the discussion tool for the weekly progress meeting.

2.4.3 Monthly Status Report (Planning Aspects Only)

- 2.4.3.1 In addition to the formal monthly report, the Contractor shall provide the following.
- 2.4.3.2 The report shall include but not be limited too:
- 2.4.3.3 The report shall summarise progress and problems encountered during that month in respect of all parts of the work under the Contract.

-
- 2.4.3.4 Progress against the approved Construction Programme;
 - 2.4.3.5 Summary of progress achieved during the period using progress 'S-Curves';
 - 2.4.3.6 List of milestones achieved during the period;
 - 2.4.3.7 Status of design, procurement, off-site works, and construction;
 - 2.4.3.8 Deviations from the Construction Programme, and in particular, the forecast completion dates of activities which should have been completed;
 - 2.4.3.9 Status of approvals;
 - 2.4.3.10 Actual or anticipated problems with corresponding action plans to mitigate / minimise their risk or impact;
 - 2.4.3.11 Summary of work activities planned for the following period;
 - 2.4.3.12 Cash flow status versus the original forecast;
 - 2.4.3.13 The Progress Report shall be submitted for review prior to the monthly progress meetings.

3. CIDB Grading 7-9

3.1 Introduction

The Construction Programme and all associated documents as detailed in this Attachment, are an essential part of the Project control system used by the Employer's Representative in monitoring the progress of the work under the Contract. The information and data provided by the Contractor shall be reliable, accurate, timely in presentation, and in an agreed format and style that allows for ease of incorporation into the Employer's Representative's Project control system.

3.2 General

- 3.2.1 The Contractor shall comply with the requirements of this Attachment.
- 3.2.2 The following templates will be provided by the Employer and shall be used for the preparation of the construction Programme and reports:
- 3.2.3 Standard Schedule Layout
- 3.2.4 S-Curve

3.3 Planning and Construction Programme

3.3.1 Submission

- 3.3.1.1 The Construction Programme shall be a time scaled bar chart with fully continuous logic that clearly highlights the critical path(s) throughout the network.
- 3.3.1.2 Within the time specified in the Contract, the Contractor shall submit for the Employer's approval, a Construction Programme which represents the sequencing and methodology accepted by the Employer's Representative at the time of award and includes the milestones and key events detailed in the. The Construction Programme shall be generated using the Primavera Project Planner (P6) software package or an approved alternative and submitted in both hard copy and native file format.

3.3.2 Activities

The Construction Programme shall break up the work under the Contract into identifiable, structured items of work ("activities"). Each activity shall:

- 3.3.2.1 Be at level 4;
- 3.3.2.2 Be an activity of work, not a piece of equipment;
- 3.3.2.3 Be readily measurable for progress;
- 3.3.2.4 Express the logical progression of the work;

-
- 3.3.2.5 Be suitable for critical path and dependency networking;
 - 3.3.2.6 Be continuous from start to finish;
 - 3.3.2.7 Be located in a single geographical area;
 - 3.3.2.8 Generally be of a single “trade” or work content;
 - 3.3.2.9 Be compatible with quality assurance plans;
 - 3.3.2.10 Be fully resourced; and
 - 3.3.2.11 Be capable of producing commodity based reports
 - 3.3.2.12 The sum total of all activities shall equate the work under the Contract.

3.3.3 Logic and Sequencing

- 3.3.3.1 The Construction Programme shall clearly indicate the logic and sequence of activities necessary to complete the work under the Contract, including but not be limited to:
 - 3.3.3.1.1 Duration of each activity;
 - 3.3.3.1.2 Early start, early finish and total float of each activity;
 - 3.3.3.1.3 Activities that lie on the critical path(s) as determined by the network;
 - 3.3.3.1.4 Precedence relationships (logic) between activities;
 - 3.3.3.1.5 Subcontractor tendering, award and mobilisation processes;
 - 3.3.3.1.6 Activities to be completed by others which may affect the timely completion of the Works including;
 - 3.3.3.1.7 Activities, dependent upon any other contractor engaged by the Employer; or
 - 3.3.3.1.8 Review time for required documentation such as specifications, drawings, procedures and calculations.
- 3.3.3.2 Tie in activities to existing services and utilities;
- 3.3.3.3 Statutory approval dates;
- 3.3.3.4 Date for access to the Site;
- 3.3.3.5 Date for access to follow-on contractors;
- 3.3.3.6 Date for Key Events and Milestones;
- 3.3.3.7 Date for Practical Completion of the Works or each Separable Portion;
- 3.3.3.8 Manufacture and delivery durations for Contractor supplied equipment and materials, with ties to the respective installation activities;

- 3.3.3.9 Activity durations shall be in working days, the programme calendar shall indicate public holidays, leisure days or other non-working days;
- 3.3.3.10 Off Site and on Site activities shall be clear and identifiable;
- 3.3.3.11 Calendar - the bar chart heading shall show the year, the month and the week. The bar chart shall commence on the date of Contract Award;

3.3.4 Construction Programme Resources

- 3.3.4.1 The Contractor shall submit histograms showing the direct labour required to complete the work under the Contract based on the approved Construction Programme.
- 3.3.4.2 The histograms shall be prepared from the schedule.
- 3.3.4.3 Equipment requirements / utilisation bar charts shall be submitted to the Employer for all Site plant and mobile equipment required to complete the work under the Contract.

3.3.5 Man-hour allocation

- 3.3.5.1 Scheduled Direct Labour Hours – Per Activity.
- 3.3.5.2 For each appropriate activity in the Construction Programme, the Contractor shall allocate the associated direct labour hours.
- 3.3.5.3 Direct Labour Hours – Total.
- 3.3.5.4 The total of the direct labour hours per week shall be calculated after activities have been resource levelled.
- 3.3.5.5 Direct Labour Workforce Histogram
- 3.3.5.6 The site workforce (direct labour only) scheduled per week shall be calculated from the direct labour hours and a histogram plotted.

3.3.6 Equipment allocation

- 3.3.6.1 Special tools and mobile equipment shall be assigned to their respective activities
- 3.3.6.2 Shared equipment such as mobile equipment shall be allocated to level of effort activities within the Construction Programme.

3.3.7 Contractor 'S-Curve'

- 3.3.7.1 The Contractor shall submit progress S-Curves for the overall Contract and each of the phases of the Contract.
- 3.3.7.2 The S-Curves shall be based upon the distribution of man-hours where attainable from within the approved Construction Programme.

- 3.3.7.3 The S-Curves shall be presented using the approved templates provided by the Employer.
- 3.3.7.4 To generate the overall Contract S-Curve each of the phases shall be weighted according to the dollar value of the phase.
- 3.3.7.5 All S-Curves shall be developed using the 'Earned Value Method'. This method applies a weighted value (WV) to all measurable components of the Works.
- 3.3.7.6 The reporting of progress for each component shall be in the form of earned value (EV), which is the physical percent progress of the component of the work.

3.3.8 Construction Programme Commodities

- 3.3.8.1 The Construction Programme site activities shall be loaded with applicable commodity quantities. Commodity curves shall be produced for forecast installation and actual installation quantities from this data. Offsite fabrication of structural steel, platework and spooling of pipework shall also be reported.
- 3.3.8.2 The Employer utilises the following commodities;
 - 3.3.8.2.1 Concrete (m³)
 - 3.3.8.2.2 Mechanical Equipment (t)
 - 3.3.8.2.3 Plate work (t)
 - 3.3.8.2.4 Structural Steel (t)
 - 3.3.8.2.5 Pipework (m) & Diameter Inch's (Inch)
 - 3.3.8.2.6 Electrical and Communication Cables (m)
 - 3.3.8.2.7 Electrical & Instrumentation Terminations (Qty)
- 3.3.8.3 Commodity Curves shall be presented in the same format as the S-Curves.

3.3.9 Approval of Construction Programme

- 3.3.9.1 The Contractor shall submit the proposed baseline Construction Programme including a native copy of the programme.
- 3.3.9.2 Provided the Construction Programme is in accordance with this Attachment 10, it will be approved as the revision '0' Baseline Construction Programme. Against which the Contractors progress will be measured.

3.3.10 Revisions to the Construction Programme

- 3.3.10.1 The Contractor shall review the Construction Programme when any one of the following events occurs:

-
- 3.3.10.2 Progress of the work under the Contract falls significantly behind or otherwise materially departs from that shown in the Construction Programme;
- 3.3.10.3 A variation is issued which affects the Construction Programme;
- 3.3.10.4 There is a change in method of working adopted by the Contractor which affects the Construction Programme; or
- 3.3.10.5 The Employer's Representative directs that the Construction Programme be revised because in the opinion of the Employer's Representative the current Construction Programme does not reflect the actual work patterns of the Contractor.
- 3.3.10.6 If any of the events listed above occurs, the Contractor shall submit for approval, within seven (7) days of the event occurring, the revised Construction Programme. Upon approval, the revised Construction Programme will become the approved baseline for all future progress updates.
- 3.3.10.7 The Contractor shall address identified deviations from the Construction Programme by either:
- 3.3.10.8 Demonstrating that the deviation does not constitute a delay; or
- 3.3.10.9 Providing a course of action to remedy the deviation.
- 3.3.10.10 The revised Construction Programme shall clearly indicate the following:
- 3.3.10.11 The differences between the revised Construction Programme and the previously approved Construction Programme; and
- 3.3.10.12 The revision number and date of issue of the revised Construction Programme.
- 3.3.10.13 The revised Construction Programme shall be accompanied by a revised manning histogram and S-Curve with an additional data line called 'reforecast planned progress'.
- 3.3.10.14 At any time additional detail may be inserted into the Construction Programme at the request of either the Contractor or Employer's Representative. In such cases, the overall start and finish dates of the detail activities shall not vary from the original summary activity(s) which were replaced.
- 3.3.10.15 All revisions to the Construction Programme shall be prepared by, and at the cost of the Contractor.

3.3.11 Supplementary Schedules and Programmes

The Employer's Representative may at any time, and at the cost and expense of the Contractor, direct the Contractor to produce supplementary documents to highlight a particular aspect of the work under the Contract.

3.3.12 Cash Flow

The Contractor shall submit to the Employer detailed cash flow forecast charts based on the Construction Programme (and any revisions) showing the anticipated monthly cash flow as represented by expected payment claim submission, not by payments received.

3.4 Progress Reporting

The cut-off, and submission dates for monthly reports will be as required by the Employer to ensure appropriate and timely integration into the Employer's overall progress reporting systems. These dates are subject to change as per the status of the project or at the discretion of the employer.

3.4.1 Progress Reporting

- 3.4.1.1 To demonstrate the actual progress of the work under the Contract the Contractor shall, on a monthly basis, update and submit to the Employer;
- 3.4.1.2 The updated Construction Programme shall show two (2) separate bars for each activity:
 - 3.4.1.2.1 The Construction Programme "baseline" activity bar.
 - 3.4.1.2.2 The current schedule activity bar identifying the currently forecast start and finish dates of the activity.
- 3.4.1.3 The progress 'S-Curves';
- 3.4.1.4 Direct Manning Histograms;
- 3.4.1.5 Deviations from the 'baseline' Construction Programme together with the 'S-Curves' will form the basis for assessing progress and performance. Where significant deviations from the scheduled progress are being tabled in the report, the Contractor shall provide sufficient detailed written analysis and data, to adequately demonstrate the primary areas of schedule concern with short term recovery plan.
- 3.4.1.6 Overall Schedule.
- 3.4.1.7 2 week look ahead Schedule.

3.4.2 Progress Monitoring and Corrective Action

- 3.4.2.1 Monitoring and review of the progress of the work under the Contract shall consist of an assessment of all activities currently in progress. The following shall be determined:
 - 3.4.2.1.1 Percentage complete;
 - 3.4.2.1.2 Forecast completion date;
 - 3.4.2.1.3 Manning histograms showing actual and forecast versus baseline figures;

- 3.4.2.1.4 Deviations from the baseline programme; and
- 3.4.2.1.5 Actions required remedying any deviations.
- 3.4.2.2 Progress reviews shall be conducted to assist control of the work under the Contract. The format, content, and structure of these reviews will be agreed between the Contractor and the Employer's Representative. The Contractor's Progress Report will be used as the discussion tool for the progress meeting.

3.4.3 Monthly Status Report (Planning Aspects Only)

- 3.4.3.1 In addition to the formal monthly report, the Contractor shall provide the following.
- 3.4.3.2 The report shall include but not be limited too:
 - 3.4.3.2.1 The report shall summarise progress and problems encountered during that month in respect of all parts of the work under the Contract.
 - 3.4.3.2.2 Progress against the approved Construction Programme;
 - 3.4.3.2.3 Summary of progress achieved during the period using progress 'S-Curves' for each of the PCS elements;
 - 3.4.3.2.4 List of milestones achieved during the period;
 - 3.4.3.2.5 Status of construction;
 - 3.4.3.2.6 Deviations from the Construction Programme, and in particular, the forecast completion dates of activities which should have been completed;
 - 3.4.3.2.7 Actual or anticipated problems with corresponding action plans to mitigate / minimise their risk or impact;
 - 3.4.3.2.8 Summary of work activities planned for the following period;
 - 3.4.3.2.9 Cash flow status versus the original forecast;
- 3.4.3.3 The Progress Report shall be submitted for review prior to the monthly progress meetings.

ANNEXURE C

SBD 1

PART A INVITATION TO BID

YOU ARE HEREBY INVITED TO BID FOR REQUIREMENTS OF THE (COEGA DEVELOPMENT CORPORATION)

BID NUMBER:	CDC/292/24	CLOSING DATE:	Wed, 06 November 2024	CLOSING TIME:	12H00
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DESCRIPTION	
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BID RESPONSE DOCUMENTS MAY BE DEPOSITED IN THE BID BOX SITUATED AT (STREET ADDRESS)

CRN ALCYON AND ZIBUKO ROAD, COEGA ZONE 1, BUSINESS CENTRE

COEGA SEZ, GQEBERHA, 6000

BIDDING PROCEDURE ENQUIRIES MAY BE DIRECTED TO	TECHNICAL ENQUIRIES MAY BE DIRECTED TO:
--	---

CONTACT PERSON	Ms Zine Mtanda	CONTACT PERSON	Ms Zine Mtanda
----------------	----------------	----------------	----------------

TELEPHONE NUMBER		TELEPHONE NUMBER	
------------------	--	------------------	--

FACSIMILE NUMBER		FACSIMILE NUMBER	
------------------	--	------------------	--

E-MAIL ADDRESS	frameworktenders@coega.co.za	E-MAIL ADDRESS	frameworktenders@coega.co.za
----------------	--	----------------	--

SUPPLIER INFORMATION

NAME OF BIDDER	
----------------	--

POSTAL ADDRESS	
----------------	--

STREET ADDRESS	
----------------	--

TELEPHONE NUMBER	CODE		NUMBER	
------------------	------	--	--------	--

CELLPHONE NUMBER	
------------------	--

FACSIMILE NUMBER	CODE		NUMBER	
------------------	------	--	--------	--

E-MAIL ADDRESS	
----------------	--

VAT REGISTRATION NUMBER	
-------------------------	--

SUPPLIER COMPLIANCE STATUS	TAX COMPLIANCE SYSTEM PIN:		OR	CENTRAL SUPPLIER DATABASE No:	MAAA
----------------------------	----------------------------	--	----	-------------------------------	------

1. ARE YOU THE ACCREDITED REPRESENTATIVE IN SOUTH AFRICA FOR THE GOODS /SERVICES OFFERED?	☐ Yes ☐ No [IF YES ENCLOSE PROOF]	2. ARE YOU A FOREIGN BASED SUPPLIER FOR THE GOODS /SERVICES OFFERED?	☐ Yes ☐ No [IF YES, ANSWER THE QUESTIONNAIRE BELOW]
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QUESTIONNAIRE TO BIDDING FOREIGN SUPPLIERS

IS THE ENTITY A RESIDENT OF THE REPUBLIC OF SOUTH AFRICA (RSA)?	☐ YES ☐ NO
---	--

DOES THE ENTITY HAVE A BRANCH IN THE RSA?	☐ YES ☐ NO
---	--

DOES THE ENTITY HAVE A PERMANENT ESTABLISHMENT IN THE RSA?	☐ YES ☐ NO
--	--

DOES THE ENTITY HAVE ANY SOURCE OF INCOME IN THE RSA?	☐ YES ☐ NO
---	--

IS THE ENTITY LIABLE IN THE RSA FOR ANY FORM OF TAXATION?	☐ YES ☐ NO
---	--

IF THE ANSWER IS "NO" TO ALL OF THE ABOVE, THEN IT IS NOT A REQUIREMENT TO REGISTER FOR A TAX COMPLIANCE STATUS SYSTEM PIN CODE FROM THE SOUTH AFRICAN REVENUE SERVICE (SARS) AND IF NOT REGISTER AS PER 2.3 BELOW.

PART B TERMS AND CONDITIONS FOR BIDDING

1. BID SUBMISSION:	
2.1.	BIDS MUST BE DELIVERED BY THE STIPULATED TIME TO THE CORRECT ADDRESS. LATE BIDS WILL NOT BE ACCEPTED FOR CONSIDERATION.
2.2.	ALL BIDS MUST BE SUBMITTED ON THE OFFICIAL FORMS PROVIDED (NOT TO BE RE-TYPED) OR IN THE MANNER PRESCRIBED IN THE BID DOCUMENT.
2.3.	THIS BID IS SUBJECT TO THE PREFERENTIAL PROCUREMENT POLICY FRAMEWORK ACT, 2000 AND THE PREFERENTIAL PROCUREMENT REGULATIONS, THE GENERAL CONDITIONS OF CONTRACT (GCC) AND, IF APPLICABLE, ANY OTHER SPECIAL CONDITIONS OF CONTRACT.
2.4.	THE SUCCESSFUL BIDDER WILL BE REQUIRED TO FILL IN AND SIGN A WRITTEN CONTRACT FORM (SBD7).
2. TAX COMPLIANCE REQUIREMENTS	
2.1	BIDDERS MUST ENSURE COMPLIANCE WITH THEIR TAX OBLIGATIONS.
2.2	BIDDERS ARE REQUIRED TO SUBMIT THEIR UNIQUE PERSONAL IDENTIFICATION NUMBER (PIN) ISSUED BY SARS TO ENABLE THE ORGAN OF STATE TO VERIFY THE TAXPAYER'S PROFILE AND TAX STATUS.
2.3	APPLICATION FOR TAX COMPLIANCE STATUS (TCS) PIN MAY BE MADE VIA E-FILING THROUGH THE SARS WEBSITE WWW.SARS.GOV.ZA
2.4	BIDDERS MAY ALSO SUBMIT A PRINTED TCS CERTIFICATE TOGETHER WITH THE BID.
2.5	IN BIDS WHERE CONSORTIA / JOINT VENTURES / SUB-CONTRACTORS ARE INVOLVED; EACH PARTY MUST SUBMIT A SEPARATE TCS CERTIFICATE / PIN / CSD NUMBER.
2.6	WHERE NO TCS PIN IS AVAILABLE BUT THE BIDDER IS REGISTERED ON THE CENTRAL SUPPLIER DATABASE (CSD), A CSD NUMBER MUST BE PROVIDED.
2.7	NO BIDS WILL BE CONSIDERED FROM PERSONS IN THE SERVICE OF THE STATE, COMPANIES WITH DIRECTORS WHO ARE PERSONS IN THE SERVICE OF THE STATE, OR CLOSE CORPORATIONS WITH MEMBERS PERSONS IN THE SERVICE OF THE STATE."

NB: FAILURE TO PROVIDE / OR COMPLY WITH ANY OF THE ABOVE PARTICULARS MAY RENDER THE BID INVALID.

SIGNATURE OF THE BIDDER:

CAPACITY UNDER WHICH THIS BID IS SIGNED:
 (Proof of authority must be submitted e.g. company resolution)

DATE:

ANNEXURE D

SBD4

BIDDER'S DISCLOSURE

1. PURPOSE OF THE FORM

Any person (natural or juristic) may make an offer or offers in terms of this invitation to bid. In line with the principles of transparency, accountability, impartiality, and ethics as enshrined in the Constitution of the Republic of South Africa and further expressed in various pieces of legislation, it is required for the bidder to make this declaration in respect of the details required hereunder.

Where a person/s are listed in the Register for Tender Defaulters and / or the List of Restricted Suppliers, that person will automatically be disqualified from the bid process.

2. Bidder's declaration

2.1 Is the bidder, or any of its directors / trustees / shareholders / members / partners or any person having a controlling interest¹ in the enterprise, employed by the state? **YES/NO**

2.1.1 If so, furnish particulars of the names, individual identity numbers, and, if applicable, state employee numbers of sole proprietor/ directors / trustees / shareholders / members/ partners or any person having a controlling interest in the enterprise, in table below.

Full Name	Identity Number	Name of State institution

1 the power, by one person or a group of persons holding the majority of the equity of an enterprise, alternatively, the person/s having the deciding vote or power to influence or to direct the course and decisions of the enterprise.

2.2 Do you, or any person connected with the bidder, have a relationship with any person who is employed by the procuring institution? **YES/NO**

2.2.1 If so, furnish particulars:

.....
.....

2.3 Does the bidder or any of its directors / trustees / shareholders / members / partners or any person having a controlling interest in the enterprise have any interest in any other related enterprise whether or not they are bidding for this contract?
YES/NO

2.3.1 If so, furnish particulars:

.....
.....

3 DECLARATION

I, _____ the _____ undersigned,
(name)..... in submitting the
accompanying bid, do hereby make the following statements that I certify to be true
and complete in every respect:

- 3.1 I have read and I understand the contents of this disclosure;
- 3.2 I understand that the accompanying bid will be disqualified if this disclosure is found not to be true and complete in every respect;
- 3.3 The bidder has arrived at the accompanying bid independently from, and without consultation, communication, agreement or arrangement with any competitor. However, communication between partners in a joint venture or consortium² will not be construed as collusive bidding.
- 3.4 In addition, there have been no consultations, communications, agreements or arrangements with any competitor regarding the quality, quantity, specifications, prices, including methods, factors or formulas used to calculate prices, market allocation, the intention or decision to submit or not to submit the bid, bidding with the intention not to win the bid and conditions or delivery particulars of the products or services to which this bid invitation relates.
- 3.5 The terms of the accompanying bid have not been, and will not be, disclosed by the

2 Joint venture or Consortium means an association of persons for the purpose of combining their expertise, property, capital, efforts, skill and knowledge in an activity for the execution of a contract.

bidder, directly or indirectly, to any competitor, prior to the date and time of the official bid opening or of the awarding of the contract.

- 3.6 There have been no consultations, communications, agreements or arrangements made by the bidder with any official of the procuring institution in relation to this procurement process prior to and during the bidding process except to provide clarification on the bid submitted where so required by the institution; and the bidder was not involved in the drafting of the specifications or terms of reference for this bid.
- 3.7 I am aware that, in addition and without prejudice to any other remedy provided to combat any restrictive practices related to bids and contracts, bids that are suspicious will be reported to the Competition Commission for investigation and possible imposition of administrative penalties in terms of section 59 of the Competition Act No 89 of 1998 and or may be reported to the National Prosecuting Authority (NPA) for criminal investigation and or may be restricted from conducting business with the public sector for a period not exceeding ten (10) years in terms of the Prevention and Combating of Corrupt Activities Act No 12 of 2004 or any other applicable legislation.

I CERTIFY THAT THE INFORMATION FURNISHED IN PARAGRAPHS 1, 2 and 3 ABOVE IS CORRECT.

I ACCEPT THAT THE STATE MAY REJECT THE BID OR ACT AGAINST ME IN TERMS OF PARAGRAPH 6 OF PFMA SCM INSTRUCTION 03 OF 2021/22 ON ENHANCING COMPLIANCE, TRANSPARENCY AND ACCOUNTABILITY IN SUPPLY CHAIN MANAGEMENT SHOULD THIS DECLARATION PROVE TO BE FALSE.

.....
Signature Date

.....
Position Name of bidder

ANNEXURE E- AUTHORITY OF SIGNATORY

Indicate the status of the tenderer by ticking the appropriate box hereunder. The tenderer must complete the certificate set out below for the relevant category.

A Company	B Partnership	C Sole Proprietor	D Close Corporation

A. Certificate for Company

I,, chairperson

of the board of,

hereby confirm that by resolution of the board (copy attached) taken on

..... 20....., Mr/Ms

acting in the capacity of, was authorised to sign all documents in connection with this tender for Contract Number. **CDC/292/24** and any contract resulting from it on behalf of the company.

As witnesses:

1.

Chairman:

2.

Date:

B. Certificate for Partnership

We, the undersigned, being the key partners in the business trading as

....., hereby authorise

Mr/Ms,

acting in the capacity of

....., to sign all documents in connection with this tender for

Contract No **CDC/292/24** and any contract resulting from it on our behalf.

Name	Address	Signature	Date

Note: This certificate is to be completed and signed by all key partners upon whom rests the direction of the affairs of the Partnership as a whole.

C. Certificate for Sole Proprietor

I,, hereby confirm that I am

the sole owner of the business trading as

As witnesses:

1.

Sole Owner:

2.

Date:

D. Certificate for Close Corporation

We, the undersigned, being the key members in the business trading as

.....

hereby authorise Mr/Ms

acting in the capacity of, to sign all to
sign all documents in connection with this tender for Contract No **CDC/292/24** and any contract resulting from it
on our behalf.

Name	Address	Signature	Date

Note: This certificate is to be completed and signed by all key partners upon whom rests the direction of the affairs of the Partnership as a whole.

ANNEXURE F- PROOF OF CIDB

1. PROOF OF REGISTRATION WITH CONSTRUCTION INDUSTRY DEVELOPMENT BOARD

The bidder shall affix to this page, Written proof of registration with the CIDB in the required categories.

Note:

Verification will be conducted through the CIDB website. Bidders who's status is not active, Suspended, De-registered or expired will not be considered and will be deemed non-responsive.

ANNEXURE G -DISTRICT MUNICIPAL SELECTION FORM

BIDDERS NAME:

***MARK WITH A x THE AREA'S THE BIDDER INTEND TO WORK**

Should a bidder fail to make a selection and not meet this requirement, it will be considered as non-responsive."

No.	DISTRICT/ METRO MUNICIPALITY	PROVINCE	SEAT	SELECTIONS
1	Alfred Nzo District Municipality	Eastern Cape	Mount Ayliff	
2	Amathole District Municipality	Eastern Cape	East London	
3	Buffalo City Metropolitan Municipality	Eastern Cape	East London	
4	Chris Hani District Municipality	Eastern Cape	Queenstown	
5	Joe Gqabi District Municipality	Eastern Cape	Barkly East	
6	Nelson Mandela Bay Metropolitan Municipality	Eastern Cape	Port Elizabeth	
7	OR Tambo District Municipality	Eastern Cape	Mthatha	
8	Sarah Baartman District Municipality	Eastern Cape	Port Elizabeth	
9	Fezile Dabi District Municipality	Free State	Sasolburg	
10	Lejweleputswa District Municipality	Free State	Welkom	
11	Mangaung Metropolitan Municipality	Free State	Bloemfontein	
12	Thabo Mofutsanyana District Municipality	Free State	Phuthaditjhaba	
13	Xhariep District Municipality	Free State	Trompsburg	
14	City of Johannesburg Metropolitan Municipality	Gauteng	Johannesburg	
15	City of Tshwane Metropolitan Municipality	Gauteng	Pretoria	
16	Ekurhuleni Metropolitan Municipality	Gauteng	Germiston	
17	Sedibeng District Municipality	Gauteng	Vereeniging	
18	West Rand District Municipality	Gauteng	Randfontein	
19	Amajuba District Municipality	KwaZulu-Natal	Newcastle	
20	eThekweni Metropolitan Municipality	KwaZulu-Natal	Durban	
21	Harry Gwala District Municipality	KwaZulu-Natal	Ixopo	
22	iLembe District Municipality	KwaZulu-Natal	KwaDukuza	
23	King Cetshwayo District Municipality	KwaZulu-Natal	Richards Bay	
24	Ugu District Municipality	KwaZulu-Natal	Port Shepstone	
25	uMgungundlovu District Municipality	KwaZulu-Natal	Pietermaritzburg	
26	uMkhanyakude District Municipality	KwaZulu-Natal	Mkuze	
27	uMzinyathi District Municipality	KwaZulu-Natal	Dundee	
28	uThukela District Municipality	KwaZulu-Natal	Ladysmith	
29	Zululand District Municipality	KwaZulu-Natal	Ulundi	

30	Capricorn District Municipality	Limpopo	Polokwane	
31	Mopani District Municipality	Limpopo	Giyani	
32	Sekhukhune District Municipality	Limpopo	Groblersdal	
33	Vhembe District Municipality	Limpopo	Thohoyandou	
34	Waterberg District Municipality	Limpopo	Modimolle	
35	Ehlanzeni District Municipality	Mpumalanga	Nelspruit	
36	Gert Sibande District Municipality	Mpumalanga	Ermelo	
37	Nkangala District Municipality	Mpumalanga	Middelburg	
38	Bojanala District Municipality	North West	Rustenburg	
39	Dr Kenneth Kaunda District Municipality	North West	Klerksdorp	
40	Dr Ruth Segomotsi Mompati District Municipality	North West	Vryburg	
41	Ngaka Modiri Molema District Municipality	North West	Mahikeng	
42	Frances Baard District Municipality	Northern Cape	Kimberley	
43	John Taolo Gaetsewe District Municipality	Northern Cape	Kuruman	
44	Namakwa District Municipality	Northern Cape	SprinEBok	
45	Pixley ka Seme District Municipality	Northern Cape	De Aar	
46	ZF Mgcawu District Municipality	Northern Cape	Upington	
47	Cape Winelands District Municipality	Western Cape	Worcester	
48	Central Karoo District Municipality	Western Cape	Beaufort West	
49	City of Cape Town Metropolitan Municipality	Western Cape	Cape Town	
50	Garden Route District Municipality	Western Cape	George	
51	Overberg District Municipality	Western Cape	Bredasdorp	
52	West Coast District Municipality	Western Cape	Moorreesburg	

ANNEXURE H – REFERENCE LETTERS OR PERFORMANCE REPORTS

The bidder shall affix to this page:

1. Reference letters must be as per below required categories per CIDB grade.

Record of at least two or more previous projects that have been completed or awarded in the last 5 – 8 years of similar nature (i.e. Mechanical Works). Details of two (2) contactable references previous Clients/Consultants for each project listed are to be included. The completion certificates or performance reports or reference letters must have completion date, summary of scope, contract value and project description.

Assessment will be as per the construction values of the minimum required CIDB grading contractor, below:

Grade 3ME- R 450 000 and above
Grade 4ME- R 900 000 and above
Grade 5ME- R 1,5m and above
Grade 6ME- R 3m and above
Grade 7ME- R 9m and above
Grade 8ME- R 30m and above
Grade 9ME- R90m and above

Annexure H (a)- serves as an example of how the report should be structured. You can either use it as a reference or provide your own letter

The Reference Letters **MUST** provide an assessment of the bidders past performance with respect to time-, cost-, quality- and risk management.

Note:

Failure to affix the documentation as prescribed to this page shall result in this bid offer being regarded as non-responsive.

ANNEXURE H (a) PERFORMANCE EVALUATION FORM (TO BE USED FOR EVALUATION OF DELIVERABLES OF SERVICE PROVIDERS)

SERVICE PROVIDERS NAME BEING EVALUATED:		
CLIENT		
CONTRACT DESCRIPTION		
VALUE OF CONTRACT		
SERVICE RENDERED		
CONTRACT PERIOD	FROM:	TO:
REVIEW DATE		

CDC RATING SCALE

RATING	EXPLANATION
5	Exceptional performance beyond all task/job requirements
4	Exceeds expectation of the task/job requirement
3	Consistently meets all task/job expectations and requirements
2	Falls below expected performance on some task/job requirements
1	Falls below expected performance overall

EVALUATION ITEM - GENERIC MEASURES	RATING 1-5	ANY PERFORMANCE COMMENTS
1. <i>Quality-Service /product deliverable:</i> Demonstration to meeting and exceeding specifications/ deliverables by service provider/contractor		
2. <i>Cost-:</i> Ability to provide services and goods cost effectively in terms of value for money		
3. <i>Time:</i> Ability to deliver products/services within the specified time period (contract duration) or within the agreed turnaround periods.		
4. <i>Communication:</i> Timeous, effective and efficient exchange of information that is pertinent to the delivery of services/products		

5. Skills and Competency Availability: refers to the actual availability and competency of staff deployed to the service/project		
6. Management: Demonstration of sound and pro- active management practices that are geared towards the achievement of service/products required.		
7. SHE Performance: Compliance with all relevant and necessary CDC SHE policies and		
8. SMME participation: Involvement of SMME during project/service delivery as per the contract		
9. Skills and Competency Development: The ability of the contractor/Service provider to develop their resources through training and development to the benefit of the CDC.		
10. Other (Proposal for additional measures).....		
Overall Score (Average of all scores relevant)		
Would you recommend the service provider for additional works (Y/N)		
General comments:		

Evaluators' Name & Surname

Designation.....

Contact Details (Tel No. & email)

Signature.....

Date:.....



ANNEXURE H (b) - SCHEDULE OF WORK CARRIED OUT BY BIDDER

Provide details of two (2) contactable references previous Clients/Consultants for each project listed and are to be included: The completion certificates or performance reports or reference letters must have completion date, summary of scope, contract value and project description. *Only projects completed in the past 5 to 8 years*

EMPLOYER (Name, Tel No. and Fax No.)	PRINCIPAL AGENT (Name, Tel No. and Fax No.)	PROJECT DESCRIPTION	VALUE OF WORK	COMPLETION DATE

ANNEXURE I

SBD 6.1

PREFERENCE POINTS CLAIM FORM IN TERMS OF THE PREFERENTIAL PROCUREMENT REGULATIONS 2022

This preference form must form part of all tenders invited. It contains general information and serves as a claim form for preference points for specific goals.

NB: BEFORE COMPLETING THIS FORM, TENDERERS MUST STUDY THE GENERAL CONDITIONS, DEFINITIONS AND DIRECTIVES APPLICABLE IN RESPECT OF THE TENDER AND PREFERENTIAL PROCUREMENT REGULATIONS, 2022

1. GENERAL CONDITIONS

1.1 The following preference point systems are applicable to invitations to tender:

- the 80/20 system for requirements with a Rand value of up to R50 000 000 (all applicable taxes included); and
- the 90/10 system for requirements with a Rand value above R50 000 000 (all applicable taxes included).

1.2 To be completed by the organ of state

(delete whichever is not applicable for this tender).

- a) The applicable preference point system for this tender is the 90/10 preference point system.
- b) The applicable preference point system for this tender is the 80/20 preference point system.
- c) Either the 90/10 or 80/20 preference point system will be applicable in this tender. The lowest/ highest acceptable tender will be used to determine the accurate system once tenders are received.

1.3 Points for this tender (even in the case of a tender for income-generating contracts) shall be awarded for:

- (a) Price; and
- (b) Specific Goals.

1.4 To be completed by the organ of state:

The maximum points for this tender are allocated as follows:

	POINTS	
PRICE	80	90
SPECIFIC GOALS	20	10
Total points for Price and SPECIFIC GOALS	100	

- 1.5 Failure on the part of a tenderer to submit proof or documentation required in terms of this tender to claim points for specific goals with the tender, will be interpreted to mean that preference points for specific goals are not claimed.
- 1.6 The organ of state reserves the right to require of a tenderer, either before a tender is adjudicated or at any time subsequently, to substantiate any claim in regard to preferences, in any manner required by the organ of state.

2. DEFINITIONS

- (a) **“tender”** means a written offer in the form determined by an organ of state in response to an invitation to provide goods or services through price quotations, competitive tendering process or any other method envisaged in legislation;
- (b) **“price”** means an amount of money tendered for goods or services, and includes all applicable taxes less all unconditional discounts;
- (c) **“rand value”** means the total estimated value of a contract in Rand, calculated at the time of bid invitation, and includes all applicable taxes;
- (d) **“tender for income-generating contracts”** means a written offer in the form determined by an organ of state in response to an invitation for the origination of income-generating contracts through any method envisaged in legislation that will result in a legal agreement between the organ of state and a third party that produces revenue for the organ of state, and includes, but is not limited to, leasing and disposal of assets and concession contracts, excluding direct sales and disposal of assets through public auctions; and
- (e) **“the Act”** means the Preferential Procurement Policy Framework Act, 2000 (Act No. 5 of 2000).

3. FORMULAE FOR PROCUREMENT OF GOODS AND SERVICES

3.1. POINTS AWARDED FOR PRICE

3.1.1 THE 80/20 OR 90/10 PREFERENCE POINT SYSTEMS

A maximum of 80 or 90 points is allocated for price on the following basis:

$$P_s = 80 \left(1 - \frac{P_t - P_{min}}{P_{min}} \right) \quad \text{or} \quad P_s = 90 \left(1 - \frac{P_t - P_{min}}{P_{min}} \right)$$

Where

- P_s = Points scored for price of tender under consideration
 P_t = Price of tender under consideration
 P_{min} = Price of lowest acceptable tender

4. POINTS AWARDED FOR SPECIFIC GOALS

- 4.1. In terms of Regulation 4(2); 5(2); 6(2) and 7(2) of the Preferential Procurement Regulations, preference points must be awarded for specific goals stated in the tender. For the purposes of this tender the tenderer will be allocated points based on the goals stated in table 1 below as may be supported by proof/ documentation stated in the conditions of this tender:
- 4.2. In cases where organs of state intend to use Regulation 3(2) of the Regulations, which states that, if it is unclear whether the 80/20 or 90/10 preference point system applies, an organ of state must, in the tender documents, stipulate in the case of—
- (a) an invitation for tender for income-generating contracts, that either the 80/20 or 90/10 preference point system will apply and that the highest acceptable tender will be used to determine the applicable preference point system; or
 - (b) any other invitation for tender, that either the 80/20 or 90/10 preference point system will apply and that the lowest acceptable tender will be used to determine the applicable preference point system,
- then the organ of state must indicate the points allocated for specific goals for both the 90/10 and 80/20 preference point system.

Table 1: Specific goals for the tender and points claimed are indicated per the table below.

(Note to organs of state: Where either the 90/10 or 80/20 preference point system is applicable, corresponding points must also be indicated as such.)

The specific goals allocated points in terms of this tender	Number of points allocated (90/10 system) (To be completed by the organ of state)	Number of points claimed (90/10 system) (To be completed by the tenderer)	Number of Number of points allocated (80/20 system) (To be completed by the organ of state)	Number of points claimed (80/20 system) (To be completed by the tenderer)
1	10		20	
2	9		18	
3	7		14	
4	6		12	
5	4		8	
6	3		6	
7	2		4	
8	1		2	
Non-compliant	0		0	

DECLARATION WITH REGARD TO COMPANY/FIRM

4.3. Name of company/firm.....

4.4. Company registration number:

4.5. TYPE OF COMPANY/ FIRM

- ☐ Partnership/Joint Venture / Consortium
 - ☐ One-person business/sole propriety
 - ☐ Close corporation
 - ☐ Public Company
 - ☐ Personal Liability Company
 - ☐ (Pty) Limited
 - ☐ Non-Profit Company
 - ☐ State Owned Company
- [TICK APPLICABLE BOX]

4.6. I, the undersigned, who is duly authorised to do so on behalf of the company/firm, certify that the points claimed, based on the specific goals as advised in the tender, qualifies the company/firm for the preference(s) shown and I acknowledge that:

- i) The information furnished is true and correct;
- ii) The preference points claimed are in accordance with the General Conditions as indicated in paragraph 1 of this form;
- iii) In the event of a contract being awarded as a result of points claimed as shown in paragraphs 1.4 and 4.2, the contractor may be required to furnish documentary proof to the satisfaction of the organ of state that the claims are correct;
- iv) If the specific goals have been claimed or obtained on a fraudulent basis or any of the conditions of contract have not been fulfilled, the organ of state may, in addition to any other remedy it may have –
 - (a) disqualify the person from the tendering process;
 - (b) recover costs, losses or damages it has incurred or suffered as a result of that person's conduct;
 - (c) cancel the contract and claim any damages which it has suffered as a result of having to make less favourable arrangements due to such cancellation;
 - (d) recommend that the tenderer or contractor, its shareholders and directors, or only the shareholders and directors who acted on a fraudulent basis, be restricted from obtaining business from any organ of state for a period not exceeding 10 years, after the *audi alteram partem* (hear the other side) rule has been applied; and



(e) forward the matter for criminal prosecution, if deemed necessary.

.....

SIGNATURE(S) OF TENDERER(S)

SURNAME AND NAME:

DATE:

ADDRESS:

.....

.....

ANNEXURE J- BBBEE CERTIFICATE OR AFFIDAVIT

B-BBEE EXEMPTED AFFIDAVIT FOR EXEMPTED MICRO ENTERPRISES (ISSUED IN TERMS OF THE AMENDED CONSTRUCTION SECTOR CODE)

(Gazette Vol. 630 No. 41287)

Issued in terms of paragraph 3.6.2.4.1 (B)

I, the undersigned,

Full names and surname	
Identity number	

Hereby declare under oath as follows:

- The contents of this statement are to the best of my knowledge a true reflection of the facts.
- I am a Member / Director / Owner of the following enterprise and am duly authorized to act on its behalf:

Enterprise Name:			
Trading Name (If Applicable):			
Registration Number:			
Physical Address:			
Type of Entity (CC, (Pty) Ltd, Sole Prop etc.):			
Nature of Construction Business: <i>Indicate the applicable category with a tick.</i>	BEP (Built Environment Professional)	Contractor	Supplier
Definition of "Black People"	As per the Broad-Based Black Economic Empowerment Act 53 of 2003 as Amended by Act No 46 of 2013 "Black People" is a generic term which means Africans, Coloureds and Indians – who are citizens of the Republic of South Africa by birth or descent; or who became citizens of the Republic of South Africa by naturalization before 27 April 1994; or after 27 April 1994 and who would have been entitled to acquire citizenship by naturalization prior to that date;"		
Definition of "Black Designated Groups"	"Black Designated Groups" means: (a) unemployed black people not attending and not required by law to attend an educational institution and not awaiting admission to an educational institution; (b) Black people who are youth as defined in the National Youth Commission Act of 1996; (c) Black people who are persons with disabilities as defined in the Code of Good Practice on employment of people with disabilities issued under the Employment Equity Act; (d) Black people living in rural and under developed areas; (e) Black military veterans who qualifies to be called a military veteran in terms of the Military Veterans Act 18 of 2011;"		

- I hereby declare under Oath that as per Amended Code Series 100 of the Amended Codes of Good Practice issued under section 9 (1) of B-BBEE Act No 53 of 2003 as Amended by Act No 46 of 2013,
 - The Enterprise is _____ % Black Owned
 - The Enterprise is _____ % Black Female Owned
 - The Enterprise is _____ % Owned by Black Designated Group (provide Black Designated Group Breakdown below as per the definition in the table above)
 - Black Youth % _____ %
 - Black Disabled % _____ %
 - Black Unemployed % _____ %
 - Black People living in Rural areas % _____ %
 - Black Military Veterans % _____ %

- Based on the Financial Statements/Management Accounts and other information available on the latest financial year-end of _____, the annual Total Revenue was less than the applicable amount confirmed **by ticking the applicable box below.**

BEP	R1.8 million	
Contractor	R3.0 million	
Supplier	R3.0 million	

If the turnover exceeds the applicable amount in the table above then this affidavit is no longer applicable and an EME certificate must be obtained from a rating agency accredited by SANAS or when applicable a B-BBEE Verification Professional Regulator appointed by the Minister of Trade and Industry.

- Please Confirm on the below table the B-BBEE Level Contributor, **by ticking the applicable box below.**

100% Black Owned	Level One (135% B-BBEE procurement recognition level)	
At least 51% Black Owned	Level Two (125% B-BBEE procurement recognition level)	
At least 30% Black Owned	Level Four (100% B-BBEE procurement recognition level)	
Less than 30% Black Owned	Level Five (80% B-BBEE procurement recognition level)	

- I know and understand the contents of this affidavit and I have no objection to take the prescribed oath and consider the oath binding on my conscience and on the Owners of the Enterprise which I represent in this matter.
- The sworn affidavit will be valid for a period of 12 months from the date signed by commissioner.

Deponent Signature: _____

Date: _____

Commissioner of Oaths Signature
& stamp

ANNEXURE K- PROPOSED KEY PERSONNEL

The bidder shall list below the key personnel (including first nominee and the second-choice alternate), whom he proposes to employ on the contract should his offer be accepted, both at his headquarters and on the Site, to direct and for the execution of the work, together with their qualifications, experience, positions held and their nationalities. **Curriculum Vitae of Key Personnel to be attached to this Bid Document.**

DESIGNATION	NAME AND NATIONALITY OF NOMINEE	SUMMARY OF QUALIFICATIONS, EXPERIENCE AND PRESENT OCCUPATION
Contracts Manager/Team Leader		
Site Agent		
Foreman		
Construction Health and Safety Officer/ Manager		

DESIGNATION	NAME AND NATIONALITY OF SECOND NOMINEE	SUMMARY OF QUALIFICATIONS, EXPERIENCE AND PRESENT OCCUPATION
Site Agent		
Foreman		
Construction Health and Safety Officer/ Manager		

SIGNATURE: DATE:

(of person authorized to sign on behalf of the Bidde)

ANNEXURE L

PROTECTION OF PERSONAL INFORMATION: CONSENT

The introduction of The Protection of Personal Information Act (POPIA) ensures the regulation of personal information through its entire life cycle of collection, transfer, storing and deletion.

As part of its business activities, the Coega Development Corporation (CDC) obtains and requires access to personal data from a wide range of internal and external parties, including without limitation bidders who respond to requests for proposals that are published by the CDC from time to time. The CDC confirms that it shall process the information disclosed by Bidders for the purpose of evaluating and subsequently awarding/appointing a successful Bidder.

In order to comply with procurement principles, set out in Section 217 of the Constitution and national procurement legislative prescripts, the names of all entities that submitted a bid, the tendered price thereof and the subsequent award will be made public.

The CDC hereby states that it does not and will never modify, amend, or alter any personal information submitted to it by a Bidder. Unless directed to do so by an order of court, the CDC does not disclose or permit the disclosure of any personal information to any Third Party without the prior written consent of the owner of the information.

Similarly, Bidders will from time-to-time access and will be seized with information of a personal nature pertaining to the CDC. Some of the information may, because of legislative compliances, be available in the public domain, whilst some is uniquely provided to bidders in pursuit of procurement or other business-related activities. In this regard, the CDC requires that Bidders which receive or have access to its personal information, process any such information in a manner compliant with the requirements of the POPIA.

AGREEMENT

1. The CDC and the Bidder (the Parties) agree and undertake that upon obtaining and having access to personal information relating to either of them, they shall always ensure that:
 - a) They process the information only for the express purpose for which it was obtained.
 - b) Information is provided only to designated and authorized personnel who require the personal information to carry out the Parties' respective obligations in terms of the Procurement processes.
 - c) They will introduce, and implement all reasonable measures ensure the protection of all personal information from unauthorized access and/or use.
 - d) They have taken appropriate measures to safeguard the security, integrity, and authenticity of all personal information in its possession or under its control.

- e) The Parties agree that if personal information is processed for any other purpose other than the one for which the accessing of the information was intended, explicit written consent will be obtained prior to the execution of such reason.
 - f) The Parties shall carry out regular assessments to identify all reasonably foreseeable internal and external risks to the interception of personal information in its possession or under its control and shall implement and maintain appropriate controls in mitigation of such risks.
2. The Parties agree that they will promptly return or destroy any personal data in their possession or control which belongs to the other Party once it no longer serves the purpose for which it was collected, subject to any legal retention requirements. The information will be destroyed in such a manner that it cannot be reconstructed to its original form, linking it to any individual or organisation.
3. Bidder's Obligations:
- a) The Bidder is required to notify the Information Officer of CDC in writing as soon as possible after it becomes aware of or suspects any loss, unauthorised access or unlawful use of any of the CDC's personal information.
 - b) The Bidder shall, at its own cost, promptly and without delay take all necessary steps to mitigate the extent of the loss or compromise of personal data.
 - c) The Bidder shall be required to provide the CDC with details of the persons affected by the compromise and the nature and extent of the compromise, including details of the identity (if known) of the unauthorized person who may have accessed or acquired the personal data.
 - d) The Bidder undertakes to co-operate with any investigation relating to security breach which is carried out by or on behalf of CDC.

On behalf of the Bidder:

.....
Signature

.....
Date

.....
Position

.....
Name of the Bidder

On behalf of the Client:

.....

Signature

.....

Date

.....

Position

.....

Name of Client Representative

ANNEXURE M

SCHEDULE OF WORK - CURRENT CONTRACTS

The Bidder shall list below current building contracts busy with.

EMPLOYER (Name, Tel No. and Fax No.)	PRINCIPAL AGENT (Name, Tel No. and Fax No.)	PROJECT DESCRIPTION	VALUE OF WORK	CONTRACT DURATION	AWARD DATE	ANTICIPATED COMPLETION DATE

SIGNATURE: **DATE:**

(of person authorised to sign on behalf of the bidder)

ANNEXURE N

PRICING SCHEDULE OF RATES



CDC/292/24- FRAMEWORK - MECHANICAL ENGINEERING SERVICES
PRICING SCHEDULE

ITEM	DESCRIPTION	UNIT	QTY	SUPPLY RATE	INSTALL RATE
1	BILL NO.1.0: HVAC SERVICES				
1.1	PRELIMINARIES & GENERAL				
1.1.1	Preliminaries and General including OHS.	%			
1,2	AIR CONDITIONING UNITS				
	The Contractor shall make provision for the supply, delivery, installation, and commissioning of the following Air Conditioning Units, to include indoor and outdoor units, supports, sundries, refrigerant piping, insulation, condensate piping, etc.,				
1.2.1	<u>Inverter Type Midwall Split AC Units (R410a refrigerant)</u>				
1.2.1.1	2.6 kW Midwall unit (9000 BTU)	No.	1		
1.2.1.2	3.5 kW Midwall unit (12000 BTU)	No.	1		
1.2.1.3	4.3 kW Midwall unit (15000 BTU)	No.	1		
1.2.1.4	4.98 kW Midwall unit (17000 BTU)	No.	1		
1.2.1.5	5.2 kW Midwall unit (18000 BTU)	No.	1		
1.2.1.6	5.5 kW Midwall unit (19000 BTU)	No.	1		
1.2.1.7	7.0 kW Midwall unit (24000 BTU)	No.	1		
1.2.1.8	7.9 kW Midwall unit (27000 BTU)	No.	1		

1.2.1.9	9.3 kW Midwall unit (32000 BTU)	No.	1		
1.2.1.10	10.5 kW Midwall unit (36000 BTU)	No.	1		
1.2.1.11	14 kW Midwall unit (48000 BTU) - 3 Phase	No.	1		
1.2.1.12	16.1 kW Midwall unit (55000 BTU) - 3 Phase	No.	1		
1.2.1.13	18 kW Midwall unit (61000 BTU) - 3 Phase	No.	1		
1.2.2	<u>Inverter Type Ceiling Cassette Units (R410a refrigerant)</u>				
1.2.2.1	2.6 kW Mini Cassette unit (9000 BTU)	No.	1		
1.2.2.2	3.5 kW Mini Cassette unit (12000 BTU)	No.	1		
1.2.2.3	4.3 kW Cassette unit (15000 BTU)	No.	1		
1.2.2.4	4.98 kW Cassette unit (17000 BTU)	No.	1		
1.2.2.5	5.2 kW Cassette unit (18000 BTU)	No.	1		
1.2.2.6	5.5 kW Cassette unit (19000 BTU)	No.	1		
1.2.2.7	7.0 kW Cassette unit (24000 BTU)	No.	1		
1.2.2.8	7.9 kW Cassette unit (27000 BTU)	No.	1		
1.2.2.9	9.3 kW Cassette unit (32000 BTU)	No.	1		
1.2.2.10	10.5 kW Cassette unit (36000 BTU)	No.	1		
1.2.2.11	14 kW Cassette unit (48000 BTU) - 3 Phase	No.	1		
1.2.2.12	16.1 kW Midwall unit (55000 BTU) - 3 Phase	No.	1		
1.2.2.13	18 kW Midwall unit (61000 BTU) - 3 Phase	No.	1		
1.2.3	<u>Ducted Split-Medium Static Heat Pump (R410a refrigerant)</u>				
1.2.3.1	5.3 kW Ducted Split Unit	No.	1		
1.2.3.2	7.0 kW Ducted Split Unit	No.	1		
1.2.3.3	10.6 kW Ducted Split Unit	No.	1		
1.2.4	<u>Ducted Split-High Static Heat Pump (R410a refrigerant)</u>				
1.2.4.1	14.1 kW Ducted Split Unit	No.	1		
1.2.4.2	16.1 kW Ducted Split Unit	No.	1		
1.2.4.3	28 kW Ducted Split Unit	No.	1		

1.2.5	<u>Underceiling Split/Floor Split Heat Pump (R410a refrigerant)</u>				
1.2.5.1	5.3 kW R410a Refrigerant Fixed Speed Range - Single Phase	No.	1		
1.2.5.2	7.0 kW R410a Refrigerant Fixed Speed Range - Single Phase	No.	1		
1.2.5.3	10.6 kW R410a Refrigerant Fixed Speed Range - Single Phase	No.	1		
1.2.5.4	14.1 kW R410a Refrigerant Fixed Speed Range - 3 Phase	No.	1		
1.2.5.5	16.1 kW R410a Refrigerant Fixed Speed Range - 3 Phase	No.	1		
1.2.6	<u>Console Units (R410a refrigerant)</u>				
1.2.6.1	2.6 kW R410a Refrigerant Fixed Speed Range - Single Phase	No.	1		
1.2.6.2	3.8 kW R410a Refrigerant Fixed Speed Range - Single Phase	No.	1		
1.2.6.3	4.4 kW R410a Refrigerant Fixed Speed Range - Single Phase	No.	1		
1.2.7	<u>Highwall Split Heat Pump R410a Inverter</u>				
1.2.7.1	2.6 kW R410a Refrigerant Inverter Speed Range - Single Phase	No.	1		
1.2.7.2	3.5 kW R410a Refrigerant Inverter Speed Range - Single Phase	No.	1		
1.2.7.3	5.3 kW R410a Refrigerant Inverter Speed Range - Single Phase	No.	1		
1.2.7.4	7.0 kW R410a Refrigerant Inverter Speed Range - Single Phase	No.	1		
1.2.7.5	8.8 kW R410a Refrigerant Inverter Speed Range - Single Phase	No.	1		
1.2.8	<u>Cassette Split Heat Pump R410a Inverter</u>				
1.2.8.1	5.3 kW R410a Refrigerant Inverter Speed Range - Single Phase	No.	1		
1.2.8.2	7.0 kW R410a Refrigerant Inverter Speed Range - Single Phase	No.	1		
1.2.8.3	10.6 kW R410a Refrigerant Inverter Speed Range - Single Phase	No.	1		
1.2.8.4	14.1 kW R410a Refrigerant Inverter Speed Range - 3 Phase	No.	1		
1.2.8.5	16.1 kW R410a Refrigerant Inverter Speed Range - 3 Phase	No.	1		
1.2.9	<u>Ducted Split Heat Pump R410a Inverter</u>				
1.2.9.1	5.3 kW R410a Refrigerant Inverter Speed Range - Single Phase	No.	1		
1.2.9.2	7.0 kW R410a Refrigerant Inverter Speed Range - Single Phase	No.	1		

1.2.9.3	10.6 kW R410a Refrigerant Inverter Speed Range - Single Phase	No.	1		
1.2.9.4	14.1 kW R410a Refrigerant Inverter Speed Range - 3 Phase	No.	1		
1.2.9.5	16.1 kW R410a Refrigerant Inverter Speed Range - 3 Phase	No.	1		
1.2.9.6	26.0 kW R410a Refrigerant Inverter Speed Range - 3 Phase	No.	1		
1.2.10	<u>Under Ceiling/Floor Split Heat Pump R410a Inverter</u>				
1.2.10.1	5.3 kW R410a Refrigerant Inverter Speed Range - Single Phase	No.	1		
1.2.10.2	7.0 kW R410a Refrigerant Inverter Speed Range - Single Phase	No.	1		
1.2.10.3	10.6 kW R410a Refrigerant Inverter Speed Range - Single Phase	No.	1		
1.2.10.4	14.1 kW R410a Refrigerant Inverter Speed Range - 3 Phase	No.	1		
1.2.10.5	16.1 kW R410a Refrigerant Inverter Speed Range - 3 Phase	No.	1		
1.2.11	<u>Console Unit Heat Pump R410a Inverter</u>				
1.2.11.1	2.6 kW R410a Refrigerant Inverter Speed Range - Single Phase	No.	1		
1.2.11.2	3.8 kW R410a Refrigerant Inverter Speed Range - Single Phase	No.	1		
1.2.11.3	4.4 kW R410a Refrigerant Inverter Speed Range - Single Phase	No.	1		
1.2.12	<u>Air Handling Units (AHU)</u>				
	The contractor to supply and install AHU units complete with Condensing Units, refrigerant piping, control panel - rigged and positioned in each plant room.				
1.2.12.1	AHU Plant 1: Supply Air: 16.5 m3/s, Cooling : 261kW, Heating: 114kW, Total Fan Pressure: 626 Pa	No.	1		
1.2.12.2	AHU Plant 2: Supply Air: 9.3 m3/s, Cooling : 161kW, Heating: 87kW, Total Fan Pressure: 621 Pa	No.	1		
1.2.12.3	AHU Plant 3: Supply Air: 10.3 m3/s, Cooling : 155kW, Heating: 92kW, Total Fan Pressure: 620 Pa	No.	1		
1.2.12.4	AHU Plant 4: Supply Air: 15.3 m3/s, Cooling : 209kW, Heating: 114kW, Total Fan Pressure: 622 Pa	No.	1		
1.2.12.5	AHU Plant 5: Supply Air: 23.4 m3/s, Cooling : 315.0kW, Heating: 172kW, Total Fan Pressure: 660 Pa	No.	1		
1.2.12.6	AHU Plant 6: Supply Air: 6.7 m3/s, Cooling : 130.0kW, Heating: 90kW, Total Fan Pressure: 540 Pa	No.	1		
1.2.12.7	Corrosion pre-treatment of the Condensing units as per specification- Bluchem: Evaporator & condenser coils	No.	1		
1.2.12.8	VRV Condensing unit - Heat Recovery REXYQ 40: 102kW, 3~380V	No.	1		
1.2.12.9	VRV Condensing unit - Heat Recovery REXYQ 32: 74.2kW, 3~380V	No.	1		

1,3	REFRIGERANT PIPING				
	The Contractor shall make provision for the supply, delivery, installation, and commissioning of the following refrigerant piping.				
1.3.1	Ø6.35mm refrigerant copper piping	m	1		
1.3.2	Ø9.52mm refrigerant copper piping	m	1		
1.3.3	Ø12.7mm refrigerant copper piping	m	1		
1.3.4	Ø15.9mm refrigerant copper piping	m	1		
1.3.5	Ø19.05mm refrigerant copper piping	m	1		
1.3.6	Ø22.23mm refrigerant copper piping	m	1		
1.3.7	Ø29.0mm refrigerant copper piping	m	1		
1.3.8	Ø32.0mm refrigerant copper piping	m	1		
1.3.9	Ø35.0mm refrigerant copper piping	m	1		
1.3.10	Ø42.0mm refrigerant copper piping	m	1		
1,4	REFRIGERANT PIPE INSULATION				
	The Contractor shall make provision for the supply, delivery, installation, and commissioning of the following refrigerant pipe insulation.				
1.4.1	Ø6.35mm refrigerant copper piping	m	1		
1.4.2	Ø9.52mm refrigerant copper piping	m	1		
1.4.3	Ø12.7mm refrigerant copper piping	m	1		
1.4.4	Ø15.9mm refrigerant copper piping	m	1		
1.4.5	Ø19.05mm refrigerant copper piping	m	1		
1.4.6	Ø22.23mm refrigerant copper piping	m	1		
1.4.7	Ø29.0mm refrigerant copper piping	m	1		
1.4.8	Ø32.0mm refrigerant copper piping	m	1		
1.4.9	Ø35.0mm refrigerant copper piping	m	1		
1.4.10	Ø42.0mm refrigerant copper piping	m	1		
1,5	CONDENSATE DRAIN PIPE				

	The Contractor shall make provision for the supply, delivery, installation, and commissioning of the condensate drain pipe.				
1.5.1	Ø32mm uPVC Condensate Drain Pipe	m	1		
1,6	<u>REMOTE CONTROLLERS:</u>				
	The Contractor to make provision for both wireless and wired remote controllers for the air conditioning units.				
1.6.1	<u>Midwall AC Units:</u> The Contractor shall make provision for the supply and installation of wireless remote controller c/w wire bracket.	No.	1		
1.6.2	<u>Ceiling Cassette Units:</u> The Contractor shall make provision for the supply and installation of wired wall mounted remote controller with temperature display, temperature set point, 3 fan speeds, heat/cool mode and ON/OFF functions.	No.	1		
1,7	<u>ANTI-CORROSION TREATMENT:</u>				
1.7.1	The Contractor shall make provision for applying anti-corrossion treatment on all the condenser coils (Bluechem or equally approved). Certificate of treatment to be submitted to the design engineer. (Rate per split unit).	No.	1		
1,8	<u>ADDITIONAL PIPING:</u>				
1.8.1	The Contractor shall make provision for additional piping between Indoor and Outdoor unit including pipe ancillaries, wire mesh tray, pipe supports, drain piping, electrical connections, and installing ancillaries	No.	1		
1,9	<u>VENTILATION RATES ALLOWANCE:</u>				
	The Contractor shall make provision for the supply of fresh air in line with regulations to all air conditioned space. The Contractor to make allowance for extraction or exhaust air requirements.				
1.9.1	Fresh air supply to air conditioned space (rate per m2)	m2	1		
1.9.2	Exhaust or extraction air from toilets, kitchens, or any areas with exhaust fumes (rate per m2)	m2	1		
1,1	<u>RECTANGULAR DUCTING:</u>				
	The Contractor shall make provision for the supply and installation of the following ducting				
1.10.1	Category 1	m2	1		

1.10.2	Category 2	m2	1		
1.10.3	Category 3	m2	1		
1.10.4	Category 4	m2	1		
1.10.5	Category 5	m2	1		
1,11	<u>SPIRAL DUCTING:</u>				
	The Contractor shall make provision for the supply and installation of the following spiral ducting				
1.11.1	Ø100mm	m	1		
1.11.2	Ø150mm	m	1		
1.11.3	Ø200mm	m	1		
1.11.4	Ø250mm	m	1		
1.11.5	Ø300mm	m	1		
1.11.6	Ø350mm	m	1		
1.11.7	Ø400mm	m	1		
1.11.8	Ø450mm	m	1		
1.11.9	Ø500mm	m	1		
1.11.10	Ø560mm	m	1		
1.11.11	Ø600mm	m	1		
1.11.12	Ø710mm	m	1		
1.11.13	Ø800mm	m	1		
1.11.14	Ø900mm	m	1		
1.11.15	Ø1000mm	m	1		
1.11.16	Ø1250mm	m	1		
1,12	<u>FLEXIBLE DUCTING:</u>				
	The Contractor shall make provision for the supply and installation of the following flexible ducting				
1.12.1	Ø100mm	m	1		
1.12.2	Ø200mm	m	1		
1.12.3	Ø250mm	m	1		

1.12.4	Ø300mm	m	1		
1.12.5	Ø315mm	m	1		
1.12.6	Ø450mm	m	1		
1.12.7	Ø530mm	m	1		
1,13	ROUND DUCTING:				
	The Contractor shall make provision for the supply and installation of the following round ducting				
1.13.1	Ø100mm	m	1		
1.13.2	Ø200mm	m	1		
1.13.3	Ø250mm	m	1		
1.13.4	Ø300mm	m	1		
1.13.5	Ø315mm	m	1		
1.13.6	Ø450mm	m	1		
1.13.7	Ø530mm	m	1		
1,14	Extra Over Duct Fittings - REDUCERS				
	The Contractor shall make provision for the supply and installation of the following Duct fittings, including hangers and supports - Reducers				
1.14.1	Ø100mm	m	1		
1.14.2	Ø150mm	m	1		
1.14.3	Ø200mm	m	1		
1.14.4	Ø250mm	m	1		
1.14.5	Ø300mm	m	1		
1.14.6	Ø350mm	m	1		
1.14.7	Ø400mm	m	1		
1.14.8	Ø450mm	m	1		
1.14.9	Ø500mm	m	1		
1.14.10	Ø560mm	m	1		
1.14.11	Ø600mm	m	1		
1.14.12	Ø710mm	m	1		

1.14.13	Ø800mm	m	1		
1.14.14	Ø900mm	m	1		
1.14.15	Ø1000mm	m	1		
1.14.16	Ø1250mm	m	1		
1,15	<u>Extra Over Duct Fittings - SPIGOTS</u>				
	The Contractor shall make provision for the supply and installation of the following Duct fittings, including hangers and supports - <u>Spigots</u>				
1.15.1	Ø100mm	m	1		
1.15.2	Ø150mm	m	1		
1.15.3	Ø200mm	m	1		
1.15.4	Ø250mm	m	1		
1.15.5	Ø300mm	m	1		
1.15.6	Ø350mm	m	1		
1.15.7	Ø400mm	m	1		
1.15.8	Ø450mm	m	1		
1.15.9	Ø500mm	m	1		
1.15.10	Ø560mm	m	1		
1.15.11	Ø600mm	m	1		
1.15.12	Ø710mm	m	1		
1.15.13	Ø800mm	m	1		
1.15.14	Ø900mm	m	1		
1.15.15	Ø1000mm	m	1		
1.15.16	Ø1250mm	m	1		
1,16	<u>BRANCH TAP</u>				
	The Contractor shall make provision for the supply and installation of the following Branch Taps				
1.16.1	Ø100mm	m	1		
1.16.2	Ø150mm	m	1		
1.16.3	Ø200mm	m	1		

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1.16.4	Ø250mm	m	1		
1.16.5	Ø300mm	m	1		
1.16.6	Ø350mm	m	1		
1.16.7	Ø400mm	m	1		
1.16.8	Ø450mm	m	1		
1.16.9	Ø500mm	m	1		
1.16.10	Ø560mm	m	1		
1.16.11	Ø600mm	m	1		
1.16.12	Ø710mm	m	1		
1.16.13	Ø800mm	m	1		
1.16.14	Ø900mm	m	1		
1.16.15	Ø1000mm	m	1		
1.16.16	Ø1250mm	m	1		
1,17	<u>BENDS</u>				
	The Contractor shall make provision for the supply and installation of the following Bends				
1.17.1	Ø100mm	m	1		
1.17.2	Ø150mm	m	1		
1.17.3	Ø200mm	m	1		
1.17.4	Ø250mm	m	1		
1.17.5	Ø300mm	m	1		
1.17.6	Ø350mm	m	1		
1.17.7	Ø400mm	m	1		
1.17.8	Ø450mm	m	1		
1.17.9	Ø500mm	m	1		
1.17.10	Ø560mm	m	1		
1.17.11	Ø600mm	m	1		
1.17.12	Ø710mm	m	1		
1.17.13	Ø800mm	m	1		
1.17.14	Ø900mm	m	1		

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1.17.15	Ø1000mm	m	1		
1.17.16	Ø1250mm	m	1		
1,18	<u>SLEEVES</u>				
	The Contractor shall make provision for the supply and installation of the following Sleeves				
1.18.1	Ø100mm	m	1		
1.18.2	Ø150mm	m	1		
1.18.3	Ø200mm	m	1		
1.18.4	Ø250mm	m	1		
1.18.5	Ø300mm	m	1		
1.18.6	Ø350mm	m	1		
1.18.7	Ø400mm	m	1		
1.18.8	Ø450mm	m	1		
1.18.9	Ø500mm	m	1		
1.18.10	Ø560mm	m	1		
1.18.11	Ø600mm	m	1		
1.18.12	Ø710mm	m	1		
1.18.13	Ø800mm	m	1		
1.18.14	Ø900mm	m	1		
1.18.15	Ø1000mm	m	1		
1.18.16	Ø1250mm	m	1		
1,19	<u>STOP END</u>				
	The Contractor shall make provision for the supply and installation of the following Stop Ends				
1.19.1	Ø100mm	m	1		
1.19.2	Ø150mm	m	1		
1.19.3	Ø200mm	m	1		
1.19.4	Ø250mm	m	1		
1.19.5	Ø300mm	m	1		

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1.19.6	Ø350mm	m	1		
1.19.7	Ø400mm	m	1		
1.19.8	Ø450mm	m	1		
1.19.9	Ø500mm	m	1		
1.19.10	Ø560mm	m	1		
1.19.11	Ø600mm	m	1		
1.19.12	Ø710mm	m	1		
1.19.13	Ø800mm	m	1		
1.19.14	Ø900mm	m	1		
1.19.15	Ø1000mm	m	1		
1.19.16	Ø1250mm	m	1		
1,2	<u>MAGNEHELIC GAUGES</u>				
	The Contractor shall make provision for the supply and installation of the following Magnehelic Gauges				
1.20.1	0-60 Pa	No.	1		
1.20.2	0-125 Pa	No.	1		
1.20.3	0-250 Pa	No.	1		
1.20.4	0-500 Pa	No.	1		
1.20.5	0-750 Pa	No.	1		
1.20.6	0-2 kPa	No.	1		
1.20.7	0-3 kPa	No.	1		
1.20.8	0-5 kPa	No.	1		
1,21	<u>MANOMETER</u>				
	The Contractor shall make provision for the supply and installation of the following Manometer				
1.21.1	Manometer 0-700 Pa	No.	1		
1.21.2	Red Gauge Oil 1 litre	No.	1		
1.21.3	Red Gauge Oil 25ml	No.	1		

1,22	<u>DAMPERS</u>				
1.22.1	<u>BALANCING DAMPERS</u>				
	<u>Round Balancing Dampers</u>				
1.22.1.1	Ø100mm	No.	1		
1.22.1.2	Ø150mm	No.	1		
1.22.1.3	Ø200mm	No.	1		
1.22.1.4	Ø250mm	No.	1		
1.22.1.5	Ø300mm	No.	1		
1.22.1.6	Ø350mm	No.	1		
	<u>Rectangular Balancing Dampers</u>				
1.22.1.7	200 x 350 - 200 x 350	No.	1		
1.22.1.8	250 x 350 - 250 x 350	No.	1		
	<u>Motorised Control Dampers</u>				
1.22.1.9	Ø500mm	No.	1		
1.22.1.10	Ø550mm	No.	1		
1.22.1.11	Ø600mm	No.	1		
1.22.1.12	900 x 300 mm	No.	1		
1.22.1.13	900 x 400 mm	No.	1		
1.22.1.14	650 x 500 mm	No.	1		
	<u>Fire Dampers</u>				
1.22.1.15	800 x 450 mm	No.	1		
1.22.1.16	900 x 450 mm	No.	1		
1.22.1.17	800 x 400 mm	No.	1		
1.22.1.18	1300 x 500 mm	No.	1		
1.22.1.19	700 x 900 mm	No.	1		
1.22.1.20	Fusible link fire damper Ø400 mm	No.	1		

1,23	<u>FANS</u>				
1.23.1	<u>AXIAL FLOW FANS</u>				
1.23.1.1	Ø400mm - 800l/s @150Pa	No.	1		
1.23.1.2	Ø500mm - 360l/s @250Pa	No.	1		
1.23.1.3	Ø560mm - 720l/s @220Pa	No.	1		
1.23.1.4	Ø560mm - 750l/s @230Pa	No.	1		
1.23.1.5	Ø560mm - 1300l/s @150Pa	No.	1		
1.23.1.6	Ø630mm - 1300l/s @240Pa	No.	1		
1.23.1.7	Ø630mm - 1485l/s @290Pa	No.	1		
1.23.1.8	Ø630mm - 2300l/s @250Pa	No.	1		
1.23.1.9	Ø710mm - 1490l/s @310Pa	No.	1		
1.23.1.10	Ø710mm - 1800l/s @270Pa	No.	1		
1.23.1.11	Ø710mm - 4000l/s @150Pa	No.	1		
1.23.1.12	Ø710mm - 5000l/s @150Pa	No.	1		
1.23.1.13	Ø900mm - 5600l/s @315Pa	No.	1		
1.23.1.14	Ø1000mm - 8000l/s @200Pa	No.	1		
1,24	<u>SOUND ATTENUATORS:</u>				
1.24.1.1	Ø400mm	No.	1		
1.24.1.2	Ø500mm	No.	1		
1.24.1.3	Ø560mm	No.	1		
1.24.1.4	Ø630mm	No.	1		
1.24.1.5	Ø710mm	No.	1		
1.24.1.6	Ø900mm	No.	1		
1.24.1.7	Ø1000mm	No.	1		
1,25	<u>DUCT INSULATION:</u>				
	The Contractor shall make provision for the duct insulation				
1.25.1	External Insulation	m2	1		

1.25.2	Internal Insulation	m2	1		
1,26	<u>SUPPLY AIR DIFFUSERS:</u>				
	The Contractor shall make provision for the supply and installation of the following Supply Air Diffusers				
1.26.1	Ø100mm	No.	1		
1.26.2	Ø150mm	No.	1		
1.26.3	Ø250mm	No.	1		
1.26.4	Ø300mm	No.	1		
1,27	<u>WEATHER LOUVRES:</u>				
	The Contractor shall make provision for the supply and installation of the following Weather Louvres (Aluminium powder coated)				
1.27.1	200 x 150mm	No.	1		
1.27.2	250 x 200mm	No.	1		
1.27.3	350 x 300mm	No.	1		
1.27.4	400 x 400mm	No.	1		
1.27.5	500 x 350mm	No.	1		
1.27.6	550 x 300mm	No.	1		
1.27.7	600 x 250mm	No.	1		
1.27.8	600 x 300mm	No.	1		
1.27.9	800 x 350mm	No.	1		
1.27.10	1500 x 400mm	No.	1		
1.27.11	1700 x 300mm	No.	1		
1,28	<u>EXTRACT AIR GRILLES:</u>				
	The Contractor shall make provision for the supply and installation of the following Extract Air Grilles				
1.28.1	300 x 600mm	No.	1		
1.28.2	350 x 650mm	No.	1		
1.28.3	400 x 450mm	No.	1		
1.28.4	450 x 450mm	No.	1		

1.28.5	500 x 500mm	No.	1		
1.28.6	600 x 600mm Extract Air Grille c/w 150mm high plenum box dia:200mm spigot	No.	1		
1.28.7	600 x 600mm Extract Air Grille c/w 150mm high plenum box dia:250mm spigot	No.	1		
1.28.8	600 x 600mm Extract Air Grille c/w 150mm high plenum box dia:300mm spigot	No.	1		
1.28.9	600 x 600mm Extract Air Grille c/w 150mm high plenum box dia:400mm spigot	No.	1		
1.28.10	Toilet Extract Disc Valve, Dia: 150mm	No.	1		
1.28.11	Toilet Extract Disc Valve, Dia: 200mm	No.	1		
1.28.12	Toilet Extract Disc Valve, Dia: 250mm	No.	1		
1,29	<u>DOOR GRILLES</u>				
	The Contractor shall make provision for the supply and installation of the following Door Grilles				
1.29.1	100 x 200mm	No.	1		
1.29.2	150 x 150mm	No.	1		
1.29.3	150 x 200mm	No.	1		
1.29.4	200 x 250mm	No.	1		
1.29.5	200 x 300mm	No.	1		
1.29.6	250 x 250mm	No.	1		
1.29.7	300 x 300mm	No.	1		
1.29.8	350 x 350mm	No.	1		
1,3	<u>FILTERS</u>				
1.30.1	<u>Washable Primary Filters (50mm) - Trox or equal approved</u>	l/s			
1.30.1.1	300x600x50	380	1		
1.30.1.2	400x400x50	3840	1		
1.30.1.3	400x500x50	410	1		
1.30.1.4	500x500x50	530	1		
1.30.1.5	500x625x50	660	1		
1.30.1.6	600x600x50	750	1		

1.30.1.7	400x625x50	530	1		
1.30.1.8	500x600x50	660	1		
1.30.1.9	400x600x50	530	1		
1.30.1.10	500x500x100		1		
1.30.1.11	600x600x100		1		
1.30.2	<u>Secondary Filters (AAF Varicel)</u>				
1.30.2.1	600x600x300	No.	1		
1.30.2.2	500x500x300	No.	1		
1.30.2.3	600x300x300	No.	1		
1.30.2.4	500x300x300	No.	1		
1.30.3	<u>Secondary Bag Filters</u>				
1.30.3.1	600x600x600	No.	1		
1.30.3.2	500x500x600	No.	1		
1.30.3.3	600x300x600	No.	1		
1.30.3.4	500x300x600	No.	1		
1,31	<u>TOILET EXTRACT FANS</u>				
1.31.1	<u>Window/wall mounted</u>				
1.31.1.1	150mm dia	No.	1		
1.31.1.2	200mm dia	No.	1		
1.31.1.3	250mm dia	No.	1		
1.31.1.4	300mm dia	No.	1		
1.31.2	<u>Ceiling mounted</u>				
1.31.2.1	150mm dia	No.	1		
1.31.2.2	200mm dia	No.	1		
1.31.2.3	250mm dia	No.	1		
1.31.2.4	300mm dia	No.	1		

1.32	<u>PRESSURE CONTROL DAMPERS - Constant Volume</u>				
1.32.1	Constant Volume Diffuser on 595x595mm plate white CCD150-350S595	No.	1		
1.32.2	Constant Volume Diffuser for skimmed Ceiling Circular white CRD150-350	No.	1		
1.32.3	Optional extra for T Ring	No.	1		
1.32.4	Constant Volume Swirl Diffuser on 595x595mm plate white CSW150-300	No.	1		
1.32.5	Constant Volume Swirl Diffuser circular for skimmed ceiling white CRW150-300	No.	1		
1.32.6	Optional extra for T Ring	No.	1		
1.32.7	White RA Grille 595x595mm over flange	No.	1		
1.32.8	White RA Grille 1195x595mm over flange	No.	1		
1.32.9	Egg Crate Grille Aluminium White 595x595mm overflange size	No.	1		
1.32.10	Egg Crate Grille Aluminium White 1195x595mm overflange size	No.	1		
1.32.11	RAFF Grille with 5mm filter media Rickard White 595x595mm OFS	No.	1		
1.32.12	RAFF Grille with 5mm filter media filter Rickard White 1195x595mm OFS	No.	1		
1.32.2	<u>Constant Volume with Heating</u>				
1.32.2.1	Constant Volume Diffuser on 595x595mm plate with Heater	No.	1		
1.32.2.2	CCD150-350S595 Master MLM Controls with Heater, Power Pack and Wall Stat	No.	1		
1.32.2.3	CCD150-350S595 Slave with Heater & 8m slave cable	No.	1		
1.32.2.4	CRD150-350 Constant Volume Diffuser Master with Heater Power Pack and Wall Stat	No.	1		
1.32.2.5	Optional extra for T Ring	No.	1		
1.32.2.6	CRD150-350 Constant Volume Diffuser Slave with Heater and 6m cable	No.	1		
1.32.2.7	Optional extra for T Ring	No.	1		
1.32.2.8	Air Flow Switch (Heater Safety Cut-Out)	No.	1		
1.32.2.9	Constant Volume Swirl Diffuser on 595x595mm plate White with Heater	No.	1		
1.32.2.10	CSW150-300S595 Master with Heater, Power Pack and Wall Stat	No.	1		
1.32.2.11	CSW150-300S595 Slave with Heater & 8m slave cable	No.	1		
1.32.2.12	CRW150-300 Constant Volume Diffuser Master with Heater Power Pack and Wall Stat	No.	1		
1.32.2.13	Optional extra for T Ring				

1.32.3	<u>Variable Volume</u>				
1.32.3.1	Variable Volume Diffuser on 595x595mm plate white no heating	No.	1		
1.32.3.2	VCD150-350 S595 Master, Power Pack and Wall Stat	No.	1		
1.32.3.3	VCD150-350S595 Slave with 8m slave cable	No.	1		
1.32.3.4	VRD150-350 Master, Power Pack and Wall Stat	No.	1		
1.32.3.5	VRD150-350 Slave with 8m slave cable	No.	1		
1.32.3.6	Optional extra for T Ring	No.	1		
1.32.3.7	Variable Volume Swirl Diffuser on 595x595mm plate white no heating	No.	1		
1.32.3.8	VSW150-300 S595 Master, Power Pack and Wall Stat	No.	1		
1.32.3.9	VSD150-300S595 Slave with 8m slave cable	No.	1		
1.32.3.10	VRW150-300 Master, Power Pack and Wall Stat	No.	1		
1.32.3.11	VRW150-300 Slave with 8m slave cable	No.	1		
1.32.3.12	Optional extra for T Ring	No.	1		
1.32.3.13	VCD150-350 S595 Master with Heater, Power Pack and Wall Stat	No.	1		
1.32.3.14	VCD150-350S595 Slave with Heater & 8m slave cable	No.	1		
1.32.3.15	Air Flow Switch (Heater Safety Cut-Out)	No.	1		
1.32.3.16	Variable Volume Diffuser Circular for skimmed Ceiling White with Heater	No.	1		
1.32.3.17	VRD150-350 Master with Heater, Power Pack and Wall Stat	No.	1		
1.32.3.18	VRD150-350 Slave with Heater & 8m Slave Cable	No.	1		
1.32.3.19	Optional extra for T Ring	No.	1		
1.32.3.20	Variable Volume Swirl Diffuser on 595x595mm plate White with Heater	No.	1		
1.32.3.21	VSW150-300 S595 Master with Heater, Power Pack and Wall Stat	No.	1		
1.32.3.22	VSW150-300S595 Slave with Heater & 8m slave cable	No.	1		
1.32.3.23	Air Flow Switch (Heater Safety Cut-Out)	No.	1		
1.32.3.24	Variable Volume Swirl Diffuser Circular for Skimmed Ceiling White with Heater	No.	1		
1.32.3.25	VRW150-300 Master, Power Pack and Wall Stat	No.	1		
1.32.3.26	VRW150-300 Slave with 8m slave cable	No.	1		
1.32.3.27	Optional extra for T Ring	No.	1		
1.32.3.28	Room Thermostat 0 - 30 Deg C	No.	1		
1.32.3.29	Room Humidistat 10-95%	No.	1		

1.32.3.30	Room Thermostat H/C 5-30 Deg C 0-10V DC Signal	No.	1		
1.32.3.31	CO2 Wall Transmitter 0-10V with display	No.	1		
1.32.3.32	30-120 deg C 1000mm Capillary with Knob & Escutcion Plate	No.	1		
1,33	<u>RETAINER CLIPS (Electroplated)</u>				
1.33.1	25mm Slide On Clip	No.	1		
1.33.2	75mm Slide On Clip	No.	1		
1.33.3	50mm Slide On Clip	No.	1		
1.33.4	100mm Slide On Clip	No.	1		
1,34	<u>HOLDING FRAMES (Zinc Pasivated Econoframes fitted with Gasket)</u>				
1.34.1	610 X 610 X 50	No.	1		
1.34.2	305 X 610 X 50	No.	1		
1.34.3	406 X 508 X 50	No.	1		
1.34.4	508 X 635 X 50	No.	1		
1.34.5	406 X 635 X 50	No.	1		
1.34.6	508 X 508 X 50	No.	1		
1.34.7	508 X 610 X 50	No.	1		
1.34.8	406 X 406 X 50	No.	1		
1.34.9	406 X 610 X 50	No.	1		
1.34.10	610 X 610 X 50 STAINLESS STEEL	No.	1		
1,35	<u>SENSORS</u>				
1.35.1	Room Air Temperature Sensor	No.	1		
1.35.2	Duct Air Temperature Sensor	No.	1		
1.35.3	CO-2 Sensors	No.	1		
1,36	<u>TURBINE VENTILATORS (WHIRLYBIRDS)</u>				
1.36.1	WHIRLYBIRD 300 ALU - 924 m3/hr	No.	1		
1.36.2	WHIRLYBIRD 350 ALU - 1155 m3/hr	No.	1		

1.36.3	GALVANIZED 300 TURBINE - 924 m3/hr	No.	1		
1.36.4	TWISTER 500 GALV - 4695 m3/hr	No.	1		
1.36.5	TWISTER 500 ALU - 4695 m3/hr	No.	1		
1.36.6	TWISTER 600 GALV - 6150 m3/hr	No.	1		
1.36.7	TWISTER 600 ALU - 6150 m3/hr	No.	1		
1.36.8	130MM VENT - AVAILABLE IN WHITE - 68m3/hr	No.	1		
1.36.9	SUPA VENT 250mm - SLATE GREY/IVORY/TERRACOTTA/GREEN/BLACK/BROWN - 1219 m3/hr	No.	1		
1.36.10	SEWER VENT 150MM - AVAILABLE IN WHITE - 488 m3/hr	No.	1		
1.36.11	GP VENT 130MM - AVAILABLE IN WHITE - 68 m3/hr	No.	1		
1.36.12	HURICANE 900MM - ALU- 10000- 12000 m3/hr	No.	1		
1,37	<u>SLOPE MOUNTED VENTILATORS</u>				
1.37.1	Throat Sizes: 415mm : 1220mm x 385mm	No.	1		
1.37.2	Throat Sizes: 615mm : 1830mm x 385mm	No.	1		
1.37.3	Throat Sizes: 724mm : 2134mm x 609mm	No.	1		
1,38	<u>SMOKE AND NATURAL VENTILATION ROOF VENTILATORS</u>				
1.38.1	Throat Area: 0.9m2 : 1010mm Width x 2120mm Length	No.	1		
1.38.2	Throat Area: 1.2m2 : 1210mm Width x 2120mm Length	No.	1		
1.38.3	Throat Area: 1.5m2 : 1530mm Width x 2120mm Length	No.	1		
1,39	<u>SMOKE ROOF VENTILATORS</u>				
1.39.1	Throat Area: 1.5m2 : 1595mm Width x 1620mm Length	No.	1		
1.39.2	Throat Area: 2.33m2 : 2045mm Width x 1870mm Length	No.	1		
1.39.3	Throat Area: 2.97m2 : 2400mm Width x 1870mm Length	No.	1		
1.39.4	Throat Area: 3.45m2 : 2400mm Width x 2120mm Length	No.	1		
1.39.5	Throat Area: 3.94m2 : 2400mm Width x 2370mm Length	No.	1		
1,4	<u>KITCHEN HVAC</u>				

	Kitchen Extraction Canopy, Ducting, and Fan Assembly - electrical equipment				
	The Contractor to make allowance for the supply, delivery, installation, and commissioning of Kitchen Extraction Canopy over electrical or gas stoves/ovens. The Extraction Canopy to c/w LED lights, grease drawers, condensate drain, baffle filters,, and extraction ducting. Rate to include ducting, filters, fans, etc.,				
1.40.1	<u>Extraction Canopy Island Type</u>				
1.40.1.1	1800 x 1800 x 600 mm	No.	1		
1.40.1.2	2400 x 1800 x 600 mm	No.	1		
1.40.1.3	3000 x 1800 x 600 mm	No.	1		
1.40.1.4	3600 x 1800 x 600 mm	No.	1		
1.40.1.5	4000 x 1800 x 600 mm	No.	1		
1.40.1.6	4800 x 1800 x 600 mm	No.	1		
1.40.1.7	6000 x 1800 x 600 mm	No.	1		
1.40.2	<u>Extraction Canopy Flat Back Type</u>				
1.40.2.1	1200 x 1200 x 600 mm	No.	1		
1.40.2.2	1800 x 1200 x 600 mm	No.	1		
1.40.2.3	2400 x 1200 x 600 mm	No.	1		
1.40.2.4	3000 x 1200 x 600 mm	No.	1		
1.40.2.5	3600 x 1200 x 600 mm	No.	1		
1.40.2.6	4000 x 1200 x 600 mm	No.	1		
1.40.2.7	4800 x 1200 x 600 mm	No.	1		
1.40.2.8	6000 x 1200 x 600 mm	No.	1		
1,41	<u>COLD ROOM</u>				
	Cold room walls, door, and roof panels polyurethane. Provision to be made for lights, condensate drain defrost elements and temperature measurement and indicator. A temperature gauge to be mounted on the outside. An emergency buzzer and light shall be mounted outside with activation button in breakglass unit inside.				
1.41.1	1.8m x 1.8m x 2.4m high	No.	1		



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1.41.2	2.4m x 2.4m x 2.4m high	No.	1		
1.41.3	3.0m x 3.0m x 2.4m high	No.	1		
1.41.4	3.0m x 3.0m x 3.0m high	No.	1		
1.41.5	3.6m x 2.3m x 2.9m high	No.	1		
1.42	<u>FREEZER ROOM</u>				
	Freezer room walls, door, and roof panels polyurethane. Provision to be made for lights, condensate drain defrost elements and temperature measurement and indicator. A temperature gauge to be mounted on the outside. An emergency buzzer and light shall be mounted outside with activation button in breakglass unit inside.				
1.42.1	1.8m x 1.8m x 2.4m high	No.	1		
1.42.2	1.8m x 2.4m x 2.4m high	No.	1		
1.42.3	2.4m x 2.4m x 2.4m high	No.	1		
1.42.4	2.4m x 3.0m x 2.4m high	No.	1		
1.42.5	2.4m x 3.6m x 2.4m high	No.	1		
1.42.6	3.6m x 2.3m x 2.9m high	No.	1		
1.42.7	3.6m x 3.6m x 2.4m high	No.	1		
1.43	<u>HOT WATER GENERATION HEAT PUMPS</u>				
1.43.1	<u>MEDIUM TEMPERATURE HEAT PUMPS (R410a) c/w Pump and Brackets</u>	No.	1		
1.43.1.1	7.7 kW Output	No.	1		
1.43.1.2	11.5 kW Output	No.	1		
1.43.1.3	19 kW Output	No.	1		
1.43.1.4	23kW Output	No.	1		
1.43.1.5	30.5 kW Output	No.	1		
1.43.1.6	38 kW Output	No.	1		
1.43.1.7	46 kW Output	No.	1		
1.43.1.8	75 kW Output	No.	1		
1.43.1.9	90 kW Output	No.	1		
1.43.1.10	110 kW Output	No.	1		

1.43.2	<u>MEDIUM TEMPERATURE HEAT PUMPS (R410a) GALVANISED (INCL FCV) c/w Pump and Brackets</u>	No.	1		
1.43.2.1	7.7 kW Output	No.	1		
1.43.2.2	30.5 kW Output	No.	1		
1.43.2.3	38 kW Output	No.	1		
1.43.2.4	46 kW Output	No.	1		
1.43.2.5	75 kW Output	No.	1		
1.43.2.6	90 kW Output	No.	1		
1.43.2.7	110 kW Output	No.	1		
1.43.3	<u>MEDIUM TEMPERATURE HEAT PUMPS (R410a) STAINLESS STEEL c/w Pump and Brackets</u>				
1.43.3.1	7.7 kW Output	No.	1		
1.43.3.2	11.5 kW Output	No.	1		
1.43.3.3	19 kW Output	No.	1		
1.43.3.4	23 kW Output	No.	1		
1.43.3.5	30.5 kW Output	No.	1		
1.43.3.6	38 kW Output	No.	1		
1.43.3.7	46 kW Output	No.	1		
1.43.3.8	75 kW Output	No.	1		
1.43.3.9	90 kW Output	No.	1		
1.43.3.10	110 kW Output	No.	1		
1.43.4	<u>MEDIUM TEMPERATURE HEAT PUMPS (R410a) STAINLESS STEEL (Incl. FCV) c/w Pump and Brackets</u>				
1.43.4.1	7.7 kW Output	No.	1		
1.43.4.2	30.5 kW Output	No.	1		
1.43.4.3	38 kW Output	No.	1		
1.43.4.4	46 kW Output	No.	1		
1.43.4.5	75 kW Output	No.	1		
1.43.4.6	90 kW Output	No.	1		

1.43.4.7	110 kW Output	No.	1		
1.43.5	<u>HIGH TEMPERATURE HEAT PUMPS (R134a) GALVANISED c/w Pump and Brackets</u>				
1.43.5.1	7.7 kW Output	No.	1		
1.43.5.2	15.5 kW Output	No.	1		
1.43.5.3	31 kW Output	No.	1		
1.43.5.4	62 kW Output	No.	1		
1.43.6	<u>HIGH TEMPERATURE HEAT PUMPS (R134a) STAINLESS STEEL c/w Pump and Brackets</u>				
1.43.6.1	7.0 kW Output	No.	1		
1.43.6.2	15.5 kW Output	No.	1		
1.43.6.3	31 kW Output	No.	1		
1.43.6.4	62 kW Output	No.	1		
1.43.7	<u>CIRCULATION PUMPS</u>				
1.43.7.1	15mm	No.	1		
1.43.7.2	25mm	No.	1		
1.43.7.3	32mm	No.	1		
1.43.7.4	50mm	No.	1		
1.43.8	<u>FLOW CONTROL VALVES</u>				
1.43.8.1	15mm	No.	1		
1.43.8.2	22mm	No.	1		
1.43.8.3	28mm	No.	1		
1.44	<u>ELECTRICAL CONNECTION:</u>				
1.44.1	The Contractor shall make provision for electrical connections for both indoor and outdoor AC Units.	No.	1		
1.45	<u>TESTING AND COMMISSIONING</u>				

1.45.1	The Contractor to allow for testing and commissioning of the entire HVAC installation after completion.	No.	1		
1.46	PROVISIONAL SUM				
	The Contractor to make allowance for the provision of items not covered in the above HVAC Scope breakdown.				
1.46.1	Miscellaneous Items				
1.46.1.1					
1.46.1.2					
1.46.1.3					
1.46.1.4					
1.46.1.5					
1.46.1.6					
ITEM	DESCRIPTION	UNIT	QTY	SUPPLY RATE	INSTALL RATE
2	BILL NO.2.0: FIRE FIGHTING EQUIPMENT AND SIGNAGE				
2,1	PRELIMINARIES & GENERAL				
2.1.1	Preliminaries and General including OHS.	%	1		
2,2	SPRINKLER SYSTEM				
2.2.1	SPRINKLER INSTALLATION CONTROL VALVE ASSEMBLY				
	Each control valve described hereunder shall consist of but not limited to the following: (1) Isolating Stop Valves, (2) A water motor alarm and gong, (3) Two pressure gauges located in either side of the alarm valve, (4) 15mm test pipe, (5) Ø50mm flushing connection, (6) Two Ø65mm instantaneous Fire Brigade booster connections, if required (7) Non-Return Valve if required, (8) bypass arrangement, (9) flow switch, (10) required fittings and supports complete with end caps.				
2.2.1.1	Ø300mm Sprinkler Control Valve Manifold	No.	1		
2.2.1.2	Ø250mm Sprinkler Control Valve Manifold	No.	1		
2.2.1.3	Ø200mm Sprinkler Control Valve Manifold	No.	1		
2.2.1.4	150mm Sprinkler Control Valve Manifold	No.	1		

2.2.1.5	Ø100mm Sprinkler Control Valve Manifold	No.	1		
2.2.1.6	Ø100mm Deluge Valve, single knock, hydraulic operated including all trim, alarm gong, gauges, flow switch and required fittings and supports	No.	1		
2.2.1.7	Ø200mm Deluge Valve, single knock, hydraulic operated including all trim, alarm gong, gauges, flow switch and required fittings and supports	No.	1		
2.2.2	<u>SPRINKLER SUPPLY MAINS - FROM ICV TO SPRINKLER ARRAY</u>				
	All sprinkler piping shall be medium grade black steel piping to SANS 62-1 or BS1387				
2.2.2.1	Ø200mm piping	m	1		
2.2.2.2	Ø150mm piping	m	1		
2.2.2.3	Ø100mm piping	m	1		
2.2.2.4	Ø80mm piping	m	1		
2.2.2.5	Ø65mm piping	m	1		
2.2.3	<u>SPRINKLER RANGE PIPING</u>				
	All sprinkler piping shall be medium grade black steel piping to SANS 62-1 or BS1387				
2.2.3.1	Ø65mm sprinkler range pipe	m	1		
2.2.3.2	Ø50mm sprinkler range pipe	m	1		
2.2.3.3	Ø40mm sprinkler range pipe	m	1		
2.2.3.4	Ø32mm sprinkler range pipe	m	1		
2.2.3.5	Ø25mm sprinkler range pipe	m	1		
2.2.3.6	Ø15mm sprinkler range pipe	m	1		
2.2.4	<u>SPRINKLER HEADS</u>				
	The Contractor to supply and install glass bulb type sprinkler heads (Viking or Victaulic or equal and approved)		1		
2.2.4.1	Ø20mm, 93°C, brass conventional, Standard Response K11.5, 15.0mm/min density roof level sprinklers	No.	1		
2.2.4.2	Ø20mm, 93°C, brass upright, Standard Response K11.5, 15.0mm/min density concrete roof exposed sprinklers	No.	1		

2.2.4.3	Ø15mm, 60°C, brass upright, Standard Response K18, 7.5mm/min density sprinklers to basement parking and offices	No.	1		
2.2.4.4	Ø15mm, 68°C, brass upright, Standard Response K8, 7.5mm/min density stairway/lobby level sprinklers including water shield and guards	No.	1		
2.2.4.5	Ø15mm, 68°C, Chrome pendant, Quick Response K8, 5.0mm/min density ceiling level sprinklers	No.	1		
2.2.4.6	Ø15mm, 93°C, brass upright, Standard Response K8, 7.5mm/min density to refuse, conveyor, and delivery areas	No.	1		
2.2.4.7	Ø15mm, 68°C, Fixed Temperature Release pilot sprinklers	No.	1		
2.2.4.8	Ø15mm, Open wall drencher (Galvanised piping)	No.	1		
2.2.4.9	Medium Velocity Nozzle Sprayers	No.	1		
2.2.4.10	Valve Chamber Protection exposed sprinkler heads	No.	1		
2.2.4.11	Allow for dry-pendant sprinklers for freezer room	No.	1		
2.2.4.12	Allow for dry-pendant sprinklers for cold room	No.	1		
2.2.4.13	22.5 mm/min Density Viking sprinkler or equal approved Sprinkler (ESFR)	No.	1		
2.2.5	<u>REMOTE TEST VALVES</u>				
2.2.5.1	End of line Drain valves installation of remote test valves in specified areas	No.	1		
2.2.6	<u>PAINTING AND FINISHINGS</u>				
	The Contractor shall make provision for painting and finishing of the sprinkler piping with one coat red oxide primer and two coats signal red paint for associated fittings and supports.		1		
2.2.6.1	Ø200mm Medium quality black sprinkler main pipework	m	1		
2.2.6.2	Ø150mm Medium quality black sprinkler main pipework	m	1		
2.2.6.3	Ø100mm Medium quality black sprinkler main pipework	m	1		
2.2.6.4	Ø80mm Medium quality black sprinkler main pipework	m	1		
2.2.6.5	Ø65mm Medium quality black sprinkler range pipework	m	1		
2.2.6.6	Ø50mm Medium quality black sprinkler range pipework	m	1		
2.2.6.7	Ø40mm Medium quality black sprinkler range pipework	m	1		
2.2.6.8	Ø32mm Medium quality black sprinkler range pipework	m	1		

2.2.6.9	Ø25mm Medium quality black sprinkler range pipework	m	1		
2.2.6.10	Ø15mm Medium quality black sprinkler range pipework	m	1		
	<u>PIPE FITTINGS</u>				
	The Contractor to make allowance for the following pipe fittings (Bends, Tees, Reducers, Couplings, Nipples, etc., as required)				
2.2.7	<u>BENDS</u>				
2.2.7.1	200 mm	No.	1		
2.2.7.2	150 mm	No.	1		
2.2.7.3	100 mm	No.	1		
2.2.7.4	80 mm	No.	1		
2.2.7.5	65 mm	No.	1		
2.2.7.6	50 mm	No.	1		
2.2.7.7	40 mm	No.	1		
2.2.7.8	32 mm	No.	1		
2.2.7.9	25 mm	No.	1		
2.2.7.10	15 mm	No.	1		
2.2.8	<u>TEES</u>				
2.2.8.1	200x200x200mm	No.	1		
2.2.8.2	200 x 150 x 200mm	No.	1		
2.2.8.3	150 x 150 x 150mm	No.	1		
2.2.8.4	150 x 100 x 150mm	No.	1		
2.2.8.5	100 x 100 x 100mm	No.	1		
2.2.8.6	100 x 80 x 100mm	No.	1		
2.2.8.7	100 x 65 x 100mm	No.	1		
2.2.8.8	80 x 80 x 80mm	No.	1		
2.2.8.9	80 x 65 x 80mm	No.	1		
2.2.8.10	65 x 65 x 65mm	No.	1		
2.2.8.11	65 x 32 x 65mm	No.	1		

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2.2.8.12	65 x 25 x 65mm	No.	1		
2.2.8.13	32 x 32 x 32mm	No.	1		
2.2.8.14	32 x 25 x 32mm	No.	1		
2.2.8.15	25 x 25 x 25mm	No.	1		
2.2.8.16	25 x 15 x 25mm	No.	1		
2.2.9	<u>COUPLINGS</u>				
2.2.9.1	200 mm	No.	1		
2.2.9.2	150 mm	No.	1		
2.2.9.3	100 mm	No.	1		
2.2.9.4	80 mm	No.	1		
2.2.9.5	65 mm	No.	1		
2.2.9.6	50 mm	No.	1		
2.2.9.7	40 mm	No.	1		
2.2.9.8	32 mm	No.	1		
2.2.10	<u>PIPE HANGERS AND BRACKETS (STEEL PIPING)</u>				
	The Contractor shall make provision for fixing and/or replacement of the pipe hangers as well as supplying additional pipe hangers and brackets for new sprinklers				
2.2.10.1	200 mm	No.	1		
2.2.10.2	150 mm	No.	1		
2.2.10.3	100 mm	No.	1		
2.2.10.4	80 mm	No.	1		
2.2.10.5	65 mm	No.	1		
2.2.10.6	50 mm	No.	1		
2.2.10.7	40 mm	No.	1		
2.2.10.8	32 mm	No.	1		
2.2.11	<u>SPARE PARTS</u>				
2.2.11.1	Spare Parts as listed in the ASIB Specifications	Set	1		

2.2.12	<u>ASIB INSPECTIONS</u>				
2.2.12.1	Allow for ASIB Inspections	No.	1		
2.2.13	<u>ITEMS NOT LISTED BUT NECESSARY FOR THE SUCCESSFUL COMPLETION OF THE FIXED AUTOMATIC SPRINKLER FIRE-FIGHTING INSTALLATION</u>				
2.2.13.1	Please specify	No.	1		
2.2.13.2	Please specify	No.	1		
2.2.13.3	Please specify	No.	1		
2.2.13.4	Please specify	No.	1		
2.2.13.5	Please specify	No.	1		
2.2.13.6	Please specify	No.	1		
2,3	<u>FIRE HOSE REELS:</u>				
	Fire hose reels to comply with requirements contained in SANS 543 and maintained in accordance with the requirements as given in SANS 1475-2 .				
2.3.1	The Contractor shall make provision for the supply and installation, testing and commissioning of the 30 m length Fire Hose Reels (of 20mm internal diameter) including 3m connecting pipework in accordance to SANS 10400 and Local Fire Department Regulations. The Fire Hose Reel to come complete with mounting brackets, stands, shut-off valve, nozzle, line pressure gauge with proper vent cock and union.	No.	1		
2,4	<u>FIRE HYDRANTS:</u>				
	Fire hydrants connections to comply with requirements contained in SANS 1128-2 . Hydrant connections be provided with a length of fire hose 30m in length together with couplings and a 16mm internal diameter nozzle. C/w pressure gauge, syphon and U-tube.				
2.4.1	<u>External Fire Hydrant:</u> The Contractor shall make provision for the supply and installation, testing and commissioning of the hand wheel operated fire hydrant valves including standpipe in accordance to SANS 10400 and Local Fire Department Regulations.	No.	1		

2.4.2	<u>Tamper Proof Fire Hydrant and Twin Booster Connection:</u> The Contractor shall make provision for the supply and installation, testing and commissioning of tamper proof external fire hydrant valves including standpipe in accordance to SANS 10400 and Local Fire Department Regulations. The Twin Fire Booster connection to come complete with Plastic material dust covers and connecting chain, pressure gauge adaptor with ball valve. Twin booster position shall be installed at site entrance or in a suitable position for access by the Fire Brigade.	No.	1		
2.4.3	<u>Internal Fire Hydrant:</u> The Contractor shall make provision for the supply and installation, testing and commissioning of hand wheel operated internal fire hydrant valves including standpipe in accordance to SANS 10400 and Local Fire Department Regulations.	No.	1		
2.4.4	<u>Canvas Fire Hose:</u> The Contractor to make provision for the supply of canvas fire hose 30m in length for one external and internal fire hydrant, c/w couplings and nozzle	No.	1		
2.4.5	<u>Backflow Preventer/ Non-Return Valve:</u> Supply and install Cast Iron Wafer Check Valve with Ductile Iron or 316 Stainless Steel Double Doors and EPDM Seal. This valve assembly to be encased in a medium grade 600mm x 480mm manhole with frame for access for maintenance.	No.	1		
2,5	<u>FIRE EXTINGUISHERS:</u>				
	Hand held fire extinguishers shall comply with the requirements contained in SANS 1910 or SANS 1151, and shall be installed, maintained, and serviced in accordance with SANS 10105-1 and SANS 1474-1.				
	The Contractor shall make provision for the supply, install, test and commission of the following Fire Extinguishers including backing boards in accordance to SANS 10400 and Local Fire Department Regulations.				
2.5.1	2kg CO2 hand held fire extinguishers	No.	1		
2.5.2	5kg CO2 hand held fire extinguishers	No.	1		
2.5.3	4.5kg DCP hand held fire extinguishers	No.	1		
2.5.4	9kg DCP hand held fire extinguishers	No.	1		
2.5.5	Backing Boards with hanging brackets	No.	1		
2.5.6	Tamper Seals	No.	1		
2.5.7	Supply and Install new Fire Extinguishers Hinged Door Cabinets/Covers, if required.	No.	1		
2,6	<u>FIRE SIGNAGE:</u>				

	The Contractor to make provision for Photoluminescent fire equipment and direction location signage and warning notices in accordance with SANS 1186-1: 2008 , and incorporating the pictographs in the standard sizes, securely fixed to wall, door, ceiling or soffit as required and as maybe indicated on drawings and architectural specifications. No fixing mechanisms by use of doubles sided tape will be permitted. Only durable steel screws and aluminium frames will be allowed.				
2.6.1	<u>Photoluminescent Signs for Fire Equipment and Direction location</u>				
2.6.1.1	150 x 150 mm	No.	1		
2.6.1.2	190 x 190 mm	No.	1		
2.6.1.3	290 x 290 mm	No.	1		
2.6.1.4	440 x 440 mm	No.	1		
2.6.2	<u>Photoluminescent Signs for Fire Escape Routes or EXITS</u>				
2.6.2.1	150 x 150 mm	No.	1		
2.6.2.2	190 x 190 mm	No.	1		
2.6.2.3	290 x 290 mm	No.	1		
2.6.2.4	440 x 440 mm	No.	1		
2,7	<u>FIRE SEALING</u>				
	The Contractor shall make provision for the supply and installation of fire sealants.				
2.7.1	Supply and install approved fire stop collar for 110mm diameter pipe penetrating firewalls	No.	1		
2.7.2	Supply and install approved fire stop collar for 50mm diameter pipe penetrating firewalls	No.	1		
2.7.3	Supply and install Firestop foam 300ml catridge or similar approved seal cable penetrations within the building where necessary upon instruction of the Fire Engineer.	No.	1		
2,8	<u>FIRE PIPING & FITTINGS</u>				
	The Contractor shall make provision for the supply and installation of Heavy duty galvanised mild steel (GMS) screwed and socketed pipes to SANS 62,in the running length, and all necessary supports, fixing, brackets, saddles, holderbats., etc.				
	Note: Rate to include for all fittings: Elbows, T-pieces, reducers, bushes, couplers, etc.,				
2.8.1	Ø150mm	No.	1		

2.8.2	Ø110mm	No.	1		
2.8.3	Ø100mm	No.	1		
2.8.4	Ø80mm	No.	1		
2.8.5	Ø50mm	No.	1		
2.8.6	Ø40mm	No.	1		
2.8.7	Ø25mm	No.	1		
2.8.8	Ø15mm	No.	1		
2,9	TESTING AND COMMISSIONING				
2.9.1	The Contractor to allow for testing and commissioning of the entire Fire Protection installation after completion.	No.	1		
2.9.2	Flushing of pipework and pressure testing as per SANS 10287 and 10252	No.	1		
2,1	BULK FIRE WATER STORAGE TANK:				
	The Contractor shall make provision for the supply and installation, testing and commissioning of the following bulk fire water storage tanks. The quote is to include all storage tank accessories.				
2.10.1	50 kLTank (50m3)	No.	1		
2.10.2	85 kLTank (85 m3)	No.	1		
2.10.3	100 kLTank (100m3)	No.	1		
2.10.4	150 kLTank (150m3)	No.	1		
2.10.5	200 kLTank (200m3)	No.	1		
2.10.6	300kLTank (300m3)	No.	1		
2.10.7	400 kLTank (400m3)	No.	1		
2.10.8	500 kLTank (500m3)	No.	1		
2.10.9	600 kLTank (600m3)	No.	1		
2.10.10	700 kLTank (700m3)	No.	1		
2.10.11	800 kLTank (800m3)	No.	1		
2,11	FIRE BOOSTER PUMPS:				
2.11.1	Sprinkler Diesel and Electric Pumps				

	Supply and install 1 x electrical duty, plus jockey pump and standby diesel driven sprinkler pump set complete with all pumphouse piping and fittings including dry run protection, electrical control panels, valves in accordance with the good practice guide of ASIB 12th edition of 2021 or latest revision.	Set	2		
	<u>Pump Duty</u>				
	1800 L/min @6-8 bar (Main electric and diesel driven pump)				
	120 L/min @ 7 bar (Jockey)				
2.11.2	<u>Hydrant Electric Pumps</u>				
	Supply and install duty and standby electrical pumps plus jockey pump complete with all pump house piping and fittings including dry run protection, electrical control panels, valves, etc., in accordance with the good practice guide of ASIB 12th edition of 2021 or latest revision.	Set	2		
	<u>Pump Duty</u>				
	2500 L/min @6 bar (duty and standby pumps)				
	90 L/min @ 6 bar (Jockey)				
2.11.3	Electric Jockey Pump and Controller	Sum	1		
2.11.4	Pump room piping	Sum	1		
2.11.5	Supply, delivery, installation, connection, testing and commissioning of Fire Booster Pumps for the fire hydrant system: duty 9m ³ /hr@4.6 bar (1 standby & 1 duty)	Set	2		
2.11.6	Supply, delivery, installation, connection, testing and commissioning of Jockey Pumps for the fire hydrant system	Sum	1		
2.12	<u>ELECTRICAL INSTALLATION:</u>				
	The electrical contractor will provide power up to a point inside the plant room. All electrical related work to the Fire Bulk Water System from this point onwards will form part of this contract.				
2.12.1	<u>Control panels</u> as per specification - weather proof - complete to operate the entire system as per SANS regulations. Allow for standby/duty selector switch on primary pumps and circulation pumps, overload protection, temperature control at 60°C (adjustable), contactors, circuit breakers, indicating pilot lights, volt meter and amp meter. Allow for pressure control sensors where applicable. Control panel to include Run/Trip indicators with bright 1Watt LED lamps. Including Temperature indicators.	No.	1		

2.12.2	All cabling, connections to equipment, unistrut, cable trays, glands, shrouds, earth cable etc to conform to the SANS Regulations as amended. All metal and copper parts to be earth bonded to system electrical network earth.	No.	1		
2.12.3	Instrumentation: complete (temperature & pressure gauges. Temp gauges scale 1-120. Pressure gauges scale 0-6bar. Pressure gauges to be fitted with U tube and brass Bib-cocks. Water meter required for hot water system as Kent impeller type or equal - one per plant).	No.	1		
2,13	<u>GALVANIZED MILD STEEL PIPING:</u>				
	The Contractor shall make provision for the supply and installation of Heavy duty galvanised mild steel (GMS) screwed and socketed pipes to SANS 62, in the running length, and all necessary supports, fixing, brackets, saddles, holder bats., etc.				
	Note: Rate to include for all fittings: Elbows, T-pieces, reducers, bushes, couplers, etc.,				
2.13.1	Ø150mm	No.	1		
2.13.2	Ø110mm	No.	1		
2.13.3	Ø100mm	No.	1		
2.13.4	Ø80mm	No.	1		
2.13.5	Ø50mm	No.	1		
2.13.6	Ø40mm	No.	1		
2.13.7	Ø25mm	No.	1		
2,14	<u>BELOW GROUND EXTERNAL PIPING (BY OTHERS)</u>				
	High Pressure uPVC Class 16 pipes and fittings to SANS 966 Part 1:2019 suitable for below-ground applications for the conveyance of portable water in reticulation systems in which continuous temperatures in excess of 25°C are not encountered.				
2.14.1	Ø160mm High pressure pipe laid in ground not exceeding 1000mm deep	No.	1		
2.14.2	Ø110mm High pressure pipe laid in ground not exceeding 1000mm deep	No.	1		
2.14.3	Ø75mm High pressure pipe laid in ground not exceeding 1000mm deep	No.	1		
2,15	<u>VALVES</u>				
	The Contractor shall make provision for the supply, installation, testing and commission of the following types of valves				

	<u>Isolating Valves</u>				
2.15.1	150mm	No.	1		
2.15.2	110mm	No.	1		
2.15.3	100mm	No.	1		
2.15.4	80mm	No.	1		
2.15.5	50mm	No.	1		
2.15.6	40mm	No.	1		
2.15.7	25mm	No.	1		
2.15.8	15mm	No.	1		
	<u>Non-Return Valves</u>				
2.15.9	150mm	No.	1		
2.15.10	110mm	No.	1		
2.15.11	100mm	No.	1		
2.15.12	80mm	No.	1		
2.15.13	50mm	No.	1		
2.15.14	40mm	No.	1		
2.15.15	25mm	No.	1		
2.15.16	15mm	No.	1		
	<u>Pressure Reducing Valves</u>				
2.15.17	150mm	No.	1		
2.15.18	110mm	No.	1		
2.15.19	100mm	No.	1		
2.15.20	80mm	No.	1		
2.15.21	50mm	No.	1		
2.15.22	40mm	No.	1		
2.15.23	25mm	No.	1		
2.15.24	15mm	No.	1		

2,16	<u>PRESSURE GAUGES</u>				
	The Contractor shall make provision for the supply, installation, testing and commission of any pressure gauges				
2.16.1	Pressure Gauges (0-6bar)	No.	1		
2,17	<u>GAS SUPPRESSION SYSTEMS -for Server Rooms and Data Centers</u>				
	The Contractor shall make provision for the supply, installation, testing and commission of gas suppression system <u>Novec 1230; FM 200</u> or similar approved				
	<u>Panel</u>				
2.17.1	3 zone contro panel	No.	1		
2.17.2	Conventional 2 Loop control panel with gas release interface	No.	1		
2.17.3	Extinguishant Release Interface (Externally Powered)	No.	1		
2.17.4	Battery 12VDC 18amp	No.	1		
2.17.5	2 off 12V DC 12 AH Battery	No.	1		
	<u>Cables</u>				
2.17.6	PH30 fire cable, 2-core, 1,5mm, screened with over sheath	m	1		
2.17.7	Network cable- SABS or NRCH approved	m	1		
2.17.8	Galvanized Cable way conduit 25mm with saddles (Saddle every 1.5m per length) - 4m lengths	No.	1		
	<u>Detectors</u>				
2.17.9	Intelligent Optical Smoke Sensors	No.	1		
2.17.10	Combination Heat and Optical detectors c/w base	No.	1		
2.17.11	Intelligent Addressable Common Mounting Base	No.	1		
2.17.12	Combination alarm sounder and flashing beacon	No.	1		
2.17.13	Bell Gong Second Knock	No.	1		
2.17.14	HVAC shutdown relay c/w enclosure	No.	1		
	<u>Manual Call Points</u>				
2.17.15	Surface/Flush Call Point - Non-resettable	No.	1		

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2.17.16	Weatherproof Call Point - Non-resettable	No.	1		
2.17.17	Protective Hinged Cover	No.	1		
2.17.18	Conventional Manual Call Points	No.	1		
	<u>Outputs</u>				
2.17.19	GCU termination and PG cage monitor	No.	1		
2.17.20	3 Channel I/O Units (resets on reset)	No.	1		
2.17.21	Wall VAD Red Flash and Shallow Base or similar approved. High volume multi-tone indoor type	No.	1		
2.17.22	<u>Extinguishant</u>				
2.17.23	50NB downstream pipes seamless steel pipe c/w hangers	No.	1		
2.17.24	40NB downstream pipes seamless steel pipe c/w hangers	No.	1		
2.17.25	25NB downstream pipes seamless steel pipe c/w hangers	No.	1		
2.17.26	Cylinders 80-300 M25DMV filled with Novec 1230	No.	1		
2.17.27	80l Novec 1230 cylinder clamps set c/w accessories	No.	1		
2.17.28	Mano switch, cable kits actuator disc elbows	No.	1		
2.17.29	Gas Suppression cylinder sized for Server of 5mx5m, FM200 or similar approved	No.	1		
2.17.30	Piping system to suit Gas Suppression System plus reticulation to suit gas, including piping, fittings and ancillaries.	No.	1		
	<u>General</u>				
2.17.31	Fire Alarm System Log Book with holder	No.	1		
2.17.32	Installation, Testing, Commissioning (including all ancillaries and small works) and hand over	No.	1		
ITEM	DESCRIPTION	UNIT	QTY	SUPPLY RATE	INSTALL RATE
3	BILL NO.3.0: WET SERVICES INSTALLATIONS				
3,1	<u>PRELIMINARIES & GENERAL</u>				
3.1.1	Preliminaries and General including OHS.	%			

	<u>HOT & COLD WATER PLUMBING:</u>				
	The Contractor shall make provision for the supply and installation, testing and commissioning of Copper Piping, including brackets, support, insulation, cladding, and painting. Copper piping to conform to SANS 460 Class 1 or 2 pipe reticulation.				
3,2	<u>COLD WATER PIPEWORK</u>				
3.2.1	<u>COLD WATER PIPEWORK - Copper Pipes</u>				
3.2.1.1	Ø100mm Pipes	m	1		
3.2.1.2	Ø80mm Pipes	m	1		
3.2.1.3	Ø65mm Pipes	m	1		
3.2.1.4	Ø50mm Pipes	m	1		
3.2.1.5	Ø35mm Pipes	m	1		
3.2.1.6	Ø28mm Pipes	m	1		
3.2.1.7	Ø22mm Pipes	m	1		
3.2.1.8	Ø15mm Pipes	m	1		
3.2.2	<u>COLD WATER PIPEWORK - Galvanised steel pipework</u>				
3.2.2.1	Ø100mm Pipes	m	1		
3.2.2.2	Ø80mm Pipes	m	1		
3.2.2.3	Ø65mm Pipes	m	1		
3.2.2.4	Ø50mm Pipes	m	1		
3.2.2.5	Ø32mm Pipes	m	1		
3.2.2.6	Ø25mm Pipes	m	1		
3.2.2.7	Ø15mm Pipes	m	1		
=	<u>ISOLATING VALVES:</u>	=	=	=	=
	The Contractor shall make provision for the supply and installation, testing and commissioning of isolating valves on cold water pipes.				
3,3	<u>ISOLATING VALVES</u>				

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3.3.1	Ø100mm	No.	1		
3.3.2	Ø80mm	No.	1		
3.3.3	Ø65mm	No.	1		
3.3.4	Ø50mm	No.	1		
3.3.5	Ø35mm	No.	1		
3.3.6	Ø28mm	No.	1		
3.3.7	Ø22mm	No.	1		
3.3.8	Ø15mm	No.	1		
	<u>COPPER PIPE BENDS:</u>				
	The Contractor shall make provision for the supply and installation, testing and commissioning of the following copper pipe bends.				
3,4	<u>COPPER PIPE BENDS</u>				
3.4.1	Ø100mm	No.	1		
3.4.2	Ø80mm	No.	1		
3.4.3	Ø65mm	No.	1		
3.4.4	Ø50mm	No.	1		
3.4.5	Ø35mm	No.	1		
3.4.6	Ø28mm	No.	1		
3.4.7	Ø22mm	No.	1		
3.4.8	Ø15mm	No.	1		
	<u>STRAINERS:</u>				
	The Contractor shall make provision for the supply and installation, testing and commissioning of the following Strainers.				
3,5	<u>STRAINERS</u>				
3.5.1	Ø100mm	No.	1		
3.5.2	Ø80mm	No.	1		

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3.5.3	Ø65mm	No.	1		
3.5.4	Ø50mm	No.	1		
3.5.5	Ø35mm	No.	1		
3.5.6	Ø28mm	No.	1		
3.5.7	Ø22mm	No.	1		
3.5.8	Ø15mm	No.	1		
=	<u>COPPER PIPE TEES:</u>	=	=	=	=
	The Contractor shall make provision for the supply and installation, testing and commissioning of the following Copper Pipe Tees.				
3,6	<u>COPPER PIPE TEES</u>				
3.6.1	Ø100mm	No.	1		
3.6.2	Ø80mm	No.	1		
3.6.3	Ø65mm	No.	1		
3.6.4	Ø50mm	No.	1		
3.6.5	Ø35mm	No.	1		
3.6.6	Ø28mm	No.	1		
3.6.7	Ø22mm	No.	1		
3.6.8	Ø15mm	No.	1		
=	<u>COPPER PIPE REDUCERS:</u>	=	=	=	=
	The Contractor shall make provision for the supply and installation, testing and commissioning of the following Copper Pipe Reducers.				
3,7	<u>COPPER PIPE REDUCERS</u>				
3.7.1	Ø54 x Ø35mm Reducer	No.	1		
3.7.2	Ø42 x Ø28mm Reducer	No.	1		
3.7.3	Ø35 x Ø15mm Reducer	No.	1		
3.7.4	Ø15 x Ø15 x Ø22mm Reducing Tee	No.	1		

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3.7.5	Ø22 x Ø15 x Ø15mm Reducing Tee	No.	1		
3.7.6	Ø35 x Ø35 x Ø15mm Reducing Tee	No.	1		
3.7.7	Ø35 x Ø35 x Ø28mm Reducing Tee	No.	1		
3.7.8	Ø54 x Ø54 x Ø22mm Reducing Tee	No.	1		
3.7.9	Ø35 x Ø35 x Ø22mm Reducing Tee	No.	1		
3.7.10	Ø22 x Ø15 x Ø22mm Reducing Tee	No.	1		
3.7.11	Ø54 x Ø22mm Reducer	No.	1		
3.7.12	Ø54 x Ø28mm Reducer	No.	1		
=	<u>PRESSURE REDUCING VALVES:</u>	=	=	=	=
	The Contractor shall make provision for the supply and installation, testing and commissioning of pressure reducing valves on cold water pipes.				
3,8	<u>PRESSURE REDUCING VALVES</u>				
3.8.1	Ø100mm	No.	1		
3.8.2	Ø80mm	No.	1		
3.8.3	Ø65mm	No.	1		
3.8.4	Ø50mm	No.	1		
3.8.5	Ø35mm	No.	1		
3.8.6	Ø28mm	No.	1		
3.8.7	Ø22mm	No.	1		
3.8.8	Ø15mm	No.	1		
	<u>WATER SUPPLIES STERILIZING</u>				
	The Contractor shall make provision for the sterilization of all water pipes prior to installation in strict accordance to the methods and specifications in SANS 10251-1 . Sterilization for all pipes including those fixed to walls in ducts with M10 rubber lined hanger brackets including M10 threaded rod not exceeding 500mm long and M10 drop-in anchor.				
3,9	<u>Water Sterilizing - Class O Copper Pipes</u>				

3.9.1	Ø15mm Pipes	m	1		
3.9.2	Ø22mm Pipes	m	1		
3.9.3	Ø28mm Pipes	m	1		
3.9.4	Ø32mm Pipes	m	1		
3.9.5	Ø40mm Pipes	m	1		
3,1	<u>HOT WATER PIPEWORK</u>				
	The Contractor to make allowance for the supply, delivery, off-load, store on site copper pipes Class 2 in accordance with SANS 460 including all fittings and other accessories for the plumbing work.				
3,1	<u>HOT WATER PIPEWORK</u>				
3.10.1	Ø40mm Pipes	m	1		
3.10.2	Ø32mm Pipes	m	1		
3.10.3	Ø28mm Pipes	m	1		
3.10.4	Ø22mm Pipes	m	1		
3.10.5	Ø15mm Pipes	m	1		
	<u>INSULATION AND CLADDING</u>				
	The Contractor to make allowance for the supply, delivery, off-load, store on site and install close cell polythene insulation complete with galvanised metal cladding for hot water pipes.				
3,11	<u>INSULATION AND CLADDING</u>				
3.11.1	Ø40mm Pipes, couplings, and fittings	m	1		
3.11.2	Ø32mm Pipes, couplings, and fittings	m	1		
3.11.3	Ø28mm Pipes, couplings, and fittings	m	1		
3.11.4	Ø22mm Pipes, couplings, and fittings	m	1		
3.11.5	Ø15mm Pipes, couplings, and fittings	m	1		
=	<u>ISOLATING VALVES</u>	=	=	=	=
	The Contractor to make allowance for the supply, delivery, off-load, store on site and installation of isolating valves on hot water piping.				
3,12	<u>ISOLATING VALVES</u>				

3.12.1	Ø40mm	No.	1		
3.12.2	Ø32mm	No.	1		
3.12.3	Ø28mm	No.	1		
3.12.4	Ø22mm	No.	1		
3.12.5	Ø15mm	No.	1		
3,13	<u>EXPANSION RELIEF VALVES</u>				
3.13.1	The Contractor to make allowance for the supply, delivery, off-load, store on site and installation of expansion relief valves on the hot water storage tanks including all fittings and accessories.	No.	1		
	=				
3,14	<u>VACUUM BREAKERS / AIR RELEASE VALVES</u>				
3.14.1	The Contractor to make allowance for the supply, delivery, off-load, store on site and installation of air release valves on the hot water storage tanks including all fittings and accessories.	No.	1		
3,15	<u>BALANCING VALVES</u>				
3.15.1	The Contractor to make allowance for the supply, delivery, off-load, store on site and installation of balancing valves on the primary circuit including all fittings and accessories.	No.	1		
3,16	<u>TEES AND REDUCERS</u>				
	The Contractor to make allowance for the supply, delivery, off-load, store on site and installation of HOT WATER PIPING TEES AND REDUCERS.				
3.16.1	Ø40mm	No.	1		
3.16.2	Ø32mm	No.	1		
3.16.3	Ø28mm	No.	1		
3.16.4	Ø22mm	No.	1		
3.16.5	Ø15mm	No.	1		
3,17	<u>PIPE PROTECTION - LAGGING TO PIPES</u>				
	The Contractor to make allowance for the supply, delivery, off-load, store on site and installation of Thermal cross linked polyethylene foam foam insulation minimum 20mm thick for hot water pipes.				

	<u>LAGGING TO PIPES</u>				
3.17.1	Ø40mm Pipes, couplings, and fittings	m	1		
3.17.2	Ø32mm Pipes, couplings, and fittings	m	1		
3.17.3	Ø28mm Pipes, couplings, and fittings	m	1		
3.17.4	Ø22mm Pipes, couplings, and fittings	m	1		
3.17.5	Ø15mm Pipes, couplings, and fittings	m	1		
3,18	<u>LEAK DETECTION</u>				
3.18.1	The Contractor to make allowance for leak detection or pressure testing both cold and hot water pipes	Sum	1		
	=				
3,19	<u>METERING</u>				
3.19.1	Ø20mm Smart Water Meter	No.	1		
3.19.2	Ø50mm Smart Water Meter	No.	1		
3,2	<u>Elevated Combined Domestic Water Storage Tanks, Pumps, Boreholes, etc.,</u>				
	The Contractor to make allowance for the supply and installation of combined domestic water tanks inclusive of fire water requirements. The rate to include associated pumps, valves, and fittings.				
3.20.1	30kL Tank	Sum	1		
3.20.2	50kL Tank	Sum	1		
3.20.3	80kL Tank	Sum	1		
3.20.4	100kL Tank	Sum	1		
3.20.5	150kL Tank	Sum	1		
3,21	<u>HOT WATER GENERATION PLANT</u>				
	The Contractor to make allowance for the supply of hot water to the kitchens, kitchenettes, and shower facilities if required.				
3.21.1	<u>Solar Geysers</u>				
3.21.1.1	100lt Solar Geyser	No.	1		
3.21.1.2	150lt Solar Geyser	No.	1		

3.21.1.3	200lt Solar Geyser	No.	1		
3.21.1.4	300lt Solar Geyser	No.	1		
3.21.2	<u>Hydroboil Units</u>				
3.21.2.1	5.0 lt White epoxy or powder coated Hydroboil Unit	No.	1		
3.21.2.2	7.5 lt White epoxy or powder coated Hydroboil Unit	No.	1		
3.21.2.3	10 lt White epoxy or powder coated Hydroboil Unit	No.	1		
3.21.2.4	15 lt White epoxy or powder coated Hydroboil Unit	No.	1		
3.21.3	<u>Heat Pumps</u>				
	The Contractor to make allowance for the supply and installation of Heat Pumps to be paired with Hot Water Storage Tanks. Heat Pumps to be supplied along with circulation pumps and other accessories. Rate to include the Heat Pump frame.				
3.21.3.1	3kw Heat Pump	No.	1		
3.21.3.2	5kw Heat Pump	No.	1		
3.21.3.3	10kw Heat Pump	No.	1		
3.21.3.4	16kw Heat Pump	No.	1		
3.21.3.5	22kw Heat Pump	No.	1		
3.21.3.6	27kw Heat Pump	No.	1		
3.21.3.7	38kw Heat Pump	No.	1		
3.21.3.8	43kw Heat Pump	No.	1		
3.21.3.9	48kw Heat Pump	No.	1		
3.21.3.10	50kw Heat Pump	No.	1		
3.21.4	<u>Hot Water Storage Tanks</u>				
	The Contractor to make allowance for the supply and installation of Hot Water Storage Tanks to be paired with Heat Pumps. Heat Pumps to be supplied along with circulation pumps and other accessories. Rate to include the hot water storage tank frame.				
3.21.4.1	150L Hot water storage tank	No.	1		
3.21.4.2	250L Hot water storage tank	No.	1		

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3.21.4.3	1000L Hot water storage tank	No.	1		
3.21.4.4	1500L Hot water storage tank	No.	1		
3.21.4.5	2000L Hot water storage tank	No.	1		
3.21.4.6	2500L Hot water storage tank	No.	1		
3.21.4.7	3500L Hot water storage tank	No.	1		
3.21.4.8	4000L Hot water storage tank	No.	1		
3.21.4.9	4500L Hot water storage tank	No.	1		
3.21.4.10	5000L Hot water storage tank	No.	1		
3,22	<u>ELECTRICAL WORK</u>				
3.22.1	The Contractor to make allowance for the electrical connection including power and control cabling and connections.	Sum	1		
3,23	<u>TESTING AND COMMISSIONING</u>				
3.23.1	The Contractor to make allowance for the testing and commissioning of hot water generation plant/system including pressure test of all system components and performance tests of the system.	Sum	1		
3,24	<u>PROVISIONAL SUM</u>				
3.24.1	The Contractor to make allowance for the provision of items not covered in the above scope breakdown.	Sum	1		
	<u>DRAINAGE SYSTEM PLUMBING:</u>				
3,25	<u>DRAINAGE PIPING</u>				
3.25.1	<u>uPVC Piping</u>				
	<i>The Contractor shall make allowance for the following uPVC Piping, installed (i) above ground and chased in wall, (ii) laid in and including trenches not exceeding 1.5m deep under surface beds.</i>				
3.25.1.1	Ø50mm Pipes - installed above ground and chased in wall	m	1		
3.25.1.2	Ø110mm Pipes - installed above ground and chased in wall	m	1		
3.25.1.3	Ø160mm Pipes - laid in and including trenches not exceeding 1.5m deep under surface beds.	m	1		

3.25.1.4	Ø110mm Pipes - laid in and including trenches not exceeding 1.5m deep under surface beds.	m	1		
3.25.2	HDPE Piping				
	<i>The Contractor shall make allowance for the following HDPE pipes including all necessary butt welds, electrowelds and expansion sockets in the running lengths fixed to soffit and walls with Sikla Holderbats or chased into walls, etc.,</i>				
3.25.2.1	Ø20mm HDPE pipe	m	1		
3.25.2.2	Ø25mm HDPE pipe	m	1		
3.25.2.3	Ø32mm HDPE pipe	m	1		
3.25.2.4	Ø50mm HDPE pipe	m	1		
3.25.2.5	Ø56mm HDPE pipe	m	1		
3.25.2.6	Ø63mm HDPE pipe	m	1		
3.25.2.7	Ø75mm HDPE pipe	m	1		
3.25.2.8	Ø110mm HDPE pipe	m	1		
3.25.2.9	Ø160mm HDPE pipe	m	1		
3.26	Extra over uPVC pipes for uPVC fittings				
3.26.1	Ø50mm Adaptor	No.	1		
3.26.2	Ø50mm Access Bend	No.	1		
3.26.3	Ø50mm Access Junction	No.	1		
3.26.4	Ø110mm Bend	No.	1		
3.26.5	Ø110mm Access Bend	No.	1		
3.26.6	Ø110mm Junction	No.	1		
3.26.7	Ø110mm Access Junction	No.	1		
3.26.8	Ø110mm Pan Connector	No.	1		
3.26.9	Ø110mm - 50mm Reducer	No.	1		
3.26.10	Ø110mm Inspection Eye	No.	1		
3.26.11	Ø110mm Rodding Eye	No.	1		
3.26.12	Ø160mm Bend	No.	1		
3.26.13	Ø160mm Junction	No.	1		

3.26.14	Ø160mm - 110mm Reducer	No.	1		
3.27	Extra over HDPE pipes for HDPE fittings				
3.27.1	Ø50mm Adaptor	No.	1		
3.27.2	Ø50mm Access Bend	No.	1		
3.27.3	Ø50mm Access Junction	No.	1		
3.27.4	Ø110mm Bend	No.	1		
3.27.5	Ø110mm Access Bend	No.	1		
3.27.6	Ø110mm Junction	No.	1		
3.27.7	Ø110mm Access Junction	No.	1		
3.27.8	Ø110mm Pan Connector	No.	1		
3.27.9	Ø110mm - 50mm Reducer	No.	1		
3.27.10	Ø110mm Inspection Eye	No.	1		
3.27.11	Ø110mm Rodding Eye	No.	1		
3.27.12	Ø110mm Threaded Cap End	No.	1		
3.27.13	Ø160mm Bend	No.	1		
3.27.14	Ø160mm Junction	No.	1		
3.27.15	Ø160mm - 110mm Reducer	No.	1		
3.27.16	Ø110mm Vent Valve	No.	1		
3.27.17	Ø110mm Electrofusion Coupling	No.	1		
3.27.18	Ø56mm x 90° Bend with long tailpipe	No.	1		
3.27.19	Ø63mm x 90° Bend with long tailpipe	No.	1		
3.27.20	Ø75mm x 90° Bend with long tailpipe	No.	1		
3.27.21	Ø56mm x 45° Bend with long tailpipe	No.	1		
3.27.22	Ø63mm x 45° Bend with long tailpipe	No.	1		
3.27.23	Ø75mm x 45° Bend with long tailpipe	No.	1		
3.27.24	Ø56mm x 56mm x 135° Y-branch	No.	1		
3.27.25	Ø75mm x 63mm x 135° Y-branch code	No.	1		
3.27.26	Ø75mm x 56mm x 135° Y-branch code	No.	1		
3.27.27	Ø110mm x 63mm x 135° Y-branch code	No.	1		

3.27.28	Ø110mm x 110mm x 135° Y-branch code	No.	1		
3,28	<u>Accessories</u>				
3.28.1	Ø50mm Stainless Steel Bottle Trap	No.	1		
3.28.2	Ø50mm P-trap	No.	1		
3.28.3	Ø50mm Shower Gully	No.	1		
3.28.4	Ø50mm Floor Drain	No.	1		
3.28.5	Ø110mm Floor Drain, c/w trap	No.	1		
3.28.6	Ø110mm Gully	No.	1		
3.28.7	Ø110mm Pan Connector	No.	1		
3.28.8	Ø63mm P-trap	No.	1		
3.28.9	Ø75mm P-trap	No.	1		
3.28.10	Ø38mm x 38mm Bottle Trap	No.	1		
3.28.11	Ø25mm uPVC pipe for WC Overflows	No.	1		
3.28.12	Ø25mm elbows for WC overflows	No.	1		
3.28.13	Sink Waste Union	No.	1		
3.28.14	Basin Waste Union	No.	1		
3.28.15	Ø110mm Air Vent Cowl	No.	1		
3.28.16	Ø110mm Vent Pipe	No.	1		
3,29	<u>TESTING AND COMMISSIONING</u>				
3.29.1	The Contractor to make allowance for the testing and commissioning of the drainage pipe system.	Sum	1		
3,3	<u>PROVISIONAL SUM</u>				
3.30.1	The Contractor to make allowance for the provision of items not covered in the above scope breakdown.	Sum	1		

ITEM	DESCRIPTION	UNIT	QTY	SUPPLY RATE	INSTALL RATE
4	LPG INSTALLATIONS/REFURBISHMENT: LPG SERVICES BILL OF QUANTITIES				
4,1	<u>PRELIMINARIES & GENERAL</u>				
4.1.1	Preliminaries and General including OHS.	%			
4,2	<u>LPG INSTALLATION</u>				
4.2.1	<u>GAS STOVE (Boiling Tables)</u>				
4.2.1.1	Supply and Install 1 Burner Boiling Table (1100 x 600 mm), rating @216 000 BTU (63.31kW)	No.	1		
4,3	<u>GAS CYLINDERS</u>				
4.3.1	Deliver to Site and Installation of Afrox' or any other equally approved 48kg low pressure liquefied petroleum gas cylinders.	No.	1		
4,4	<u>LPG MANIFOLD</u>				
4.4.1	All necessary piping and manifold support work, pigtails connecting to manifold c/w hose fittings including emergency control regulator, metal tray and change-over valve. Supply, Test, and Commission Cylinder Bank Manifolds C/w Isolating/Non-return valves, pigtails, primary regulators, Safety Valves, Valve Vents, Purge and Test Cocks, Gauges, and all other ancillaries	No.	1		
4,5	<u>MANUAL CHANGE-OVER REGULATOR</u>				
4.5.1	All necessary piping and manifold support work, pigtails connecting to manifold c/w hose fittings including emergency control regulator, metal tray and change-over valve. Supply, Test, and Commission Cylinder Bank Manifolds C/w Isolating/Non-return valves, pigtails, primary regulators, Safety Valves, Valve Vents, Purge and Test Cocks, Gauges, and all other ancillaries	No.	1		
4,6	<u>GALVANISED CAGE</u>				
4.6.1	Deliver to Site and Installation of a Galvanised Cage to Hold 2 x 48kg LPG Cylinder with deposits.	No.	1		
4.6.2	Deliver to Site and Installation of a Galvanised Cage to Hold 4 x 48kg LPG Cylinder with deposits.	No.	1		
4.6.3	Deliver to Site and Installation of a Galvanised Cage to Hold 6 x 48kg LPG Cylinder with deposits.	No.	1		
4,7	<u>LPG-Grade Piping, fittings, elbows, & couplers</u>				
4.7.1	Ø28mm Class-Two copper piping c/w insulation and support brackets	m	1		

4,8	Extra over 28 mm outside diameter pipe for:				
4.8.1	90° Bend	No.	1		
4.8.2	Dia 28mm Isolating Ball valve	No.	1		
4.8.3	Low Pessure regulator	No.	1		
4.8.4	Tee	No.	1		
4,9	<u>SAFETY COMPONENTS</u>				
4.9.1	Complete safety and regulatory signage	Sum	1		
4.9.2	Pipe Identification and colour coding and earthing	Sum	1		
4.9.3	Bonding to Earth of All Piping at Entrance to Each Building As per SANS-0224	Sum	1		
4,1	<u>PROVISIONAL SUM</u>				
4.10.1	Allow for providing all necessary apparatus for testing and commissioning of the complete LPG installation, in accordance with statutory requirements and as directed by the architect and engineer and re-testing after taking out and replacing any defective work to his entire satisfaction.	Sum	1		
4,11	<u>LP GAS CERTIFICATE OF COMPLIANCE</u>				
4.11.1	Supply LP Gas Certificate of Compliance	Item	1		
4,12	<u>KITCHEN EQUIPMENT</u>				
4.12.1	Prep Sink Double Bowl	No.	1		
4.12.2	Pot Sink Double Centre Bowl	No.	1		
4.12.3	Electronic Platform Scale	No.	1		
4.12.4	4 Tier Modular Shelving Units (2 per kitchen)	No.	1		
4.12.5	Stainless Steel Table c/w Splashback (2 per kitchchen)	No.	1		
4.12.6	FAGOR IKORE Series 10 Pan Electric Combi Oven (1 per kitchen)	No.	1		
4.12.7	IKORE Combi Steamer Stand	No.	1		
4.12.8	Electric Heated Tilting Pan	No.	1		

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4.12.9	Electric Heated Deep Fryer	No.	1		
4.12.10	Solid Top Electric Range Stove with Oven	No.	1		
4.12.11	Electric Heated Boiling Pot (2 per Kitchen)	No.	1		
4.12.12	5 Division Bain Marie c/w hot closet	No.	1		
4.12.13	Full Solid insert (5)	No.	1		
4.12.14	Full insert lid (5)	No.	1		
4.12.15	Self-Contained Cabinet	No.	1		
4.12.16	Insect Exterminator	No.	1		
4.12.17	Pot Rack Stainless Steel	No.	1		
4.12.18	Cold Room (4.3 m x 3.78m x 2.9m high)	No.	1		
4.12.19	Freezer Room (3.6m x 2.25m x 2.9m high)	No.	1		
4.12.20	Extraction Canopy (4.3m x 2.8m x 600mm high)	No.	1		
4.12.21	Gas Burner Stove- Boiling Table (1100 x 600)	No.	1		
4.12.22	Grease Trap	No.	1		
ITEM	DESCRIPTION	UNIT	QTY	SUPPLY RATE	INSTALL RATE
5	LIFT INSTALLATIONS: LIFT SERVICES BILL OF QUANTITIES				
5,1	<u>PRELIMINARIES & GENERAL</u>				
5.1.1	Preliminaries and General including OHS.	%			
5,2	<u>PASSENGER LIFTS</u>				
	The contractor to make allowance for the supply, delivery, and installatin of the following passenger lifts				
5.2.1	480kg lift (with 3 stops)	No.	1		
5.2.2	1000kg /13 persons lift (1.0m/s speed, with 3 stops)	No.	1		
5,3	<u>GOODS LIFTS</u>				
	The contractor to make allowance for the supply, delivery, and installatin of the following goods lifts				
5.3.1	1000kg lift (with 2 stops)	No.	1		

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5.3.2	1600kg lift (with 2 stops)	No.	1		
5.3.2	2000kg (with 2 stops)	No.	1		
5,4	<u>STAIRLIFTS</u>				
5.4.1	The contractor to make allowance for the supply, delivery, and installatin of the following curved stairlift with remote controller. Maximum carrying capacity 120 kg c/w charging station at the top and bottom of stairs.	No.	1		
5.4.2	The contractor to make allowance for the supply, delivery, and installatin of the following curved stairlift with remote controller. Maximum carrying capacity 127 kg c/w charging station at the top and bottom of stairs.	No.	1		
	I, THE UNDERSIGNED (FULL NAME)..... Signature Date Position Name of Bidder				
END OF PRICING SCHEDULE					

ANNEXURE O

Safety, Health and Environment (P&G) requirements guide

Note to Quantity Surveyor

Failure, by the Tenderer, to price the items indicated below individually or per item will result in the Tender being deemed non-responsive. The legal requirements contemplated in the Construction Regulations (CR) 5(1)(g):

“A Client must ensure that potential principal contractors submitting tenders, have made adequate provision for the cost of health and safety measures” and CR 5(1)(h)

“A client must ensure that principal contractor to be appointed has the necessary competencies and resources to carry out the construction work safely”

Shall apply and will be used to motivate the disqualification of the Tender. The contractor's attention is further drawn to Section 41 of the **Occupational Health and Safety Act No. 85 of 1993: This Act not affected by agreements**

Subject to the provisions of Sections 10 (4) and 37 (2), a provision of this Act or a condition specified in any notice or direction issued there under or subject to which exemption was granted to any person under Section 40, shall not be affected by any condition of any agreement, whether such agreement was entered into before or after the commencement of this Act or before or after the imposition of any such condition, as the case may be.

Note to Principal Contractor and/or Quantity Surveyor

Prior to pricing the principal contractor must familiarize him/herself with the Occupational Health and Safety Act and Regulations, (Act 85 of 1993), read with Construction Regulations 2014, other relevant Regulations, the Disaster Management Act, (57 OF 2002) read with COVID-19 Regulations. It is imperative for the Contractor to familiarize him/herself on the Client's project specific requirements defined in the Project Specific Safety and Health and Environmental Specifications. The pricing schedule must also consider adequate provisions including Contractors that will be accountable to the Principal Contractor.

After pricing of the health and safety bill of quantities, the **Contractor** must sign the **Certificate of Acquaintance** as evidence that he is au fait regarding the contents, obligations and demands of the **Occupational Health and Safety Act No. 85 Of 1993, Construction Regulations 2014, other relevant Regulations and Standards as well as project specific Health & Safety specifications**. Failure, by the Tenderer, to sign the Certificate of Acquaintance may result in the Tender being deemed non-responsive.

	Description	Unit	Qty	Rate	Total
1	Notify the provincial director of the DoEL in the form of Annexure 2 of the construction regulations 2014 within the respective area of the intended construction work. A Contractor shall secure a letter of receipt and acknowledgement or stamped Annexure 2 by the DoEL prior commencement of intended activities and must always be kept in the SHE File.	item	1		
2	Allow for the necessary Workman's Compensation Fund or approved Insurer contributions for the duration of the project with and including renewals	item	1		
3	Allow for the preparation and approval of project-specific H&S Plan & File [CR 7(1)(a)]	item	1		
4	Allow for the implementation and maintenance of project-specific H&S Plan & File. [CR 7]	Months	1		
5	Allow for the appointment of a full/part-time Construction Health & Safety Officer or Manager (CHSO/M) registered with SACPCMP to assist in the control of all health and safety related aspects on site as per [CR 8(5)]. <i>*Dependent on the project risk profile and project scope as agreed with the PM*</i>	Months	1		
6	Allow for the appointment of a full/part-time Construction Environmental Officer (CEO) to assist in the control of all environmental related aspects on site. <i>*Dependent on the project risk profile and project scope as agreed with the PM*</i>	Months	1		
7	Provide for appointment of responsible and competent person/s to manage and supervise the works and administer and enforce health and safety on site as per [CR 8(1) & CR 8(7)]	Months	1		
8	Allow for provision of communication facilities for the appointed CHSO/M i.e. desktop/laptop, cellphone etc	Months	1		
9	Allow for provision of Basic Emergency Preparedness and Response equipment & at least one First Aider	Months	1		
10	Provide, supply and maintenance for <u>each</u> employee the following SANS approved personal protective equipment & clothing dependent on site-specific risk assessments:				
10.1	Hard Hats (High Density polyethylene, & 6-point lining)	No	1		

10.2	Overall/work suit (100% Cotton)	No	1		
10.3	Safety boots/shoes (Steel-Toe)	No	1		
10.4	Safety gloves	No	1		
10.5	Ear Plugs/Muffs	No	1		
10.6	Dust Masks (at least FF2 type)	No	1		
10.7	Respirators	No	1		
10.8	Safety goggles	No	1		
10.9	Reflector vests	No	1		
10.10	Personal Fall arrest and rescue equipment with and including lifelines and associated equipment	No	1		
10.11	High visibility reflective vests and/or bibs	No	1		
10.12	Temporary handrails, toe boards other than for access scaffolding	Meters	1		
10.13	Temporary warning signage and symbols	No	1		
10.14	SANS approved safety netting (orange color with minimum of 1,2 meters high)	Meters	1		
10.15	Provision for the supply and maintenance of Road Traffic Signs as in terms of the South African Road Traffic Signs Manual complete	No	1		
11	HEALTH AND SAFETY EDUCATION				
11.1	Allow for Pre-employment medical examinations	item	1		
11.2	Allow for Periodic medical examinations	item	1		
11.3	Allow for exit medical examinations before demobilization	item	1		
11.4	Allow for HIV/AIDS awareness and Implementation programmes, including STI, and TB etc	Months	1		

11.5	Allow for all compulsory health and safety awareness programme (e.g., inductions, toolbox talks, safety promotions, H&S related training, etc.)	Months	1		
12	ENVIRONMENTAL				
12.1	Provide for adequate handling and storage of materials to minimize contamination of ground, air or water.	Months	1		
12.2	Provide for the adequate safe collection and disposal of waste material from site by an approved method.	Months	1		
12.3	Provide Site Establishment Facilities and Eating Area for workers	item	1		
12.4	Provide for landscaping and rehabilitation on completion of site disturbed areas and temporary access routes not covered by construction area	item	1		
12.5	Maintenance of alien vegetation or landscaping specifications upon completion of construction work and during defects liability				
12.6	Provide for stockpiling of topsoil for re-use	item	1		
13	COMPULSORY BREAKDOWN FOR THE ADJUSTMENT OF PRELIMINARIES				
13.1	Value Related	Item			
13.2	Fixed Value Related	Item			
13.3	Time Related	Item			
	TOTAL				

CERTIFICATE OF ACQUITTANCE WITH TENDER DOCUMENTS

Name of Company_____

I/We_____

Hereby certify that I/we acquainted ourselves with the Health and Safety Act 85 of 1993 as well as the Construction Regulations, 2014 and all conditions contained herein as laid down by the State for the carrying out of construction work for which I/We submit our response.

I/We further agree that the State shall recognise no claim from me/us for relief based on allegations that I/We overlooked any tender requirements or failed to consider the purpose of completing the documentation as required.

Signed at_____ on this the_____ day of_____ 2024.

WITNESS

NAME IN BLOCK LETTERS

For and on behalf of Contractor

Contractors Signature

I.D of Signatory

END OF EXPRESSION OF INTEREST DOCUMENT
MECHANICAL WORKS
CDC/292/24