TENDER NO: 013S/2025/26

SUPPLY, INSTALLATION AND AD-HOC MAINTENANCE OF CONTROL SYSTEMS INFRASTRUCTURE AT VARIOUS CITY OF CAPE TOWN SITES

CONTRACT PERIOD: 36 MONTHS FROM THE COMMENCEMENT DATE OF THE CONTRACT

CLOSING DATE	**26 August 2025**
CLOSING TIME	**10:00 am**
TENDER BOX NUMBER	**187**
TENDER FEE	**R200**

Non – refundable tender fee payable to the City of Cape Town (CCT) for a hard copy of the tender document. This fee is not applicable to website downloads of the tender document**.**

TENDERER	
NAME of Company/Close Corporation or Partnership / Joint Venture/ Consortium or Sole Proprietor /Individual (hereinafter the "Tenderer")	
TRADING AS (if different from above)	
Registration number of Tenderer	
Physical address and chosen domicilium citandi et executandi of Tenderer	

NATURE OF TENDER OFFER (please indicate below)	
Main Offer (see clause 2.2.11.1)	
Alternative Offer (see clause 2.2.11.1)	

TENDER SERIAL NO.:
SIGNATURES OF CCT OFFICIALS AT TENDER OPENING
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THE TENDER

T.1 GENERAL TENDER INFORMATION

TENDER ADVERTISED	**:**	**25 July 2025**
SITE VISIT/CLARIFICATION MEETING	:	08 August 2025 at 10:00 via MSTeams (Not compulsory, but strongly recommended)
VENUE FOR SITE VISIT/CLARIFICATION MEETING	:	Meeting ID: 388 725 511 043, Passcode: wN7DV2tG
TENDER BOX & ADDRESS	:	**Tender Box as per front cover** at the **Tender & Quotation Boxes Office**, 2nd Floor (Concourse Level), Civic Centre, 12 Hertzog Boulevard, Cape Town.
	:	The Tender Document (which includes the Form of Offer and Acceptance) completed and signed in all respects, plus any additional supporting documents required, must be submitted in a sealed envelope with the name and address of the tenderer, the endorsement "**TENDER NO. 013S/2025/26: SUPPLY, INSTALLATION AND AD HOC MAINTENANCE OF CONTROL SYSTEMS INFRASTRUCTURE AT VARIOUS CITY OF CAPE TOWN SITES",** the tender box number. and the closing date indicated on the envelope. The sealed envelope must be inserted into the appropriate official tender box before closing time. If the tender offer is too large to fit into the abovementioned box or the box is full, please enquire at the public counter (Tender Distribution Office) for alternative instructions. It remains the tenderer's responsibility to ensure that the tender is placed in either the original box or as alternatively instructed.
CCT TENDER REPRESENTATIVE	**:**	Email: **[scm.tenders7@capetown.gov.za]**

TENDERERS MUST NOTE THAT WHEREVER THIS DOCUMENT REFERS TO ANY PARTICULAR TRADE MARK, NAME, PATENT, DESIGN, TYPE, SPECIFIC ORIGIN OR PRODUCER, SUCH REFERENCE SHALL BE DEEMED TO BE ACCOMPANIED BY THE WORDS "OR EQUIVALENT"

T.2 CONDITIONS OF TENDER

2.1 General

2.1.1 Actions

2.1.1.1 The City of Cape Town (hereafter referred to as the "CCT") and each tenderer submitting a tender offer (hereinafter referred to as the "tenderer" or the "supplier") shall comply with item T.2 of this Tender Document Goods and Services (hereinafter referred to as these "Conditions of Tender"). The tenderer and the CCT shall collectively hereinafter be referred to as the "Parties" and individually a "Party"). In their dealings with each other, the Parties shall discharge their duties and obligations as set out in these Conditions of Tender, timeously and with integrity, and behave equitably, honestly and transparently, and shall comply with all legal obligations imposed on the Parties herein and in accordance with all applicable laws.

The Parties agree that this tender Tender Document Goods and Services (hereinafter referred to as the"Tender" / "Tender Document"), its evaluation and acceptance and any resulting contract shall also be subject to the CCT's Supply Chain Management Policy ('SCM Policy') that was applicable on the date the bid was advertised and as amended from time to time. If the CCT adopts a new SCM Policy which contemplates that any clause therein would apply to the Contract emanating from this tender (hereinafter referred to as the "Contract"), such clause shall also be applicable to that Contract. Please refer to this document contained on the CCT's website.

Abuse of the supply chain management system is not permitted and may result, inter alia, (1) in the tender being rejected; (2) cancellation of the contract; (3) restriction of the supplier, and/or (4) the exercise by the CCT of any other remedies available to it as provided for in the SCM Policy and/or the the Contract and/or this tender and/or any applicable laws .

2.1.1.2 The CCT, the tenderer and their agents and employees involved in the tender process shall avoid conflicts of interest and where a conflict of interest is perceived or known, declare any such conflict of interest, indicating the nature of such conflict. Tenderers shall declare any potential conflict of interest in their tender submissions. Employees, agents and advisors of the CCT shall declare any conflict of interest to the CCT at the start of any deliberations relating to the procurement process or as soon as they become aware of such conflict, and abstain from any decisions where such conflict exists or recuse themselves from the procurement process, as appropriate.

2.1.1.3 The CCT shall not seek, and a tenderer shall not submit a tender, without having a firm intention and capacity to proceed with the contract.

2.1.2 Interpretation

2.1.2.1 The additional requirements contained in Annexure F to the contract (hereinafter referred to as the "returnable documents" / "Returnable Schedules") are part of these Conditions of Tender and are specifically hereby incorporated into these Conditions of Tender.

2.1.2.2 These Conditions of Tender and returnable Documents which are required for CCT's tender evaluation purposes herein, shall form part of the Contract arising from the CCT's corresponding invitation to tender.

2.1.3 Communication during tender process

Verbal or any other form of communication, from the CCT, its employees, agents or advisors during site visits/clarification meetings or at any other time prior to the award of the Contract, will not be regarded as binding on the CCT, unless communicated by the CCT in writing to suppliers / tenderers by its Director: Supply Chain Management or his nominee. Similarly, any communication of the tenderer / supplier that is not reduced to writing by the tenderer / supplier, its employees, agents or advisors, shall not be regarded as binding on the CCT, unless communicated to the CCT in writing by the suppliers / tenderers, or their duly authorised representatives.

2.1.4 The CCT's right to accept or reject any tender offer

2.1.4.1 The CCT may accept or reject any tender offer and may cancel the corresponding tender process or reject all tender offers at any time before the formation of a contract. The CCT may, prior to the award of the tender, cancel a tender if:

(a) due to changed circumstances, there is no longer a need for the services, works or goods requested; or
(b) funds are no longer available to cover the total envisaged expenditure; or
(c) no acceptable tenders are received;
(d) there is a material irregularity in the tender process; or
(e) the Parties are unable to negotiate market related pricing.

The CCT shall not accept or incur any liability to a tenderer for such cancellation or rejection, but will give written reasons for such action upon receiving a written request to do so.

2.1.5 Procurement procedures

2.1.5.1 General

Engineering and Asset Management operate in three Water and Sanitation, Cape Metropolitan operational regions namely Schaapkraal Region 1, Blomtuin Region 2 and Killarney Region 3. In each of the three operational regions there are a number of Bulk water, Wastewater treatment facilities and Reticulation pumping stations.

The CCT intends to appoint two tenderers per Region (the highest ranked tenderer ("the winner") and in addition an "alternative") for the allocation of work. Tenderers can only be the "winner" of one Region but can be the "alternative tenderer" of one other Region. If insufficient responsive bids are received, the CCT reserves the right to appoint fewer tenderers, or not to appoint any tenderers at all.

The tenderer must indicate the Region Preference in **Schedule F.16: Region Preference**.

Tenderers, once appointed and subject to operational requirements, will be invited to deliver the goods and services on a "winner-takes-all" basis, whereby the order will always be offered and, if accepted, allocated to the highest ranked tenderer ("the winner") for that Region, and only if he refuses will the work be offered to the alternative tenderer for that Region.

The contract period shall be for a period of **[36]** months from the commencement date of the contract not prior to 1 September 2026.

2.1.5.2 Proposal procedure using the two stage-system

A two-stage system will not be followed.

2.1.5.3 Nomination of Standby Bidder

"Standby Bidder" means a bidder, identified by the CCT at the time of awarding a bid that will be considered for award should the contract be terminated for any reason whatsoever. In the event that a contract is terminated during the execution thereof, the CCT may consider the award of the contract, or non-award, to the Standby Bidder in terms of the procedures included its SCM Policy, as amended from time to time.

2.1.6 Objections, complaints, queries and disputes/ Appeals in terms of Section 62 of the Systems Act/ Access to court

2.1.6.1 Disputes, objections, complaints and queries

In terms of Regulations 49 and 50 of the Local Government: Municipal Finance Management Act, 56 of 2003 Municipal Supply Chain Management Regulations (Board Notice 868 of 2005):

a) Persons aggrieved by decisions or actions taken by the CCT in the implementation of its supply chain management system, may lodge within 14 days of the decision or action, a written objection or complaint or query or dispute against the decision or action.

2.1.6.2 Appeals

a) In terms of Section 62 of the Local Government: Municipal Systems Act, 32 of 2000 a person whose rights are affected by a decision taken by the CCT, may appeal against that decision by giving written notice of the appeal and reasons to the City Manager within 21 days of the date of the notification of the decision.

b) An appeal must contain the following:
   i. Must be in writing
   ii. It must set out the reasons for the appeal
   iii. It must state in which way the Appellant's rights were affected by the decision;
   iv. It must state the remedy sought; and
   v. It must be accompanied with a copy of the notification advising the person of the decision

c) The relevant CCT appeal authority must consider the appeal and **may confirm, vary or revoke** the decision that has been appealed, but no such revocation of a decision may detract from any rights that may have accrued as a result of the decision.

2.1.6.3 Right to approach the courts and rights in terms of Promotion of Administrative Justice Act, 3 of 2000 and Promotion of Access to Information Act, 2 of 2000

The sub- clauses above do not influence any affected person's rights to approach the High Court at any time or its rights in terms of the Promotion of Administrative Justice Act (PAJA) and Promotion of Access to Information Act (PAIA).

2.1.6.4 All requests referring to sub clauses 2.1.6.1 and 2.1.6.2 must be submitted in writing to:
The City Manager - C/o the Manager: Legal Compliance Unit, Legal Services Department, Office of the City Manager
Via hand delivery at: 20th Floor, Tower Block, 12 Hertzog Boulevard, Cape Town 8001
Via post at: Private Bag X918, Cape Town, 8000
Via email at: MSA.Appeals@capetown.gov.za

2.1.6.5 All requests referring to clause 2.1.6.3 must be submitted in writing to:
The City Manager - C/o the Manager: Access to Information Unit, Legal Service Department, Office of the City Manager
Via hand delivery at: 20th Floor, Tower Block, 12 Hertzog Boulevard, Cape Town 8001
Via post at: Private Bag X918, Cape Town, 8000
Via email at: Access2info.Act@capetown.gov.za

2.1.6.6 The minimum standards regarding accessing and 'processing' of any personal information belonging to another in terms of Protection of Personal Information Act, 2013 (POPIA).

For purposes of this clause 2.1.6.6, the contract and these Conditions of Tender, the terms "data subject", "Personal Information" and "Processing" shall have the meaning as set out in section 1 of POPIA, and "Process" shall have the corresponding meaning.

The CCT, its employees, representatives and sub-contractors may, from time to time, Process the tenderer's and/or its employees', representatives' and/or sub-contractors' Personal Information, for purposes of, and/or relating to, the tender, the contract and these Conditions of Tender, for research purposes, and/or as otherwise may be envisaged in the CCT's Privacy Notice and/or in relation to the CCT's Supply Chain Management Policy or as may be otherwise permitted by law. This includes the Processing of the latter Personal Information by the CCT's due diligence assurance provider, professional advisors and the Appeal Authority as applicable. The CCT's justification for the processing of such aforesaid Personal Information is based on section 11(1)(b) of POPIA, i.e., in terms of which the CCT's Processing of the said Personal Information is necessary to carry out actions for the conclusion and/or performance of the contract, to which the applicable data subject (envisaged in this clause 2.1.6.6 above) is a party.

All requests relating to data protection must be submitted in writing to:
The City Manager - C/o the Information Officer, Office of the City Manager
Via hand delivery at: 20th Floor, Tower Block, 12 Hertzog Boulevard, Cape Town 8001
Via post at: Private Bag X9181, Cape Town, 8000
Via email at: Popia@capetown.gov.za.

2.1.6.7 Compliance to the CCTs Appeals Policy.

In terms of the CCT's Appeals Policy, a fixed upfront administration fee will be charged. In addition, a surcharge may be imposed for vexatious and frivolous or otherwise manifestly inappropriate tender related appeals.

The current approved administration fee is R300.00 and may be paid at any of the Municipal Offices or at the Civic Centre in Cape Town using the GL Data Capture Receipt attached as Annexure F.14: Appeal Application Form. Alternatively, via EFT into the CCT's NEDBANK Account: CITY OF CAPE TOWN and using Reference number: 198158966. You are required to send proof of payment when lodging your appeal.

The current surcharge for vexatious and frivolous or otherwise manifestly inappropriate tender related appeals will be calculated as ½ (Administrative cost of the tender appeal) + 0.25 %(Appellant's tender price).

Should the payment of the administration fee of R300.00 or the surcharge not be received, such fee or surcharge will be added as a Sundry Tariff to the bidder's municipal account.

In the event where the bidder does not have a Municipal account with the CCT, the fee or surcharge may be recovered in terms of the CCT's Credit Control and Debt Collection By-law, 2006 (as amended) and its Credit Control and Debt Collection Policy.

2.1.7 CCT Supplier Database Registration

Tenderers are required to be registered on the CCT Supplier Database as a service provider. Tenderers must register as such upon being requested to do so in writing and within the period contained in such a request, failing which no orders can be raised or payments processed from the resulting contract. In the case of Joint Venture partnerships this requirement will apply individually to each party of the Joint Venture.

Tenderers who wish to register on the CCT's Supplier Database may collect registration forms from the Supplier Management Unit located within the Supplier Management / Registration Office, 2nd Floor (Concourse Level), Civic Centre, 12 Hertzog Boulevard, Cape Town (Tel 021 400 9242/3/4/5). Registration forms and related information are also available on the CCT's website www.capetown.gov.za (follow the Supply Chain Management link to Supplier registration).

It is each tenderer's responsibility to keep all the information on the CCT Supplier Database updated.

2.1.8 National Treasury Web Based Central Supplier Database (CSD) Registration

Tenderers are required to be registered on the National Treasury Web Based Central Supplier Database (CSD) as a service provider. Tenderers must register as such upon being requested to do so in writing and within the period contained in such a request, failing which no orders can be raised or payments processed from the resulting contract. In the case of Joint Venture partnerships this requirement will apply individually to each party of the Joint Venture.

Tenderers who wish to register on the National Treasury Web Based Central Supplier Database (CSD) may do so via the web address **https://secure.csd.gov.za**.

It is each tenderer's responsibility to keep all the information on the National Treasury Web Based Central Supplier Database (CSD) updated.

2.2 Tenderer's obligations

2.2.1 Eligibility Criteria

2.2.1.1 Tenderers are obligated to submit a tender offer that complies in all aspects to the conditions as detailed in this tender document and the Conditions of Tender. An 'acceptable tender must "COMPLY IN ALL" aspects with the tender, Conditions of Tender, all Specifications (i.e., item C.5 below, hereinafter the "Specifications"), pricing instructions herein and the Contract including its conditions.

2.2.1.1.1 Submit a tender offer

Only those tender submissions from which it can be established, *inter alia* that a clear, irrevocable and unambiguous offer has been made to CCT, by whom the offer has been made and what the offer constitutes, will be declared responsive.

2.2.1.1.2 Compliance with requirements of CCT SCM Policy and procedures

Only those tenders that are compliant with the requirements below will be declared responsive:

a) A completed **Details of Tenderer** to be provided (applicable schedule below to be completed);
b) A completed **Certificate of Authority for Partnerships/ Joint Ventures/ Consortiums** to be provided authorising the tender to be made and the signatory to sign the tender on the partnership /joint venture/consortium's (applicable schedule below to be completed);
c) A copy of the partnership / joint venture / consortium agreement to be provided, where applicable.

d) A completed **Declaration of Interest – State Employees** to be provided and which does not indicate any non-compliance with the legal requirements relating to state employees (applicable schedule below to be completed);
e) A completed **Declaration – Conflict of Interest and Declaration of Bidders' past Supply Chain Management Practices** to be provided and which does not indicate any conflict or past practises that renders the tender non-responsive based on the conditions contained thereon (applicable schedules below to be completed);
f) A completed **Certificate of Independent Bid Determination** to be provided and which does not indicate any non-compliance with the requirements of the schedule (applicable schedule below to be completed);
g) The tenderer (including any of its representatives, directors or members), has not been restricted in terms of abuse of the Supply Chain Management Policy,
h) The tenderer's tax matters with SARS are in order, or the tenderer is a foreign supplier that is not required to be registered for tax compliance with SARS;
i) The tenderer is not an advisor or consultant contracted with the CCT whose prior or current obligations creates any conflict of interest or unfair advantage;
j) The tenderer is not a person, advisor, corporate entity or a director of such corporate entity, who is directly or indirectly involved or associated with the bid specification committee;
k) A completed **Authorisation for the Deduction of Outstanding Amounts Owed to the CCT** to be provided and which does not indicate any details that renders the tender non-responsive based on the conditions contained thereon (applicable schedules below to be completed);
l) The tenderer (including any of its representatives, directors or members), has not been found guilty of contravening the Competition Act 89 of 1998, as amended from time to time;
m) The tenderer (including any of its representatives, directors or members), has not been found guilty on any other basis listed in the Supply Chain Management Policy.

2.2.1.1.3 Compulsory clarification meeting

Not Applicable

2.2.1.1.4 Minimum score for functionality

Only those tenders submitted by tenderers who achieve the minimum score for functionality as stated below will be declared responsive.

The description of the evaluation criteria and the maximum possible score for each is shown in the tables below. The score achieved for functionality will be the sum of the scores achieved, in the evaluation process, for the individual criteria**.**

Evaluation Criteria – Key Staff		
Position	**Evaluation Criteria**	**Applicable points**
HMI Programmer	• N6 or National Diploma in Electrical/Electronics/Mechatronics Engineering or Software related programming • Minimum of 5 years applicable post qualification experience	• Equal to 1 HMI Programmer = 10 Points • Less than 1 HMI Programmer = 0 Points
PLC Programmer	• N6 or National Diploma in Electrical/Electronics/Mechatronics Engineering or Software related programming • Minimum of 5 years applicable post qualification experience	• Two or more PLC Programmers = 15 Points • Equal to 1 PLC Programmer = 10 Points • Less than 1 PLC Programmer = 0 Points
Instrumentation Technician/Artisan	• N6 or National Diploma in Electrical/Electronic Mechatronics or Instrumentation Engineering or Instrumentation Mechanician trade qualification • Minimum of 5 years applicable post qualification experience	• Two or more Instrumentation Technician/Artisans = 15 Points • Equal to 1 Instrumentation Technician/Artisan: = 10 Points

		• Less than 1 Instrumentation Technician/Artisans = 0 Points
SCADA Programmer	• N6 or National Diploma in Electrical/Electronic/ Mechatronics Engineering/Computer/Software Programming • Minimum of 5 years applicable post qualification experience	• Two or more SCADA Programmers = 15 Points • Equal to 1 SCADA Programmer = 10 Points • Less than 1 SCADA Programmer = 0 Points
Telemetry Technician	• N6 or National Diploma in Electrical/Electronic/ Mechatronics Engineering/Communications related • Minimum of 5 years applicable post qualification experience	• Equal to 1 Telemetry Technician = 10 Points • Less than 1 Telemetry Technician = 0 Points
MAX TOTAL		**65**

Different individuals are to be identified for each of the key personnel listed above and on **Schedule 15A: Key Personnel**. The tenderer may however propose the same personel for the PLC and HMI, provided that such persons meet the requirements for each criteria and the tender submission must clearly indicate such compliance. **Copies of qualifications and curriculum vitaes must be attached.**

A signed undertaking must be submitted where the key personnel is not in the employment of the bidder at the time of closing. This must indicate that the personnel will undertake the necessary work for the duration of the contract if appointed. Such undertaking must be attached to **Schedule 15A: Key Personnel (returnable schedule).**

Evaluation Criteria - Tendering Entity Experience	
Description	**Applicable points**
Criteria 1: Installing process control systems utilising programmable logic controllers. The scope includes installation, design and programming. Minimum project value: R200 000.	• Equal to or more than 10 projects = 15 Points • Equal to or more than 8 projects = 10 Points • Equal to or more than 5 projects = 5 Points • Less than 5 projects = 0 Points
Criteria 2: SCADA installation utilising various communication medium like fibre wireless and copper coupled with variety of industrial protocols. Minimum project value: R200 000.	• Equal to or more than 10 projects = 15 Points • Equal to or more than 8 projects = 10 Points • Equal to or more than 5 projects = 5 Points • Less than 5 projects = 0 Points
Criteria 3: Installation of flow measurement equipment. (includes magnetic flowmeters and ultrasonic flow measurement). Minimum project value: R50 000.	• Equal to or more than 10 projects = 15 Points • Equal to or more than 8 projects = 10 Points • Equal to or more than 5 projects = 5 Points • Less than 5 projects = 0 Points
MAX TOTAL	45

Tenderers must provide references with active contact details that can validate all information provided in this regard. The reference letters and further details must be indicated on **Schedule 15B: Tendering Entity Track Record.**

Tenderers shall ensure that all relevant information has been submitted with the tender offer in the prescribed format to ensure optimal evaluation of the responsiveness criteria. Failure to provide all information IN THIS TENDER SUBMISSION could result in the tenderer not being able to achieve the specified minimum requirements and declared non-responsive. **See Schedule 15B: Tendering Entity Track Record**.

Where the entity tendering is a Joint Venture, the tenderer's tender response must be accompanied by a statement describing exactly what aspects of the work will be undertaken by each party to the joint venture.

The minimum qualifying score for functionality is **[77]** out of a maximum of **[110]**.

2.2.1.1.7 Provision of samples

Not applicable

2.2.2 Cost of tendering

The CCT will not be liable for any costs incurred in the preparation and submission of a tender offer, including the costs of any testing necessary to demonstrate that aspects of the offer complies with requirements.

2.2.3 Check documents

The documents issued by the CCT for the purpose of a tender offer are listed in the index of this tender document.

Before submission of any tender, the tenderer should check the number of pages, and if any are found to be missing or duplicated, or the figures or writing is indistinct, or if the Price Schedule contains any obvious errors, the tenderer must apply to the CCT at once to have the same rectified.

2.2.4 Confidentiality and copyright of documents

The tenderer shall treat as strictly confidential all matters arising in connection with the tender. Use and copy the documents issued by the CCT only for the purpose of preparing and submitting a tender offer in response to the invitation.

2.2.5 Reference documents

The tenderer shall obtain, as necessary for submitting a tender offer, copies of the latest versions of standards, specifications, Conditions of Contract and other publications, which are not attached but which are incorporated into the tender document(s) by reference.

2.2.6 Acknowledge and comply with notices

The tenderer shall acknowledge receipt of notices to the tender documents, which the CCT may issue, and shall fully comply with all instructions issued in the said notices, and if necessary, apply for an extension of the closing time stated on the front page of the tender document, in order to take the notices into account. Notwithstanding any requests for confirmation of receipt of the said notices issued, the tenderer shall be deemed to have received such notices if the CCT can show proof of transmission thereof via electronic mail, facsimile, or registered post or other lawful means.

2.2.7 Clarification meeting

The tenderer shall attend, where required, a clarification meeting at which tenderers may familiarise themselves with aspects of the proposed work, services or supply and pose questions. Details of the meeting(s) are stated in the General Tender Information (i.e., in item T.1 above).

Tenderers should be represented at the site visit/clarification meeting by a duly authorised person who is suitably qualified and experienced to comprehend the implications of the work involved.

2.2.8 Seek clarification

The tenderer shall request clarification of the tender documents, if necessary, by notifying the employer at least five (5) working days before the closing time stated in the tender data.

2.2.9 Pricing the tender offer

2.2.9.1 The tenderer shall comply with all pricing instructions as stated on the Price Schedule.

2.2.10 Alterations to documents

The tenderer shall not make any alterations or additions to the tender documents, except to comply with instructions issued by the CCT in writing, or necessary to correct errors made by the tenderer. All signatories to the tender offer shall initial all such alterations.

2.2.11 Alternative tender offers

2.2.11.1 Unless otherwise stated in the Conditions of Tender, the tenderers may submit alternative tender offers only if a main tender offer, strictly in accordance with all the requirements of the tender documents, is also submitted.

If a tenderer wishes to submit an alternative tender offer, he/she/it shall do so as a separate offer on a complete set of tender documents. The alternative tender offer shall be submitted in a separate sealed envelope clearly marked “Alternative Tender” in order to distinguish it from the main tender offer.

Only the alternative of the highest ranked acceptable main tender offer (that is, submitted by the same tenderer) will be considered, and if appropriate, recommended for award.

Alternative tender offers of any but the highest ranked main tender offer will not be considered.

An alternative tender offer to the highest ranked acceptable main tender offer that is priced higher than the main tender offer may be recommended for award, provided that the ranking of the alternative tender offer is higher than the ranking of the next ranked acceptable main tender offer.

The CCT will not be bound to consider alternative tenders and shall have sole discretion in this regard.

In the event that the alternative is accepted, the tenderer warrants that the alternative offer complies in all respects with the CCT’s standards and requirements as set out in the tender document.

2.2.11.2 Acceptance of an alternative tender offer by the CCT may be based only on the criteria stated in the Conditions of Tender or applicable criteria otherwise acceptable to the CCT.

2.2.12 Submitting a tender offer

2.2.12.1 The tenderer is required to submit one tender offer only on the original tender documents as issued by the CCT, either as a single tendering entity or as a member in a joint venture to provide the whole of the works, services or supply identified in the Conditions of Contract and described in the Specifications. Only those tenders submitted on the tender documents as issued by the CCT together with all Tender Returnable Documents duly completed and signed will be declared responsive.

2.2.12.2 The tenderer shall return the entire tender document to the CCT after completing it in its entirety, either electronically (if they were issued in electronic format) or by writing legibly in non-erasable ink.

2.2.12.3 The tenderer shall sign the original tender offer where required in terms of the Conditions of Tender. The tender shall be signed by a person duly authorised by the tenderer to do so. Tenders submitted by joint ventures of two or more firms shall be accompanied by the document of formation / founding document of the joint venture or any other document signed by all Parties, in which is defined precisely the conditions under which the joint venture will function, its period of duration, the persons authorised to represent and obligate it, the participation of the several firms forming the joint venture, and any other information necessary to permit a full appraisal of its functioning. Signatories for tenderers proposing to contract as joint ventures shall state which of the signatories is the lead partner.

2.2.12.4 Where a two-envelope system is required in terms of the Conditions of Tender, place and seal the returnable documents listed in the Conditions of Tender in an envelope marked “financial proposal” and place the remaining returnable documents in an envelope marked “technical proposal”. Each envelope shall state on the outside the CCT’s address and identification details stated in the General Tender Information (i.e., item T.1 above), as well as the tenderer's name and contact address.

2.2.12.5 The tenderer shall seal the original tender offer and copy packages together in an outer package that states on the outside only the CCT's address and identification details as stated in the General Tender Information. . If it is not possible to submit the original tender and the required copies (see 2.2.12.3) in a single envelope, then the tenderer must seal the original and each copy of the tender offer as

separate packages marking the packages as “ORIGINAL” and “COPY” in addition to the aforementioned tender submission details.

2.2.12.6 The CCT shall not assume any responsibility for the misplacement or premature opening of the tender offer if the outer package is not sealed and marked as stated.

2.2.12.7 Tender offers submitted by facsimile or e-mail will be rejected by the CCT, unless stated otherwise in the Conditions of Tender.

2.2.12.8 By signing the offer part of the Form of Offer (**Section C.2, Part A hereto**) the tenderer warrants and agrees that all information provided in the tender submission is true and correct.

2.2.12.9 Tenderers shall properly deposit its bid in the designated tender box (as detailed on the front page of this tender document) on or before the closing date and before the closing time, in the relevant tender box at the Tender & Quotation Boxes Office situated on the 2nd floor, Concourse Level, Civic Centre, 12 Hertzog Boulevard, Cape Town. If the tender submission is too large to fit in the allocated box, please enquire at the public counter for assistance.

2.2.12.10 The tenderer must record and reference all information submitted contained in other documents for example cover letters, brochures, catalogues, etc. in the Returnable Schedule titled **List of Other Documents Attached by Tenderer**.

2.2.13 Information and data to be completed in all respects

Tender offers, which do not provide all the data or information requested completely and in the form required, may be regarded by the CCT as non-responsive.

2.2.14 Closing time

2.2.14.1 The tenderer shall ensure that the CCT receives the tender offer, together with all applicable documents specified herein, at the address specified in the General Tender Information herein prior to the closing time stated on the front page of the tender document.

2.2.14.2 If the CCT extends the closing time stated on the front page of the tender document for any reason, the requirements of these Conditions of Tender apply equally to the extended deadline.

2.2.14.3 The CCT shall not consider tenders that are received after the closing date and time for such a tender (late tenders).

2.2.15 Tender offer validity and withdrawal of tenders

2.2.15.1 The tenderer shall warrant that the tender offer(s) remains valid, irrevocable and open for acceptance by the CCT at any time for a period of 120 days after the closing date stated on the front page of the tender document.

2.2.15.2 Notwithstanding the period stated in clause 2.2.15.1 above, bids shall remain valid for acceptance for a period of twelve (12) months after the expiry of the original validity period, unless the CCT is notified in writing of anything to the contrary by the bidder. The validity of bids may be further extended by a period of not more than six months subject to mutual agreement by the parties, administrative processes and upon approval by the City Manager, unless the required extension is as a result of an appeal process or court ruling.

In circumstances where the validity period of a tender has expired, and the tender has not been awarded, the tender process is considered “completed”, despite there being no decision (award or cancellation) made. This anomaly does not fall under any of the listed grounds of cancellation and should be treated as a "non award". A “non award” is supported as a recommendation to the CCT’s Bod Adjudication Committee (“BAC”) for noting.

2.2.15.3 A tenderer may request in writing, after the closing date, that its tender offer be withdrawn. Such withdrawal will be permitted or refused at the sole discretion of the CCT after consideration of the reasons for the withdrawal, which shall be fully set out by the tenderer in such written request for withdrawal. Should the tender offer be withdrawn in contravention hereof, the tenderer agrees that:

a) it shall be liable to the CCT for any additional expense incurred or losses suffered by the CCT

in having either to accept another tender or, if new tenders have to be invited, the additional expenses incurred or losses suffered by the invitation of new tenders and the subsequent acceptance of any other tender;

b) the CCT shall also have the right to recover such additional expenses or losses by set-off against monies which may be due or become due to the tenderer under this or any other tender or contract or against any guarantee or deposit that may have been furnished by the tenderer or on its behalf for the due fulfilment of this or any other tender or contract. Pending the ascertainment of the amount of such additional expenses or losses, the CCT shall be entitled to retain such monies, guarantee or deposit as security for any such expenses or loss, without prejudice to the CCT's other rights and/or remedies available to it in accordance with any applicable laws.

2.2.16 Clarification of tender offer, or additional information, after submission

Tenderer's shall promptly provide clarification of its tender offer, or additional information, in response to a written request to do so from the CCT during the evaluation of tender offers within the time period stated in such request. No change in the competitive position of tenderers or substance of the tender offer is sought, offered, or permitted.

Note: This clause does not preclude the negotiation of the final terms of the contract with a preferred tenderer following a competitive selection process, should the CCT elect to do so.

Failure, or refusal, to provide such clarification or additional information within the time for submission stated in the CCT's written request may render the tender non-responsive.

2.2.17 Provide other material

2.2.17.1 Tenderer's shall promptly provide, upon request by the CCT, any other material that has a bearing on the tender offer, the tenderer's commercial position (including joint venture agreements), preferencing arrangements, or samples of materials, considered necessary by the CCT for the purpose of the evaluation of the tender. Should the tenderer not provide the material, or a satisfactory reason as to why it cannot be provided, by the time for submission stated in the CCT's request, the CCT may regard the tender offer as non-responsive.

2.2.17.2 The tenderer shall provide, on written request by the CCT, where the transaction value inclusive of VAT **exceeds R 10 million**:

a) audited annual financial statement for the past 3 years, or for the period since establishment if established during the past 3 years, if required by law to prepare annual financial statements for auditing;
b) a certificate signed by the tenderer certifying that the tenderer has no undisputed commitments for municipal services towards a municipality or other service provider in respect of which payment is overdue for more than 30 days;
c) particulars of any contracts awarded to the tenderer by an organ of state during the past five years, including particulars of any material non-compliance or dispute concerning the execution of such contract;
d) a statement indicating whether any portion of the goods or services are expected to be sourced from outside the Republic, and, if so, what portion and whether any portion of payment from the municipality or municipal entity is expected to be transferred out of the Republic.

Each entity to a Consortium/Joint Venture bid shall submit separate certificates/statements in the above regard.

2.2.17.3 Tenderers shall be required to undertake to fully cooperate with the CCT's external service provider appointed to perform a due diligence review and risk assessment upon receipt of such written instruction from the CCT.

2.2.18 Samples, Inspections, tests and analysis

Tenderers shall provide access during working hours to premises for inspections, tests and analysis as provided for in the Conditions of Tender or Specifications.

If the Specifications requires the tenderer to provide samples, these shall be provided strictly in accordance with the instructions set out in the Specification.

If such samples are not submitted as required in the bid documents or within any further time stipulated by the CCT in writing, then the bid concerned may be declared non-responsive.

The samples provided by all successful bidders will be retained by the CCT for the duration of any subsequent contract. Bidders are to note that samples are requested for testing purposes therefore samples submitted to the CCT may not in all instances be returned in the same state of supply and in other instances may not be returned at all. Unsuccessful bidders will be advised by the Project Manager or dedicated CCT Official to collect their samples, save in the aforementioned instances where the samples would not be returned.

2.2.19 Certificates

The tenderer must provide the CCT with all certificates as stated below:

2.2.19.1. Preference Points for Specific Goals
In order to qualify for preference points for HDI and/or Specific Goals, it is the responsibility of the tenderer to submit documentary proof (Company registration certification, Central Supplier Database report, BBBEE certificate, Proof of Disability, Financial Statements,commissioned sworn affidavits, etc.) in support of tenderer claims for such preference for that specific goal.

Tenderers are further referred to the content of the Preference Schedule for the full terms and conditions applicable to the awarding of preference points.

2.2.19.2 Evidence of tax compliance

Tenderers shall be registered with the South African Revenue Service (SARS) and their tax affairs must be in order and they must be tax compliant subject to the requirements of clause 2.2.1.1.2.h. In this regard, it is the responsibility of the Tenderer to submit evidence in the form of a valid Tax Compliance Status PIN issued by SARS to the CCT at the Supplier Management Unit located within the Supplier Management / Registration Office, 2nd Floor (Concourse Level), Civic Centre, 12 Hertzog Boulevard, Cape Town (Tel 021 400 9242/3/4/5), or included with this tender. The tenderer must record its Tax Compliance Status PIN number on the **Details of Tenderer** pages of the tender submission.

Each party to a Consortium/Joint Venture shall submit a separate Tax Compliance Status Pin.

Before making an award the CCT must verify the bidder's tax compliance status. Where the recommended bidder is not tax compliant, the bidder should be notified of the non-compliant status and be requested to submit to the CCT, within 7 working days, written proof from SARS that they have made arrangement to meet their outstanding tax obligations. The proof of tax compliance submitted by the bidder must be verified by the CCT via CSD or e-Filing. The CCT should reject a bid submitted by the bidder if such bidder fails to provide proof of tax compliance within the timeframe stated herein.

Only foreign suppliers who have answered "NO" to all the questions contained in the Questionnaire to Bidding Foreign Suppliers section on the **Details of Tenderer** pages of the tender submission, are not required to register for a tax compliance status with SARS.

2.2.20 Compliance with Occupational Health and Safety Act, 85 of 1993

Tenderers are to note the requirements of the Occupational Health and Safety Act, 85 of 1993. The Tenderer shall be deemed to have read and fully understood the requirements of the above Act and Regulations and to have allowed for all costs in compliance therewith.

In this regard the Tenderer shall submit **upon written request to do so by the CCT**, a Health and Safety Plan in sufficient detail to demonstrate the necessary competencies and resources to deliver the goods or services all in accordance with the Act, Regulations and Health and Safety Specification.

2.2.21 Claims arising from submission of tender

By responding to the tender herein, the tenderer warrants that it has:
a) Inspected the Specifications and read and fully understood the Conditions of Contract.
b) Read and fully understood the whole text of the Specifications and Price Schedule and thoroughly acquainted himself with the nature of the goods or services proposed and generally of all matters which may influence the Contract.
c) visited the site(s) where delivery of the proposed goods will take place, carefully examined existing

conditions, the means of access to the site(s), the conditions under which the delivery is to be made, and acquainted himself with any limitations or restrictions that may be imposed by the Municipal or other Authorities in regard to access and transport of materials, plant and equipment to and from the site(s) and made the necessary provisions for any additional costs involved thereby.

d) requested the CCT to clarify the actual requirements of anything in the Specifications and Price Schedule, the exact meaning or interpretation of which is not clearly intelligible to the Tenderer.

e) Received any notices to the tender documents which have been issued in accordance with the CCT's Supply Chain Management Policy.

The CCT will therefore not be liable for the payment of any extra costs or claims arising from the submission of the tender.

2.3 The CCT's undertakings

2.3.1 Respond to requests from the tenderer

2.3.1.1 Unless otherwise stated in the Conditions of Tender, the CCT shall respond to a request for clarification received up to one week (where possible) before the tender closing time stated on the front page of the tender document.

2.3.1.2 The CCT's duly authorised representative for the purpose of this tender is stated on the General Tender Information page above.

2.3.2 Issue Notices

If necessary, the CCT may issue addenda in writing that may amend or amplify the tender documents to each tenderer during the period from the date the tender documents are available until one week before the tender closing time stated in the Tender Data. The CCT reserves its rights to issue addenda less than one week before the tender closing time in exceptional circumstances If, as a result a tenderer applies for an extension to the closing time stated on the front page of the tender document, the CCT may grant such extension and, shall then notify all tenderers who drew documents.

Notwithstanding any requests for confirmation of receipt of notices issued, the tenderer shall be deemed to have received such notices if the CCT can show proof of transmission thereof via electronic mail, facsimile or registered post.

2.3.3 Opening of tender submissions

2.3.3.1 Unless the two-envelope system is to be followed, CCT shall open tender submissions in the presence of tenderers' agents who choose to attend at the time and place stated in the Conditions of Tender.

Tenders will be opened immediately after the closing time for receipt of tenders as stated on the front page of the tender document, or as stated in any Notice extending the closing date and at the closing venue as stated in the General Tender Information.

2.3.3.2 Announce at the meeting held immediately after the opening of tender submissions, at the closing venue as stated in the General Tender Information, the name of each tenderer whose tender offer is opened and, where possible, the prices indicated.

2.3.3.3 Make available a record of the details announced at the tender opening meeting on the CCT's website (http://www.capetown.gov.za/en/SupplyChainManagement/Pages/default.aspx.)

2.3.4 Two-envelope system

2.3.4.1 Where stated in the Conditions of Tender that a two-envelope system is to be followed, the CCT shall open only the technical proposal of tenders in the presence of tenderers' agents who choose to attend at the time and place stated in the Conditions of Tender and announce the name of each tenderer whose technical proposal is opened.

2.3.4.2 The CCT shall evaluate the quality of the technical proposals offered by tenderers, then advise tenderers who have submitted responsive technical proposals of the time and place when the financial proposals will be opened. The CCT shall open only the financial proposals of tenderers, who have submitted responsive technical proposals in accordance with the requirements as stated in the Conditions of Tender, and announce the total price and any preference claimed. Return unopened

financial proposals to tenderers whose technical proposals were non responsive.

2.3.5 Non-disclosure

The CCT shall not disclose to tenderers, or to any other person not officially concerned with such processes, information relating to the evaluation and comparison of tender offers and recommendations for the award of a contract, until after the award of the contract to the successful tenderer.

2.3.6 Grounds for rejection and disqualification

The CCT shall determine whether there has been any effort by a tenderer to influence the processing of tender offers and instantly disqualify a tenderer (and his tender offer) if it is established that he engaged in corrupt or fraudulent practices.

2.3.7 Test for responsiveness

2.3.7.1 Appoint a Bid Evaluation Committee and determine after opening whether each tender offer properly received:

a) complies with the requirements of these Conditions of Tender,
b) has been properly and fully completed and signed, and
c) is responsive to the other requirements of the tender documents.

2.3.7.2 A responsive tender is one that conforms to all the terms, conditions, and specifications of the tender documents without material deviation or qualification. A material deviation or qualification is one which, in the CCT's opinion, would:

a) Detrimentally affect the scope, quality, or performance of the goods, services or supply identified in the Specifications,
b) Significantly change the CCT's or the tenderer's risks and responsibilities under the contract, or
c) affect the competitive position of other tenderers presenting responsive tenders, if it were to be rectified.

Reject a non-responsive tender offer, and not allow it to be subsequently made responsive by correction or withdrawal of any material deviation or qualification.

The CCT reserves the right to accept a tender offer which does not, in the CCT’s opinion, materially and/or substantially deviate from the terms, conditions, and specifications of the tender documents.

2.3.8 Arithmetical errors, omissions and discrepancies

2.3.8.1 Check the responsive tenders for:

a) The gross misplacement of the decimal point in any unit rate;
b) Omissions made in completing the Price Schedule; or
c) Arithmetic errors in:
    i) line item totals resulting from the product of a unit rate and a quantity in the Price Schedule; or
    ii) The summation of the prices; or
    iii) Calculation of individual rates.

2.3.8.2 The CCT must correct the arithmetical errors in the following manner:

a) Where there is a discrepancy between the amounts in words and amounts in figures, the amount in words shall govern.
b) If pricing schedules apply and there is an error in the line item total resulting from the product of the unit rate and the quantity, the line item total shall govern and the rate shall be corrected. Where there is an obviously gross misplacement of the decimal point in the unit rate, the line item total as tendered shall govern, and the unit rate shall be corrected.
c) Where there is an error in the total of the prices either as a result of other corrections required by this checking process or in the tenderer's addition of prices, the total of the prices shall govern and the tenderer will be asked to revise selected item prices (and their rates if Price Schedules apply) to achieve the tendered total of the prices.

Consider the rejection of a tender offer if the tenderer does not correct or accept the correction of the

arithmetical error in the manner described above.

2.3.8.3 In the event of tendered rates or lump sums being declared by the CCT to be unacceptable to it because they are not priced, either excessively low or high, or not in proper balance with other rates or lump sums, the tenderer may be required to produce evidence and advance arguments in support of the tendered rates or lump sums objected to. If, after submission of such evidence and any further evidence requested, the CCT is still not satisfied with the tendered rates or lump sums objected to, it may request the tenderer to amend these rates and lump sums along the lines indicated by it.

The tenderer will then have the option to alter and/or amend the rates and lump sums objected to and such other related amounts as are agreed on by the CCT, but this shall be done without altering the tender offer in accordance with this clause.

Should the tenderer fail to amend his tender in a manner acceptable to and within the time stated by the CCT, the CCT may declare the tender as non-responsive.

2.3.9 Clarification of a tender offer

The CCT may, after the closing date, request additional information or clarification from tenderers, in writing on any matter affecting the evaluation of the tender offer or that could give rise to ambiguity in a contract arising from the tender offer, which written request and related response shall not change or affect their competitive position or the substance of their offer. Such request may only be made in writing by the Director: Supply Chain Management using any means as appropriate.

2.3.10 Evaluation of tender offers

2.3.10.1 General

2.3.10.1.1 The CCT may reduce each responsive tender offer to a comparative price and evaluate them using the tender evaluation methods and associated evaluation criteria and weightings that are specified in the Conditions of Tender.

2.3.10.1.2 For evaluation purposes only, the effects of the relevant contract price adjustment methods will be considered in the determination of comparative prices as follows:

a) If the selected method is based on bidders supplying rates or percentages for outer years, comparative prices would be determined over the entire contract period based on such rates or percentages.
b) If the selected method is based on a formula, indices, coefficients, etc. that is the same for all bidders during the contract period, comparative prices would be the prices as tendered for year one.
c) If the selected method is based on a formula, indices, coefficients, etc. that varies between bidders, comparative prices would be determined over the entire contract period based on published indices relevant during the 12 months prior to the closing date of tenders.
d) If the selected method includes an imported content requiring rate of exchange variation, comparative prices would be determined based on the exchange rates tendered for the prices as tendered for year one. The rand equivalent of the applicable currency 14 days prior to the closing date of tender will be used (the CCT will check all quoted rates against those supplied by its own bank).
e) If the selected method is based on suppliers' price lists, comparative prices would be the prices as tendered for year one.
f) If the selected method is based on suppliers' price lists and / or rate of exchange, comparative prices would be determined as tendered for year one whilst taking into account the tendered percentage subject to rate of exchange (see sub clause (d) for details on the calculation of the rate of exchange).

2.3.10.1.3 Where the scoring of functionality forms part of a bid process, each member of the Bid Evaluation Committee must individually score functionality. The individual scores must then be interrogated and calibrated if required where there are significant discrepancies. The individual scores must then be added together and averaged to determine the final score.

2.3.10.2 Decimal places

Score financial offers, preferences and functionality, as relevant, to two decimal places.

2.3.10.3 Scoring of tenders (price and preference)

2.3.10.3.1 Points for price will be allocated in accordance with the formula set out in this clause based on the price per item / rates as set out in the **Price Schedule (Section C.4)**:

Based on the sum of the prices/rates in relation to a estimate quantities.

2.3.10.3.2 Points for preference will be allocated in accordance with the provisions of **Preference Schedule** and the table in this clause.

2.3.10.3.3 The terms and conditions of **Preference Schedule** as it relates to preference shall apply in all respects to the tender evaluation process and any subsequent contract.

2.3.10.3.4 Applicable formula:

The 90/10 price/preference points system will be applied to the evaluation of responsive tenders above a Rand value of R50'000'000 (all applicable taxes included), whereby the order(s) will be placed with the tenderer(s) scoring the highest total number of adjudication points.
Price shall be scored as follows:

$$Ps = 90 \times \left(1 - \frac{Pt - Pmin}{Pmin}\right)$$

Where: Ps is the number of points scored for price;
Pt is the price of the tender under consideration;
Pmin is the price of the lowest responsive tender.

Preference points shall be based on the Specific Goal as per below:

Table B2: Awards above R50 mil (VAT Inclusive)

#	Specific goals allocated points	Preference Points (90/10) *Above R50 mil*	Evidence	Additional Guidance
	Persons, or categories of persons, historically disadvantaged- (HDI) by unfair discrimination on the basis of			
1	***Gender are women (ownership)**** *>75% - 100% women ownership: 3 points* *>50% - 75% women ownership: 2 points* *>25% - 50% women ownership: 1 point* *>0% - 25% women ownership: 0.5 point* *0% women ownership = 0 points*	3	• Company Registration Certification	• Issued by the Companies and Intellectual Property Commission
			• Central Supplier Database report	• Report name: CSD Registration report
2	***Race are black persons (ownership)**** *>75% - 100% black ownership: 3 points* *>50% - 75% black ownership: 2 points* *>25% - 50% black ownership: 1 point* *>0% - 25% black ownership: 0.5 point* *0% black ownership = 0 points*	3	• B-BBEE certificate;	• South African National Accreditation System approved certificate or commissioned sworn affidavit
			• Company Registration Certification	• Issued by the Companies and Intellectual Property Commission
			• Central Supplier Database report	• Report name: CSD Registration report
3	***Disability are disabled persons (ownership)****	1	• Proof of disability	• Medical certificate/ South African Revenue Services disability registration

	WHO disability guideline *>2% ownership: 1 points* *>0% - 2% ownership: 0.5 point* *0% ownership = 0 point*		• Company Registration Certification	• Issued by the Companies and Intellectual Property Commission
	Reconstruction and Development Programme (RDP) as published in Government Gazette			
4	***Promotion of Micro and Small Enterprises*** *Micro with a turnover up to R20million and Small with a turnover up to R80 million as per National Small Enterprise Act, 1996 (Act No.102 of 1996* *SME partnership, sub-contracting, joint venture or consortiums*	3	• B-BBEE status level of contributor;	• Specifically in line with the respective sector codes which the company operates, • South African National Accreditation System approved certificate or commissioned sworn affidavit
			• South African owned enterprises;	• Certificate of incorporation or commissioned sworn affidavit
			• Financial Statement to determine annual turnover	• Latest financial statements (1 Year)
	Total points	10		

**Ownership: main tendering entity*

2.3.10.5 Risk Analysis

Notwithstanding compliance with regard to any requirements of the tender, the CCT will perform a risk analysis in respect of the following:

a) reasonableness of the financial offer
b) reasonableness of unit rates and prices
c) the tenderer's ability to fulfil its obligations in terms of the tender document, that is, that the tenderer can demonstrate that he/she possesses the necessary professional and technical qualifications, professional and technical competence, financial resources, equipment and other physical facilities, managerial capability, reliability, capacity, experience, reputation, personnel to perform the contract, etc.; the CCT reserves the right to consider a tenderer's existing contracts with the CCT in this regard
d) any other matter relating to the submitted bid, the tendering entity, matters of compliance, verification of submitted information and documents, etc.

The conclusions drawn from this risk analysis will be used by the CCT in determining the acceptability of the tender offer.

No tenderer will be recommended for an award unless the tenderer has demonstrated to the satisfaction of the CCT that he/she has the resources and skills required.

2.3.11 Negotiations with preferred tenderers

The CCT may negotiate the final terms of a contract with tenderers identified through a competitive tendering process as preferred tenderers provided that such negotiation:

a) Does not allow any preferred tenderer a second or unfair opportunity;
b) Is not to the detriment of any other tenderer; and
c) Does not lead to a higher price than the tender as submitted.

If negotiations fail to result in acceptable contract terms, the City Manager (or his delegated authority) may terminate the negotiations and cancel the tender, or invite the next ranked tenderer for negotiations. The original preferred tenderer should be informed of the reasons for termination of the negotiations. If the decision is to invite the next highest ranked tenderer for negotiations, the failed earlier negotiations may not be reopened by the CCT.

Minutes of any such negotiations shall be kept for record purposes.

The provisions of this clause will be equally applicable to any invitation to negotiate with any other tenderers.

In terms of the CCT's SCM Policy, tenders must be cancelled in the event that negotiations fail to achieve a market related price with any of the three highest scoring tenderers.

2.3.12 Acceptance of tender offer

Notwithstanding any other provisions contained in the tender document, the CCT reserves the right to:

2.3.12.1 Accept a tender offer(s) which does not, in the CCT's opinion, materially and/or substantially deviate from the terms, conditions, and specifications of the tender document.

2.3.12.2 Accept the whole tender or part of a tender or any item or part of any item or items from multiple manufacturers, or to accept more than one tender (in the event of a number of items being offered), and the CCT is not obliged to accept the lowest or any tender.

2.3.12.3 Accept the tender offer(s), if in the opinion of the CCT, it does not present any material risk and only if the tenderer(s):

a) is not under restrictions, has any principals who are under restrictions, or is not currently a supplier to whom notice has been served for abuse of the supply chain management system, preventing participation in the CCT's procurement,
b) can, as necessary and in relation to the proposed contract, demonstrate that he or she possesses the professional and technical qualifications, professional and technical competence, financial resources, equipment and other physical facilities, managerial capability, reliability, experience and reputation, expertise and the personnel, to perform the contract,
c) has the legal capacity to enter into the contract,
d) is not insolvent, in receivership, under Business Rescue as provided for in chapter 6 of the Companies Act, 2008, bankrupt or being wound up, has his affairs administered by a court or a judicial officer, has suspended his business activities, or is subject to legal proceedings in respect of any of the foregoing, complies with the legal requirements, if any, stated in the tender data, and
e) is able, in the opinion of the CCT, to perform the contract free of conflicts of interest.

If an award cannot be made in terms of anything contained herein, the CCT reserves the right to consider the next ranked tenderer(s).

2.3.12.4 The CCT reserves the right not to make an award, or revoke an award already made, where the implementation of the contract may result in reputational risk or harm to the CCT as a result of (inter alia):

a) reports of poor governance or unethical behaviour, or both;
b) association with known notorious individuals and family of notorious individuals;
c) poor performance issues, known to the CCT;
d) negative media reports, including negative social media reports;
e) adverse assurance (e.g. due diligence) report outcomes; and
f) circumstances where the relevant vendor has employed, or is directed by, anyone who was previously employed in the service of the state (as defined in clause 1.49 of the SCM Policy), where the person is or was negatively implicated in any SCM irregularity.

2.3.12.5 The CCT reserves the right to nominate an StandbyBbidder at the time when an award is made and in the event that a contract is terminated during the execution thereof, the CCT may consider the award of the contract, or non-award, to the Standby Bidder in terms of the procedures included its SCM Policy.

2.3.13 Prepare contract documents

2.3.13.1 If necessary, revise documents that shall form part of the contract and that were issued by the CCT as part of the tender documents to take account of:

a) Notices issued during the tender period,
b) Inclusion of some of the returnable documents, and
c) Other revisions agreed between the CCT and the successful tenderer.

2.3.13.2 Complete the schedule of deviations attached to the form of offer and acceptance, if any.

2.3.14 Notice to successful and unsuccessful tenderers

2.3.14.1 Before accepting the tender of the successful tenderer the CCT shall notify the successful tenderer in writing of the decision of the CCT's Bid Adjudication Committee to award the tender to the successful tenderer. No rights shall accrue to the successful tenderer in terms of this notice

2.3.14.2 The CCT shall, at the same time as notifying the successful tenderer of the Bid Adjudication Committee's decision to award the tender to the successful tenderer, also give written notice to the other tenderers informing them that they have been unsuccessful.

2.3.15 Provide written reasons for actions taken

Provide upon request written reasons to tenderers for any action that is taken in applying these Conditions of Tender, but withhold information which is not in the public interest to be divulged, which is considered to prejudice the legitimate commercial interests of tenderers or might prejudice fair competition between tenderers.

TENDER NO: 013S/2025/26

SUPPLY, INSTALLATION AND AD-HOC MAINTENANCE OF CONTROL SYSTEMS INFRASTRUCTURE AT VARIOUS CITY OF CAPE TOWN SITES.

CONTRACT PERIOD: 36 MONTHS FROM THE COMMENCEMENT DATE OF THE CONTRACT

THE CONTRACT

THE CITY OF CAPE TOWN	
A metropolitan municipality, established in terms of the Local Government: Municipal Structures Act, 117 of 1998 read with the Province of the Western Cape: Provincial Gazette 5588 dated 22 September 2000, as amended ("the Purchaser") herein represented by	
AUTHORISED REPRESENTATIVE	

AND

SUPPLIER	
NAME of Company/Close Corporation or Partnership / Joint Venture/ Consortium or Sole Proprietor /Individual (The "Supplier" / "tenderer")	
TRADING AS (if different from above)	
REGISTRATION NUMBER	
PHYSICAL ADDRESS / CHOSEN DOMICILIUM CITANI ET EXECTUANDI OF THE SUPPLIER	
AUTHORISED REPRESENTATIVE	
CAPACITY OF AUTHORISED REPRESENTATIVE	

(HEREINAFTER COLLECTIVELY REFERRED TO AS "THE PARTIES" AND INDIVIDUALLY A "PARTY")

NATURE OF TENDER OFFER (please indicate below)	
Main Offer (see clause 2.2.11.1)	
Alternative Offer (see clause 2.2.11.1)	

C.1 DETAILS OF TENDERER/SUPPLIER

1.1 Type of Entity (Please tick one box)

☐ Individual / Sole Proprietor ☐ Close Corporation ☐ Company

☐ Partnership or Joint Venture or Consortium ☐ Trust ☐ Other:

1.2 Required Details (Please provide applicable details in full):

Name of Company / Close Corporation or Partnership / Joint Venture / Consortium or Individual /Sole Proprietor	
Trading as (if different from above	
Company / Close Corporation registration number (if applicable)	
Postal address	Postal Code _____
Physical address (Chosen Domicilium Citandi Et Executandi)	Postal Code _____
Contact details of the person duly authorised to represent the tenderer	Name: Mr/Ms _____ (Name & Surname) Telephone :(____) _____ Fax :(____) _____ Cellular Telephone:_____ E-mail address:_____
Income tax number	
VAT registration number	
SARS Tax Compliance Status PIN	
CCT Supplier Database Registration Number (See Conditions of Tender)	
National Treasury Central Supplier Database registration number (See Conditions of Tender)	
Is tenderer the accredited representative in South Africa for the Goods / Services / Works offered?	☐Yes ☐No If yes, enclose proof
Is tenderer a foreign based supplier for the Goods / Services / Works offered?	☐Yes ☐No If yes, answer the Questionnaire to Bidding Foreign Suppliers (below)
Questionnaire to Bidding Foreign Suppliers	a) Is the tenderer a resident of the Republic of South Africa or an entity registered in South Africa? ☐Yes ☐No
	b) Does the tenderer have a permanent establishment in the Republic of South Africa? ☐Yes ☐No
	c) Does the tenderer have any source of income in the Republic of South Africa? ☐Yes ☐No
	d) Is the tenderer liable in the Republic of South Africa for any form of taxation? ☐Yes ☐No
Other Required registration numbers	

C.2 FORM OF OFFER AND ACCEPTANCE

TENDER 013S/2025/26: SUPPLY, INSTALLATION AND AD-HOC MAINTENANCE OF CONTROL SYSTEMS INFRASTRUCTURE AT VARIOUS CITY OF CAPE TOWN SITES.

C.2.1 Offer (To Be Completed by the Tenderer as Part of Tender Submission)

The tenderer, identified in the offer signature table below,

HEREBY AGREES THAT by signing the *Form of Offer and Acceptance,* the tenderer:

1. confirms that it has examined the documents listed in the Index (including Schedules and Annexures) and has accepted all the Conditions of Tender;

2. confirms that it has received and incorporated any and all notices issued to tenderers issued by the CCT;

3. confirms that it has satisfied itself as to the correctness and validity of the tender offer; that the price(s) and rate(s) offered cover all the goods and/or services specified in the tender documents; that the price(s) and rate(s) cover all its obligations and accepts that any mistakes regarding price(s), rate(s) and calculations will be at its own risk;

4. offers to supply all or any of the goods and/or render all or any of the services described in the tender document to the CCT in accordance with the:
   4.1 terms and conditions stipulated in this tender document;
   4.2 specifications stipulated in this tender document; and
   4.3 at the prices as set out in the **Price Schedule**.

5. accepts full responsibility for the proper execution and fulfilment of all obligations and conditions devolving on it in terms of the Contract.

SIGNED AT _____ (PLACE) ON THE _____ (DAY) OF_____ (MONTH AND YEAR)

_____
For and on behalf of the Supplier
(Duly Authorised)
Name and Surname:

_____
Witness 1 Signature
Name and Surname:

_____
Witness 2 Signature
Name and Surname:

INITIALS OF CCT OFFICIALS		
1	**2**	**3**

TENDER 013S/2025/26: SUPPLY, INSTALLATION AND AD-HOC MAINTENANCE OF CONTROL SYSTEMS INFRASTRUCTURE AT VARIOUS CITY OF CAPE TOWN SITES.

C.2.2 Acceptance (To Be Completed by the CCT)

By signing this part of this *Form of Offer and Acceptance*, the CCT accepts the tenderer's (if awarded the Supplier's) offer. In consideration thereof, the CCT shall pay the Supplier the amount due in accordance with the conditions of contract. Acceptance of the Supplier's offer shall form an agreement between the CCT and the Supplier upon the terms and conditions contained in this document.

The terms of the agreement are contained in the Contract (as defined) including drawings and documents or parts thereof, which may be incorporated by reference.

Deviations from and amendments to the documents listed in the tender data and any addenda thereto as listed in the *Tender Returnable Documents* as well as any changes to the terms of the offer agreed by the tenderer and the CCT during this process of offer and acceptance, are contained in the *Schedule of Deviations* attached to and forming part of this *Form of Offer and Acceptance*. No amendments to or deviations from said documents are valid unless contained in the *Schedule of Deviations.*

The Supplier shall within 2 (two) weeks after contract commencement, contact the CCT to arrange the delivery of any securities, bonds, guarantees, proof of insurance and any other documents to be provided in terms the *Special Conditions of Contract*. Failure to fulfil any of these obligations in accordance with those terms shall constitute a repudiation / breach of the agreement.

Unless indicated otherwise in the deviation schedule, this agreement comes into effect on the Commencement Date, being the date upon which the Supplier confirms receipt from the CCT of 1 (one) complete, signed copy of the Contract, including amendments or deviations contained in the *Schedule of Deviations* (if any).

_____
For and on behalf of the City of Cape Town
(Duly Authorised)
Name and Surname:

_____
Witness 1 Signature
Name and Surname:

_____
Witness 2 Signature
Name and Surname:

TENDER 013S/2025/26: SUPPLY, INSTALLATION AND AD-HOC MAINTENANCE OF CONTROL SYSTEMS INFRASTRUCTURE AT VARIOUS CITY OF CAPE TOWN SITES.

C.2.3 Schedule of Deviations (To be Completed by the CCT upon Acceptance)

Notes:

1. The extent of deviations from the tender documents issued by the CCT before the tender closing date, is limited to those permitted in terms of the conditions of tender.
2. A tenderer's covering letter shall not be included in the final Contract document. Should any matter in such letter, which constitutes a deviation as aforesaid, become the subject of agreements reached during the process of offer and acceptance, the outcome of such agreement shall be recorded here.
3. Any other matter arising from the process of offer and acceptance either as a confirmation, clarification or change to the tender documents and which it is agreed by the Parties to become an obligation of the Contract, shall be recorded here.
4. Any change or addition to the tender documents arising from the above agreements and recorded here, shall form part of the Contract.

1 Subject . . . . . .

Details . . . . . .

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2 Subject . . . . . .

Details . . . . . .

. . . . . .

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. . . . . .

3 Subject . . . . . .

Details . . . . . .

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4 Subject . . . . . .

Details . . . . . .

. . . . . .

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By the duly authorised representatives signing this agreement, the CCT and the tenderer agree to and accept the foregoing schedule of deviations as the only deviations from and amendments to this tender document and addenda thereto as listed in the *Tender Returnable Documents*, as well as any confirmation, clarification or changes to the terms of the offer agreed by the tenderer and the CCT during this process of offer and acceptance.

It is expressly agreed that no other matter whether in writing, oral communication or implied during the period between the issue of the tender documents and the Commencement Date, shall have any meaning or effect between the Parties arising from the agreement.

TENDER 013S/2025/26: SUPPLY, INSTALLATION AND AD HOC MAINTENANCE OF CONTROL SYSTEMS INFRASTRUCTURE AT VARIOUS CITY OF CAPE TOWN SITES

C.2.4 Confirmation of Receipt (To be Completed by Supplier upon Acceptance)

The Supplier identified in the offer part of the Contract hereby confirms receipt from the CCT of 1 (one) complete, signed copy of the Contract, including the *Schedule of Deviations* (if any) on:

The..... (Day)

Of..... (Month)

20..... (year)

At..... (Place)

For the Supplier: Signature(s) . . . . . .
Name(s) . . . . . .
Capacity . . . . . .
Signature and name of witness:

Signature . . . . . Name . . . . . .

C.3 OCCUPATIONAL HEALTH AND SAFETY AGREEMENT

AGREEMENT MADE AND ENTERED INTO BETWEEN THE CCT (HEREINAFTER CALLED THE "CCT") AND

……..……..…… ,
(Supplier/Mandatary/Company/CC Name)

IN TERMS OF SECTION 37(2) OF THE OCCUPATIONAL HEALTH AND SAFETY ACT, 85 OF 1993 AS AMENDED.

I, ……..……..……, representing

……..……..…… , as an employer in its own right in its own right, do hereby undertake to ensure, as far as is reasonably practicable, that all work will be performed, and all equipment, machinery or plant used in such a manner as to comply with the provisions of the Occupational Health and Safety Act (hereafter "OHSA") and the Regulations promulgated thereunder.

I furthermore confirm that I am/we are registered with the Compensation Commissioner and that all registration and assessment monies due to the Compensation Commissioner have been fully paid or that I/We are insured with an approved licensed compensation insurer.

COID ACT Registration Number: ……..

OR Compensation Insurer: ..... Policy No.: .....

I undertake to appoint, where required, suitable competent persons, in writing, in terms of the requirements of OHSA and the Regulations and to charge him/them with the duty of ensuring that the provisions of OHSA and Regulations as well as the Council's Special Conditions of Contract, Way Leave, Lock-Out and Work Permit Procedures are adhered to as far as reasonably practicable.

I further undertake to ensure that any subcontractors employed by me will enter into an occupational health and safety agreement separately, and that such subcontractors comply with the conditions set.

I hereby declare that I have read and understand the Occupational Health and Safety Specifications contained in this tender and undertake to comply therewith at all times.

I hereby also undertake to comply with the Occupational Health and Safety Specification and Plan submitted and approved in terms thereof.

Signed at .....on the.....day of.....20….

_____ _____
Witness **Mandatary**

Signed at..... on the.....day of.....20 ....

_____ _____
Witness for and on behalf of
CCT

C.4 PRICE SCHEDULE

Bid specifications may not make any reference to any particular trade mark, name, patent, design, type, specific origin or producer, unless there is no other sufficiently precise or intelligible way of describing the characteristics of the work, in which case such reference must be accompanied by the words “or equivalent”.

TENDERERS MUST NOTE THAT WHEREVER THIS DOCUMENT REFERS TO ANY PARTICULAR TRADE MARK, NAME, PATENT, DESIGN, TYPE, SPECIFIC ORIGIN OR PRODUCER, SUCH REFERENCE SHALL BE DEEMED TO BE ACCOMPANIED BY THE WORDS ‘OR EQUIVALENT”

Item No	Payment Refers	Short Description	Unit	Total Rate R c
		SCHEDULE A: SUPPLY OF ITEMS		
	1	**PLC TYPE 1**		
1	1.1	Type 1 CPU	each	
2	1.2	Serial Card (RS 485)	each	
3	1.3	Ethernet (Modbus TCP) Card Type 1	each	
4	1.4	Ethernet (Modbus TCP/EtherNetIP) Card Type 2	each	
	2	**PLC TYPE 2**		
5	2.1	PLC TYPE 2 CPU	each	
6	2.2	PLC TYPE 2 Interbus communication module	each	
7	2.3	PLC TYPE 2 Ethernet communication module	each	
8	2.4	Momentum Modbus Plus communication module	each	
9	2.5	32 Channel DI Card	each	
10	2.6	16 Channel DI Card	each	
11	2.7	16DI/16DO	each	
12	2.8	16 DO card	each	
13	2.9	4 Channel AO Card	each	
14	2.1	16 Channel AI Card	each	
15	2.11	8 Channel AI Card	each	
16	2.12	4 Channel AI Card	each	
17	2.13	Interconnector/Tap	each	
18	2.14	Interbus pre connected cord	each	
	3	**PLC TYPE 3**		
19	3.1	CPU Level 1	each	
20	3.2	CPU Level 2A	each	
21	3.3	CPU Level 2B	each	
22	3.4	CPU Level 3A	each	
23	3.5	CPU Level 3B	each	
24	3.6	CPU Level 4A	each	
25	3.7	CPU Level 4B	each	
	4	**PLC TYPE 4**		
26	4.1	CPU 4.1	each	
27	4.2	CPU 4.2	each	
28	4.3	CPU 4.3	each	
	5	**REMOTE INPUT / OUTPUT MODULES**		
29	5.1	Ethernet remote I/O drop adaptor	each	
30	5.2	Ethernet remote I/O station	each	

	6	**INPUT/OUTPUT MODULES**		
	6.1	**Digital input modules**	each	
31	6.1.1	16 Digital input module	each	
32	6.1.1	32 Digital input module	each	
33	6.1.1	64 Digital input module	each	
34	6.1.2	16 Digital input module	each	
35	6.1.2	32 Digital input module	each	
	6.2	**Digital output modules**		
36	6.2.1	16 Digital output module	each	
37	6.2.1	32 Digital output module	each	
38	6.2.1	64 Digital output module	each	
39	6.2.2	16 Digital output module	each	
40	6.2.2	32 Digital output module	each	
	6.3	**Analog input modules**		
41	6.3.1	4 Channel input	each	
42	6.3.1	8 Channel input	each	
43	6.3.2	4 Channel input	each	
44	6.3.2	8 Channel input	each	
	6.4	**Analog output modules**		
45	6.4.1	4 Channel output	each	
46	6.4.1	8 Channel output	each	
47	6.4.2	2 Channel output	each	
48	6.4.2	4 Channel output	each	
	6.5	**Input/Output Connector**		
	6.5.1	**Removable terminal blocks**		
49	6.5.1	20-way Removable terminal block - Screw	each	
50	6.5.1	28-way Removable terminal blocks - Screw	each	
51	6.5.1	20-way Removable terminal blocks - Spring type	each	
52	6.5.1	28-way Removable terminal blocks - Spring type	each	
	6.5.2	**Preformed cord**		
53	6.5.2	40-way Preformed cord set with one end with flying leads - 3m	each	
54	6.5.2	40-way Preformed cord set with one end with flying leads - 5m	each	
	6.5.3	**Removable terminal prewired cord**		
55	6.5.3	20-way Removable terminal pre-wired cord for 4 Analogue card	each	
56	6.5.3	28-way Removable terminal pre-wired cord for 8 Analogue card	each	
	6.5.4	**Input/Output Connectors CPU 4**	each	
57	6.5.4.1	Front connector module	each	
58	6.5.4.1	Front connector 35mm with screw terminals	each	
59	6.5.4.1	Front connector 35mm with push-in terminals	each	
60	6.5.4.1	Front connector 25mm with push-in terminals	each	
61	6.5.4.2	Terminal module	each	
62	6.5.4.2	Terminal module screw-type terminals	each	
63	6.5.4.2	Terminal module push-in system	each	
64	6.5.4.3	Connecting cord	each	
65	6.5.4.3	16-pin round cord (shielded or unshielded) max. 10m	each	
66	6.5.4.3	50-pin round cord (shielded or unshielded) max. 10m	each	
67	6.5.4.3	16-pin round-sheath ribbon cord (shielded or unshielded) max. 30m	each	

68	6.5.4.3	2x16-pin round-sheath ribbon cord (unshielded) max. 30m	each	
69	6.5.4.4	Front connector with single wires	each	
	7	**BACKPLANE MODULES**		
	7.1	**Backplanes**		
70	7.1.1	4-slot Ethernet + X-bus backplane	each	
71	7.1.1	8-slot Ethernet + X-bus backplane	each	
72	7.1.1	12-slot Ethernet + X-bus backplane	each	
	7.2	**Backplane extender**		
73	7.2.1	I/O Rack expansion module	each	
	7.3	**Backplane extender cord set**		
74	7.3.1	X-Bus Extension cord sets - 0.8m	each	
75	7.3.1	X-Bus Extension cord sets - 3m	each	
76	7.3.1	X-Bus Extension cord sets - 5m	each	
	7.4	**Backplane end terminator**		
77	7.4.1	X-Bus line terminator set	each	
	7.5	**CPU 4 Backplanes**		
78	7.5.1	CPU 4 mounting rail 830mm width	each	
	8	**POWER SUPPLY MODULES**		
	8.1	**POWER SUPPLY MODULES CPU 1&3**		
79	8.1.1	220Vac Module	each	
80	8.1.2	24Vdc Module	each	
	8.2	**POWER SUPPLY MODULES CPU 4**		
81	8.2.1	CPU 4 - 220Vac Module	each	
82	8.2.2	CPU 4 - 24Vdc Module	each	
	9	**FIELDBUS MODULES**		
83	9.1	Profibus Remote Master	each	
84	9.2	Ethernet to Modbus Plus Gateway/Bridge	each	
85	9.3	Modbus Plus Proxy Module	each	
86	9.4	CPU 4 -Communications processor for PROFINET	each	
87	9.5	CPU 4 - Communications processor for Industrial Ethernet	each	
88	9.6	CPU 4 -Communications module for PROFIBUS DP	each	
89	9.7	CPU 4 -Communications module for serial RS232 with 10m cord	each	
90	9.8	CPU 4 -Communications module for serial RS485 with 10m cord	each	
	9.9	**PLC PROGRAMMING TOOLBOX**		
91	9.9.1	Single user licence PLC type 3	each	
92	9.9.2	Single licence for PLC type 4	each	
	10	**PLC TYPE 5**		
93	10.1	Plc type 5 cpu 1	each	
94	10.2	Power supply	each	
95	10.3	Ethernet card(ip adapter) type 1, plc type 5 cpu1	each	
96	10.4	Plc programming toolbox plc type 5	each	
97	10.5	Ethernet card(ip adapter) type 2, plc type 5 cpu1	each	
98	10.6	16 Digital input module for plc type 5 cpu1	each	
99	10.6	32 Digital input module for plc type 5 cpu1	each	
100	10.7	16 Digital output module for plc type 5 cpu1	each	
101	10.7	32 Digital output module for plc type 5 cpu1	each	
102	10.8	4 Analog input modules for plc type 5 cpu1	each	

103	10.8	8 Analog input modules for plc type 5 cpu1	each	
104	10.9	4 Analog output modules for plc type 5 cpu 1	each	
105	10.9	8 Analog output modules for plc type 5 cpu 1	each	
	10.10	**INPUT / OUTPUT MODULES CONNECTORS FOR PLC TYPE 5 CPU 1**		
	10.10.1	**Removable terminal blocks**		
106	10.10.1	20-way Removable terminal block - Screw	each	
107	10.10.1	28-way Removable terminal blocks - Screw	each	
108	10.10.1	20-way Removable terminal blocks - Spring type	each	
109	10.10.1	28-way Removable terminal blocks - Spring type	each	
	10.10.2	**Preformed cord**		
110	10.10.2	40-way Preformed cord set with one end with flying leads - 3m	each	
111	10.10.2	40-way Preformed cord set with one end with flying leads - 5m	each	
	10.10.3	**Removable terminal prewired cord**		
112	10.10.3	20-way Removable terminal pre-wired cord for 4 Analogue card	each	
113	10.10.3	28-way Removable terminal pre-wired cord for 8 Analogue card	each	
	10.11	**BACKPLANE MODULES**		
114	10.11.1	Backplanes(4 slots chassis) for plc type5 cpu 1	each	
115	10.11.2	Backplanes (7 slots chassis) for plc type 5 cpu 1	each	
116	10.11.3	Backplanes(13 slots chassis) for plc type 5 cpu 1	each	
117	10.11.4	Backplane extender for plc type 5 cpu 1	each	
118	10.12	Communications module for serial rs422/rs485 type5 cpu1	each	
119	10.13	Plc type 5 cpu 2	each	
120	10.14	Power supply	each	
121	10.15	Ethernet card (ip adapter) type 1 , plc type 5 cpu 2	each	
122	10.16	Ethernet card (ip adapter) type 2 , plc type 5 cpu 2	each	
123	10.17	Plc programming toolbox type cpu 2	each	
124	10.18	Communications module for serial rs422/rs485 plc5 cpu2	each	
125	10.19	16 Digital input modules for plc type 5, cpu 2	each	
126	10.19	32 Digital input modules for plc type 5, cpu 2	each	
127	10.20	16 Digital output modules for plc type5, cpu 2	each	
128	10.20	32 Digital output modules for plc type5, cpu 2	each	
129	10.21	4 Analog input modules for plc type 5 cpu 2	each	
130	10.21	8 Analog input modules for plc type 5 cpu 2	each	
131	10.22	4 Analog output modules for plc type 5 cpu 2	each	
132	10.22	8 Analog output modules for plc type 5 cpu 2	each	
133	10.23	Plc type 5 cpu 3	each	
134	10.24	Power supply	each	
135	10.25	Ethernet card (ip adapter) type 1 , plc type 5 cpu 3	each	
136	10.26	Ethernet card (ip adapter) type 2 plc type 5 cpu 3	each	
137	10.27	PLC programming toolbox	each	
138	10.28.1	32 Digital input modules for plc type 5 cpu 3	each	
139	10.28.2	16 Digital input modules for plc type 5 cpu 3	each	
140	10.29.1	32 Digital output modules for plc type 5 cpu 3	each	
141	10.29.2	16 Digital output modules for plc type 5 cpu 3	each	
142	10.30	4 Analog input modules for plc type 5 cpu 3	each	
143	10.30	8 Analog input modules for plc type 5 cpu 3	each	
144	10.25.1	4 Analog output modules for plc type 5 cpu 3	each	

145	10.25.2	8 Analog output modules for plc type 5 cpu 3	each	
	11	**PLC TYPE 6**		
146	11.1	CPU PLC type 6	each	
147	11.2	Plc programming toolbox for plc type 6	each	
148	11.3	8 Digital input modules for plc type 6	each	
149	11.3	16 Digital input modules for plc type 6	each	
150	11.4	8 Digital output modules for plc type 6	each	
151	11.4	16 Digital output modules for plc type 6	each	
152	11.5	4 Analog input modules for plc type 6	each	
153	11.5	8 Analog input modules for plc type 6	each	
154	11.6	4 Analog output modules for plc type 6	each	
	12	**PLC TYPE 7**		
155	12.1	CPU type 7 with integrated I/O	each	
156	12.2	PLC programming toolbox for PLC type 7	each	
157	12.3	Electronic Programmable Motor protection relay	each	
158	12.4	Electronic Programmable Feeder protection relay	each	
159	12.5	Electronic Programmbale Transformer protection relay	each	
160	12.6	Electronic Programmbale Generator protection relay	each	
161	12.7	Electronic Programmbale Capacitor bank protection relay	each	
162	12.8	Electronic Programmbale Line Differential protection relay	each	
	13	**HMI TYPE 1**		
163	13.1	HMI 12.1 inch	each	
164	13.2	HMI 15 inch	each	
165	13.3	Open BOX for Universal Panel	each	
166	13.4	Memory card	each	
167	13.5	HMI programming toolbox: Single user licence for HMI and IPC	each	
168	13.5	Run time licence for IPC	each	
169	13.6	12.1” IPC screen	each	
170	13.7	15” IPC screen	each	
171	13.8	IPC modular pc box	each	
	14	**HMI TYPE 2**		
172	14.1	HMI 10.1 inch	each	
173	14.2	HMI 7.0 inch	each	
174	14.3	Memory card	each	
	15	**SCADA**		
	15.1	**New scada licence (single designer with 3 operators)**		
175	15.1.1	300 Tag/Object Point	each	
176	15.1.2	750 Tag/Object Point	each	
177	15.1.3	1500 Tag/Object Point	each	
178	15.1.4	2500 Tag/Object Point	each	
179	15.1.5	5000 Tag/Object Point	each	
180	15.1.6	Unlimited Tag/Object Point	each	
	15.2	**Upgrade of licence (single designer with 3 operators)**		
181	15.2.1	300 Tag Point	each	
182	15.2.2	750 Tag Point	each	
183	15.2.3	1500 Tag Point	each	
184	15.2.4	2500 Tag Point	each	
185	15.2.5	5000 Tag Point	each	

186	15.2.6	Unlimited Tag Point	each	
	15.3	**Alarm management licence**		
187	15.3.1	300 Tag Point	each	
188	15.3.2	750 Tag Point	each	
189	15.3.3	1500 Tag Point	each	
190	15.3.4	2500 Tag Point	each	
191	15.3.5	5000 Tag Point	each	
	15.4	**SCADA HARDWARE**		
192	15,4.1	SCADA & SQL Server with operating system.	each	
193	15.4.2	Desktop PC small form	each	
194	15.4.3	Programming Laptop A	each	
	15.4.4	**Monitors**		
195	15.4.4.1	55 inch 24/7 display	each	
196	15.4.4.2	49 inch 24/7 display	each	
197	15.4.4.3	43 inch 24/7 display	each	
198	15.4.4.4	32 inch computer monitor	each	
199	15.4.4.5	27-inch computer monitor	each	
200	15.4.5	KVM with foldable screen rack mount	each	
201	15.4.6	KVM extender VGA	each	
202	15.4.7.1	3KVA UPS	each	
203	15.4.7.2	5KVA UPS	each	
204	15.4.7.3	10KVA UPS	each	
205	15.4.8	UPS battery extender module for 3/5 KVA	each	
206	15.4.9	Rugged tablet 10 “ or greater	each	
207	15.4.10	42U 19 inch server rack cabinet	each	
	16	**TELEMETRY**		
208	16.1	CPU Type 1	each	
209	16.2	CPU Type 1 Power supply	each	
210	16.3	OPC Server for CPU Type 1	each	
	16.4	**I/O for Type 1 CPU**		
211	16.4.1	Digital Input Type 1	each	
212	16.4.2	Digital Output Type 1	each	
213	16.4.3	Analog input Type 1	each	
214	16.5	Complete Telemetry Station Type 1	each	
	16.6	**Antennas compatible with TYPE1 RTU**		
215	16.6.1	Omni directional type	each	
216	16.6.2	Directional type	each	
217	16.6.3	Rubber duck type for Tetra	each	
218	16.7	CPU Type 2	each	
219	16.8	CPU Type 2 Power supply	each	
220	16.9	OPC Server for CPU Type 2	each	
	16.10	**I/O for Type 2 CPU**		
221	16.10.1	Digital Input Type 2	each	
222	16.10.2	Digital Output Type 2	each	
223	16.10.3	Analog input Type 2	each	
224	16.10.4	Analog output for Type 2	each	
225	16.10.5	Digital input Surge protection Type 2	each	
226	16.10.6	Analog input surge protection Type 2	each	

227	16.10.7	Interposing output relay unit type 2	each	
228	16.11	Complete Telemetry Station Type 2	each	
	16.12	**Antennas compatible with TYPE2 RTU**		
229	16.12.1	Omni directional type	each	
230	16.12.2	Directional type	each	
231	16.12.3	Rubber duck type for Tetra	each	
232	16.13	CPU TYPE 3	each	
233	16.14	CPU TYPE 4	each	
234	16.15	CPU TYPE 5	each	
235	16.16	Expansion I/O for Type3,4 & 5	each	
236	16.17	Complete telemetry station type 3 or 4	each	
237	16.18.1	Omni directional type antenna compatible with TYPE3,4,5 RTU	each	
238	16.18.2	Directional type antenna compatible with TYPE3,4,5 RTU	each	
239	16.18.3	GSM Type antenna compatible with TYPE3,4,5 RTU	each	
	17	**NETWORKING**		
	17.1	**FIBER OPTIC**		
	17.1.1	SFP modules		
240	17.1.1.1	10GB Multi mode	each	
241	17.1.1.2	10GB Single mode	each	
242	17.1.1.3	1GB Multi mode	each	
243	17.1.1.4	1GB Single mode	each	
	17.1.2	**Patch Leads**		
	17.1.2.1	**LC-LC**		
244	17.1.2.1.1	0.5m	each	
245	17.1.2.1.2	1m	each	
246	17.1.2.1.3	5m	each	
247	17.1.2.1.4	10m	each	
	17.1.2.2	**LC-SC**		
248	17.1.2.2.1	0.5m	each	
249	17.1.2.2.2	1m	each	
250	17.1.2.2.3	5m	each	
251	17.1.2.2.4	10m	each	
	17.1.2.3	**LC-ST**		
252	17.1.2.3.1	0.5m	each	
253	17.1.2.3.2	1m	each	
254	17.1.2.3.3	5m	each	
255	17.1.2.3.4	10m	each	
	17.1.2.4	**ST-ST**		
256	17.1.2.4.1	0.5m	each	
257	17.1.2.4.2	1m	each	
258	17.1.2.4.3	5m	each	
259	17.1.2.4.4	10m	each	
	17.1.2.5	**ST-SC**		
260	17.1.2.5.1	0.5m	each	
261	17.1.2.5.2	1m	each	
262	17.1.2.5.3	5m	each	
263	17.1.2.5.4	10m	each	
	17.1.2.6	**SC-SC**		

264	17.1.2.6.1	0.5m	each	
265	17.1.2.6.2	1m	each	
266	17.1.2.6.1	5m	each	
267	17.1.2.6.2	10m	each	
	17.2	**Network Switches**		
268	17.2.1	Managed Network Switch Layer 2 Type1	each	
269	17.2.2	Managed Network Switch Layer 2 Type2	each	
270	17.2.3	Managed Network Switch Layer 3	each	
271	17.2.4	Unmanaged Network Switch Layer 2	each	
	17.3	**Wireless Network**		
272	17.3.1	Wireless network modem	each	
	18	**INSTRUMENTATION**		
	18.1	**Multi Parameter Controller**		
273	18.1.1	Multi Parameter Controller - Analogue output, one digital sensor input	each	
274	18.1.1	Multi Parameter Controller - Analogue output, one analogue sensor input	each	
275	18.1.1	Multi Parameter Controller - Analogue output, two digital sensor inputs	each	
276	18.1.1	Multi Parameter Controller - Analogue output, one digital one analogue sensor input	each	
277	18.1.1	Multi Parameter Controller - Profibus DP output, two digital sensor inputs	each	
278	18.1.2	PH/ORP Sensor compatible with Controller	each	
279	18.1.3	Dissolved Oxygen Probe Caps	each	
280	18.1.4	Oxygen Scavenger sensor module	each	
281	18.1.5	Conducting Conductivity Sensor compatible with Controller	each	
282	18.1.6	Inductive Conductivity Sensor compatible with Controller	each	
283	18.1.7	Dissolved Oxygen probe	each	
284	18.1.8	Portable Dissolved Oxygen meter including Rugged LDO sensor probe	each	
285	18.1.8	Rugged LDO sensor probe	each	
286	18.1.8	Replacment Sensor cap compatible with Rugged LDO sensor	each	
287	18.1.9	Portable Suspended Solids device	each	
288	18.1.10	Turbidity Meter Controller	each	
289	18.1.10	Turbidity probe	each	
	18.2	**Residual Chlorine Analyser**		
290	18.2.1	Residual chlorine sensor unit complete	each	
291	18.2.2	Residual chlorine analyser controller	each	
292	18.2.3	Residual chlorine analyser probe	each	
	18.3	**Flow Meters**		
	18.3.1	**Electromagnetic Flow meters**		
293	18.3.1	Electromagnetic flow meter transmitter remote mount 230 Vac	each	
294	18.3.1	Electromagnetic flow meter transmitter remote mount 24 Vdc	each	
	18.3.1	Electromagnetic Flow Sensor with the following DN and PN ratings:		
295	18.3.1	DN 40 PN 40	each	
296	18.3.1	DN 50 PN 40	each	
297	18.3.1	DN 80 PN 16	each	
298	18.3.1	DN 80 PN 10	each	

299	18.3.1	DN 100 PN 16	each	
300	18.3.1	DN 100 PN 10	each	
301	18.3.1	DN 125 PN 16	each	
302	18.3.1	DN 125 PN 10	each	
303	18.3.1	DN 150 PN 16	each	
304	18.3.1	DN 150 PN 10	each	
305	18.3.1	DN 200 PN 16	each	
306	18.3.1	DN 200 PN 10	each	
307	18.3.1	DN 250 PN 10	each	
308	18.3.1	DN 250 PN 16	each	
309	18.3.1	DN 300 PN 10	each	
310	18.3.1	DN 300 PN 16	each	
311	18.3.1	DN 350 PN 10	each	
312	18.3.1	DN 350 PN 16	each	
313	18.3.1	DN 400 PN 10	each	
314	18.3.1	DN 400 PN 16	each	
315	18.3.1	DN 450 PN 10	each	
316	18.3.1	DN 450 PN 16	each	
317	18.3.1	DN 500 PN 10	each	
318	18.3.1	DN 500 PN 16	each	
319	18.3.1	DN 600 PN 10	each	
320	18.3.1	DN 600 PN 16	each	
321	18.3.1	DN 700 PN 10	each	
322	18.3.1	DN 700 PN 16	each	
323	18.3.1	DN 800 PN 10	each	
324	18.3.1	DN 800 PN 16	each	
325	18.3.1	DN 900 PN 10	each	
326	18.3.1	DN 900 PN 16	each	
327	18.3.1	DN 1000 PN 10	each	
328	18.3.1	DN 1000 PN 16	each	
329	18.3.1	Potting kit for remote mount units	each	
330	18.3.1	Flow meter cord for remote mount units - 10m	each	
331	18.3.1	Flow meter cord for remote mount units - 20m	each	
332	18.3.1	Flow meter cord for remote mount units - 30m	each	
333	18.3.1	Flow meter cord for remote mount units - 40m	each	
334	18.3.1	Flow meter cord for remote mount units - 50m	each	
335	18.3.1	DN 40 PN 16 Battery powered	each	
336	18.3.1	DN 50 PN 16 Battery powered	each	
337	18.3.1	DN 80 PN 16 Battery powered	each	
338	18.3.1	DN 100 PN 16 Battery powered	each	
339	18.3.1	DN 125 PN 16 Battery powered	each	
340	18.3.1	DN 150 PN 16 Battery powered	each	
341	18.3.1	DN 250 PN 16 Battery powered	each	
342	18.3.1	DN 300 PN 16 Battery powered	each	
343	18.3.1	Battery Electromagnetic flow meter transmitter/display	each	
344	18.3.1	Replacement Battery pack for Battery Electromagnetic flow meter transmitter/display	each	
	18.3.2	**Differential Pressure Flow**		
345	18.3.2	Controller/Transmitter	each	

	18.3.3	**Clamp on flow meter**		
346	18.3.3	Clamp-on flow meter, 220VAC with universal sensors & mounting equipment for pipe sizes 51 - 305mm including 10m Cable Set	each	
347	18.3.3	Clamp-on flow meter, 220VAC with universal sensors & mounting equipment for pipe sizes 203 - 610mm including 10m Cable Set	each	
348	18.3.3	Clamp-on flow meter, 24VDC with universal sensors & mounting equipment for pipe sizes 51 - 305mm including 10m Cable Set	each	
349	18.3.3	Clamp-on flow meter, 24VDC with universal sensors & mounting equipment for pipe sizes 203 - 610mm including 10m Cable Set	each	
350	18.3.3	Clamp-on flow meter, 220VAC, Replacement Transmitter only	each	
351	18.3.3	Clamp-on flow meter, 24VDC, Replacement Transmitter only	each	
352	18.3.3	Replacement Cable for Clamp-on flow meter, 10m, with Termination Kit	each	
353	18.3.3	Replacement Cable for Clamp-on flow meter, 20m, with Termination Kit	each	
354	18.3.3	Replacement Cable for Clamp-on flow meter, 30m, with Termination Kit	each	
355	18.3.3	Spare coupling compound, Permanent mount	each	
356	18.3.3	Spare coupling compound, Submersible sensor	each	
	18.3.4	**Thermal mass flow meter**		
357	18.3.4.1	Sensor A	each	
358	18.3.4.2	Sensor B	each	
359	18.3.4.3	Sensor C	each	
360	18.3.4.4	Sensor D	each	
361	18.3.4.5	Transmitter A	each	
362	18.3.4.6	Transmitter B	each	
	18.4	**Level control**		
	18.4.1	**Ultrasonic**		
363	18.4.1.1	Type 1 transmitter , Wall mount, Input 4–20 mA Hart, Output 4–20 mA, 4 relays, 230Vac	each	
364	18.4.1.1	Type 1 transmitter , Wall mount, Input 4–20 mA Hart, Output 4–20 mA, 4 relays, 12 to 30Vdc	each	
365	18.4.1.1	Type 1 transducer, Output 4–20 mA Hart, 10m Range, 10m Cable	each	
366	18.4.1.2	Type 2 transmitter , Wall mount, Input Ultrasonic and 4–20 mA, Output 4–20 mA, 6 relays, 230Vac	each	
367	18.4.1.2	Type 2 transmitter, Wall mount, Input Ultrasonic and 4–20 mA, Output 4–20 mA, 6 relays, 12 to 30Vdc	each	
368	18.4.1.2	Type 2 transmitter, Panel mount, Input Ultrasonic and 4–20 mA, Output 4–20 mA, 6 relays, 230Vac	each	
369	18.4.1.2	Type 2 transmitter, Panel mount, Input Ultrasonic and 4–20 mA, Output 4–20 mA, 6 relays, 12 to 30Vdc	each	
370	18.4.1.2	Type 2 transmitter, Wall mount, Input Dual Ultrasonic, Output 4–20 mA, 6 relays, 230Vac	each	
371	18.4.1.2	Type 2 transmitter, Wall mount, Input Dual Ultrasonic, Output 4–20 mA, 6 relays, 12 to 30Vdc	each	
372	18.4.1.2	Type 2 transducer, 10m Range, 5m Cable		

373	18.4.1.2	Type 2 transducer, 10m Range, 10m Cable	each	
374	18.4.1.2	Type 2 transducer subshield	each	
375	18.4.1.3	Type 3 transmitter, Wall mount, 1 sensor, Output: 2x4-20mA, 6 relays, 230Vac	each	
376	18.4.1.3	Type 3 transmitter , Wall mount, 1 sensor, Output: 2x4-20mA, 6 relays, 12 to 30Vdc	each	
377	18.4.1.3	Type 3 transmitter, DIN rail mount, 1 sensor, Output: 2x0/4-20mA, 6 relays, 230Vac	each	
378	18.4.1.3	Type 3 transmitter, DIN rail mount, 1 sensor, Output: 2x4-20mA, 6 relays, 12 to 30Vdc	each	
379	18.4.1.3	Type 3 transmitter, Wall mount, 2 sensor, Output: 2x4-20mA, 6 relays, 230Vac	each	
380	18.4.1.3	Type 3 transmitter, Wall mount, 2 sensor, Output: 2x4-20mA, 6 relays, 12 to 30Vdc	each	
381	18.4.1.3	Type 3 transmitter, DIN rail mount, 2 sensor, Output: 2x4-20mA, 6 relays, 230Vac	each	
382	18.4.1.3	Type 3 transmitter, DIN rail mount, 2 sensor, Output: 2x4-20mA, 6 relays, 12 to 30Vdc	each	
383	18.4.1.3	Type 3 transducer, Range: 0.3 to 10m, IP68, Cable length 5m	each	
384	18.4.1.3	Type 3 transducer, Range: 0.3 to 10m, IP68, Cable length 15m	each	
385	18.4.1.3	Type 3 transducer, Range: 0.4 to 20m, IP68, Cable length 5m	each	
386	18.4.1.3	Type 3 transducer, Range: 0.4 to 20m, IP68, Cable length 15m	each	
	18.4.2	**Hydrostatic**		
387	18.4.2.1	Hydrostatic Level Transmitter	each	
	18.4.3	**Floats**		
388	18.4.3.1	Floats Type 1	each	
389	18.4.3.2	Floats Type 2	each	
390	18.4.3.3	Floats Type 3	each	
	18.4.4	**Point Level Detection**		
391	18.4.4.1	Conductive Probes	each	
392	18.4.4.2	Point level probe	each	
	18.4.5	**Radar**		
393	18.4.5.1	Type 1 transmitter , Wall mount, Input 4–20 mA Hart, Output 4–20 mA, 6 relays, 12 to 30Vdc	each	
394	18.4.5.1	Type 1 transmitter , DIN rail mount, Input 4–20 mA Hart, Output 4–20 mA, 6 relays, 12 to 30Vdc		
395	18.4.5.1	Type 1 transducer, Output 4–20 mA, 10m Range, 10m Cable	each	
396	18.4.5.1	Type 1 transducer, Output 4–20 mA, 20m Range, 10m Cable	each	
397	18.4.5.2	Type 2 transmitter, Wall mount, Input 4–20 mA, Output 4–20 mA, 6 relays, Modbus RTU, 230Vac	each	
398	18.4.5.2	Type 2 transmitter, Wall mount, Input Ultrasonic and 4–20 mA, Output 4–20 mA, 6 relays, Modbus RTU, 12 to 30Vdc	each	
399	18.4.5.2	Type 2 transmitter,, Panel mount, Input 4–20 mA, Output 4–20 mA, 6 relays, Modbus RTU, 230Vac	each	
400	18.4.5.2	Type 2 transmitter, Panel mount, Input 4–20 mA, Output 4–20 mA, 6 relays, Modbus RTU, 12 to 30Vdc	each	
401	18.4.5.2	Type 2 transducer, Output 4–20 mA Hart, 15m Range, 5m Cable	each	

402	18.4.5.2	Type 2 transducer, Output 4–20 mA Hart, 15m Range, 10m Cable	each	
403	18.4.5.2	Type 2 transducer, Output Modbus RTU, 15m Range, 5m Cable	each	
404	18.4.5.2	Type 2 transducer, Output Modbus RTU, 15m Range, 10m Cable	each	
405	18.4.5.3	Type 3 transducer, Output 4–20 mA Hart, 12m Range, 10m Cable	each	
	18.5	**Pressure**		
406	18.5.3	Differential Pressure Transmitter	each	
407	18.5.4	Pressure Gauge (-1 to 10), 100mm	each	
408	18.5.4	Pressure Gauge (0 to 6), 63mm	each	
409	18.5.4	Pressure Gauge (0 to 6), 100mm	each	
410	18.5.4	Pressure Gauge (0 to 10), 100mm	each	
411	18.5.4	Pressure Gauge (0 to 16), 100mm	each	
412	18.5.4	Pressure Gauge (-1 to 16), 100mm	each	
413	18.5.4	Pressure Gauge (0 to 20 bar), 100mm	each	
414	18.5.5	Pressure Transmitter (loop powered with display) 10 Bar	each	
415	18.5.5	Pressure Transmitter (loop powered with display) 20 Bar	each	
416	18.5.5	Pressure Transmitter (loop powered without display) -1 to 10 Bar	each	
417	18.5.5	Pressure Transmitter (loop powered without display) 0 to 6 Bar	each	
418	18.5.5	Pressure Transmitter (loop powered without display) 0 to 10 Bar	each	
419	18.5.5	Pressure Transmitter (loop powered without display) 0 to 20 Bar	each	
420	18.5.6	E&H PTP33B-AA4M1PGBWQJ or equivalent, Switching range: range: 10Bar, Output PNP, IP67, M12 connector	each	
421	18.5.6	FEMA DCMV6 or equivalent, Switching range: 0.5…6 bar, Floating changeover contact, Plug connection	each	
422	18.5.6	FEMA DCMV10 or equivalent, Switching range: 1...10 bar, Floating changeover contact, Plug connection	each	
423	18.5.6	FEMA DCMV16 or equivalent, Switching range: 3...16 bar, Floating changeover contact, Plug connection	each	
424	18.5.1	Chemical seal for corrosive applications.(Monel or Hasloy C)	each	
425	18.5.1	Chemical seal for oxygen deficient applications (Ceramic)	each	
	18.6	**Proximity switches PNP Type**		
426	18.6	M5 sensing distance 1.5mm with plug	each	
427	18.6	M12 sensing distance 2mm with plug	each	
428	18.6	M12 sensing distance 4mm with plug	each	
429	18.6	M12 sensing distance 8mm with plug	each	
430	18.6	M18 sensing distance 5mm with plug	each	
431	18.6	M18 sensing distance 8mm with plug	each	
432	18.6	M18 sensing distance 12mm with plug	each	
433	18.6	M30 sensing distance 10mm with plug	each	
434	18.6	M30 sensing distance 15mm with plug	each	
435	18.6	M30 sensing distance 20mm with plug	each	
436	18.6	Rectangular 40 x 40 x 118mm, sensing distance 40mm	each	
437	18.6	Festo SME-8M-ZS-24V-K-2,5-OE or equivalent, compatible with Festo T-slot cylinders, 2-wire, NO, 5 - 30Vdc, IP65/68, 2.5m cable	each	
438	18.6	Right angled plug for proximity with 5m pre formed connection	each	
439	18.6	Straight connector plug for proximity with 5m pre formed connection	each	

440	18.6	25m pre formed cord with 5 pin angle connector for sensor	each	
441	18.6	20m pre formed cord,one 5 pin angle connector for I/O link sensor	each	
442	18.6	10m pre formed cord,one 5 pin angle connector for I/O link sensor	each	
443	18.6	Preformed power cord for i/o link master	each	
444	18.6	20m pre formed i/o link cord with 2 plugs	each	
445	18.6	10m preformed cord i/o link with 2 plugs	each	
446	18.6	5m preformed cord i/o link with 2 plugs	each	
	18.6.2	**Limit switches**		
447	18.6.2.1	IP 66 body with normally close and open contacts insert	each	
448	18.6.2.2	Top steel roller plunger	each	
449	18.6.2.3	Roller lever side action	each	
450	18.6.2.4	Roller lever vertical action	each	
451	18.6.2.5	Adjustable roller lever action	each	
452	18.6.2.6	Wobble stick/flexible spring	each	
	18.7	**Signal isolators**		
453	18.7.1	Signal isolator/splitter	each	
454	18.7.2	Loop powered isolator 2 channel	each	
455	18.7.3	Signal isolator/converter	each	
456	18.7.4	Signal isolator busbar power supply	each	
	18.8	**Chlorinator**		
457	18.8	15kg/h chlorinator	each	
	18.9	**Load cell indicators**		
458	18.9	Load cell indicators	each	
	18.10	**CHLORINE LEAK DETECTORS**		
459	18.10	Chlorine leak detector 0-5ppm	each	
	18.11	**Fixed gas detectors**		
460	18.11	Gas detector Drager Polytron 5100 8344862	each	
461	18.11	LeL detector Drager Polytron 5200 8344152	each	
462	18.11	H2S sensor Drager 6810435	each	
463	18.11	O2 sensor 6809630	each	
464	18.11	CO sensor 6809605	each	
	18.12	**Portable gas detector**		
465	18.12.1	Type 1 Gas Portable gas detector (O2, CO, H2S, LeL sensors incl)	each	
466	18.12.1	Type 1 Portable gas detector oxygen cell	each	
467	18.12.1	Type 1 Portable gas detector H2S cell	each	
468	18.12.1	Type 1 Portable gas detector LeL cell	each	
469	18.12.1	Type 1 Portable gas detector CO cell	each	
470	18.12.1	Type 1 Portable gas detector Battery	each	
471	18.12.1	Type 1 Portable gas detector pump with probe for confined spaces	each	
472	18.12.2	Type 2 Gas Portable gas detector (O2, CO, H2S, LeL sensors incl)	each	
473	18.12.2	Type 2 Portable gas detector oxygen cell	each	
474	18.12.2	Type 2 Portable gas detector H2S cell	each	
475	18.12.2	Type 2 Portable gas detector LeL cell	each	
476	18.12.2	Type 2 Portable gas detector CO cell	each	

477	18.12.2	Type 2 Portable gas detector Battery	each	
478	18.12.2	Type 2 Portable gas detector pump with probe for confined spaces	each	
	18.13	**Vibration sensing**		
479	18.13.1	Vibration sensor/transmitter	each	
480	18.13.2	Vibration monitor	each	
	18.14	**Temperature**		
481	18.14	Thermowell socket for PT100	each	
482	18.14	PT100	each	
483	18.14	4-20ma insert	each	
484	18.14	Resistance to I/O link converter	each	
	18.15	**Paperless Chart Recorder**		
485	18.15.1	6 channel	each	
486	18.15.2	12 channel	each	
	18.16	**Paper Chart Recorders**		
487	18.16	Circular Chart recoder single pen	each	
488	18.16	Circular Chart recoder dual pen	each	
489	18.16	Circular Charts (0-50) 7 day	each	
490	18.16	Circular Charts (0-100) 7 day	each	
491	18.16	Circular Charts (0-200) 7 day	each	
492	18.16	Circular Charts (0-300) 7 day	each	
493	18.16	Circular Charts (0-600) 7 day	each	
494	18.16	Circular Chart recorder pens (various colours)	each	
495	18.16	Paperless Chart recoder 6 channel	each	
496	18.16	Paperless chart recorder 12 channel	each	
	18.17	**PANEL MOUNT PROCESS METERS**		
497	18.17.1	96mm x 96mm Process meter, RIA452 or equivalent	each	
498	18.17.2	48mm x 96mm Process meter, RIA45 or equivalent	each	
	19	**CABLING AND ACCESSORIES**		
	19.1	**INSTRUMENT CABLING**		
499	19.1	Alvern IP010004 or equivalent, core size: 1.0mm2, Pairs: 4, OD: 12.8mm, Gland size: 1, pairs induvidual screened and overall screened	500m	
500	19.1	Alvern IP010008 or equivalent, core size: 1.0mm2, Pairs: 8, OD: 16.7mm, Gland size: 2, pairs induvidual screened and overall screened	500m	
	19.2	**COMPRESSION GLANDS**		
500	19.2	Compression gland Size 00, CCG A2 053500 or equivalent approved, Entry tread: M20 x 1.5, Cable OD: 3.0 - 8.5mm , Material: Nickel plated brass, Cable type: Unarmoured	each	
501	19.2	Compression gland Size 0s, Pratley 22187 or equivalent approved, Entry tread: M20 Material: brass, Cable type: Unarmoured	each	
502	19.2	Compression gland Size 0, Pratley 22188 or equivalent approved, Entry tread: M20 Material: brass, Cable type: Unarmoured	each	
503	19.2	Compression gland Size 1, Pratley 22189 or equivalent approved, Entry tread: M20 Material: brass, Cable type: Unarmoured	each	
	19.3	**UTILITY BOXES**		

504	19.3	4-Way junction box, CCG 100301 or equivalent aproved, Number of entries: 4, Entry tread: M20 , OD: 118mm, height: 98mm	each	
	19.4	**STAINLESS STEEL WIRE ROPE**		
505	19.4	Stainless Steel wire rope, AISI 304 Stainless Steel, OD: 1.5mm, Number of cores: 19	100m	
506	19.4	Stainless Steel Thimbles for wire size 3mm (10 units per pack)	pack	
507	19.4	Ferrules 6mm 304 stainless steel (50 units per pack)	pack	
	19.5	**INSULATED BOOTLACE FERULES**		
508	19.5	Insulated Crimp Bootlace Ferrule, 8mm Pin Length, 1.3mm Pin Diameter, 0.5mm² Wire Size, White, (100 units per pack)	pack	
509	19.5	Insulated Crimp Bootlace Ferrule, 8mm Pin Length, 1.5mm Pin Diameter, 2 x 0.5mm² Wire Size, White, (100 units per pack)	pack	
510	19.5	Insulated Crimp Bootlace Ferrule, 8mm Pin Length, 1.7mm Pin Diameter, 1mm² Wire Size, Red, (100 units per pack)	pack	
511	19.5	Insulated Crimp Bootlace Ferrule, 8mm Pin Length, 2.4mm Pin Diameter, 2 x 1mm² Wire Size, Red, (100 units per pack)	pack	
512	19.5	Insulated Crimp Bootlace Ferrule, 8mm Pin Length, 2mm Pin Diameter, 1.5mm² Wire Size, Black, (100 units per pack)	pack	
513	19.5	Insulated Crimp Bootlace Ferrule, 8mm Pin Length, 2.3mm Pin Diameter, 2 x 1.5mm² Wire Size, Black, (100 units per pack)	pack	
	19.6	**CABLE TRAYS**		
514	19.6	Medium Duty Welded Wire Mesh Cable tray straights, CBT WWMD 100MM STR 50 X 50 3M HDG or equivalent approved	each	
515	19.6	Medium Duty Welded Wire Mesh Horizontal Bend 90°, CBT WWMD 100MM HOR 90 DEG R160 HDG or equivalent approved	each	
516	19.6	Medium Duty Welded Wire Mesh Riser, CBT WWMD 100MM RISER 90 DEG R160 HDG or equivalent approved	each	
517	19.6	Medium Duty Welded Wire Mesh Dropper, CBT WWMD 100MM DROP 90 DEG R160 HDG or equivalent approved	each	
518	19.6	Medium Duty Welded Wire Mesh Tee, CBT WWMD 100MM TEE R160 HDG or equivalent approved	each	
519	19.6	Medium Duty Welded Wire Mesh 4 Way Crossovers, CBT WWMD 100MM 4WAY CROSS R160 HDG or equivalent approved	each	
520	19.6	Medium Duty Welded Wire Mesh Joiner set, CBT WM 4PCE JOINER CLAMP SET COMPL HDG or equivalent approved	each	
521	19.6	Medium Duty Welded Wire Mesh Hold down saddle, CBT WM FLUSH HOLD DOWN SADDLE 8,5MM HDG or equivalent approved	each	
522	19.6	Medium Duty Welded Wire Mesh Support channel, CBT WM CLIP-ON SUPPORT CHANNEL 1200MM PG or equivalent approved	each	
	19.7	**SLOTTED TRUNKING**		
523	19.7	W40xH40 Slotted Trunking N 2M, TSL040040N or equivalent approved	each	
	20	**PNUEMATICS**		
	20.1	**ELECTRONIC VALVE BLOCKS**		
524	20.1.1	CPU	each	
525	20.1.2	Input Module	each	
526	20.1.3	Ouput Module	each	

527	20.1.4	5/2 way cartridge	each	
528	20.1.5	5/3 way cartridge	each	
529	20.1.6	Interlinking module	each	
530	20.1.7	Valve electronic module	each	
	20.2	**PNUEMATICS**		
531	20.2.1	Valve: Function: 5/2, Mounting Style: NAMUR, Metal Work 7021020100 or equivalent	each	
532	20.2.1	Coil: Size 22mm, Ø 8mm BA 2W-24VDC 24VDC, Metal Work W0215000101 or equivalent	each	
533	20.2.1	Coil: Size 22, Ø 8mm BA 3.5VA-220VAC 220V 50/60Hz, Metal Work W0215000131 or equivalent	each	
534	20.2.1	Coil connector: Colour Transparent, Ø 9mm, Type LED, 24V, W0970510012 or equivalent	each	
535	20.2.1	Coil connector: Colour Transparent, Ø 9mm, Type LED, 220V, W0970510014 or equivalent	each	
536	20.2.2	5/2 Pneumatic Control Valve - Solenoid/Pilot G 1/8, ASCO 52000001 or equivalent, Mounting Style: Manifold, Function: 5/2, Connection Port Thread: G 1/8, Actuation Type: Solenoid/Pilot	each	
537	20.2.3	Sub Base Manifold Type 1, ASCO 35500337 or equivalent, Type: Multiple Manifold, Thread Size: 1/8in, Number of valves: 6	each	
538	20.2.4	Valve: Function: 3/2 way direct - acting solenoind valve, Burkett 041 235 or equivalent, normally open. Seal material: NBR. Body and seat material: Brass. Voltage/Frequency: 24/50.	each	
539	20.2.5	Sub Base Manifolds Type 2, Burkett 005 366 or equivalent, Length 106mm, Hole Spacing: 37mm, Material: Anodized Aluminum	each	
540	20.2.6	Filter Regulator: SMC AW30-F02D-B or equivelant, Filtration Size: 5µm, Port Connection: G1/4, Max Op Press: 10 bar, Bracket and guage included	each	
541	20.2	Push-in fitting, Festo QS-¼-8 or equivalent, R1/4, Tubing OD: 8mm	each	
542	20.2	Push-in fitting, Festo QSL-¼-8 or equivalent, R1/4, Tubing OD: 8mm	each	
543	20.2	Push-in fitting, Festo QS-1/8-8 or equivalent, R1/8, Tubing OD: 8mm	each	
544	20.2	Push-in fitting, Festo QSL-1/8-8 or equivalent, R1/8, Tubing OD: 8mm	each	
545	20.2	Bulkhead Tube-to-Tube Adapter Straight Push In 8 mm to Push In 8 mm. Festo QSS-8 or equivelant	each	
546	20.2	Bulkhead Tube-to-Tube Adapter Straight Push In 10 mm to Push In 10 mm. Festo QSS-10 or equivelant	each	
547	20.2	Nickel Plated Brass G 1/4 Blanking Plug. Festo NPQH-BK-G14-P10 or equivelant	each	
548	20.2	Pneumatic Straight Threaded-to-Tube Adapter, G 1/4 Male, Push In 10 mm, Legris 3101 10 13 or equivelant approved	each	
549	20.2	Tee Tube-to-Tube Adapter, Push In 10 mm x Push In 10 mm x Push In 10 mm. Festo QST-10 or equivelant	each	
550	20.2	Elbow Tube-to-Tube Adapter Push In 10 mm to Push In 10 mm. Festo QSL-10 or equivelant	each	
551	20.2	Y Tube-to-Tube Adapter, Push In 8 mm Legris 3140 08 00 or equivelant approved	each	

552	20.2	Push-in connector, Ø 6mm, Festo QS-6 or equivalent, Tubing OD: 6mm	each	
553	20.2	Push-in connector, Ø 8mm, Festo QS-8 or equivalent, Tubing OD: 8mm	each	
554	20.2	Push-in connector, Ø 10mm, Festo QS-10 or equivalent, Tubing OD: 10mm	each	
555	20.2	Blanking plug, Festo QSC-8H or equivalent, D1: 8mm,	each	
556	20.2	Pnuematic tubing, Festo PUN-6X1-BL or equivalent, OD 6mm, length 50m, max pressure 10 bar	each	
557	20.2	Pnuematic tubing, Festo PUN-8X1,25-BL or equivalent, OD 8mm, length 50m, max pressure 10 bar	each	
558	20.2	Pnuematic tubing, Festo PUN-10X1,5-BL or equivalent, OD 10mm, length 50m, max pressure 10 bar	each	
	20.3	**ACTUATORS AND POSITIONERS**		
	20.3.1	**90 Degree actuators**		
559	20.3.1.1	Type 1: AT101U or equivalent	each	
560	20.3.1.2	Type 2: AT251U or equivalent	each	
561	20.3.1.3	Type 3: AT451U or equivalent	each	
562	20.3.2	Switchbox: LSA-M2WARNM or equivalent	each	
563	20.3.3	Valve positioner: SRD998 or equivalent	each	
	21	**I/O LINK EQUIPMENT**		
564	21.1	Type 5 I/O Link Master (panel mount)	each	
565	21.2	Type 5 I/O Link Master (external mount)	each	
566	21.3	4-20ma (input) to i/o link converter	each	
567	21.4	i/o link to 4-20ma (output)converter	each	
568	21.5	i/o link display	each	
	22	**INSTRUMENT POWER SUPPLY**		
569	22.1	AC-DC DIN rail single output power supply with battery charger (UPS function), Output 27.6Vdc at 5A, DRC-180B or equivalent approved	each	
	23	**PROVISIONAL SUM**		
570	23.1	Provisional sum		R 300 000.00
571	23.2	Mark up on provisional sum	15%	
	24	**LABOUR RATES**		
		Base labour rate: x 1.0 Weekdays		
572		HMI Technician	Hour	
573		PLC Technician	Hour	
574		SCADA Technician	Hour	
575		Instrumentation Technician	Hour	
576		Telemetry Technician	Hour	
577		Electrician	Hour	
578		Artisan assistant	Hour	
579		Draughtsman	Hour	
580		Service Technician - Level control equipment (Multi-ranger, FMU90 or equivalent)	Hour	
581		Service Technician - Flowmeters (Sitrans, Promag or equivalent)	Hour	
582		Service Technician - Water Analytics (Hach, E&H or equivalent)	Hour	
		Base labour rate: x 1.5 Weekends and after hours		
583		HMI Technician	Hour	

584		PLC Technician	Hour	
585		SCADA Technician	Hour	
586		Instrumentation Technician	Hour	
587		Telemetry Technician	Hour	
588		Electrician	Hour	
589		Artisan assistant	Hour	
590		Draughtsman	Hour	
591		Service Technician - Level control equipment (Multi-ranger, FMU90 or equivalent)	Hour	
592		Service Technician - Flowmeters (Sitrans, Promag or equivalent)	Hour	
593		Service Technician - Water Analytics (Hach, E&H or equivalent)	Hour	
		Base labour rate: x 2.0 Sundays and Public Holidays		
594		HMI Technician	Hour	
595		PLC Technician	Hour	
596		SCADA Technician	Hour	
597		Telemetry Technician	Hour	
598		Instrumentation Technician	Hour	
599		Electrician	Hour	
600		Artisan assistant	Hour	
601		Draughtsman	Hour	
602		Service Technician - Level control equipment (Multi-ranger, FMU90 or equivalent)	Hour	
603		Service Technician - Flowmeters (Sitrans, Promag or equivalent)	Hour	
604		Service Technician - Water Analytics (Hach, E&H or equivalent)	Hour	
	25	**TRAINING RATES**		
605	25.1	Telemetry Training Facilitator	Day	
606	25.2	HMI Training Facilitator	Day	
607	25.3	PLC Training Facilitator	Day	
608	25.4	Instrumentation Training Facilitator	Day	
609	25.5	SCADA Training Facilitator	Day	
	26	**TASKS**		
610	26.1	HW MicroClip XL gas monitor Calibration	each	
611	26.1	RKI GX-3R/GX-2009 gas monitor Calibration	each	
612	26.2	Siemens magnetic flowmeter verification	each	
613	26.2	E&H magnetic flowmeter verification	each	
614	26.3	Siemens magnetic flowmeter qualification	each	
615	26.4	Ultrasonic open channel flowmeter verification	each	
	27	**TRANSPORT**		
616	27.1	Light delivery vehicle or panel van (0.5 - 1.0 Ton) and driver	km	
617	27.2	Labour traveling rate	km	

Pricing Instructions:

5.1 State the rates and prices in Rand unless instructed otherwise in the Conditions of Tender.

5.2 Include in the rates, prices, and the tendered total of the prices (if any) all duties, taxes (except Value Added Tax (VAT), and other levies payable by the successful tenderer, such duties, taxes and levies being those applicable 14 days before the closing time stated in the General Tender Information.

5.3 All prices tendered must include all expenses, disbursements and costs (e.g. transport, accommodation

etc.) that may be required for the execution of the tenderer's obligations in terms of the Contract, and shall cover the cost of all general risks, liabilities and obligations set forth or implied in the Contract as well as overhead charges and profit (in the event that the tender is successful). All prices tendered will be final and binding.

5.4 All prices shall be tendered in accordance with the units specified in this schedule.

5.5 Where a value is given in the Quantity column, a Rate and Price (the product of the Quantity and Rate) is required to be inserted in the relevant columns.

5.6 The successful tenderer is required to perform all tasks listed against each item. The tenderer must therefore tender prices/rates on all items as per the section in the Price Schedule. **An item against which no rate is/are entered, or if anything other than a rate or a nil rate (for example, a zero, a dash or the word "included" or abbreviations thereof) is entered against an item, it will also be regarded as a nil rate having been entered against that item, i.e. that there is no charge for that item. The Tenderer may be requested to clarify nil rates, or items regarded as having nil rates; and the CCT may also perform a risk analysis with regard to the reasonableness of such rates.**

5.7 Provide fixed rates and prices for the duration of the contract that are not subject to adjustment except as otherwise provided for in clause 17 of the Conditions of Contract and as amplified in the Special Conditions of Contract.

5.8 Items listed as per pricing schedule will be the same for all three regions.

5.9 *Provisional sum* is an allowance for fitings,cabling and other spare parts in the selection, supply, delivery and installation of goods associated with this control systems tender, where the added parts are not listed in the pricing schedule or could not be specified and are unforeseen before the time of tender. The Provisional Sum is the Defined Cost plus the percentage/s, in the case of this tender 15%, for overheads and profit.

Procedure for the selection of sub-contractors/suppliers (Ad hoc items):

Where monetary allowances for provisional sums or prime cost items have been provided for in the contract, and where the work or items to which the allowances relate are to be executed/supplied by sub-contractors/suppliers, then the following selection process shall be followed in respect of the required sub-contractors/suppliers:

Where the monetary allowance is less than or equal to R300 000, the Supplier shall invite three quotations from suitably qualified sub-contractors/suppliers for the required work or items. The selection of the three sub-contractors/suppliers shall be in consultation with, and to the approval of the Purchaser's Agent. The evaluation of the quotations received must include a preference points system as described in the Tender Data.

INITIALS OF CCT OFFICIALS		
1	**2**	**3**

C.5 SPECIFICATION(S)

SCHEDULE B

1 PLC TYPE 1

All electronic cards to conformally coated

1.1 PLC TYPE 1 CPU

1.1.1 Racks capability per CPU

The number of racks the CPU can handle shall not be less than 4.

1.1.2 Slots capability per CPU

CPU must be able to handle 11 slots.

1.1.3 Input and Output capability of CPU

The processor must be able to handle 1024 I/O on multi racks and 704 I/O on single racks. The processor must further be able to handle 256 Analogue I/O on a multi rack and 66I/O on a single rack.

1.1.4 Communication ports on CPU

The CPU shall have a Non isolated serial link RJ45, which allows for master/slave Modbus, RTU/ASCII, transmission mode over RS232C or RS485.

The CPU shall further have a USB port on board via which programming is possible.

The CPU shall also have an Ethernet TCP/IP RJ45 port via which communication is possible.

1.1.5 Processor Communication capability

The processor must be capable of handling 2 Ethernet communication modules and 4 AS interface modules.

1.1.6 Embedded communication service capability

The CPU shall allow for bandwidth management Ethernet TCP/IP data editing, Ethernet TCP/IP Modbus TCP/IP messaging, TCP/IP rack viewing and TCP/IP SNMP network administration.

1.1.7 CPU memory

The CPU shall have internal RAM of at least 4 MB. The CPU must also include an 8 MB memory card.

1.1.8 Compatibility

The CPU must be compatible with existing M340 and M580 or equivalent backplanes.

1.1.9 Programming

The CPU must be programmable with the existing unity software. The CPU must be capable of being integrated seamlessly into existing Modbus Plus communication infrastructure.

1.2 SERIAL CARD (TWO-WAY SERIAL LINK CARD)

1.2.1 Number of ports

The card must at least have 3 ports of which at least one will be RS485 port and one RS232. The card should be of the NOM200 type.

1.2.2 Indication

The unit shall have status indication indicating various faults and running conditions.

1.2.3 Compatibility

The card must be compatible with current M340 and M580 or equivalent backplanes. The card must be able to handle the Modbus protocol.

1.2.4 Programming

The card must be configurable utilising with the existing unity software. The card must be capable of being integrated seamlessly with existing M340 and M580 or equivalent CPU's.

1.2.5 Power supply

The unit shall be powered via the backplane or rack of a typical M580 or equivalent backplane.

1.3 ETHERNET CARD TYPE 1

1.3.1 Number of ports

The card must at least have one Ethernet port and should be of the NOE type.

1.3.2 Embedded communication service capability

The Ethernet card shall allow for bandwidth management Ethernet TCP/IP data editing, Ethernet TCP/IP Modbus TCP/IP messaging, TCP/IP rack viewing, TCP/IP SNMP network administration and I/O scanning. The unit shall be configurable via the embedded webserver.

1.3.3 Power supply

The unit shall be powered via the backplane or rack of a typical M580 or equivalent backplane.

1.3.4 Indication

The unit shall have status indication indicating various faults and running conditions.

1.3.5 Compatibility

The card must be compatible with current M340 and M580 equivalent backplanes. The card must be able to handle the Modbus TCP/IP protocol.

1.3.6 Programming

The card must be configurable utilising with the existing unity software. The card must be capable of being integrated seamlessly with existing M340 and M580 CPU's.

1.4 ETHERNET CARD TYPE 2

1.4.1 Number of ports

The card must at least have 4 Ethernet ports and should be of the NOC type.

1.4.2 Embedded communication service capability

The Ethernet card shall allow for bandwidth management Ethernet TCP/IP data editing, Ethernet TCP/IP Modbus TCP/IP messaging, TCP/IP rack viewing, TCP/IP SNMP network administration and I/O scanning. The unit shall be configurable via the embedded webserver. The unit shall have DTM/FDT interface capability.

1.4.3 Power supply

The unit shall be powered via the backplane or rack of a typical M580 or equivalent backplane.

1.4.4 Indication

The unit shall have status indication indicating various faults and running conditions.

1.4.5 Compatibility

The card must be compatible with current M340 and M580 or equivalent backplanes. The card must be able to handle Modbus TCP/IP and EtherNetIP.

1.4.6 Programming

The card must be configurable utilising with the existing unity software. The card must be capable of being integrated seamlessly with existing M340 and M580 or equivalent CPU's.

1.5 WIFI MODULE WITH ANTENNA

1.5.1 Number of ports

The card must at least have 3 Ethernet ports capable of the Modbus TCP/IP protocol.

1.5.2 Wifi capability

The unit shall be capable of dealing with 2.4GHz and 5GHz wireless frequencies. The unit shall make use of encrypted over air protocol in the form of WPA-PSK or WPA2-PSK.

1.5.3 Power supply

The unit shall be powered via the backplane or rack of a typical M580 or equivalent backplane

1.5.4 Indication

The unit shall have status indication indicating various faults and running conditions.

1.5.5 Compatibility

The card must be compatible with current M340 and M580 or equivalent backplanes. The card must be able to handle Modbus TCP/IP.

1.5.6 Programming

The card must be configurable utilising with the existing unity software. The card must be capable of being integrated seamlessly with existing M340 and M580 or equivalent CPU's.

1.5.7 Functionality

The unit shall be capable of acting as a Bridge router or repeater. The unit shall further be capable of handling hot swapping.

2 PLC TYPE 2

All electronic cards to conformally coated

2.1 PLC TYPE 2 CPU WITH I/O SCANNING

2.1.1 Devices capability per CPU

The CPU shall be able to I/O scan 32 devices.

2.1.2 Communication ports on CPU

The CPU shall have a Serial RS 232 or RS 485 port. The CPU shall further have a USB port on board via which programming is possible. The CPU shall also have an Ethernet TCP/IP RJ45 port via which communication is possible. The CPU shall be able to handle the Modbus protocol via Serial communication and via Ethernet (TCP/IP).

2.1.3 Processor Communication capability

The processor shall be at least 333Mhz with 3.5MB RAM. It should allow for a real time clock and memory retention.

2.1.4 Indication

The unit shall have status indication indicating various faults and running conditions.

2.1.5 Power supply

The unit shall be powered via the existing momentum backplanes.

2.1.6 Embedded communication service capability

The CPU shall allow for diagnostics using the embedded web server.

2.1.7 CPU memory

The CPU shall have internal RAM of at least 3.5 MB.

2.1.8 Compatibility

The CPU must be compatible with current Momentum or equivalent bases.

2.1.9 Programming

The CPU must be programmable with the existing unity software. The CPU must be capable of being integrated seamlessly into existing Modbus Plus communication infrastructure.

2.2 PLC TYPE 2 INTERBUS COMMUNICATION MODULE

2.2.1 Compatibility

The module must be compatible with current Momentum or equivalent bases.

2.2.2 Programming

The unit must be programmable with the existing unity software. The unit must be capable of being integrated seamlessly into existing Modbus Plus communication infrastructure.

2.2.3 Communication ports

The unit shall have 2, RS 485 ports one for the incoming connection bus and one for the remote connection branch or outgoing branch. The unit should allow for interconnectivity between adjacent basis.

2.2.4 Indication

The unit shall have status indication indicating various faults and running conditions.

2.3 PLC TYPE 2 ETHERNET COMMUNICATION MODULE

2.3.1 Compatibility

The module must be compatible with current Momentum bases. Must be able to support faulty device replacement using BOOTP server.

2.3.2 Programming

The unit must be programmable with the existing unity software. The unit must be capable of being integrated seamlessly into existing Modbus TCP/IP communication infrastructure.

2.3.3 Communication ports

The unit shall have at least one Ethernet port. The unit should allow for interconnectivity between adjacent basis. The unit must be capable of using the multidrop or star topology network.

2.3.4 Indicatio:

The unit shall have status indication indicating various faults and running conditions.

2.4 PLC TYPE 2 MODBUS PLUS COMMUNICATION MODULE

2.4.1 Compatibility

The module must be compatible with current Momentum or equivalent bases.

2.4.2 Programming

The unit must be programmable with the existing unity software. The unit must be capable of being integrated seamlessly into existing Modbus Plus communication infrastructure.

2.4.3 Communication ports

The unit shall have at least two SUB-D 9 ports. One port should be capable of connecting to Modbus plus network and the other should be capable of connecting to a redundant Modbus plus network. The unit should allow for interconnectivity between adjacent basis. The units should be capable of dealing with a milt drop network topology

2.4.4 Indication

The unit shall have status indication indicating various faults and running conditions.

2.5 PLC TYPE 2 32 CHANNEL DIGITAL INPUT CARD

2.5.1 Compatibility

The module must be compatible with existing Momentum CPU and communication modules. The unit must be able to be addressed via the Modbus TCP/IP and serial protocols.

2.5.2 Programming

The unit must be programmable with the existing unity software. The unit must be capable of being integrated seamlessly into existing Modbus Plus communication infrastructure.

2.5.3 Inputs

The unit shall have 32 discrete inputs. The minimum ON voltage shall be 11Vdc. The Maximum OFF voltage shall be 5Vdc. The unit shall be able to handle an input voltage ranging between -3Vdc to 30Vdc. The unit must be able to at least handle 45V peak for 10ms. The operating voltage shall be 24Vdc.

2.5.4 Indication

The unit shall have status indication indicating various faults and running conditions.

2.6 PLC TYPE 2 16 CHANNEL DIGITAL INPUT CARD

2.6.1 Compatibility

The module must be compatible with existing Momentum or equivalent CPU and communication

modules. The unit must be able to be addressed via the Modbus TCP/IP and serial protocols.

2.6.2 Programming

The unit must be programmable with the existing unity software. The unit must be capable of being integrated seamlessly into existing Modbus Plus communication infrastructure.

2.6.3 Inputs

The unit shall have 16 discrete inputs. The minimum ON voltage shall be 11Vdc. The Maximum OFF voltage shall be 5Vdc. The unit shall be able to handle an input voltage ranging between -3Vdc to 30Vdc. The unit must be able to at least handle 45V peak for 10ms. The operating voltage shall be 24Vdc.

2.6.4 Indication

The unit shall have status indication indicating various faults and running conditions.

2.7 PLC TYPE 2 16DI/16DO CHANNEL CARD

2.7.1 Compatibility

The module must be compatible with existing Momentum or equivalent CPU and communication modules. The unit must be able to be addressed via the Modbus TCP/IP and serial protocols.

2.7.2 Programming

The unit must be programmable with the existing unity software. The unit must be capable of being integrated seamlessly into existing Modbus Plus communication infrastructure.

2.7.3 Inputs/Outputs

The unit shall have 16 discrete inputs and 16 discrete outputs. The minimum ON voltage shall be 11Vdc. The Maximum OFF voltage shall be 5Vdc. The unit shall be able to handle an input voltage ranging between -3Vdc to 30Vdc. The unit must be able to at least handle 45V peak for 10ms. The operating voltage shall be 24Vdc.

2.7.4 Indication

The unit shall have status indication indicating various faults and running conditions.

2.8 PLC TYPE 2 16 CHANNEL DIGITAL OUTPUT CARD

2.8.1 Compatibility

The module must be compatible with existing Momentum or equivalent CPU and communication modules. The unit must be able to be addressed via the Modbus TCP/IP and serial protocols.

2.8.2 Programming

The unit must be programmable with the existing unity software. The unit must be capable of being integrated seamlessly into existing Modbus Plus communication infrastructure.

2.8.3 Outputs

The unit shall have 16 discrete outputs. The minimum ON voltage shall be 11Vdc. The Maximum OFF voltage shall be 5Vdc. The unit shall be able to handle an input voltage ranging between -3Vdc to 30Vdc. The unit must be able to at least handle 45V peak for 10ms. The operating voltage shall be 24Vdc.

2.8.4 Indication

The unit shall have status indication indicating various faults and running conditions.

2.9 PLC TYPE 2 4 CHANNEL ANALOG OUTPUT CARD

2.9.1 Compatibility

The module must be compatible with existing Momentum or equivalent CPU and communication modules. The unit must be able to be addressed via the Modbus TCP/IP and serial protocols.

2.9.2 Programming

The unit must be programmable with the existing unity software. The unit must be capable of being integrated seamlessly into existing Modbus Plus communication infrastructure.

2.9.3 Outputs

The unit shall have 4 Analog outputs channels. The unit shall provide a resolution of 12 bits plus a sign bit. The conversion time shall be no more than 2ms for all channels. The settling time of outputs shall be equal to or faster than 150 ms to settle within 0.1% of the final value. The maximum error allowed at 25 degrees Celsius is 0.2 % for voltage and 0.25% for current. Further the maximum error allowed at 60 degrees Celsius is 0.25 % for voltage and 0.40 % for current. The unit should be capable of handling a load of 1K Ohms @ +-10Vdc and 600 Ohm @ 0-20mA. The unit shall be supplied by 24Vdc.

2.9.4 Indication

The unit shall have status indication indicating various faults and running conditions.

2.10 PLC TYPE 2 16 CHANNEL ANALOG INPUT CARD

2.10.1 Compatibility

The module must be compatible with existing Momentum or equivalent CPU and communication modules. The unit must be able to be addressed via the Modbus TCP/IP and serial protocols.

2.10.2 Programming

The unit must be programmable with the existing unity software. The unit must be capable of being integrated seamlessly into existing Modbus Plus communication infrastructure.

2.10.3 Inputs

The unit shall have 16 single ended input channels. The unit shall be capable of handling voltage and current. The unit shall provide a resolution of 12 bits plus a sign bit. The conversion time shall be no more than 25 ms for all channels. The maximum error allowed at 25 degrees Celsius is 0.15 % for voltage and 0.25% for current. Further the maximum error allowed at 60 degrees Celsius is 0.25 % for voltage and 0.45 % for current. The unit should be capable of handling a load of 2.2M Ohms for voltage and 250 Ohm for current. The unit shall be supplied by 24Vdc. The unit must be able to handle an input voltage of 30Vdc and an input current of 25mA.

2.10.4 Indication

The unit shall have status indication indicating various faults and running conditions.

2.11 PLC TYPE 2 8 CHANNEL ANALOG INPUT CARD

2.11.1 Compatibility

The module must be compatible with existing Momentum or equivalent CPU and communication modules. The unit must be able to be addressed via the Modbus TCP/IP and serial protocols.

2.11.2 Programming

The unit must be programmable with the existing unity software. The unit must be capable of being

integrated seamlessly into existing Modbus Plus communication infrastructure.

2.11.3 Inputs

The unit shall have 8 differential input channels. The unit shall be capable of handling voltage and current. The unit shall provide a resolution of 14 bits plus a sign bit. The conversion time shall be no more than 12 ms for all channels. The maximum error allowed at 25 degrees Celsius is 0.27 % for voltage and 0.27% for current. The unit should be capable of handling a load of 0.1k Ohms for voltage and 250k Ohm for current. The unit shall be supplied by 24Vdc. The unit must be able to provide isolation up to 200V DC between channels, 500V DC between channels and ground and 500V DC between channels and bus.

2.11.4 Indication

The unit shall have status indication indicating various faults and running conditions.

2.12 PLC TYPE 2 4 CHANNEL ANALOG INPUT CARD

2.12.1 Compatibility

The module must be compatible with existing Momentum or equivalent CPU and communication modules. The unit must be able to be addressed via the Modbus TCP/IP and serial protocols.

2.12.2 Programming

The unit must be programmable with the existing unity software. The unit must be capable of being integrated seamlessly into existing Modbus Plus communication infrastructure.

2.12.3 Inputs

The unit shall have 4 differential input channels. The unit shall be capable of handling various thermocouples. The unit shall provide a resolution of 16 signed bits. The update time shall be no more than 500 ms for all channels. The maximum error allowed at 25 degrees Celsius is 25micro Volt for 25mV and 27micro Volt for 100mV. The unit shall be supplied by 24Vdc. The unit must be able to provide isolation up to 400V DC between channels and 500V DC between channels and ground.

2.12.4 Temperature probe type

The unit must be able to handle Ni 100, Ni1000, Pt100 and Pt1000 probes.

2.12.5 Indication

The unit shall have status indication indicating various faults and running conditions.

2.13 INTERCONNECTOR/TAP

2.13.1 Compatibility

The tap/interconnector must be compatible with the existing Modbus Plus network infrastructure. The unit must be able to handle the milt drop network topology. Each unit shall allow for a network drop. The unit shall allow interconnectivity between different Modbus Plus devices.

2.13.2 Connections

The unit must have the capability of connecting 3 cables, of which one shall be the incoming line, one the dropper or node and the other the outgoing line. The unit shall also allow for jumpers in case of end of line termination needed.

2.14 INTERBUS PRE CONNECTED CORD

2.14.1 Compatibility

The interbus connector must be compatible with the existing Momentum infrastructure. The cord shall allow interconnectivity between different Momentum communication modules.

2.14.2 Connections

The cord shall be of the 9 pin male and female type and have a length of at least 0.11m for shorter connection length and a length of at least 1m for a longer connection.

3 PLC TYPE 3

All electronic cards to conformally coated.

3.1 CPU LEVEL 1

3.1.1 Compatibility

The CPU must be compatible with existing Modbus Plus infrastructure. The unit shall be programmable via the Unity software. The CPU must be able to fit onto the existing M580 backplane/rack. The CPU must be able to utilise FDT/DTM interfaces.

3.1.2 Memory Size

The CPU must have a data/program capacity of at least 4MB. The memory must be expandable via SD memory card.

3.1.3 Communication

The CPU must have at least 4 communication ports of which one will be usb, through which the CPU can be programmed. Furthermore, the CPU shall have a service port and at least 2 device network ports. The CPU should allow for the use of an embedded web server.

3.1.4 Capability

The CPU must be capable of handling 1024 discrete input/output channels and 256 Analog channels. The CPU must be able to handle up to 64 distributed components. The CPU shall further be able to handle 2 Ethernet modules. The CPU shall be able to handle 4 racks. The CPU shall have a real time clock with back up feature.

3.1.5 Indication

The CPU shall indicate the various statuses like faults and running status.

3.2 CPU LEVEL 2 A

3.2.1 Compatibility

The CPU must be compatible with existing Modbus Plus infrastructure. The unit shall be programmable via the Unity software. The CPU must be able to fit onto the existing M580 backplane/rack. The CPU must be able to utilise FDT/DTM interfaces.

3.2.2 Memory Size

The CPU must have a data/program capacity of at least 9MB. The memory must be expandable via SD memory card.

3.2.3 Communication

The CPU must have at least 4 communication ports of which one will be usb, through which the CPU can be programmed. Furthermore, the CPU shall have a service port and at least 2 device network ports. The CPU should allow for the use of an embedded web server.

3.2.4 Capability

The CPU must be capable of handling 2048 discrete input/output channels and 512 Analog channels. The CPU must be able to handle up to 128 distributed components. The CPU shall further be able to handle 2 Ethernet modules. The CPU shall be able to handle 4 racks. The CPU shall have a real time clock with back up feature.

3.2.5 Indication

The CPU shall indicate the various statuses like faults and running status.

3.3 CPU LEVEL 2 B

3.3.1 Compatibility

The CPU must be compatible with existing Modbus Plus infrastructure. The unit shall be programmable via the Unity software. The CPU must be able to fit onto the existing M580 or equivalent backplane/rack. The CPU must be able to utilise FDT/DTM interfaces.

3.3.2 Memory Size

The CPU must have a data/program capacity of at least 9MB. The memory must be expandable via SD memory card.

3.3.3 Communication

The CPU must have at least 4 communication ports of which one will be usb, through which the CPU can be programmed. Furthermore, the CPU shall have a service port and at least 2 device network ports. The CPU should allow for the use of an embedded web server.

3.3.4 Capability

The CPU must be capable of handling 2048 discrete input/output channels and 512 Analog channels. The CPU must be able to handle up to 64 distributed components and 64 remote input/output modules. The CPU shall further be able to handle 2 Ethernet modules. The CPU shall be able to handle 4 racks and 8 remote drops (2 racks per drop). The CPU shall have a real time clock with back up feature.

3.3.5 Indication

The CPU shall indicate the various statuses like faults and running status.

3.4 CPU LEVEL 3 A

3.4.1 Compatibility

The CPU must be compatible with existing Modbus Plus infrastructure. The unit shall be programmable via the Unity software. The CPU must be able to fit onto the existing M580 or equivalent backplane/rack. The CPU must be able to utilise FDT/DTM interfaces.

3.4.2 Memory Size

The CPU must have a data/program capacity of at least 13 MB. The memory must be expandable via SD memory card.

3.4.3 Communication

The CPU must have at least 4 communication ports of which one will be usb, through which the CPU can be programmed. Furthermore, the CPU shall have a service port and at least 2 device network ports. The CPU should allow for the use of an embedded web server.

3.4.4 Capability

The CPU must be capable of handling 3072 discrete input/output channels and 768 Analog channels. The CPU must be able to handle up to 128 distributed components. The CPU shall further be able to handle 3 Ethernet modules. The CPU shall be able to handle 8 racks. The CPU shall have a real time

clock with back up feature.

3.4.5 Indication

The CPU shall indicate the various statuses like faults and running status.

3.5. CPU LEVEL 3 B

3.5.1 Compatibility

The CPU must be compatible with existing Modbus Plus infrastructure. The unit shall be programmable via the Unity software. The CPU must be able to fit onto the existing M580 backplane/rack. The CPU must be able to utilise FDT/DTM interfaces.

3.5.2 Memory Size

The CPU must have a data/program capacity of at least 13 MB. The memory must be expandable via SD memory card.

3.5.3 Communication

The CPU must have at least 4 communication ports of which one will be usb, through which the CPU can be programmed. Furthermore, the CPU shall have a service port and at least 2 device network ports. The CPU should allow for the use of an embedded web server.

3.5.4 Capability

The CPU must be capable of handling 3072 discrete input/output channels and 768 Analog channels. The CPU must be able to handle up to 128 remote input/output modules and 64 distributed components. The CPU shall further be able to handle 3 Ethernet modules. The CPU shall be able to handle 8 racks and 16 remote drops (2 racks per drop). The CPU shall have a real time clock with back up feature.

3.5.5 Indication

The CPU shall indicate the various statuses like faults and running status.

3.6 CPU LEVEL 4 A

3.6.1 Compatibility

The CPU must be compatible with existing Modbus Plus infrastructure. The unit shall be programmable via the Unity software. The CPU must be able to fit onto the existing M580 or equivalent backplane/rack. The CPU must be able to utilise FDT/DTM interfaces.

3.6.2 Memory Size

The CPU must have a data/program capacity of at least 18 MB. The memory must be expandable via SD memory card.

3.6.3 Communication

The CPU must have at least 4 communication ports of which one will be usb, through which the CPU can be programmed. Furthermore, the CPU shall have a service port and at least 2 device network ports. The CPU should allow for the use of an embedded web server.

3.6.4 Capability

The CPU must be capable of handling 4096 discrete input/output channels and 1024 Analog channels. The CPU must be able to handle up to 128 distributed components. The CPU shall further be able to handle 4 Ethernet modules. The CPU shall be able to handle 8 racks. The CPU shall have a real time clock with back up feature.

3.6.5 Indication

The CPU shall indicate the various statuses like faults and running status.

3.7 CPU LEVEL 4 B

3.7.1 Compatibility

The CPU must be compatible with existing Modbus Plus infrastructure. The unit shall be programmable via the Unity software. The CPU must be able to fit onto the existing M580 or equivalent backplane/rack. The CPU must be able to utilise FDT/DTM interfaces.

3.7.2 Memory Size

The CPU must have a data/program capacity of at least 18 MB. The memory must be expandable via SD memory card.

3.7.3 Communication

The CPU must have at least 4 communication ports of which one will be usb, through which the CPU can be programmed. Furthermore, the CPU shall have a service port and at least 2 device network ports. The CPU should allow for the use of an embedded web server.

3.7.4 Capability

The CPU must be capable of handling 4096 discrete input/output channels and 1024 Analog channels. The CPU must be able to handle up to 128 remote input/output modules and 64 distributed components. The CPU shall further be able to handle 4 Ethernet modules. The CPU shall be able to handle 8 racks and 16 remote drops (2 racks per drop). The CPU shall have a real time clock with back up feature.

3.7.5 Indication

The CPU shall indicate the various statuses like faults and running status.

4. PLC TYPE 4

4.1 CPU 4.1

4.1.1 Compatibility

The CPU must be compatible with existing Ethernet/PROFINET infrastructure. The unit shall be programmable via the Step 7 TIA Portal software. The CPU must be able to fit onto the existing mounting rail. The CPU must be able to utilise PROFINET interfaces.

4.1.2 Memory Size

The CPU must have a data/program capacity of at least 1.5MB/300KB. The memory must be expandable via SD memory card 32GB max.

4.1.3 Communication

The CPU must have atleast 1 PROFINET interface with interface type RJ45 (Ethernet) and at least 2 communication ports with integrated switch, through which the CPU can be programmed. The CPU should allow for the use of an embedded web server.

4.1.4 Capability

The CPU must be capable of handling 2048 IO modules. The CPU must be able to handle up to 32 distributed IO systems. The CPU must be able to handle up to 31 modules per rack. The CPU shall have a hardware clock.

4.1.5 Indication

The CPU shall have a display screen (diagonal 3.45cm) to indicate various statuses like faults and running

status.

4.2 **CPU 4.2**

4.2.1 Compatibility

The CPU must be compatible with existing Ethernet/PROFINET infrastructure. The unit shall be programmable via the Step 7 TIA Portal software. The CPU must be able to fit onto the existing mounting rail. The CPU must be able to utilise PROFINET interfaces.

4.2.2 Memory Size

The CPU must have a data/program capacity of at least 3MB/500KB. The memory must be expandable via SD memory card 32GB max..

4.2.3 Communication

The CPU must have atleast 2 PROFINET interfaces with interface type RJ45 (Ethernet) and at least 3 communication ports, also with integrated switch, through which the CPU can be programmed. The CPU should allow for the use of an embedded web server.

4.2.4 Capability

The CPU must be capable of handling 8192 IO modules. The CPU must be able to handle up to 64 distributed IO systems. The CPU must be able to handle up to 31 modules per rack. The CPU shall have a hardware clock.

4.2.5 Indication

The CPU shall have a display screen (diagonal 6.1cm) to indicate various statuses like faults and running status.

4.3 CPU 4.3

4.3.1 Compatibility

The CPU must be compatible with existing Ethernet/PROFINET infrastructure. The unit shall be programmable via the Step 7 TIA Portal software. The CPU must be able to fit onto the existing mounting rail. The CPU must be able to utilise PROFINET interfaces.

4.3.2 Memory Size

The CPU must have a data/program capacity of at least 8MB/2MB. The memory must be expandable via SD memory card 32GB max.

4.3.3 Communication

The CPU must have atleast 2 PROFINET interfaces with interface type RJ45 (Ethernet) and at least 3 communication ports, also with integrated switch, through which the CPU can be programmed. The CPU must have atleast 1 PROFIBUS interface with RS485 communication port. The CPU should allow for the use of an embedded web server.

4.3.4 Capability

The CPU must be capable of handling 16384 IO modules. The CPU must be able to handle up to 64 distributed IO systems. The CPU must be able to handle up to 31 modules per rack. The CPU shall have a hardware clock..

4.3.5 Indication

The CPU shall have a display screen (diagonal 6.1cm) to indicate various statuses like faults and running status.

5 REMOTE INPUT / OUTPUT MODULES

5.1 ETHERNET REMOTE I/O DROP ADAPTOR

5.1.1 Compatibility

The unit must be compatible with existing Modbus TCP/IP infrastructure. The unit shall be programmable via the Unity software. The unit must be able to fit onto the existing M580 or equivanlent backplane/rack. The unit shall be compatible with X-bus racks. The unit shall be compatible with the existing M580 or equivalent CPU.

5.1.2 Communication

The unit shall at least have 3 communication Ethernet RJ45 ports. The unit shall allow for configuration of IP's. The unit shall allow for diagnostic of remote input and output modules. The remote I/O header shall be capable to collect data from input modules and update output module. The unit shall allow for configuration change on the fly technology in order to minimise down time.

5.1.3 Indication

The unit shall indicate the various statuses like faults and running status.

5.2 ETHERNET REMOTE I/O STATION

5.2.1 Compatibility

The unit must be compatible with existing Modbus TCP/IP infrastructure. The unit shall be programmable via the Unity software. The unit must be able to fit onto the existing M340/M580 or equivalent backplane/rack. The unit shall be compatible with the existing M340 or equivalent CPU. The unit shall be capable of handling at least 1024 discrete inputs/outputs, 256 Analog signals and 2 Ethernet modules. The unit can typically be of the PRA type.

5.2.2 Communication

The unit shall at least have 1 communication Ethernet RJ45 port. The unit shall allow for at least 1 Master task within the application structure.

5.2.3 Indication

The unit shall indicate the various statuses like faults and running status.

5.2.4 Memory

The unit shall have an internal memory of at least 448kB and capable of handling 96kB removable memory.

6 INPUT / OUTPUT MODULES

6.1 DIGITAL INPUT MODULES

6.1.1 DIGITAL INPUT CPU 1 & 3

6.1.1.1 Compatibility

The unit must be compatible with existing Modbus TCP/IP infrastructure. The unit shall be programmable via the Unity software. The unit must be able to fit onto the existing M340/M580 or equivalent backplane/rack. The unit shall be compatible with the existing M340/M580 or equivalent CPU. The unit shall be capable of handling 16 discrete isolated inputs (type 1), 32 discrete isolated inputs (type 2) and 64 discrete isolated inputs (type 3). The inputs should be logical positive (current sink type). The unit must allow for 2 wire and 3 wire field devices.

6.1.1.2 Communication

The unit shall be able to communicate with the existing M580/M340 or equivalent CPU via the existing M580/M340 or equivalent backplane.

6.1.1.3 Indication

The unit shall indicate the various statuses like inputs, faults and running status.

6.1.1.4. Power consumption

The unit shall use an input voltage of 24Vdc and allow for an input current of 1mA for 64 inputs, 2mA for 32 inputs and 3.5mA for 16 inputs.

6.1.1.5 Protection

The unit shall have reverse polarity protection with an external fast blow fuse per channel group.

6.1.2 DIGITAL INPUT CPU 4

6.1.2.1 Compatibility

The unit must be compatible with existing PROFINET infrastructure. The unit shall be programmable via the Step 7 TIA Portal software. The unit must be able to fit onto the existing SIMATIC S7-1500 or equivalent mounting rail. The unit shall be compatible with the existing SIMATIC S7-1500 or equivalent CPU. The unit shall be capable of handling 16 discrete isolated inputs and 32 discrete isolated inputs. The inputs should be logical positive (current sink type). The unit must allow for 2 wire and 3 wire field devices.

6.1.2.2 Communication

The unit shall be able to communicate with the existing SIMATIC S7-1500 CPU or equivalent via the existing SIMATIC S7-1500 or equivalent mounting rail.

6.1.2.3 Indication

The unit shall indicate the various statuses like inputs, faults and running status.

6.1.2.4 Power consumption

The unit shall use an input voltage of 24Vdc and allow for an input current of 2.7mA for 16 inputs and 2.7mA for 32 inputs.

6.1.2.5 Protection

The unit shall have an external fast blow fuse per channel group.

6.2 DIGITAL OUTPUT MODULES

6.2.1 DIGITAL OUTPUT MODULES CPU 1 & 3

6.2.1.1 Compatibility

The unit must be compatible with existing Modbus TCP/IP infrastructure. The unit shall be programmable via the Unity software. The unit must be able to fit onto the existing M340/M580 or equivalent backplane/rack. The unit shall be compatible with the existing M340/M580 CPU. The unit shall be capable of handling 16 discrete insulated outputs (type 1), 32 discrete insulated outputs (type 2) and 64 discrete insulated outputs (type 3). The outputs should be logical positive (current sink type). The unit must allow for 2 wire and 3 wire field devices.

6.2.1.2 Communication

The unit shall be able to communicate with the existing M580/M340 or equivalent CPU via the existing M580/M340 or equivalent backplane. The unit shall allow for a 20 pin connector (type 1), 40 pin connector (type 2), 2 of 40 pin connectors (type 3).

6.2.1.3 Indication

The unit shall indicate the various statuses like inputs, faults and running status.

6.2.1.4 Power consumption

The unit shall use an output voltage of 24Vdc and allow for an input current of 0.1A for 64 outputs, 0.1A for 32 outputs and 0.5A for 16 outputs.

6.2.1.5 Protection

The unit shall have protection against short-circuits and overloads. The unit must allow for automatic or controlled reactivation and fast electromagnet demagnetization of the circuit. The unit shall have an external fuse for short circuit protection.

6.2.2 DIGITAL OUTPUT MODULES CPU 4

6.2.2.1 Compatibility

The unit must be compatible with existing PROFINET infrastructure. The unit shall be programmable via the Step 7 TIA Portal software. The unit must be able to fit onto the existing SIMATIC S7-1500 or equivalent mounting rail. The unit shall be compatible with the existing SIMATIC S7-1500 or equivalent CPU. The unit shall be capable of handling 16 discrete isolated transistor outputs and 32 discrete isolated transistor outputs. The outputs should be logical positive (current source type). The unit must allow for 2 wire and 3 wire field devices.

6.2.2.2 Communication

The unit shall be able to communicate with the existing SIMATIC S7-1500 or equivalent CPU via the existing SIMATIC S7-1500 or equivalent mounting rail.

6.2.2.3 Indication

The unit shall indicate the various statuses like outputs, faults and running status.

6.2.2.4 Power consumption

The unit shall use an input voltage of 24Vdc and allow for an output current of 0.5A for 16 outputs and 0.5A for 32 outputs.

6.2.2.5 Protection

The unit shall have protection against short-circuits.. The unit shall have an external fuse for short circuit protection.

6.3. ANALOG INPUT MODULES

6.3.1 ANALOG INPUT MODULES CPU 1&3

6.3.1.1 Compatibility

The unit must be compatible with existing Modbus TCP/IP infrastructure. The unit shall be programmable via the Unity software. The unit must be able to fit onto the existing M340/M580 or equivalent backplane/rack. The unit shall be compatible with the existing M340/M580 or equivalent CPU. The unit shall be capable of handling 4 isolated voltage or current inputs, 8 isolated voltage or current inputs.

6.3.1.2 Communication

The unit shall be able to communicate with the existing M580/M340 or equivalent CPU via the existing M580/M340 backplane. The unit shall allow for a 20-way connector and 28-way connector.

6.3.1.3 Indication

The unit shall indicate the various statuses like inputs, faults and running status.

6.3.1.4 Power consumption

The unit shall typically consume a max of 1W @ 24Vdc

6.3.1.5 Protection

The unit shall allow for 30V overload on voltage inputs and at least 30mA overload on current input.

6.3.2 ANALOG INPUT MODULES CPU 4

6.3.2.1 Compatibility

The unit must be compatible with existing PROFINET infrastructure. The unit shall be programmable via the Step 7 TIA Portal software. The unit must be able to fit onto the existing SIMATIC S7-1500 or equivalent mounting rail. The unit shall be compatible with the existing SIMATIC S7-1500 or equivalent CPU. The unit shall be capable of handling 4 isolated voltage or current inputs and 8 isolated voltage or current inputs.

6.3.2.2 Communication

The unit shall be able to communicate with the existing SIMATIC S7-1500 or equivalent CPU via the existing SIMATIC S7-1500 or equivalent mounting rail. The unit shall allow for a front connector with single wires.

6.3.2.3 Indication

The unit shall indicate the various statuses like inputs, faults and running status.

6.3.2.4 Power consumption

The unit shall typically have 0.7W @ 24Vdc available from the backplane bus.

6.3.2.5 Protection

The unit shall have reverse polarity protection.

6.4.1 ANALOG OUTPUT MODULES CPU 1&3

6.4.1.1 Compatibility

The unit must be compatible with existing Modbus TCP/IP infrastructure. The unit shall be programmable via the Unity software. The unit must be able to fit onto the existing M340/M580 or equivalent backplane/rack. The unit shall be compatible with the existing M340/M580 or equivalent CPU. The unit shall be capable of handling 4 isolated voltage or current outputs (type 1), 8 non-isolated voltage or current outputs (type 2).

6.4.1.2 Communication

The unit shall be able to communicate with the existing M580/M340 or equivalent CPU via the existing M580/M340 or equivalent backplane. The unit shall allow for a 20-way connector.

6.4.1.3 Indication

The unit shall indicate the various statuses like inputs, faults and running status.

6.4.1.4 Power consumption

The unit shall typically consume a max of 3.7W @ 24Vdc.

6.4.1.5 Protection

The unit shall allow for overload and short circuit protection. The unit should be able to withstand 21mA.

6.4.2 PLC TYPE 4

6.4.2.1 Compatibility

The unit must be compatible with existing PROFINET infrastructure. The unit shall be programmable via the Step 7 TIA Portal software. The unit must be able to fit onto the existing SIMATIC S7-1500 or equivalent mounting rail. The unit shall be compatible with the existing SIMATIC S7-1500 or equivalent CPU. The unit shall be capable of handling 2 voltage or current outputs (type 1), 4 voltage or current outputs (type 2).

6.4.2.2 Communication

The unit shall be able to communicate with the existing SIMATIC S7-1500 or equivalent CPU via the existing SIMATIC S7-1500 or equivalent mounting rail. The unit shall allow for a fully modular connection or flexible connection.

6.4.2.3 Indication

The unit shall indicate the various statuses like inputs, faults and running status.

6.4.2.4 Power consumption

The unit shall typically have 0.6W @ 24Vdc available from the backplane bus.

6.4.2.5 Protection

The unit shall have voltage output short-circuit protection.

6.5 INPUT / OUTPUT MODULES CONNECTORS CPU 1&3

6.5.1 Removable Terminal blocks

The terminal blocks need to be compatible with the X80 series Input and Output module cards. Type 1 should be of the 20-way removable terminal block screw type or spring terminal type, whilst Type 2 should be of the 28-way removable terminal screw type or spring terminal type.

6.5.2 Preformed cord

The preformed cord needs to be compatible with the X80 series Input and Output module cards. Type 1 should allow for 40-way and be at least 3 meter in length, whilst Type 2 should allow for 40-way and be at least 5 meter in length. Both should have fly leads on one end and plug on one end.

6.5.3 Removable terminal Prewired cord

The removable prewired cord needs to be compatible with the X80 series Analog input and output module cards. Type 1 should allow for 20-way prewired terminal connector, whilst Type 2 should allow for 28-way prewired terminal connector.

6.5.4 INPUT / OUTPUT MODULES CONNECTORS CPU 4

6.5.4.1 Front connector module

The front connector module be able to plug into the I/O module to be wired. The front connector module shall be avaible for digital input/output modules (power supply with push-in or screw-type terminals) and for analog modules.

6.5.4.2 Terminal module

The connecting cord front connector with single wires needs to be compatible with the Input and Output

module cards. Up to 16 or 32 digital input and output channels should be able to connect directly to the IO with a front connector with singles wires.

6.5.4.3 Connecting cord

The connecting cord shall be able to connect the front connector module with the terminal modules. The connecting cord shall be available in three versions. Round cord 16-pin and 50-pin (shielded or unshielded), pre-assembled, max. length 10mA. Round-sheath ribbon cord 16-pin (shielded or unshielded), for assembly by the user, max. 30m. Round-sheath ribbon cord 2x16-pin (unshielded), for assembly by the user, max. 30m.

6.5.4.4 Front connector with single wires

A front connector with single wires needs to be compatible with the Input and Output module cards. Up to 16 or 32 digital input and output channels should be able to connect directly to the IO with a front connector with singles wires.

7 BACKPLANE MODULES

7.1 BACKPLANES

The backplane modules must be capable of housing the x80 type modules. The backplane must be Ethernet capable and utilise X-bus or similar for the backplane connection. Type 1 should allow for at least 4 slots, whilst Type 2 should allow for at least 8 slots and Type 3 for at least 12 slots.

7.2 BACKPLANE EXTENDER

The unit must be capable of extending the X80 X-Bus or similar Ethernet based back plane to up to for similar backplanes. The unit shall have at least 2 sub DB 9 pin connectors on which the cord linking the two backplanes shall be connected. The unit shall have indication regarding status. The unit shall be able to fit onto the existing X80 X-bus type backplanes.

7.3 BACKPLANE EXTENDER CORD SET

The cord sets shall be able to connect between two backplane extender modules utilising DB.9 pin connectors. The cord shall be premade with 90 degree angled 9way sub D connectors on both ends and be available in Type 1 (0.8 meter), Type 2 (3 meter) and Type 3 (5 meter).

7.4 BACKPLANE END TERMINATORS

The end termination shall be able to provide end of line termination and shall consist of a 2 sub DB 9 way connectors. The connectors need to be compatible with the X80 X-bus system.

7.5 CPU 4 BACKPLANE

7.5.1 Mounting Rail

The mounting rail shall be approx. 830mm wide and must be capable of housing the SIMATIC S7-1500 modules. The mounting rail must include a grounding screw, intergrated DIN rail for mounting of incidentals such as terminals, automatic circuit breakers and relays.

8 POWER SUPPLY MODULES

8.1 POWER SUPPLY MODULES CPU 1&3

Power supply units shall be compatible with the X80 series X-Bus backplanes. The unit must be able to mount onto the backplane. The power supply unit shall have an alarm relay for the loss of power. The power supply shall have a reset button which has the capability to trigger an initialisation sequence through the rack it supplies. The Power supply (220V ac) shall further have an integrated 24Vdc supply for powering sensors.

8.1.1 220VAC POWER SUPPLY MODULE

The unit shall be powered by 220V ac and be capable of delivering 36W of power.

8.1.2 24V DC POWER SUPPLY MODULE

The unit shall be powered by 24V dc and be capable of delivering 32W of power. The unit shall primary shall be isolated.

8.2. POWER SUPPLY MODULES CPU 4

Power supply units shall be compatible with the SIMATIC S7-1500 series mounting rail.

8.2.1 230VAC POWER SUPPLY MODULE

The unit shall be powered by 230V ac and be capable of delivering 72W of power.

8.2.2 24V DC POWER SUPPLY MODULE

The unit shall be powered by 24Vdc and be capable of delivering 60W of power.

9. FIELD BUS MODULES

9.1 PROFIBUS MASTER MODULE

The unit shall allow the Modbus TCP/IP devices like the CPU M580 or equivalent to communicate with Profibus slave devices. The unit shall be compatible with the X80 X-Bus backplanes. The unit must be capable of handling devices using DTM structure and be complaint with the hot standby configuration.

9.2 Ethernet to Modbus Plus Gateway/Router

The unit shall allow the Modbus TCP/IP devices like the CPU M580 or equivalent to communicate with Modbus plus devices. The unit shall have connectivity for Modbus TCP/IP via the RJ45 port and for the Modbus Plus via an RS 485 connection port. The unit shall be transparent ready. The unit shall be capable of running web services.

9.3 Ethernet to Modbus Plus Proxy

The unit shall allow one Modbus TCP/IP device like the CPU M340 or equivalent to communicate with up t0 128 Modbus plus devices. The unit shall have connectivity for Modbus TCP/IP via the RJ45 port and for the Modbus Plus via an RS 485 connection port. The unit shall be capable of running web services and the Small Networks Management Protocol.

9.4 Communications processor for PROFINET

The unit shall allow for connection of SIMATIC S7-1500 or equivalent devices and infrastructure. Support communication services; PROFINET IO, Open User Communication and S7 communication.

9.5 Communications processor for Industrial Ethernet

The unit shall allow for connection of SIMATIC S7-1500 or equivalent devices and infrastructure. Support communication services; Open User Communication, S7 communication FTP/FTPS and FETCH/WRITE.

9.6 Communications module for PROFIBUS DP

The unit shall allow for connection of SIMATIC S7-1500 or equivalent devices and infrastructure. The unit shall allow for Class 1 DP master and DP slave modes of operation. Support communication services; PROFIBUS DP master (class 1), PROFIBUS DP slave, FDL, S7 communication and Data record routing/field device parameter assignment.

9.7 Communications module for serial RS232

The unit shall allow be compatible with SIMATIC S7-1500 or equivalent devices and infrastructure. The unit shall have a RS232 interface, be short-circuit proof and electrically disconnected. The unit shall be compatible with RS232 connecting cord 5m, 10m and 15m.

9.8 Communications module for serial RS422/RS485

The unit shall allow be compatible with SIMATIC S7-1500 or equivalent devices and infrastructure. The unit shall have a RS422/485 interface, be short-circuit proof and electrically disconnected. The unit shall be compatible with RS422/485 connecting cord X27 interface 5m, 10m and 50m.

10 PLC TYPE 5

All electronic cards to conformally coated

10.1 PLC TYPE 5 CPU 1

10.1.1 Racks capability per CPU

The number of racks the CPU can handle shall not be less than 4.

10.1.2 Slots capability per CPU

CPU must be able to handle 11 slots.

10.1.3 Input and Output capability of CPU

The processor must be able to handle 1024 I/O on multi racks and 704 I/O on single racks. The processor must further be able to handle 256 Analogue I/O on a multi rack and 66I/O on a single rack.

10.1.4 Communication ports on CPU

The CPU shall have a Non isolated serial link RJ45, which allows for master/slave Modbus, RTU/ASCII, transmission mode over RS232C or RS485 and EtherNet/IP

The CPU shall further have a USB port on board via which programming is possible

The CPU shall also have an Ethernet TCP/IP RJ45 port via which communication is possible.

10.1.5 Processor Communication capability

The processor must be capable of handling 2 Ethernet communication modules and 4 AS interface modules.

10.1.6 Embedded communication service capability

The CPU shall allow for bandwidth management Ethernet TCP/IP data editing, Ethernet TCP/IP Modbus TCP/IP messaging, TCP/IP rack viewing and TCP/IP SNMP network administration.

10.1.7 CPU memory

The CPU shall have internal RAM of at least 4 MB. The CPU must also include an 8 MB memory card.

10.1.8 Compatibility

The CPU must be compatible with ControlLogix 5580 and GuardLogix5580 Controllers.

10.1.9 Programming

The CPU must be programmable Studio 5000 Logix Designer (formerly known as RSlogix 5000)The CPU must be capable of being integrated seamlessly into existing Modbus Plus communication infrastructure.

10.1.10 Indication

The unit shall have status indication indicating various faults and running conditions.

10.1.11 I/O Card Compatibility

The The I/O cards must be compatible with ControlLogix 5580. The card must be able to handle the Modbus protocol.

10.1.12 Programming

The card must be configurable utilising Studio 5000 Logix Designer (formerly known as RSlogix 5000) software. The card must be capable of being integrated seamlessly with existing ControlLogix 5580CPU's or equivalent.

10.2 POWER SUPPLY

The unit shall be powered via the backplane or rack of a typical ControlLogix 5580 or equivalent backplane

10.3 ETHERNET CARD (IP ADAPTER) TYPE1 , PLC TYPE 5 CPU1

10.3.1 Number of ports

The card must at least have one Ethernet port and should be of the 1747-AENTR type.

10.3.2 Embedded communication service capability

The Ethernet card shall allow for bandwidth management Ethernet TCP/IP data editing, Ethernet TCP/IP Modbus TCP/IP messaging, TCP/IP rack viewing, TCP/IP SNMP network administration and I/O scanning. The unit shall be configurable via the embedded webserver

10.3.3 Power supply

The unit shall be powered via the backplane or rack of a typical ControlLogix 5580 or equivalent backplane

10.3.4 Indication

The unit shall have status indication indicating various faults and running conditions.

10.3.5 Compatibility

The card must be compatible with current ControlLogix 5580 backplanes. The card must be able to handle the Modbus TCP/IP protocol.

10.4 PLC PROGRAMMING TOOLBOX

The Software must be able to program the all Studio 5000 Logix Designer. The Software shall be available as a single user.

10.5 ETHERNET CARD (IP ADAPTER) TYPE 2 , PLC TYPE 5 CPU 1

10.5.1 Number of ports

The card must at least have 2 Ethernet ports and should be of the 1756-EN4TR type.

10.5.2 Embedded communication service capability

The Ethernet card shall allow for bandwidth management Ethernet TCP/IP data editing, Ethernet TCP/IP Modbus TCP/IP messaging, TCP/IP rack viewing, TCP/IP SNMP network administration and I/O scanning. The unit shall be configurable via the embedded webserver. The unit shall have TCP/IP interface capability.

10.5.3 Power supply

The unit shall be powered via the backplane or rack of a ControlLogix 5580 or equivalent backplane

10.5.4 Indication

The unit shall have status indication indicating various faults and running conditions.

10.5.5 Compatibility

The card must be compatible with current ControlLogix 5580 or equivalent backplanes. The card must be able to handle Modbus TCP/IP and EtherNetIP.

10.5.6 Programming

The card must be configurable utilising with the Studio 5000 Logix Designer. The card must be capable of being integrated seamlessly with existing ControlLogix 5580 or equivalent CPU's.

10.6 DIGITAL INPUT MODULES FOR PLC TYPE 5 CPU 1

10.6.1 Compatibility

The unit must be compatible with ControlLogix 5580 infrastructure. The unit shall be programmable via Studio 5000 Logix Designer software. The unit must be able to fit onto the existing ControlLogix 5580 and GuardLogix5580 or equivalent. The unit shall be compatible with the ControlLogix 5580 or equivalent CPU. The unit shall be capable of handling 16 discrete isolated inputs and 32 discrete isolated inputs. The inputs should be logical positive (current sink type). The unit must allow for 2 wire and 3 wire field devices.

10.6.2 Communication

The unit shall be able to communicate with the existing ControlLogix 5580 or equivalent via the existing Studio 5000 Logix Designer mounting rail.

10.6.3 Indication

The unit shall indicate the various statuses like inputs, faults and running status.

10.6.4 Power consumption

The unit shall use an input voltage of 24Vdc and allow for an input current of 2.7mA for 16 inputs and 2.7mA for 32 inputs.

10.6.5 Protection

The unit shall have an external fast blow fuse per channel group.

10.7 DIGITAL OUTPUT MODULES FOR PLC TYPE 5 CPU 1

10.7.1 Compatibility

The unit must be compatible with existing Modbus TCP/IP infrastructure. The unit shall be programmable via the Studio 5000 Logix Designer software. The unit must be able to fit onto the ControlLogix 5580 or equivalent backplane/rack. The unit shall be compatible with the ControlLogix 5580 or equivalent CPU. The unit shall be capable of handling 16 discrete insulated outputs (type 1) and 32 discrete insulated outputs (type 2). The outputs should be logical positive (current sink type). The unit must allow for 2 wire and 3 wire field devices.

10.7.2 Communication

The unit shall be able to communicate with ControlLogix 5580 or equivalent CPU via the ControlLogix 5580 or equivalent backplane. The unit shall allow for a 20 pin connector (type 1), 40 pin connector (type 2), 2 of 40 pin connectors (type 3).

10.7.3 Indication

The unit shall indicate the various statuses like inputs, faults and running status.

10.7.4 Power consumption

The unit shall use an output voltage of 24Vdc and allow for an input current of 0.1A for 64 outputs, 0.1A for 32 outputs and 0.5A for 16 outputs.

10.7.5 Protection

The unit shall have protection against short-circuits and overloads. The unit must allow for automatic or controlled reactivation and fast electromagnet demagnetization of the circuit. The unit shall have an external fuse for short circuit protection.

10.8 ANALOG INPUT MODULES FOR PLC TYPE 5 CPU 1

10.8.1 Compatibility

The unit must be compatible with existing Modbus TCP/IP infrastructure. The unit shall be programmable via the Studio 5000 Logix Designer . The unit must be able to fit onto the ControlLogix 5580 or equivalent backplane/rack. The unit shall be compatible with the existing ControlLogix 5580 or equivalent CPU. The unit shall be capable of handling 4 isolated voltage or current inputs, 8 isolated voltage or current inputs.

10.8.2 Communication

The unit shall be able to communicate with the ControlLogix 5580 CPU via the existing ControlLogix 5580 or equivalent backplane. The unit shall allow for a connector module.

10.8.3 Indication

The unit shall indicate the various statuses like inputs, faults and running status.

10.8.4 Power consumption

The unit shall typically consume a max of 1W @ 24Vdc.

10.8.5 Protection

The unit shall allow for 30V overload on voltage inputs and at least 30mA overload on current input.

10.9 ANALOG OUTPUT MODULES FOR PLC TYPE 5 CPU 1

10.9.1 Compatibility

The unit must be compatible with existing Modbus TCP/IP infrastructure. The unit shall be programmable via the Studio 5000 Logix Designer software. The unit must be able to fit onto the ControlLogix 5580 or equivalent rack. The unit shall be compatible with the ControlLogix 5580 or equivalent CPU. The unit shall be capable of handling 4 isolated voltage or current outputs (type 1), 8 non-isolated voltage or current outputs (type 2).

10.9.2 Communication

The unit shall be able to communicate with the ControlLogix 5580 or equivalent CPU via the existing ControlLogix 5580 or equivalent backplane. The unit shall allow for a 20-way connector.

10.9.3 Indication

The unit shall indicate the various statuses like inputs, faults and running status.

10.9.4 Power consumption

The unit shall typically consume a max of 3.7W @ 24Vdc.

10.9.5 Protection

The unit shall allow for overload and short circuit protection. The unit should be able to withstand 21mA.

10.10 INPUT / OUTPUT MODULES CONNECTORS FOR PLC TYPE 5 CPU 1

10.10.1 Removable Terminal blocks

The terminal blocks need to be compatible with the ControlLogix 5580 or equivalent series Input and Output module cards..

10.10.2 Preformed cord

The preformed cord needs to be compatible with the ControlLogix 5580 or equivalent series Input and Output module cards.

10.10.3 Removable terminal Prewired cord

The removable prewired cord needs to be compatible with the ControlLogix 5580 or equivalent series Analog input and output module cards. .

10.11 BACKPLANE MODULES

10.11.1 BACKPLANES(CHASSIS) FOR PLC TYPE 5 CPU 1

The backplane modules must be capable of housing the ControlLogix 5580 or equivalent type modules with 4 slots available (1756-A4K)

10.11.2 BACKPLANES (CHASSIS) FOR PLC TYPE 5 CPU 1

The backplane modules must be capable of housing the ControlLogix 5580 or equivalent type modules with 7 slots available (1756-A7K).

10.11.3 BACKPLANES (CHASSIS) FOR PLC TYPE 5 CPU 1

The backplane modules must be capable of housing the ControlLogix 5580 or equivalent type modules with 13 slots available (1756-A13K).

10.11.4 BACKPLANE EXTENDER FOR PLC TYPE 5 CPU 1

The unit must be capable of extending the ControlLogix 5580 or equivalent Backplane (Chassis).

10.12 COMMUNICATIONS MODULE FOR SERIAL RS422/RS485

The unit shall be compatible with ControlLogix 5580 or equivalent CPU devices and infrastructure. The unit shall have RS422/485 interface, be short-circuit proof and electrically disconnected. The unit shall be compatible with RS422/485 connecting cord X27 interface 5m, 10m and 50m.

10.13 PLC TYPE 5 CPU 2

10.13.1 Embedded communication service capability

The CPU shall allow for bandwidth management Ethernet TCP/IP data editing, Ethernet TCP/IP Modbus TCP/IP messaging, TCP/IP rack viewing and TCP/IP SNMP network administration.

10.13.2 CPU memory

The CPU shall have internal RAM of at least 4 MB. The CPU must also include an 8 MB memory card.

10.13.3 Compatibility

The CPU must be compatible with CompactLogix 5480 Controllers.

10.13.4 Programming

The CPU must be programmable Studio 5000 Logix Designer (formerly known as RSlogix 5000 VER 32).The CPU must be capable of being integrated seamlessly into existing Modbus Plus communication infrastructure using a communication gate way.

10.13.5 Indication

The unit shall have status indication indicating various faults and running conditions.

10.13.6 I/O Card Compatibility

The The I/O cards must be compatible with CompactLogix 5480 or equivalent Controllers. The card must be able to handle the Modbus protocol.

10.13.7 Programming

The card must be configurable utilising Studio 5000 Logix Designer (formerly known as RSlogix 5000) software. The card must be capable of being integrated seamlessly with existing CompactLogix 5480 or equivalent Controllers CPU's.

10.14 POWER SUPPLY

The unit shall be powered via the backplane or rack of a typical CompactLogix 5480 or equivalent Controllers.

10.15 ETHERNET CARD (IP ADAPTER) PLC TYPE 1

10.15.1 Number of ports

The card must at least have one Ethernet port .

10.15.2 Embedded communication service capability

The Ethernet card shall allow for bandwidth management Ethernet TCP/IP data editing, Ethernet TCP/IP Modbus TCP/IP messaging, TCP/IP rack viewing, TCP/IP SNMP network administration and I/O scanning. The unit shall be configurable via the embedded webserver

10.15.3 Power supply

The unit shall be powered via the backplane or rack of a typical CompactLogix 5480 or equivalent Controllers.

10.15.4 Indication

The unit shall have status indication indicating various faults and running conditions.

10.15.5 Compatibility

The card must be compatible with current CompactLogix 5480 or equivalent Controllers . The card must be able to handle the Modbus TCP/IP protocol.

10.15.6 Programming

The I/P adaptor card must be configurable utilising with the Studio 5000 Logix Designer. The card must be capable of being integrated seamlessly with CompactLogix 5480 or equivalent Controllers CPU's.

10.16 ETHERNET CARD (IP ADAPTER) TYPE 1 , PLC TYPE 5 CPU 2

10.16.1 Number of ports

The card must at least have 2 Ethernet ports .

10.16.2 Embedded communication service capability

The Ethernet card shall allow for bandwidth management Ethernet TCP/IP data editing, Ethernet TCP/IP Modbus TCP/IP messaging, TCP/IP rack viewing, TCP/IP SNMP network administration and I/O scanning. The unit shall be configurable via the embedded webserver. The unit shall have TCP/IP interface capability.

10.16.3 Power supply

The unit shall be powered via the backplane or rack of a CompactLogix 5480 or equivalent

10.16.4 Indication

The unit shall have status indication indicating various faults and running conditions.

10.16.5 Compatibility

The card must be compatible with current CompactLogix 5480. The card must be able to handle Modbus TCP/IP and EtherNetIP.

10.16.6 Programming

The card must be configurable utilising with the existing Studio 5000 Logix Designer software. The card must be capable of being integrated seamlessly with existing ControlLogix 5580 or equivalent CPU's.

10.17 PLC PROGRAMMING TOOLBOX

The Software must be able to program the all Studio 5000 Logix Designer. The Software shall be available as a single user.

10.18 COMMUNICATIONS MODULE FOR SERIAL RS422/RS485

The unit shall be compatible with ControlLogix 5580 or equivalent CPU devices and infrastructure. The unit shall have RS422/485 interface, be short-circuit proof and electrically disconnected. The unit shall be compatible with RS422/485 connecting cord X27 interface 5m, 10m and 50m.

10.19 DIGITAL INPUT MODULES FOR PLC TYPE 5, CPU 2

10.19.1 Compatibility

The unit must be compatible with CompactLogix 5480 or equivalent infrastructure. The unit shall be programmable via Studio 5000 Logix Designer software. The unit must be able to fit onto the CompactLogix 5480. The unit shall be compatible with the CompactLogix 5480 or equivalent CPU. The unit shall be capable of handling 16 discrete isolated inputs and 32 discrete isolated inputs. The inputs should be logical positive (current sink type). The unit must allow for 2 wire and 3 wire field devices.

10.19.2 Communication

The unit shall be able to communicate with the existing CompactLogix or equivalent 5480 via the existing Studio 5000 Logix Designer mounting rail.

10.19.3 Indication

The unit shall indicate the various statuses like inputs, faults and running status.

10.19.4 Power consumption

The unit shall use an input voltage of 24Vdc and allow for an input current of 2.7mA for 16 inputs and 2.7mA for 32 inputs.

10.19.5 Protection

The unit shall have an external fast blow fuse per channel group.

10.20 DIGITAL OUTPUT MODULES FOR PLC TYPE 5 CPU 2

10.20.1 Compatibility

The unit must be compatible with existing Modbus TCP/IP infrastructure. The unit shall be programmable via the Studio 5000 Logix Designer software. The unit must be able to fit onto the CompactLogix or equivalent 5480. The unit shall be compatible with the CompactLogix or equivalent 5480 CPU. The unit shall be capable of handling 16 discrete insulated outputs (type 1) and 32 discrete insulated outputs (type 2). The outputs should be logical positive (current sink type). The unit must allow for 2 wire and 3 wire field devices.

10.20.2 Communication

The unit shall be able to communicate with CompactLogix 5480 or equivalent CPU via the CompactLogix 5480 or equivalent. The unit shall allow for a 20 pin connector (type 1), 40 pin connector (type 2), 2 of 40 pin connectors (type 3).

10.20.3 Indication

The unit shall indicate the various statuses like inputs, faults and running status.

10.20.4 Power consumption

The unit shall use an output voltage of 24Vdc and allow for an input current of 0.1A for 64 outputs, 0.1A for 32 outputs and 0.5A for 16 outputs.

10.20.5 Protection

The unit shall have protection against short-circuits and overloads. The unit must allow for automatic or controlled reactivation and fast electromagnet demagnetization of the circuit. The unit shall have an external fuse for short circuit protection.

10.21 ANALOG INPUT MODULES FOR PLC TYPE 5 CPU 2

10.21.1 Compatibility

The unit must be compatible with existing Modbus TCP/IP infrastructure. The unit shall be programmable via the Studio 5000 Logix Designer . The unit must be able to fit onto the CompactLogix 5480 or equivalent Controllers. The unit shall be compatible with the existing CompactLogix 5480 or equivalent ControllersCPU. The unit shall be capable of handling 4 isolated voltage or current inputs, 8 isolated voltage or current inputs.

10.21.2 Communication

The unit shall be able to communicate with the ControlLogix 5580 or equivalent CPU via the existing ControlLogix 5580 or equivalent backplane. The unit shall allow for a connector module

10.21.3 Indication

The unit shall indicate the various statuses like inputs, faults and running status.

10.21.4 Power consumption

The unit shall typically consume a max of 1W @ 24Vdc.

10.21.5 Protection

The unit shall allow for 30V overload on voltage inputs and at least 30mA overload on current input.

10.22 ANALOG OUTPUT MODULES FOR PLC TYPE 5 CPU 2

10.22.1 Compatibility

The unit must be compatible with existing Modbus TCP/IP infrastructure. The unit shall be programmable via the Studio 5000 Logix Designer software. The unit must be able to fit onto the CompactLogix 5480 or equivalent ControllersThe unit shall be compatible with the CompactLogix 5480 Controllers CPU. The unit shall be capable of handling 4 isolated voltage or current outputs (type 1), 8 non-isolated voltage or current outputs (type 2).

10.22.2 Communication

The unit shall be able to communicate with the CompactLogix 5480 or equivalent ControllersCPU via the existing CompactLogix 5480 or equivalent Controllers. The unit shall allow for a 20-way connector.

10.22.3 Indication

The unit shall indicate the various statuses like inputs, faults and running status.

10.22.4 Power consumption

The unit shall typically consume a max of 3.7W @ 24Vdc.

10.22.5 Protection

The unit shall allow for overload and short circuit protection. The unit should be able to withstand 21mA.

10.23 PLC TYPE 5 CPU 3

10.23.1 CPU

The CPU shall allow for bandwidth management Ethernet TCP/IP data editing, Ethernet TCP/IP Modbus TCP/IP messaging, TCP/IP rack viewing and TCP/IP SNMP network administration and EtherNet/IP.

10.23.2 CPU memory

The CPU shall have internal RAM of at least 4 MB. The CPU must also include an 8 MB memory card.

10.23.3 Compatibility

The CPU must be compatible with Micro850 or equivalent Programmable Logic Controller.

10.23.4 Programming

The CPU must be programmable Studio 5000 Logix Designer (formerly known as RSlogix 5000 VER 32).The CPU must be capable of being integrated seamlessly into existing Modbus Plus communication infrastructure using a communication gate way.

10.23.5 Indication

The unit shall have status indication indicating various faults and running conditions.

10.23.6 I/O Card Compatibility

The The I/O cards must be compatible with Micro850 or equivalent Programmable Logic Controller. The card must be able to handle the Modbus protocol.

10.23.7 Programming

The card must be configurable utilising Studio 5000 Logix Designer (formerly known as RSlogix 5000) software. The card must be capable of being integrated seamlessly with Micro850 or equivalent Programmable Logic Controller CPU's.

10.24 POWER SUPPLY

The unit shall be powered via the backplane or rack of a typical Micro850 Programmable Logic Controller.

10.25 ETHERNET CARD (IP ADAPTER) TYPE1 , PLC TYPE 5 CPU 3

10.25.1 Number of ports

The card must at least have one Ethernet port .

10.25.2 Embedded communication service capability

The Ethernet card shall allow for bandwidth management Ethernet TCP/IP data editing, Ethernet TCP/IP Modbus TCP/IP messaging, TCP/IP rack viewing, TCP/IP SNMP network administration and I/O scanning. The unit shall be configurable via the embedded webserver

10.25.3 Power supply

The unit shall be powered via the backplane or rack of a typical Micro850 or equivalent Programmable Logic Controller.

10.25.4 Indication

The unit shall have status indication indicating various faults and running conditions.

10.25.5 Compatibility

The card must be compatible with current Micro850 or equivalent Programmable Logic Controller. The card must be able to handle the Modbus TCP/IP protocol.

10.25.6 Programming

The I/P adaptor card must be configurable utilising with the Studio 5000 Logix Designer. The card must be capable of being integrated seamlessly with Micro850 Programmable Logic Controller CPU's.

10.26 ETHERNET CARD (IP ADAPTER) TYPE2 PLC TYPE 5 CPU 3

10.26.1 Number of ports

The card must at least have 2 Ethernet ports .

10.26.2 Embedded communication service capability

The Ethernet card shall allow for bandwidth management Ethernet TCP/IP data editing, Ethernet TCP/IP Modbus TCP/IP messaging, TCP/IP rack viewing, TCP/IP SNMP network administration and I/O scanning. The unit shall be configurable via the embedded webserver. The unit shall have TCP/IP interface capability.

10.26.3 Power supply

The unit shall be powered via the backplane or rack of a Micro850 or equivalent Programmable Logic Controller

10.26.4 Indication

The unit shall have status indication indicating various faults and running conditions.

10.26.5 Compatibility

The card must be compatible with current CompactLogix 5480 or equivalent. The card must be able to handle Modbus TCP/IP and EtherNetIP.

10.26.6 Programming

The card must be configurable utilising with the existing Studio 5000 Logix Designer software. The card must be capable of being integrated seamlessly with existing Micro850 or equivalent Programmable Logic Controller CPU's.

10.27 PLC PROGRAMMING TOOLBOX

The Software must be able to program the all Studio 5000 Logix Designer. The Software shall be available as a single user.

10.28 DIGITAL INPUT MODULES FOR PLC TYPE 5 CPU 3

10.28.1 Compatibility

The unit must be compatible with Micro850 or equivalent Programmable Logic Controller infrastructure. The unit shall be programmable via Studio 5000 Logix Designer software. The unit must be able to fit onto the Micro850 Programmable Logic Controller. The unit shall be compatible with the Micro850 or equivalent Programmable Logic Controller CPU. The unit shall be capable of handling 16 discrete isolated inputs and 32 discrete isolated inputs. The inputs should be logical positive (current sink type). The unit must allow for 2 wire and 3 wire field devices.

10.28.2 Communication

The unit shall be able to communicate with the existing Micro850 or equivalent Programmable Logic Controller via the existing Studio 5000 Logix Designer mounting rail.

10.28.3 Indication

The unit shall indicate the various statuses like inputs, faults and running status.

10.28.4 Power consumption

The unit shall use an input voltage of 24Vdc and allow for an input current of 2.7mA for 16 inputs and 2.7mA for 32 inputs.

10.28.5 Protection

The unit shall have an external fast blow fuse per channel group.

10.29 DIGITAL OUTPUT MODULES FOR PLC TYPE 5 CPU 3

10.29.1 Compatibility

The unit must be compatible with existing Modbus TCP/IP infrastructure. The unit shall be programmable via the Studio 5000 Logix Designer software. The unit must be able to fit onto the CompactLogix 5480 or equivalent. The unit shall be compatible with the Micro850 Programmable Logic Controller CPU. The unit shall be capable of handling 16 discrete insulated outputs (type 1) and 32 discrete insulated outputs (type 2). The outputs should be logical positive (current sink type). The unit must allow for 2 wire and 3 wire field devices.

10.29.2 Communication

The unit shall be able to communicate with Micro850 Programmable Logic Controller CPU via the

CompactLogix 5480 or equivalent. The unit shall allow for a 20 pin connector (type 1), 40 pin connector (type 2), 2 of 40 pin connectors (type 3).

10.29.3 Indication

The unit shall indicate the various statuses like inputs, faults and running status.

10.29.4 Power consumption

The unit shall use an output voltage of 24Vdc and allow for an input current range of 0.1A for 64 outputs, 0.1A for 32 outputs and 0.5A for 16 outputs.

10.29.5 Protection

The unit shall have protection against short-circuits and overloads. The unit must allow for automatic or controlled reactivation and fast electromagnet demagnetization of the circuit. The unit shall have an external fuse for short circuit protection.

10.30 ANALOG INPUT MODULES FOR PLC TYPE 5 CPU 3

10.30.1 Compatibility

The unit must be compatible with existing Modbus TCP/IP infrastructure. The unit shall be programmable via the Studio 5000 Logix Designer. The unit must be able to fit onto the Micro850 or equivalent Programmable Logic Controller. The unit shall be compatible with the existing Micro850 or equivalent Programmable Logic Controller CPU. The unit shall be capable of handling 4 isolated voltage or current inputs, 8 isolated voltage or current inputs.

10.30.2 Communication

The unit shall be able to communicate with the Micro850 or equivalent Programmable Logic Controller CPU via the existing Micro850 or equivalent Programmable Logic Controller backplane. The unit shall allow for a connector module

10.30.3 Indication

The unit shall indicate the various statuses like inputs, faults and running status.

10.30.4 Power consumption

The unit shall typically consume a max of 1W @ 24Vdc

10.30.5 Protection

The unit shall allow for 30V overload on voltage inputs and at least 30mA overload on current input.

10.31 ANALOG OUTPUT MODULES FOR PLC TYPE 5 CPU 3

10.31.1 Compatibility

The unit must be compatible with existing Modbus TCP/IP infrastructure. The unit shall be programmable via the Studio 5000 Logix Designer software. The unit must be able to fit onto the CompactLogix 5480 or equivalent ControllersThe unit shall be compatible with the Micro850 or equivalent Programmable Logic Controller CPU. The unit shall be capable of handling 4 isolated voltage or current outputs (type 1), 8 non-isolated voltage or current outputs (type 2).

10.30.2 Communication

The unit shall be able to communicate with the Micro850 or equivalent Programmable Logic Controller CPU via the existing Micro850 or equivalent Programmable Logic Controller. The unit shall allow for a 20-way connector.

10.30.3 Indication

The unit shall indicate the various statuses like inputs, faults and running status.

10.30.4 Power consumption

The unit shall typically consume a max of 3.7W @ 24Vdc.

10.30.5 Protection

The unit shall allow for overload and short circuit protection. The unit should be able to withstand 21mA

11 PLC TYPE 6

11.1 PLC TYPE 6 CPU

11.1.1 Communication

The CPU shall allow for bandwidth management Ethernet TCP/IP data editing, Ethernet TCP/IP Modbus TCP/IP messaging, TCP/IP rack viewing and TCP/IP SNMP network administration and EtherNet/IP

11.1.2 CPU memory

The CPU shall have internal RAM of at least 4 MB. The CPU must also include an 8 MB plus memory card.

11.1.3 Compatibility

The CPU must be compatible with WAGO PFC200 or equivalent Logic Controller.

11.1.4 Programming

The CPU must be programmable CODESYS 2.3 /e!Cockpit 2.3.The CPU must be capable of being integrated seamlessly into existing Modbus Plus communication infrastructure using a communication gate way.

11.1.5 Indication

The unit shall have status indication indicating various faults and running conditions.

11.1.6 I/O Card Compatibility

The The I/O cards must be compatible with WAGO PFC200 or equivalent Logic Controller. The card must be able to handle the Modbus protocol.

11.1.7 Programming

The card must be configurable utilising CODESYS 2.3 / e!Cockpit 2.3 software. The card must be capable of being integrated seamlessly with WAGO PFC200 or equivalent Logic Controller CPU's.

11.1.8 Power supply

The unit shall be powered via the dinrail or rack of a typical WAGO PFC200 or equivalent Logic Controller.

11.2 PLC PROGRAMMING TOOLBOX FOR PLC TYPE 6

The Software must be able to program CODESYS 2.3 / e!Cockpit 2.3 . The Software shall be available as a single user.

11.3 DIGITAL INPUT MODULES FOR PLC TYPE 6

11.3.1 Compatibility

The unit must be compatible with WAGO PFC200 or equivalent Logic Controller CPU. infrastructure. The unit shall be programmable via CODESYS 2.3 / e!Cockpit 2.3 software. The unit must be able to fit onto the WAGO PFC200 or equivalent Logic Controller CPU. The unit shall be compatible with the WAGO PFC200 or equivalent Logic Controller CPU CPU. The unit shall be capable of handling 8 discrete isolated inputs and 16 discrete isolated inputs. The inputs should be logical positive (current sink type). The unit must allow for 2 wire and 3 wire field devices.

11.3.2 Communication

The unit shall be able to communicate with the existing PFC200 or equivalent Logic Controller via the existing CODESYS 2.3 / e!Cockpit.

11.3.3 Indication

The unit shall indicate the various statuses like inputs, faults and running status.

11.3.4 Power consumption

The unit shall use an input voltage of 24Vdc and allow for an input current of 2.7mA for 16 inputs and 2.7mA for 32 inputs.

11.3.5 Protection

The unit shall have an external fast blow fuse per channel group.

11.4 DIGITAL OUTPUT MODULES FOR PLC TYPE 6

11.4.1 Compatibility

The unit must be compatible with existing Modbus TCP/IP infrastructure.The unit must be able to fit onto the PFC200 or equivalent Logic Controller. The unit shall be compatible with the PFC200 or equivalent Logic Controller CPU. The unit shall be capable of handling 8 discrete insulated outputs (type 1) and 32 discrete insulated outputs (type 2). The outputs should be logical positive (current sink type). The unit must allow for 2 wire and 3 wire field devices.

11.4.2 Communication

The unit shall be able to communicate with Modbus devices

11.4.3 Indication

The unit shall indicate the various statuses like inputs, faults and running status.

11.4.4 Power consumption

The unit shall use an output voltage of 24Vdc and allow for an input current range of 0.1A for 64 outputs, 0.1A for 32 outputs and 0.5A for 16 outputs.

11.4.5 Protection

The unit shall have protection against short-circuits and overloads. The unit must allow for automatic or controlled reactivation and fast electromagnet demagnetization of the circuit. The unit shall have an external fuse for short circuit protection.

11.5 ANALOG INPUT MODULES FOR PLC TYPE 6

11.5.1 Compatibility

The unit must be compatible with existing Modbus TCP/IP infrastructure. The unit shall be programmable via the CODESYS 2.3 /e!Cockpit 2.3. The unit must be able to fit onto the PFC200 or equivalent Logic Controller . The unit shall be capable of handling 4 isolated voltage or current inputs, 8 isolated voltage or current inputs.

11.5.2 Communication

The unit shall be able to communicate with the PFC200 Logic Controller CPU or equivalent. The unit shall allow for a connector module.

11.5.3 Indication

The unit shall indicate the various statuses like inputs, faults and running status.

11.5.4 Power consumption

The unit shall typically consume a max of 1W @ 24Vdc1.

11.5.5 Protection

The unit shall allow for 30V overload on voltage inputs and at least 30mA overload on current input.

11.8 ANALOG OUTPUT MODULES FOR PLC TYPE 6

11.8.1 Compatibility

The unit must be able to fit onto the PFC200 Logic Controller or equivalent Dinrail .The module shall be compatible with the PFC200 Logic Controller CPU or equivalent. The unit shall be capable of handling 4 isolated voltage or current outputs (type 1).

11.8.2 Communication

The unit shall be able to communicate with the PFC200 Logic Controller or equivalent CPU .

11.8.3 Indication

The unit shall indicate the various statuses like inputs, faults and running status.

11.8.4 Power consumption

The unit shall typically consume a max of 3.7W @ 24Vdc.

11.8.5 Protection

The unit shall allow for overload and short circuit protection. The unit should be able to withstand 21mA

12 PLC TYPE 7

12.1 CPU

The CPU shall allow for bandwidth management Ethernet TCP/IP data editing, Ethernet TCP/IP Modbus TCP/IP messaging, TCP/IP rack viewing and TCP/IP SNMP network administration and EtherNet/IP. The CPU can be of the type with on board I/O.

12.1.2 CPU memory

The CPU shall have internal RAM of at least 4 MB. The CPU must also include an 8 MB plus memory card.

12.1.3 Compatibility

The CPU must be able to integrate with Altus XP340 or equivalent programmable Logic Controllers

12.1.4 Programming

The CPU must be programmable CODESYS 2.3 /e!Cockpit 2.3.The CPU must be capable of being integrated seamlessly into existing infrastructure.

12.1.5 Indication

The unit shall have status indication indicating various faults and running conditions.

12.1.6 I/O Card Compatibility

The The I/O cards must be compatible with Altus XP340 programmable Logic Controller or equivalent. The card must be able to handle the Modbus protocol.

12.1.7 Programming

The card must be configurable utilising CODESYS 2.3 / e!Cockpit 2.3 software. The card must be capable of being integrated seamlessly with Altus XP340 programmable Logic Controller or equivalent CPU's.

12.1.8 Power supply

The unit shall be powered via the dinrail or rack of a typical Altus XP340 programmable Logic Controller or equivalent compatible .

12.2 PLC PROGRAMMING TOOLBOX FOR PLC TYPE 7

The Software must be able to program MasterTool IEC XE . The Software shall be available as a free PLC programm.

12.3 MOTOR PROTECTION (ABB REM 615) or Equivalent

12.3.1 Protection functions

12.3.1.1. Start-up and control

The relay shall include motor start-up supervision. The function shall offer protection in case of an excessive start-up time of the motor. The start-up supervision shall be based on monitoring the true RMS value of all the phase currents or by monitoring the status of the circuit breaker connected to the motor. The relay shall include support for connecting a speed switch indicating whether the rotor is rotating or not. The phase reversal protection (46R) must be based on the calculated negative phase-sequence (NPS) current. During motor start-up, the relay shall, by monitoring the NPS current values, detect incorrectly connected phases and inhibit the motor from rotating in the opposite direction. The relay shall include motor load jam protection, i.e. locked rotor protection (51LR) for a running motor. The motor load jam protection function shall be blocked by the motor start-up supervision protection function. The relay shall include loss of load supervision (37), as loss of load is considered a fault condition. The function shall operate when the current drops below the set start value. The relay shall differentiate between loss of load and standstill situations. The relay shall include an emergency start function, which shall allow motor start-up during emergency conditions. The function shall force the relay to allow motor restart. After the emergency start input has been activated, it shall be possible to start the motor normally.

12.3.1.2. Thermal protection

- The relay shall include motor thermal overload protection (49Mo protect the electric motor from overheating). To meet critical operational requirements, it must be possible to block the function.
- The motor thermal overload protection shall consider both the true RMS and negative-sequence currents. In case of unbalanced phase currents, the negative-sequence current must be considered since it causes additional heating. For accurate calculation of the different motor thermal conditions, the relay shall have three time constants for the running conditions of the motor, i.e. start-up, normal run and power-off.
- The relay shall include two stages of negative sequence overcurrent protection (46M) settable between 0.01 and 5 times pu. The negative sequence overcurrent protection must be blocked if the current circuit supervision detects a fault in the current measuring circuit, or if the relay detects a reverse network rotating direction via a binary input signal from an external device.

12.3.1.3. Overcurrent and earth fault functions:

- The relay shall have non-directional phase overcurrent and earth-fault protection (50/51) with multiple

stages, definite time (DT) and inverse definite minimum time (IDMT) characteristics, and IEC operating curves.
- The relay shall include phase unbalance, voltage and frequency protections.
- For applications, requiring sensitive earth fault protection the relay shall offer an optional 0.2/1 A residual current input. The selection of 0.2 A or 1 A shall be software based.
- The relay shall have three-phase current and voltage measurement (fundamental or RMS-based as selectable options) with an accuracy of ±0.5% and zero, negative and positive-sequence current and voltage measurement functionality with an accuracy of ±1% within the range of ±2Hz of the nominal frequency.

12.3.1.4. Inputs and outputs

- The relay shall have 8 binary inputs and 9 binary outputs and all of them freely configurable. Optionally, it must be possible to add 8 more binary inputs and 1 more binary output.
- To enable direct tripping of the circuit breaker, the relay must have 2 double-pole power output relays with integrated trip-circuit supervision (TCS). The two power output relays shall be rated to make and carry 30 A for 0.5 s with a breaking capacity of ≥1 A (L/R<40 ms).
- To enable fast direct tripping of the circuit breaker, the relay must have 3 optional high-speed binary outputs with an operate time of ≤ 1 ms. The binary output contacts shall be rated to make and carry 30 A for 0.5 s with a breaking capacity of ≥1 A (L/R<40 ms). The threshold voltage of the relays binary inputs shall be settable to 16…176 V DC.
- The relay shall be equipped with inputs for detecting temperature using resistance temperature detector (RTD) sensors. At least 6 inputs shall be required to measure stator winding, bearing and ambient temperatures of a three-phase motor.
- The relay shall support the commonly used sensor types Pt100, Pt250, Ni100, Ni120, Ni250, Cu10 with 2-wire or 3-wire connection with common ground.
- The phase current inputs and the residual current input of the relay shall be rated 1/5 A. The selection of 1A or 5A shall be software based.
- The relay must offer optional current and voltage sensor inputs and support the use of combined current and voltage sensors connected with one connector per phase. The current sensor inputs must facilitate the usage of the sensors within the nominal range of 40….1250 A without any external adaptors.

12.3.1.5. Measurements, alarms and reporting

- To collect sequence-of-events (SoE) information, the relay must include a non-volatile memory with a capacity of storing at least 1024 event codes with associated time stamps.
- The relay must support the storage of at least 128 fault records in the relay's non-volatile memory.
- The fault record values must at least include phase currents, phase voltages, zero, negative and positive-sequence currents and voltages, and the active setting group.
- The relay shall have a disturbance recorder supporting a sampling frequency of 32 samples per cycle and featuring up to 12 analog and 64 binary signal channels.
- The relay's disturbance recorder shall support not less than 6 three-second recordings at 32 samples per cycle for 12 analog channels and 64 binary channels.
- The relay shall support up to 100 disturbance recordings.
- The relay must have a load profile recorder for phase currents and voltages supporting up to 12 selectable load quantities and more than 1 year of recording length. The load profile recorder output shall be in COMTRADE format.
- The relay shall include a motor runtime counter for calculating and presenting the accumulated operation time of a machine. The function shall alert the operator via a warning and an alarm when the accumulated operation time exceeds the set limit.

12.3.1.6. Communication

- The relay must support IEC 61850 Edition 1 and Edition 2.
- The relay must support, besides IEC 61850, simultaneous communication using one of the following communication protocols: Modbus® (RTU-ASCII/TCP), IEC 60870-5-103 or DNP3 (serial/ TCP).
- The relay must have an Ethernet port (RJ45) on the front for local parametrization and data retrieval. The relay shall support up to five IEC 61850 (MMS) clients simultaneously.
- The relay must have two fiber-optic Ethernet ports with HSR and PRP-1.
- The relay shall have a third Ethernet port for providing connectivity of any other Ethernet device to an IEC 61850 station bus inside a switchgear bay.

- The relay must support IEC 61850 GOOSE messaging and meet the performance requirements for tripping applications (<10 ms) as defined by the IEC 61850 standard.
- The relay shall have support for sharing analog values like temperature, resistance, tap positions using IEC 61850 GOOSE messaging.

12.3.1.7. Real time clock and time synchronization

- The relay must support IEEE 1588 v2 for high accuracy time synchronization (<4 µs) in Ethernet based applications. The relay shall also support the SNTP (Simple Network time Protocol) and IRIG-B (Inter-Range Instrumentation Group – Time Code Format B) time synchronization methods.
- The relay must support IEC 61850-9-2LE with IEEE 1588 v2 for accurate time synchronization.

12.3.1.8. Engineering and configurability

- The relay must have 6 independent settings groups for the relevant protection settings (start value, operate time). It must be possible to change protection-setting values from one setting group to another in less than 20 ms from the binary input activation.
- The relay must have a web browser-based human-machine interface (WHMI) with secured communication (TLS) and shall provide the following functions:
    - Programmable LEDs and event lists
    - System supervision
    - Parameter settings
    - Measurement display
    - Disturbance records
    - Phasor diagram
    - Single-line diagram (SLD)
    - Importing and exporting of parameters
- When a protection function is disabled or removed from the configuration, neither the relay nor the programming tool shall show the function-related settings.
- The relay HMI and engineering tool shall have multilingual support.
- The relay HMI and engineering tool shall support IEC protection function codes.
- The relay shall have at least 11 freely configurable and programmable two-color LEDs.
- The relay must have at least 10 user-configurable local HMI views including measurements and SLDs.
- The relay shall have a graphical configuration tool for the complete relay application including multi-level logic programming support, timers and flip-flops.
- The relay configuration tool must include online visualization of the relay application state.
- It must be possible to keep the relay configuration tool up-to-date using an online update functionality.
- The relay configuration tool shall support viewing of relay events, fault records and visualization of disturbance recordings.
- The relay configuration tool must include the complete relay documentation including operation and technical details.
- The relay configuration tool must include functionality for comparing the archived configuration to the configuration in the relay.
- The relay configuration tool must allow configuration of IEC 61850 vertical and horizontal communication including GOOSE and sampled values.
- The relay configuration tool must support importing and exporting of valid IEC 61850 files (ICD, CID, SCD, IID).
- The relay configuration tool must be compatible with earlier relay versions.

12.3.1.9. Arc flash protection

- The relay shall have arc protection based on simultaneous detection of current and light. During maintenance work at the substation, it shall be possible to change the operation criteria to light only via a binary input.

12.3.1.10. Type tests and other compliance requirements

- The relay shall have an operational temperature range of -25 … +55ºC and transport/storage temperature range of -40...+85ºC.
- The relay must fulfill the mechanical test requirements according to IEC 60255-21-1, -2 and -3, Class 2 for vibration, shock, bump and seismic compliance.

- The relay's maximum DC auxiliary power consumption shall be less than 20 W (all inputs activated and over the full supply range).
- The relay must have an IEC 61850 Edition 2 certificate from an accredited Level A testing laboratory.
- The relay must fulfill the electromagnetic compatibility (EMC) test requirements according to IEC 60255-26.
- The relay must be tested according to the requirements of the IEC or an equivalent standard.

12.4. FEEDER PROTECTION (ABB REF 615) or Equivalent

12.4.1. Protection functions

- The relay shall include phase unbalance, voltage and frequency protection.
- For overhead line applications, the relay shall have an optional multi-shot auto-reclose function.

12.4.1.1. Overcurrent and earth fault relay functionality

- The relay shall have directional and non-directional phase overcurrent and earth-fault protection (50/51/67) with three stages (low-set, high-set and non-directional instantaneous stage), definite time (DT) and inverse definite minimum time (IDMT) characteristics, and IEC operating curves.
- The relay must have three-stage directional phase overcurrent protection (67) with voltage memory and positive and negative-sequence polarization.
- The relay must have three-stage directional earth-fault protection (67N) with selectable negative and zero-sequence polarization. I_o and U_o shall be derived either from the phase voltages and currents or from the measured neutral current and residual voltage.
- In compensated, unearthed and high-resistance earthed networks, the relay shall be able to detect transient, intermittent and continuous earth faults. The fault direction determination criterion of the protection function must include multiple harmonics.
- In compensated, unearthed and high-resistance earthed networks, the relay shall have admittance (21YN/67YN) and watt metric-based (32N) earth-fault protection.
- The relay shall include a fault-locating algorithm to calculate the fault location with +/- 2.5 % accuracy for phase-to-phase and phase-to-earth faults in effectively and low-resistance earthed networks.
- For applications requiring sensitive earth-fault protection, the relay shall offer an optional 0.2/ 1 A residual current input. The selection of 0.2 A or 1 A shall be software-based.

12.4.1.2. Inputs and outputs

- The relay shall have 8 binary inputs and 9 binary outputs and all of them freely configurable. Optionally, it must be possible to add 8 more binary inputs and 1 more binary output.
- To enable direct tripping of the circuit breaker, the relay must have 2 double-pole power output relays with integrated trip-circuit supervision (TCS). The two power output relays shall be rated to make and carry 30 A for 0.5 s with a breaking capacity of ≥1 A (L/R<40 ms).
- To enable fast direct tripping of the circuit breaker, the relay must have 3 optional high-speed binary outputs with an operate time of ≤ 1 ms. The binary output contacts shall be rated to make and carry 30 A for 0.5 s with a breaking capacity of ≥1 A (L/R<40 ms).
- The threshold voltage of the relays binary inputs shall be settable to 16…176 V DC.
- The binary inputs of the relay shall, when energized, utilize a higher inrush current to facilitate the breaking of possible dirt or sulfide from the surface of the activating contact.
- The relay shall offer two optional RTD inputs and one mA input.
- The phase current inputs and the residual current input of the relay shall be rated 1/5 A. The selection of 1 A or 5 A shall be software based.
- The relay must offer optional current and voltage sensor inputs and support the use of combined current and voltage sensors connected with one connector per phase. The current sensor inputs must facilitate the usage of the sensors within the nominal range of 40….1250 A without any external adaptors.

12.4.1.3. Measurements, alarms and reporting

- The relay shall have three-phase current and voltage measurement (fundamental or RMS-based as selectable options) with an accuracy of ±0.5% and zero, negative and positive-sequence current and voltage measurement with an accuracy of ±1% within the range of ±2Hz of the nominal frequency.

- To collect sequence-of-events (SoE) information, the relay must include a non-volatile memory with a capacity of storing at least 1024 event codes with associated time stamps.
- The relay must support the storage of at least 128 fault records in the relay's non-volatile memory.
- The fault record values must at least include phase currents, phase voltages, zero, negative and positive-sequence currents and voltages, and the active setting group.
- The relay shall have a disturbance recorder supporting a sampling frequency of 32 samples per cycle and featuring up to 12 analog and 64 binary signal channels.
- The relay's disturbance recorder shall support not less than 6 three-second recordings at 32 samples per cycle for 12 analog channels and 64 binary channels.
- The relay shall support up to 100 disturbance recordings.
- The relay must have a load profile recorder for phase currents and voltages supporting up to 12 selectable load quantities and more than 1 year of recording length. The load profile recorder output shall be in COMTRADE format.

12.4.1.4. Communication

- The relay must support IEC 61850 Edition 1 and Edition 2.
- The relay must support, besides IEC 61850, simultaneous communication using one of the following communication protocols: Modbus® (RTU-ASCII/TCP), IEC 60870-5-103 or DNP3 (serial/ TCP).
- The relay must have an Ethernet port (RJ45) on the front for local parametrization and data retrieval.
- The relay shall support up to five IEC 61850 (MMS) clients simultaneously.
- The relay must have two fiber-optic Ethernet ports with HSR and PRP-1.
- The relay shall have a third Ethernet port for providing connectivity of any other Ethernet device to an IEC 61850 station bus inside a switchgear bay.
- The relay must support IEC 61850 GOOSE messaging and meet the performance requirements for tripping applications (<10 ms) as defined by the IEC 61850 standard.
- The relay shall support sharing analog values such as temperature, resistance and tap positions using IEC 61850 GOOSE messaging.

12.4.1.5. Real time clock and time synchronization

- The relay must support IEEE 1588 v2 for high accuracy time synchronization (<4 µs) in Ethernet based applications. The relay shall also support the SNTP (Simple Network time Protocol) and IRIG-B (Inter-Range Instrumentation Group – Time Code Format B) time synchronization methods.
- The relay must support IEC 61850-9-2LE with IEEE 1588 v2 for accurate time synchronization.

12.4.1.6. Engineering and configurability

- The relay must have 6 independent settings groups for the relevant protection settings (start value, operate time). It must be possible to change protection-setting values from one setting group to another in less than 20 ms from the binary input activation.
- The relay must have a web browser-based human-machine interface (WHMI) with secured communication (TLS) and shall provide the following functions:
    - Programmable LEDs and event lists
    - System supervision
    - Parameter settings
    - Measurement display
    - Disturbance records
    - Phasor diagram
    - Single-line diagram (SLD)
    - Importing and exporting of parameters

- When a protection function is disabled or removed from the configuration, neither the relay nor the configuration tool shall show the function-related settings.
- The relay HMI and engineering tool shall have multilingual support.
- The relay HMI and configuration tool shall support IEC protection function codes.
- The relay shall have at least 11 freely configurable and programmable two-color LEDs.
- The relay must have at least 10 user-configurable local HMI views including measurements and SLDs.
- The relay shall have a graphical configuration tool for the complete relay application including multi-level logic programming support, timers and flip-flops.

- The relay configuration tool must include online visualization of the relay application state.
- It must be possible to keep the relay configuration tool up-to-date using an online update functionality.
- The relay configuration tool shall support viewing of relay events, fault records and visualization of disturbance recordings.
- The relay configuration tool must include the complete relay documentation including operation and technical details.
- The relay configuration tool must include functionality for comparing the archived configuration to the configuration in the relay.
- The relay configuration tool must allow configuration of IEC 61850 vertical and horizontal communication including GOOSE and sampled values.
- The relay configuration tool must support importing and exporting of valid IEC 61850 files (ICD, CID, SCD, IID).
- The relay configuration tool must be compatible with earlier relay versions.

12.4.1.7. Arc flash protection

- The relay shall have arc-protection based on simultaneous detection of current and light. During maintenance work at the substation, it shall be possible to change the operation criteria to light only via a binary input.

12.4.1.8. Type tests and other compliance requirements

- The relay shall have an operating temperature range of -25 … +55ºC and transport/storage temperature range of -40...+85ºC.
- The relay must fulfill the mechanical test requirements according to IEC 60255-21-1, -2 and -3, Class 2 for vibration, shock, bump and seismic compliance.
- The relay's maximum DC auxiliary power consumption shall be less than 20 W (all inputs activated and over the full supply range).
- The relay must have an IEC 61850 Edition 2 certificate from an accredited Level A testing laboratory.
- The relay must fulfill the electromagnetic compatibility (EMC) test requirements according to IEC 60255-26.
- The relay must be tested according to the requirements of the IEC or an equivalent standard.

12.5. TRANSFORMER PROTECTION (ABB RET 615) or Equivalent

12.5.1. Protection functions

12.5.1.1. Differential protection for two-winding transformers

- The relay shall have stabilized differential protection (87T) with two independently settable stages. The biased low-set stage shall provide fast fault clearance while remaining stable when high currents are passing through the protected zone, which increases current measurement errors. The instantaneous high-set stage shall provide very fast clearance of severe internal power transformer faults with a high differential current regardless of their harmonics content. The operate time of the instantaneous stage shall be less than 25 ms.
- The necessary adaptation to the current ratios and vector groups shall be made using software (with internally settable adaptation for CT ratio matching and vector group) and all current inputs (1A and 5A) shall allow direct connection to the main CT, i.e. no interposing current transformers for matching transformer group and main CTs ratio shall be required.
- The differential protection functions shall be provided with a 2nd harmonic blocking to avoid tripping at magnetizing inrush when the transformer is energized either from the HV or LV-side and with a 5th harmonic restraint to avoid tripping at over-excitation. It shall be possible to set the blocking and unblocking levels for the 5th harmonic restraint to manage excessive overvoltage situations.
- The relay shall detect CT saturation conditions and prevent the differential protection from malfunctioning during external faults.
- The biased stage of the differential protection shall have a fully adjustable three-section restraint characteristic to manage measuring errors due to CT errors and tap changer position.
- The relay shall be able to eliminate the zero-sequence current from the measured current. Elimination of the zero-sequence current shall be possible for either the HV or LV winding or both.
- Tap changer position compensation shall be included to enable more sensitive settings to be used.

The correction of the transformation ratio due to changing tap changer positions shall be done automatically based on the tap changer position information.

12.5.1.2. Restricted earth-fault protection

- The relay shall have either high or low-impedance restricted earth-fault protection.
- The stabilized restricted low-impedance earth-fault protection (87NL) shall be based on the numerically stabilized differential current principle and the neutral-current second harmonic shall be used for blocking the function in a transformer inrush situation. No external stabilizing resistors or non-linear resistors shall be required. The operating characteristics shall be according to the definite time mode.

12.5.1.3. Other protection

- The relay shall have two-stage, three-phase overvoltage (59) and residual overvoltage (59G) protection.
- The relay shall include three-phase thermal overload protection (49T) and shall protect the transformer mainly from short-time overloads. The protection shall be able to utilize either one or two time constants, which shall be selectable.

12.5.1.4. Overcurrent relay functionality

- The relay shall have three separate non-directional overcurrent (50/51) stages settable between 0.05 and 40 times pu. The operation characteristic of the low and high-set stages shall be settable to either definite time or inverse time mode, supporting various types of inverse curves, including a user-definable one. The instantaneous stage shall support the peak-to-peak measurement mode and include a possibility to introduce a dedicated two-times setting value peak detection for fast operation in conditions when the current transformers have saturated.
- The number of overcurrent elements shall be available for the LV and HV-side respectively. It shall be possible to select the number of started phases for operation, either one, two or all three phases.
- The relay shall include two negative-sequence overcurrent protection (46) stages settable between 0.01 and 5 times pu.

12.5.1.5. Inputs and outputs

- The relay shall have 8 binary inputs and 9 binary outputs and all of them freely configurable. Optionally, it must be possible to add 4 more binary inputs and 1 more binary output.
- To enable direct tripping of the circuit breaker, the relay must have 2 double-pole power output relays with integrated trip-circuit supervision (TCS). The two power output relays shall be rated to make and carry 30 A for 0.5 s with a breaking capacity of ≥1 A (L/R<40 ms).
- To enable fast direct tripping of the circuit breaker, the relay must have 3 optional high-speed binary outputs with an operate time of ≤ 1 ms. The binary output contacts shall be rated to make and carry 30 A for 0.5 s with a breaking capacity of ≥1 A (L/R<40 ms).
- The threshold voltage of the relays binary inputs shall be settable to 16…176 V DC.
- The binary inputs of the relay shall, when energized, utilize a higher inrush current to facilitate the breaking of possible dirt or sulfide from the surface of the activating contact.
- The relay shall be equipped with inputs for detecting temperature using resistance temperature detector (RTD) sensors. At least 2 inputs shall be required to measure transformer oil and ambient temperatures. The relay shall support the commonly used sensor types Pt100, Pt250, Ni100, Ni120, Ni250 and Cu10 with 2-wire or 3-wire connection with common ground.
- The phase current inputs and residual current input of the relay shall be rated 1/5 A. The selection of 1 A or 5 A shall be software-based and separate for HV and LV side of the transformer.

12.5.1.6. Measurements, alarms and reporting

- The relay shall have three-phase current and voltage measurement (fundamental or RMS-based as selectable options) with an accuracy of ±0.5% and zero, negative and positive-sequence current and voltage measurement functionality with an accuracy of ±1% within the range of ±2Hz of the nominal frequency.
- To collect sequence-of-events (SoE) information, the relay must include a non-volatile memory with

a capacity of storing at least 1024 event codes with associated time stamps.
- The relay must support the storage of at least 128 fault records in the relay's non-volatile memory.
- The fault record values must at least include phase currents, phase voltages, zero, negative and positive-sequence currents and voltages, and the active setting group.
- The relay shall have a disturbance recorder supporting a sampling frequency of 32 samples per cycle and featuring up to 12 analog and 64 binary signal channels.
- The relay's disturbance recorder shall support not less than 6 three-second recordings at 32 samples per cycle for 12 analog channels and 64 binary channels.
- The relay shall support up to 100 disturbance recordings.
- The relay must have a load profile recorder for phase currents and voltages supporting up to 12 selectable load quantities and more than 1 year of recording length. The load profile recorder output shall be in COMTRADE format.

12.5.1.7. Communication

- The relay must support IEC 61850 Edition 1 and Edition 2.
- The relay must support, besides IEC 61850, simultaneous communication using one of the following communication protocols: Modbus® (RTU-ASCII/TCP), IEC 60870-5-103 or DNP3 (serial/ TCP).
- The relay must have an Ethernet port (RJ45) on the front for local parametrization and data retrieval.
- The relay shall support up to five IEC 61850 (MMS) clients simultaneously.
- The relay must have two fiber-optic Ethernet ports with HSR and PRP-1.
- The relay shall have a third Ethernet port for providing connectivity of any other Ethernet device to an IEC 61850 station bus inside a switchgear bay.
- The relay must support IEC 61850 GOOSE messaging and meet the performance requirements for tripping applications (<10 ms) as defined by the IEC 61850 standard.
- The relay shall support sharing analog values such as temperature, resistance and tap positions using IEC 61850 GOOSE messaging.

12.5.1.8. Real time clock and time synchronization

- The relay must support IEEE 1588 v2 for high accuracy time synchronization (<4 µs) in Ethernet based applications. The relay shall also support the SNTP (Simple Network time Protocol) and IRIG-B (Inter-Range Instrumentation Group – Time Code Format B) time synchronization methods.
- The relay must support IEC 61850-9-2LE with IEEE 1588 v2 for accurate time synchronization.

12.5.1.9. Engineering and configurability

- The relay must have 6 independent settings groups for the relevant protection settings (start value, operate time). It must be possible to change protection-setting values from one setting group to another in less than 20 ms from the binary input activation.
- The relay must have a web browser-based human-machine interface (WHMI) with secured communication (TLS) and shall provide the following functions:
    - Programmable LEDs and event lists
    - System supervision
    - Parameter settings
    - Measurement display
    - Disturbance records
    - Phasor diagram
    - Single-line diagram (SLD)
    - Importing and exporting of parameters
- When a protection function is disabled or removed from the configuration, neither the relay nor the programming tool shall show the function-related settings.
- The relay HMI and configuration tool shall have multilingual support.
- The relay HMI and configuration tool shall support IEC protection function codes.
- The relay shall have at least 11 freely configurable and programmable two-color LEDs.
- The relay must have at least 10 user-configurable local HMI views including measurements and SLDs.
- The relay shall have a graphical configuration tool for the complete relay application including multi-level logic programming support, timers and flip-flops.
- The relay configuration tool must include online visualization of the relay application state.
- It must be possible to keep the relay configuration tool up-to-date using an online update functionality.

- The relay configuration tool shall support viewing of relay events, fault records and visualization of disturbance recordings.
- The relay configuration tool must include the complete relay documentation including operation and technical details.
- The relay configuration tool must include functionality for comparing the archived configuration to the configuration in the relay.
- The relay configuration tool must allow configuration of IEC 61850 vertical and horizontal communication including GOOSE and sampled values.
- The relay configuration tool must support importing and exporting of valid IEC 61850 files (ICD, CID, SCD, IID).
- The relay configuration tool must be compatible with earlier relay versions.

12.5.1.10. Arc flash protection

- The relay shall have arc protection based on simultaneous detection of current and light. During maintenance work at the substation, it shall be possible to change the operation criteria to light only via a binary input.

12.5.1.11. Type tests and other compliance requirements

- The relay shall have an operating temperature range of -25 … +55ºC and transport/storage temperature range of -40...+85ºC.
- The relay must fulfill the mechanical test requirements according to IEC 60255-21-1, -2 and -3, Class 2 for vibration, shock, bump and seismic compliance.
- The relay's maximum DC auxiliary power consumption shall be less than 20 W (all inputs activated and over the full supply range).
- The relay must have an IEC 61850 Edition 2 certificate from an accredited Level A testing laboratory.
- The relay must fulfill the electromagnetic compatibility (EMC) test requirements according to IEC 60255-26.
- The relay must be tested according to the requirements of the IEC or an equivalent standard.

12.6. GENERATOR PROTECTION (ABB REG 615) or Equivalent

12.6.1. Protection functions

12.6.1.1. Protection and control during start-up and shutdown

- To ensure sensitive and selective protection during generator start-up and shutdown in low frequency and low-voltage amplitude conditions, it shall be possible to enable frequency adaptivity for the below-mentioned start-up protection functions. The relay shall provide protection in the operating frequency range of 10...75 Hz (12...90 Hz for 60 Hz networks). By using the selectable wide peak-to-peak measuring principle, the overcurrent protection shall, if required, operate from as low as 2 Hz during start-up or shutdown.
    - The relay shall have non-directional overcurrent (50/51) and earth-fault (50/51N) protection with multiple stages and settable definite time (DT) and inverse definite minimum time (IDMT) characteristics, supporting IEC operating curves. The relay shall have three-stage directional earth-fault protection (67N) with selectable negative and zero-sequence voltage polarization. I_0 and U_0shall be derived either from the phase voltages and currents or from the measured neutral current and residual voltage.
    - The relay shall have comprehensive voltage protection functionality, including at least overvoltage (59), under-voltage (27), positive-sequence under-voltage (47U+), negative-sequence overvoltage (47O-) and residual overvoltage (59G) protection.
    - The relay shall have over-excitation (V/Hz) protection (24) to protect generators and transformers against an excessive flux density and saturation of the magnetic core. The function shall include settable definite time (DT) and inverse definite minimum time (IDMT) characteristics, and a settable alarm.
    - For complete (100%) stator earth-fault protection, the relay shall have third harmonic-based stator earth-fault protection (27/59THD) in addition to fundamental frequency-based residual overvoltage protection. The third harmonic-based protection shall offer the following alternative protection methods:
        - Differential of the third harmonic component measured both at the generator neutral

and terminal side.
    - Neutral side third harmonic under-voltage
- When the function is selected to operate as third harmonic-based neutral point under-voltage protection, it shall be possible to block the function during generator start-up and shutdown, and in case of insufficient voltage. To make the operation immune to varying load conditions, the differential method is preferable.

12.6.1.2. Protection and control during normal run

- The relay shall have six-stage frequency protection (81), including at least over-frequency (81O), under-frequency (81U) and frequency rate-of-change protection (81R) with rate-of-rise or rate-of-fall freely selectable for each stage.
- The relay shall have three-phase thermal overload protection (49T/G) and protect the transformer/ generator mainly from short-time overloads. The protection shall be able to utilize either one or two time constants, which shall be selectable. It shall be possible to include the ambient temperature measured from an external temperature sensor in thermal modeling for better accuracy.
- The relay shall have two-stage under power protection (32U) for protecting the generator and prime mover against the effects of very low power output or reverse power conditions.
- To protect the generator and turbine from the harmful effect of excessive power/motoring, the relay shall have three stage reverse power/ directional overpower protection (32R/32O). It shall be possible to use positive-sequence components for calculating power, which makes the determination of power insensitive to the possible asymmetry in currents or voltages and corresponds to the real load of the generator's prime mover. The protection function shall have a power angle settable between -90 and +90 degrees and an adjustable power setting range of 1...200%.
- The relay shall have under-excitation protection (40) to protect synchronous machines against under-excitation or loss of field/excitation conditions, which may cause excessive heating in the end region of the stator winding, damaging the insulation of the stator winding and the iron core. The function shall prevent the machine from operating in the asynchronous mode, which increases the rotor speed, causing heating in the rotor iron and damper windings. The protection shall be based on the offset-mho circle characteristic on the impedance plane, defined by setting the Offset, Diameter and Displacement values. For impedance calculation, the voltage selection option s shall be 1Phase-earth, 1Phase-phase, 3Phase-earth, 3Phase-phase and Positive Sequence.
- For protection of generator-transformer blocks, the relay shall have under-impedance protection (21G) as backup protection against short circuits at the generator terminals or on the HV- side of a transformer. Under-impedance protection shall be applied instead of definite time voltage-dependent er protection to obtain a limited protection zone and an optimum operating time.
- The relay must have impedance monitoring-based out-of-step protection (78). An out-of-step condition (pole slip) is characterized by periodic changes in the rotor angle. The main purpose of the function is to detect, evaluate and, if required, operate during pole slip conditions. The out-of-step protection function shall detect stable power swings and out-of-step conditions based on the measured impedance travel time through the settable impedance blinders (inner and outer blinders). For selective relay operation during power swing conditions (near or far), it shall be possible to divide the impedance characteristic into two zones. The number of pole slips shall be independently settable for each zone. To avoid breaker stress, it shall be possible to include the breaker opening time to optimize the tripping.

12.6.1.3. Overcurrent and earth fault relay functions

- The relay shall have three-phase voltage dependent overcurrent protection (51V) against short circuits close to the generator terminals. The function shall include settable definite time (DT) and inverse definite minimum time (IDMT) characteristics. The function shall operate when the current exceeds a set value dynamically calculated based on the measured terminal voltage. It shall also be possible to select either a voltage restrained /voltage slope or voltage controlled/voltage step characteristic.
- The relay shall have two-stage negative-sequence overcurrent protection (46M) against single-phasing, unbalanced load or unsymmetrical voltage, with DT or IDMT characteristics and settable between 0.01 and 5 times pu. The negative-sequence overcurrent protection must be blocked if the current circuit supervision detects a fault in the current measuring circuit.
- The relay shall have a three-phase inrush detection function (68) to avoid tripping in magnetizing inrush conditions in the generator transformer. It shall be possible to selectively block the overcurrent and earth-fault stages when the ratio of the second harmonic component over the fundamental component exceeds the set value.

- For applications, requiring sensitive earth fault protection the relay shall offer an optional 0.2/1 A residual current input. The selection of 0.2 A or 1 A shall be software based.

12.6.1.4. Breaker monitoring

- The relay shall have circuit breaker failure protection (51BF/5 1NBF) including independent timers for repeated tripping of the same breaker and backup tripping of the upstream breaker. The function shall allow higher selectivity by avoiding tripping of the upstream breaker if the repeated tripping of the breaker closest to the fault is successful.

12.6.1.5. Inputs and outputs

- The relay shall have 12 binary inputs and 9 binary outputs and all of them freely configurable. Optionally, it must be possible to add 4 more binary inputs and 1 more binary output.
- To enable direct tripping of the circuit breaker, the relay must have 2 double-pole power output relays with integrated trip-circuit supervision (TCS). The two power output relays shall be rated to make and carry 30 A for 0.5 s with a breaking capacity of ≥1 A (L/R<40 ms).
- To enable fast direct tripping of the circuit breaker, the relay must have 3 optional high-speed binary outputs with an operate time of ≤ 1 ms. The binary output contacts shall be rated to make and carry 30 A for 0.5 s with a breaking capacity of ≥1 A (L/R<40 ms).
- The threshold voltage of the relays binary inputs shall be settable to 16…176 V DC.
- The relay shall be equipped with inputs for detecting temperature using resistance temperature detector (RTD) sensors. At least 2 inputs shall be required. It shall be possible to include ambient temperature measured from an external temperature sensor in thermal modeling of the three phase thermal protection for feeders.
- The relay shall support the commonly used sensor types Pt100, Pt250, Ni100, Ni120, Ni250 and Cu10 with 2-wire or 3-wire connection with common ground.
- The phase current inputs and residual current input of the relay shall be rated 1/5 A. The selection of 1 A or 5 A shall be software-based.

12.6.1.6. Measurements, alarms and reporting

- The relay shall have three-phase current and voltage measurement (fundamental or RMS-based as selectable options) with an accuracy of ±0.5% and zero, negative and positive-sequence current and voltage measurement functionality with an accuracy of ±1% within the range of ±2Hz of the nominal frequency.
- To collect sequence-of-events (SoE) information, the relay must include a non-volatile memory with a capacity of storing at least 1024 event codes with associated time stamps.
- The relay must support the storage of at least 128 fault records in the relay's non-volatile memory.
- The fault record values must at least include phase currents, phase voltages, zero, negative and positive-sequence currents and voltages, and the active setting group.
- The relay shall have a disturbance recorder supporting a sampling frequency of 32 samples per cycle and featuring up to 12 analog and 64 binary signal channels.
- The relay's disturbance recorder shall support not less than 6 three-second recordings at 32 samples per cycle for 12 analog channels and 64 binary channels.
- The relay shall support up to 100 disturbance recordings.
- The relay must have a load profile recorder for phase currents and voltages supporting up to 12 selectable load quantities and more than 1 year of recording length. The load profile recorder output shall be in COMTRADE format.
- The relay shall include a motor runtime counter for calculating and presenting the accumulated operation time of a machine. The function shall alert the operator via a warning and an alarm when the accumulated operation time exceeds the set limit.

12.6.1.7. Communication

- The relay must support IEC 61850 Edition 1 and Edition 2.
- The relay must support, besides IEC 61850, simultaneous communication using one of the following communication protocols: Modbus® (RTU-ASCII/TCP), IEC 60870-5-103 or DNP3 (serial/ TCP).
- The relay must have an Ethernet port (RJ45) on the front for local parametrization and data retrieval.
- The relay shall support up to five IEC 61850 (MMS) clients simultaneously.

- The relay must have two fiber-optic Ethernet ports with HSR and PRP-1.
- The relay shall have a third Ethernet port for providing connectivity of any other Ethernet device to an IEC 61850 station bus inside a switchgear bay.
- The relay must support IEC 61850 GOOSE messaging and meet the performance requirements for tripping applications (<10 ms) as defined by the IEC 61850 standard.
- The relay shall support sharing analog values such as temperature, resistance and tap positions using IEC 61850 GOOSE messaging.

12.6.1.8. Real time clock and time synchronization

- The relay must support IEEE 1588 v2 for high accuracy time synchronization (<4 µs) in Ethernet based applications. The relay shall also support the SNTP (Simple Network time Protocol) and IRIG-B (Inter-Range Instrumentation Group – Time Code Format B) time synchronization methods.
- The relay must support IEC 61850-9-2LE with IEEE 1588 v2 for accurate time synchronization.

12.6.1.9. Engineering and configurability

- The relay must have 6 independent settings groups for the relevant protection settings (start value, operate time). It must be possible to change protection-setting values from one setting group to another in less than 20 ms from the binary input activation.
- The relay must have a web browser-based human-machine interface (WHMI) with secured communication (TLS) and shall provide the following functions:
    - Programmable LEDs and event lists
    - System supervision
    - Parameter settings
    - Measurement display
    - Disturbance records
    - Phasor diagram
    - Single-line diagram (SLD)
    - Importing and exporting of parameters
- When a protection function is disabled or removed from the configuration, neither the relay nor the programming tool shall show the function-related settings.
- The relay HMI and engineering tool shall have multilingual support.
- The relay HMI and engineering tool shall support IEC protection function codes.
- The relay shall have at least 11 freely configurable and programmable two-color LEDs.
- The relay must have at least 10 user-configurable local HMI views including measurements and SLDs.
- The relay shall have a graphical configuration tool for the complete relay application including multi-level logic programming support, timers and flip-flops.
- The relay configuration tool must include online visualization of the relay application state.
- It must be possible to keep the relay configuration tool up-to-date using an online update functionality.
- The relay configuration tool shall support viewing of relay events, fault records and visualization of disturbance recordings.
- The relay configuration tool must include the complete relay documentation including operation and technical details.
- The relay configuration tool must include functionality for comparing the archived configuration to the configuration in the relay.
- The relay configuration tool must allow configuration of IEC 61850 vertical and horizontal communication including GOOSE and sampled values.
- The relay configuration tool must support importing and exporting of valid IEC 61850 files (ICD, CID, SCD, IID).
- The relay configuration tool must be compatible with earlier relay versions.

12.6.1.10. Arc flush detection

- The relay shall have arc protection based on simultaneous detection of current and light. During maintenance work at the substation, it shall be possible to change the operation criteria to light only via a binary input.

12.6.1.11. Type tests and other compliance requirements

- The relay shall have an operating temperature range of -25 … +55ºC and transport/storage temperature range of -40...+85ºC.
- The relay must fulfill the mechanical test requirements according to IEC 60255-21-1, -2 and -3, Class 2 for vibration, shock, bump and seismic compliance.
- The relay's maximum DC auxiliary power consumption shall be less than 20 W (all inputs activated and over the full supply range).
- The relay must have an IEC 61850 Edition 2 certificate from an accredited Level A testing laboratory.
- The relay must fulfill the electromagnetic compatibility (EMC) test requirements according to IEC 60255-26.
- The relay must be tested according to the requirements of the IEC or an equivalent standard.

12.7. CAPACITOR BANK PROTECTION (ABB REV 615) or Equivalent

12.7.1. Protection functions

- The relay shall have single, two and three-phase capacitor bank overload protection (51C) against overloads caused by harmonic currents and over-voltages in shunt capacitor banks. The operation of the overload protection shall be based on the peak value of the integrated current that is proportional to the voltage across the capacitor.
- The relay shall have undercurrent protection for detecting disconnection of the capacitor bank. To avoid an undercurrent trip when the capacitor bank is disconnected from the power system, the undercurrent protection shall be blocked using the capacitor bank circuit breaker open status signal.
- To provide protection against reconnection of a charged capacitor to a live network and ensure complete capacitor discharging before breaker reclosing, the relay shall include breaker reclosing inhibit functionality. The capacitor bank discharge time shall be settable between 1 and 6000 seconds.
- The relay shall have current unbalance protection (51NC-1) for shunt capacitor banks to protect double Y-connected capacitor banks against internal faults. The function shall suit internally fused, externally fused and fuse-less applications and include settable definite time (DT) and inverse definite minimum time (IDMT) characteristics. The function shall have two stages of operation, one operation and one alarm stage. The operation of the alarm stage shall be based either on the DT characteristic or on the faulty element counter of the capacitor bank.
- The relay shall have three-phase current unbalance protection (51NC-2) for shunt capacitor banks to protect H-bridge capacitor banks against internal faults. The function shall suit internally fused, externally fused and fuse-less applications and include settable definite time (DT) and inverse definite minimum time (IDMT) characteristics. The function shall have two stages of operation, one operation and one alarm stage. The operation of the alarm stage shall be based on the DT characteristic.
- The relay must have current-based shunt capacitor bank switching resonance protection (55TD) for detecting three-phase resonance caused by capacitor switching or topology changes in the network. The operation of the switching resonance protection shall be based on the definite time (DT) characteristic. In harmonic filter applications, it shall be possible to exclude the designed harmonic filter frequency. Detection and disconnection of the harmonic resonance situation shall avoid the need for a detailed system study for each installation to determine the right size and operating range of the capacitor bank.
- If specified, the relay shall have comprehensive voltage protection, including at least overvoltage (59), under-voltage (27), positive-sequence under-voltage (47U+), negative-sequence overvoltage (47O-) and residual overvoltage protection (59G). The protection functions shall operate in one, two, or three-phase mode according to application requirements, and the operation mode shall be individually settable for each stage. Functions (59) and (27) shall measure either the phase-to-phase or phase-to-earth voltages. The selection shall be software-based and individually selectable for each stage.

12.7.1.1. Overcurrent and earth fault relay function

- The relay shall have non-directional phase overcurrent and earth-fault protection (50/51, 50/51N) with three stages (low-set, high-set and non-directional instantaneous stage), definite time (DT) and inverse definite minimum time (IDMT) characteristics, and IEC operating curves.
- If specified, the relay shall have three-stage directional earth-fault protection (67N) with selectable negative and zero-sequence polarization. I_o and U_o shall be derived either from the phase voltages and currents or from the measured neutral current and residual voltage.
- The relay shall have two-stage negative-sequence overcurrent protection (46) with definite time (DT) and inverse definite minimum time (IDMT) characteristics.
- In compensated, unearthed and high-resistance earthed networks, the relay shall be able to detect

transient, intermittent and continuous earth faults.

12.7.1.2. Inputs and outputs

- The relay shall have 5 voltage inputs, three for phase voltage measurement supporting both phase-to-phase and phase-to-earth VT connections, one for open delta voltage measurement, and one for capacitor bank residual voltage measurement from the neutral.
- The relay shall have 7 current inputs, 3 phase current inputs, 3 unbalance current inputs and 1 residual current input for earth-fault protection.
- The relay shall have 8 binary inputs and 9 binary outputs and all of them freely configurable. Optionally, it must be possible to add up to 6 more binary inputs and 3 more binary outputs.
- To enable direct tripping of the circuit breaker, the relay must have 2 double-pole power output relays with integrated trip-circuit supervision (TCS). The two power output relays shall be rated to make and carry 30 A for 0.5s with a breaking capacity of ≥1 A (L/R< 40ms).
- To enable fast direct tripping of the circuit breaker, the relay must have 3 optional high-speed binary outputs with an operate time of ≤1 ms. The binary output contacts shall be rated to make and carry 30 A for 0.5 s with a breaking capacity of ≥1 A (L/R<40 ms).
- The threshold voltage of the relays binary inputs shall be settable to 16…176 V DC.
- The binary inputs of the relay shall, when energized, utilize a higher inrush current to facilitate the breaking of possible dirt or sulfide from the surface of the activating contact.

12.7.1.3. Measurements, alarms and reporting

- The relay shall have three-phase current and voltage measurement (fundamental or RMS-based as selectable options) with an accuracy of ±0.5% and zero, negative and positive-sequence voltage measurement functionality with an accuracy of ±1% within the range of ±2Hz of the nominal frequency.
- The relay shall have frequency measurement with an accuracy of 10mHz within the range of 35…75Hz.
- To collect sequence-of-events (SoE) information, the relay must include a non-volatile memory with a capacity of storing at least 1024 event codes with associated time stamps.
- The relay must support the storage of at least 128 fault records in the relay's non-volatile memory.
- The fault record values must at least include phase currents, phase voltages, zero, negative and positive-sequence currents and voltages, and the active setting group.
- The relay shall have a disturbance recorder supporting a sampling frequency of 32 samples per cycle and featuring up to 12 analog and 64 binary signal channels.
- The relay's disturbance recorder shall support not less than 6 three-second recordings at 32 samples per cycle for 12 analog channels and 64 binary channels.
- The relay shall support up to 100 disturbance recordings.
- The relay must have a load profile recorder for phase voltages supporting up to 12 selectable load quantities and more than 1 year of recording length. The load profile recorder output shall be in COMTRADE format.

12.7.1.4. Communication

- The relay must support IEC 61850 Edition 1 and Edition 2.
- The relay must support, besides IEC 61850, simultaneous communication using one of the following communication protocols: Modbus® (RTU-ASCII/TCP), IEC 60870-5-103 or DNP3 (serial/ TCP).
- The relay must have an Ethernet port (RJ45) on the front for local parametrization and data retrieval.
- The relay shall support up to five IEC 61850 (MMS) clients simultaneously.
- The relay must have two fiber-optic Ethernet ports with HSR and PRP-1.
- The relay shall have a third Ethernet port for providing connectivity of any other Ethernet device to an IEC 61850 station bus inside a switchgear bay.
- The relay must support IEC 61850 GOOSE messaging and meet the performance requirements for tripping applications (<10 ms) as defined by the IEC 61850 standard.
- The relay shall support subscribing analog values using IEC 61850 GOOSE messaging.

12.7.1.5. Real time clock and time synchronization

- The relay must support IEEE 1588 v2 for high accuracy time synchronization (<4 µs) in Ethernet based applications. The relay shall also support the SNTP (Simple Network time Protocol) and IRIG-

B (Inter-Range Instrumentation Group – Time Code Format B) time synchronization methods.
- The relay must support IEC 61850-9-2LE with IEEE 1588 v2 for accurate time synchronization.

12.7.1.6. Engineering and configurability

- The relay must have 6 independent settings groups for the relevant protection settings (start value and operate time). It must be possible to change protection-setting values from one setting group to another in less than 20 ms from the binary input activation.
- The relay must have a web browser-based human-machine interface (WHMI) with secured communication (TLS) and shall provide the following functions:
    - Programmable LEDs and event lists
    - System supervision
    - Parameter settings
    - Measurement display
    - Disturbance records
    - Phasor diagram
    - Single-line diagram (SLD)
    - Importing and exporting of parameters
- When a protection function is disabled or removed from the configuration, neither the relay nor the configuration tool shall show the function-related settings.
- The relay HMI and configuration tool shall have multilingual support.
- The relay HMI and configuration tool shall support IEC protection function codes.
- The relay shall have at least 11 freely configurable and programmable two-color LEDs.
- The relay must have at least 10 user-configurable local HMI views including measurements and SLDs.
- The relay shall have a graphical configuration tool for the complete relay application including multi-level logic programming support, timers and flip-flops.
- The relay configuration tool must include online visualization of the relay application state.
- It must be possible to keep the relay configuration tool up-to-date using an online update functionality.
- The relay configuration tool shall support viewing of relay events, fault records and visualization of disturbance recordings.
- The relay configuration tool must include the complete relay documentation including operation and technical details.
- The relay configuration tool must include functionality for comparing the archived configuration to the configuration in the relay.
- The relay configuration tool must allow configuration of IEC 61850 vertical and horizontal communication including GOOSE and sampled values.
- The relay configuration tool must support importing and exporting of valid IEC 61850 files (ICD, CID, SCD, IID).
- The relay configuration tool must be compatible with earlier relay versions.

12.7.1.7. Type tests and other compliance requirements

- The relay shall have an operating temperature range of -25 … +55ºC and transport/storage temperature range of -40...+85ºC.
- The relay must fulfill the mechanical test requirements according to IEC 60255-21-1, -2 and -3, Class 2 for vibration, shock, bump and seismic compliance.
- The relay's maximum DC auxiliary power consumption shall be less than 20 W (all inputs activated and over the full supply range).
- The relay must have an IEC 61850 Edition 2 certificate from an accredited Level A testing laboratory.
- The relay must fulfill the electromagnetic compatibility (EMC) test requirements according to IEC 60255-26.
- The relay must be tested according to the requirements of the IEC or an equivalent standard.

12.8. LINE DIFFERENTIAL PROTECTION (ABB RED 615) or Equivalent

12.8.1. Protection functions

- The relay must have phase-segregated line differential protection with two stages, one biased (low-set) and the other (high-set) non-biased.

- The line differential protection algorithm shall be independently executed in the local and remote end relay according to the so-called Master-Master principle. In order to maximize protection co-ordination and simultaneous tripping of the circuit breakers at both ends, the relays shall additionally send an inter-trip command to the remote end as a dedicated binary signal over the protection communication channel.
- The line differential protection shall be able to accommodate a power transformer within the protection zone. The relay shall match both the power transformer connection group and different current transformer ratios.
- In order to ensure selective operation of the protection functions on the LV-side of a small tapped power transformer within the protection zone, the biased stage of the line differential protection must be able to operate based on definite time (DT) and inverse definite minimum time (IDMT) characteristics.
- It shall be possible to block the biased stage of the line differential protection based on the detected inrush condition. The detection shall be based on the content of the second harmonic component of the measured phase currents. The detected inrush condition shall be transferred to the remote end as dedicated phase segregated binary signals over the protection communication channel to block the remote end line differential protection.
- Interferences in the protection communication link between the local and remote end units shall be detected. The supervision shall cover missing, delayed or corrupted messages.
- Detected interference in the protection communication link, which may lead to delayed tripping or mal-tripping of the line differential protection, shall block the line differential protection and release the selected backup protection.
- When the protection communication recovers, the line differential protection scheme shall automatically return to normal status.
- For overhead line applications, the relay shall have an optional multi-shot auto-reclose function. The auto-reclose function shall be capable of performing coordinated local and remote end circuit breaker closing based on the Master-Follower scheme.
- For closed loop and ring-type distribution networks, the relay has to be able to provide synchro-check for circuit breaker closing.
- The relay shall include current circuit supervision that is capable of preventing mal-tripping by blocking the affected protection functions. The operation speed of this supervision function is critical, especially for line differential protection. The supervision method shall be based on comparing the reference current, originating either from different CT cores or from different CTs, with the currents that the line differential protection is using.

12.8.1.1. Overcurrent and earth fault relay function

- The relay shall have selectable directional or non-directional phase-overcurrent and earth-fault protection (50/51/67) with three stages (low-set, high-set and non-directional instantaneous stage), definite time (DT) and inverse definite minimum time (IDMT) characteristics, and IEC operating curves.
- The three-stage directional phase overcurrent protection (67) shall have voltage memory and positive and negative-sequence polarization.
- The relay must have selectable three-stage non-directional (50/51N) or directional earth-fault protection (67N).
- The directional earth-fault protection shall have selectable negative or zero-sequence polarization. I_o and U_o shall be derived either from the phase voltages and currents or from the measured neutral current and residual voltage.
- In compensated, unearthed and high-resistance earthed networks, the relay shall be able to detect transient, intermittent and continuous earth faults.
- In compensated, unearthed and high-resistance earthed networks, the relay shall have admittance (21YN) and watt-metric-based (32N) earth-fault protection.
- The relay shall include phase unbalance, voltage and frequency protection.
- The relay shall include a fault-locating algorithm to calculate the fault location with +/- 2.5 % accuracy for phase-to-phase and phase-to-earth faults in effectively and low-resistance earthed radial networks.
- For applications requiring sensitive earth fault protection, the relay shall offer an optional 0.2/ 1A residual current input. The selection of 0.2 A or 1A shall be software based.

12.8.1.2. Inputs and outputs

- The relay shall have 8 binary inputs and 10 binary outputs and all of them freely configurable.

Optionally, it must be possible to add 8 more binary inputs.

- To enable direct tripping of the circuit breaker, the relay must have 2 double-pole power output relays with integrated trip-circuit supervision (TCS). The two power output relays shall be rated to make and carry 30 A for 0.5 s with a breaking capacity of ≥1 A (L/R< 40ms).
- The binary inputs of the relay shall, when energized, utilize a higher inrush current to facilitate the breaking of possible dirt or sulfide from the surface of the activating contact.
- The relay shall offer two optional RTD inputs and one mA input.
- The phase current inputs and the residual current input of the relay shall be rated 1/5 A. The selection of 1 A or 5 A shall be software based.
- The relay must offer optional current and voltage sensor inputs and support the use of combined current and voltage sensors connected with one connector per phase. The current sensor inputs must facilitate the usage of sensors within the nominal range of 40…1250 A without any external adaptors.
- In addition to the physical inputs and outputs, the local relay has to be able to simultaneously send and receive 8 binary signals to and from the remote end relay. The signals shall be freely usable within the relay logics and /or relays physical inputs and outputs. The data transfer shall be of full-duplex type with a signalling delay less than 10 ms.

12.8.1.3. Measurements, alarms and reporting

- The relay shall have three-phase current and voltage measurement (fundamental or RMS-based as selectable options) with an accuracy of ±0.5% and zero, negative and positive-sequence current and voltage measurement functionality with an accuracy of ±1% within the range of ±2Hz of the nominal frequency.
- To collect sequence-of-events (SoE) information, the relay must include a non-volatile memory with a capacity of storing at least 1024 event codes with associated time stamps.
- The relay must support the storage of at least 128 fault records in the relay's non-volatile memory.
- The fault record values must at least include phase currents, phase voltages, zero, negative and positive-sequence currents and voltages, and the active setting group.
- The relay shall have a disturbance recorder supporting a sampling frequency of 32 samples per cycle and featuring up to 12 analog and 64 binary signal channels.
- The relay's disturbance recorder shall support not less than 6 three-second recordings at 32 samples per cycle for 12 analog channels and 64 binary channels.
- The relay shall support up to 100 disturbance recordings.
- The relay must have a load profile recorder for phase currents and voltages supporting up to 12 selectable load quantities and more than 1 year of recording length. The load profile recorder output shall be in COMTRADE format.

12.8.1.4. Communication

- The relay must support IEC 61850 Edition 1 and Edition 2.
- The relay must support, besides IEC 61850, simultaneous communication using one of the following communication protocols: Modbus® (RTU-ASCII/TCP), IEC 60870-5-103 or DNP3 (serial/ TCP).
- The relay must have an Ethernet port (RJ45) on the front for local parametrization and data retrieval.
- The relay shall support up to five IEC 61850 (MMS) clients simultaneously.
- The relay must have two fiber-optic Ethernet ports with HSR and PRP-1.
- The relay must support IEC 61850 GOOSE messaging and meet the performance requirements for tripping applications (<10 ms) as defined by the IEC 61850 standard.
- The relay shall support sharing analog values, such as temperature, resistance and tap positions using IEC 61850 GOOSE messaging.
- The relay shall have a dedicated fiber-optic port for protection communication between local and remote end units. The port shall support either multimode or single mode 1300nm optical media with LC connectors. The maximum distance to be covered shall be no less than 20 km between the local and remote end units. The optical communication link interface shall be integrated in the relay and thus available without any additional converters.
- The relay shall optionally support the usage of a galvanic pilot wire connection. It shall be possible to later change from galvanic to optical media without modifying the relays hardware or software. The use of galvanic media shall not affect the relays performance or features.

12.8.1.5. Real time clock and time synchronization

- The relay must support IEEE 1588 v2 for high accuracy time synchronization (<4 µs) in Ethernet

based applications. The relay shall also support the SNTP (Simple Network time Protocol) and IRIG-B (Inter-Range Instrumentation Group – Time Code Format B) time synchronization methods.
- The relay must support IEC 61850-9-2LE with IEEE 1588 v2 for accurate time synchronization.
- It shall be possible to send a station-time synchronization message to the remote end unit over the protection communication link in case there is no synchronizing source available at the remote end.
- Protection communication, including related time synchronization, shall be delivered by the supplier ready to use without any parameterization.
- Protection communication time synchronization between the local and remote end relays shall be independent of the station bus time.

12.8.1.6. Engineering and configurability

- The relay must have 6 independent settings groups for the relevant protection settings (start value and operate time). It must be possible to change protection-setting values from one setting group to another in less than 20 ms from the binary input activation.
- The relay must have a web browser-based human-machine interface (WHMI) with secured communication (TLS) and shall provide the following functions:
    - Programmable LEDs and event lists
    - System supervision
    - Parameter settings
    - Measurement display
    - Disturbance records
    - Phasor diagram
    - Single-line diagram (SLD)
    - Importing and exporting of parameters
- When a protection function is disabled or removed from the configuration, neither the relay nor the configuration tool shall show the function-related settings.
- The relay HMI and configuration tool shall have multilingual support.
- The relay HMI and configuration tool shall support IEC protection function codes.
- The relay shall have at least 11 freely configurable and programmable two-color LEDs.
- The relay must have at least 10 user-configurable local HMI views including measurements and SLDs.
- The relay shall have a graphical configuration tool for the complete relay application including multi-level logic programming support, timers and flip-flops.
- The relay configuration tool must include online visualization of the relay application state.
- It must be possible to keep the relay configuration tool up-to-date using an online update functionality.
- The relay configuration tool shall support viewing of relay events, fault records and visualization of disturbance recordings.
- The relay configuration tool must include the complete relay documentation including operation and technical details.
- The relay configuration tool must include functionality for comparing the archived configuration to the configuration in the relay.
- The relay configuration tool must allow configuration of IEC 61850 vertical and horizontal communication including GOOSE and sampled values.
- The relay configuration tool must support importing and exporting of valid IEC 61850 files (ICD, CID, SCD, IID).
- The relay configuration tool must be compatible with earlier relay versions.

12.8.1.7. Type tests and other compliance requirements

- The relay shall have an operating temperature range of -25 … +55ºC and transport/storage temperature range of -40...+85ºC.
- The relay must fulfill the mechanical test requirements according to IEC 60255-21-1, -2 and -3, Class 2 for vibration, shock, bump and seismic compliance.
- The relay’s maximum DC auxiliary power consumption shall be less than 20 W (all inputs activated and over the full supply range).
- The relay must have an IEC 61850 Edition 2 certificate from an accredited Level A testing laboratory.
- The relay must fulfill the electromagnetic compatibility (EMC) test requirements according to IEC 60255-26.
- The relay must be tested according to the requirements of the IEC or an equivalent standard.

13. HMI TYPE1

The HMI needs to be compatible with the existing M580/M340 infrastructure. The HMI needs to be programmable via the Vijeo Designer software.

13.1. HMI 12.1 INCH

The HMI shall be offered with a gasket, which should also be available separately, to ensure a tight fit in cubicle. Furthermore, the HMI shall offer a screen protector, which should also be available separately. The HMI can be of the GTU smart display series or similar. The HMI shall provide for an external SD memory card slot in order to expand internal memory.

13.2. HMI 15 INCH

The HMI shall be offered with a gasket, which should also be available separately, to ensure a tight fit in cubicle. Furthermore, the HMI shall offer a screen protector, which should also be available separately. The HMI can be of the GTU smart display series or similar. The HMI shall provide for an external SD memory card slot in order to expand internal memory.

13.3. OPEN BOX BASE UNIT

The unit shall be able to interface with the GTU series HMI. The unit shall operate on windows. The unit shall support the .NET framework. The unit shall be provided with internet explorer as part of the windows operating system.

13.4. MEMORY CARD

The memory card shall be of the Cfast type providing at least 32GB extra memory for data logging. The memory card shall be compatible with the GTU series HMI.

13.5. HMI PROGRAMMING TOOLBOX

The Software must be able to program the all GTU HMI units. The Software shall be available as a single user.

13.6. IPC 12 INCH SCREEN

Multi touch capacitive monitor, size 12 inch or greater. Resoltion can be WHD WXGA,1280 x 800, 16 million colors. The screen shall be at least IP66 with anti scratch screen. The unit shall offer a backlife service of around 50000 hours. The modular box shall be able to mount on the back of the Screen

13.7. IPC 15 INCH SCREEN

Multi touch capacitive monitor, size 15 inch or greater. Resoltion can be WHD WXGA,1366 x 768, 16 million colors. The screen shall be at least IP66 with anti scratch screen. The unit shall offer a backlife service of around 50000 hours. The modular box shall be able to mount on the back of the Screen

13.8. IPC MODULAR BOX PC

The CPU shall at least be a i3 8145UE or greater.The unit should have an expansion PCIe slot. The main drive should at least be 250GB SSD.The RAMM should at least be 8GB. The operating system should be of a windowns 10 version or greater. There should at least one RJ45 port, one RS 232/485,one USB 2.0, one USB 3.0. The unit should at least have 1 display ports with the option to expand to another. The unit should have a watch dog timer with a WLAN and gprs antenna where possible. The unit should be programmable with EcoStruxure. The modular box should be able to mount on the back of the screen. When supplying box pc ensure the mounting kit is supplied with.

14. HMI TYPE 2

14.1. HMI 10.1 INCH

The HMI shall be offered with a gasket, which should also be available separately, to ensure a tight fit in cubicle. Furthermore, the HMI shall offer a screen protector .
The HMI needs to be compatible with the e!DISPLAY Web Panels and existing PFC200 Logic Controller infrastructure. The HMI needs to be programmable via the e!Cockpit 2.3. The e!DISPLAY Web Touch Panel should be 10.1 INCH. Shall have Modern visualization via CODESYS V2.3 and e!COCKPIT (based on CODESYS V3. The touch panel Control shall have full CODESYS runtime. It shall Support HTML5 High-performance automation solutions in connection with WAGO PFC100 and PFC200 Controllers.

14.2. HMI 7.0 INCH

The HMI shall be offered with a gasket, which should also be available separately, to ensure a tight fit in cubicle. Furthermore, the HMI shall offer a screen protector .
The HMI needs to be compatible with the e!DISPLAY Web Panels and existing PFC200 Logic Controller infrastructure. The HMI needs to be programmable via the e!Cockpit 2.3. The e!DISPLAY Web Touch Panel should be 7.0 INCH. Shall have Modern visualization via CODESYS V2.3 and e!COCKPIT (based on CODESYS V3. The touch panel Control shall have full CODESYS runtime. It shall Support HTML5 High-performance automation solutions in connection with WAGO PFC100 and PFC200 Controllers.

14.3. MEMORY CARD

The memory card shall be of the Cfast type providing at least 8GB extra memory for data logging. The memory card shall be compatible with the e!DISPLAY Web Touch Panel .

15. SCADA

The SCADA software needs to be compatible with Windows 10 and Windows server 2019. The SCADA system shall be wizard driven database form generation. The SCADA shall support multiple data sources. The SCADA system shall be manageable from a central point and allow for auto deployment. Furthermore, the SCADA shall allow for multi-language support and internet imbedded communications. The SCADA shall support various graphics forms, which may include vector graphics and the import of XAML objects. Disparate data sources shall be securely and easy accessible. The SCADA package shall allow for various sizes based on scan, tag or object points. The upgrading of licencing should also allow

for upgrades of the current ADROIT system to the latest version or similar available. The SCADA shall be able to make use of a designer and operator system where the designer application is on separate hardware as the operator application for added security. The SCADA package shall have an Alarm Management system that can deploy reports on web services. The Alarm Management system shall be capable of grouping Alarms based on the user design and need. Alarms shall over but not be limited to grouping according criticality, region, department and type of alarm. The SCADA could work on a scan point, tag or object orientated basis. All Tag points to be quoted on below is an estimation of package sizing. When offering a similar package ensure that scan points are within range. For object orientated packages allow for 4 tag points per object. A 400 tag point system will hence be equivalent to a 100 object orientated SCADA. When quoting please ensure you allow for the minimum Tag points as requested or more.

15.1. NEW SCADA LICENCE (SINGLE DESIGNER WITH 3 OPERATORS)

15.1.1. 300 Tag/Object Point

15.1.2. 750 Tag/Object Point

15.1.3. 1500 Tag/Object Point

15.1.4. 2500 Tag/Object Point

15.1.5. 5000 Tag/Object Point

15.1.6. Unlimited Tag/Object Point

15.2. UPGRADE OF LICENCE (SINGLE DESIGNER WITH 3 OPERATORS)

15.2.1. 300 Tag Point

13.2.2. 750 Tag Point

15.2.3. 1500 Tag Point

15.2.4. 2500 Tag Point

15.2.5. 5000 Tag Point

15..2.6. Unlimited Tag Point

15.3. ALARM MANAGEMENT LICENCE

15.3.1. 300 Tag Point

15.3.2. 750 Tag Point

15.3.3. 1500 Tag Point

15.3.4. 2500 Tag Point

15.3.5. 5000 Tag Point

15.4. SCADA HARDWARE

15.4.1. SCADA & SQL Server with operating system.

Each server shall be provided with the relevant operating system and SQL. The server shall consist of the following:

- Chassis with up to 8 x 2.5" SAS/SATA Hard Drives for 1CPU Configuration
- PowerEdge R740/R740XD Motherboard
- Intel Xeon Silver 4114 2.2G, 10C/20T, 9.6GT/s, 14M Cache, Turbo, HT (85W) DDR4-2400

- PowerEdge 2U Standard Bezel
- Riser Config 1, 4 x8 slots
- 4 X 16GB RDIMM, 2666MT/s, Dual Rank
- iDRAC9, Enterprise
- 2 X 300GB 15K RPM SAS 12Gbps 512n 2.5in Hot-plug Hard Drive
- 2 X 1TB 7.2K RPM NLSAS 12Gbps 512n 2.5in Hot-plug Hard Drive
- PERC H740P RAID Controller, 8GB NV Cache, Mini card
- Standard 1U Heatsink
- DVD+/-RW, SATA, Int
- Dual, Hot-plug, Redundant Power Supply (1+1), 750W
- C13 to C14, PDU Style, 10 AMP, 6.5 Feet (2m), Power Cord
- Broadcom 5720 QP 1Gb Network Daughter Card
- Ready Rails Sliding Rails with Cable Management Arm
- Windows Server 2019 or latest Standard,16 CORE, Factory Installed, No Media, NO CAL
- Windows Server 2019 or latest Standard,16 CORE, Media Kit
- Microsoft SQL Server 2019 or latest Standard, OEM, Includes 5 USER CALs, NFI, ENGLISH
- 5-pack of Windows Server 2019,2012 USER CALs (Standard or Data center)
- 3Yr Pro Support and Next Business Day Onsite Service

15.4.2. Desktop PC small form

The Processor shall be an 12th Generation Intel® Core™ i7-8700 processor or similar. The Memory shall be a minimum of 8GB RAM. The Desktop shall be of the small form factor type. The desktop shall allow for a minimum of 2 usb 2 USB 3.1 Gen 1 Type-A ports. The desktop shall also allow 1 VGA, 1 HDMI out,4 USB 2.0 and 1 Network Port. The hard drive shall allow for minimum of 1TB storage. The desktop shall also have a solid state drive of 256GB. The desktop shall be provided with Windows 11 professional as operating system.

15.4.3. Programming Laptop

12th Gen Intel® Core™ i7 Processor (6-Core, 2.2GHz) or similar, 15.6-inch FHD (1920 x 1080) IPS Anti-Glare LED-Backlit Display, 8GB minimum with spare RAM slot, DDR4, 2666MHz, 512GB Nvme Solid State Drive minimum, NVIDIA GeForce GTX 1050Ti 4GB or similar, 802.11ac + Bluetooth 5.0, Dual Band 2.4&5 GHz, MU-MIMO/160Mhz, 2x2, Keyboard US Int (Backlit), Windows 11 Professional 64bit, 3Yr Hardware Support.

15.4.4. Monitors

All displays shall be able to operate 24/7.

Type:	60Hz E-LED BLU
Resolution:	1920 x 1080 (16:9)
Brightness (Typ.):	500 nits
Contrast Ratio (Typ.):	3000:1 for 43” and 4000:1 49” and 55”
Viewing Angle (H / V):	178/178
Response Time (G-to-G):	6ms – 8ms
Orientation:	Landscape / Portrait
Operation Hours	24/7
Anti-Reflective:	44% for the 43” and 25% for 49” and 55”

Furthermore, the displays shall allow for the following inputs/outputs:

RGB:	DVI-I (D-Sub Common), DisplayPort 1.2 (2)
Video:	HDMI (2) / HDCP 2.2
Audio:	Stereo Mini Jack
USB:	USB 2.0 x 2
Output Audio:	Stereo Mini Jack, RGB / DVI / HDMI
External Control:	RS232C (In / Out) thru Stereo Jack, RJ45

15.4.4.1. 55 inch 24/7 display

15.4.4.2. 49 inch 24/7 display

15.4.4.3. 43 inch 24/7 display

15.4.4.4. 32 inch computer monitor

The 32” Monitors shall comply to the following specifications:

Diagonal Viewing Size:	80 cm 31.5 inches
Preset Display Area (H x V):	392.2 mm x 697.3 mm 15.44" x 27.45" 273505.9 mm² (423.93 inch²)
Aspect Ratio:	16:9
Panel Type:	In-Plane switching Technology
Maximum Preset Resolution:	3840 x 2160 at 60 Hz
Border Width (Edge of Monitor active area):	7.6 mm (Top/Left/Right) 14.7 mm (Bottom)
Viewing Angle:	178° (vertical) typical 178° (horizontal) typical
Pixel Pitch:	0.182 mm x 0.182 mm
Pixel Per Inch (PPI):	140
Contrast Ratio:	1300 : 1 (typical)
Backlight Technology:	LED edge light system
Brightness:	400 cd/m² (typical)
Adjustability:	Height adjustable stand (150 mm) Tilt (-5° to 21°) Swivel (-30° to 30°) Pivot (-90° to 90°)
Response Time:	8 ms (normal) ; 5 ms (Fast) - (gray to gray)
Flat Panel Mount Interface:	VESA (100 mm x 100mm)
Display Screen Coating:	Antiglare with 3H hardness

15.4.4.5. 27-inch computer monitor

The 27-inch monitor shall meet the following requirements:

Diagonal Viewing Size:	68.6 cm (27.0 inches)
Active Viewing Area (H x V):	597.89mm x 336.31mm (23.54" x 13.24")
Viewable Screen Area (H x V):	201,076.38 mm² (311.67 inches²)
Maximum Preset Resolution:	1920 x 1080 at 60Hz
Features:	Arsenic-free glass and mercury-free panel
TUV Certified:	Yes, Comfort View and Flicker-free
Audit Output:	2x 5W Waves Maxx Audio®

Security lock slot:	Yes
Aspect Ratio:	16:9
Pixel Pitch:	0.3114 mm
Pixel per Inch (PPI):	81
Brightness:	250 cd/m² (typ)
Displayable Colors:	1 6.7 million
Contrast Ratio:	1,000 : 1 (typical)
Display Screen Coating:	Low haze with 3H hardness
Viewing Angle:	178° vertical/178° horizontal
Response time (typical):	5ms typical (gray to gray)
Panel Type:	In-Plane Switching (IPS)
Backlight Technology:	LED edge light system
HDCP Support:	HDCP 1.4 (HDMI)
Narrow Bezels:	Yes
Bezel Dimensions (L/R, T/B):	6.8mm/6.8mm, 6.7mm/8.4mm (0.27"/0.27", 0.26"/0.33")
Tilt Angles:	-5° to 21°

15.4.5. KVM with foldable screen rack mount

The KVM Switch should comply to the following criteria:

- 8-Port PS/2-USB VGA LCD KVM Switch
- Slide away 17” LCD KVM Switch is a control unit that allows access to multiple computers from a single PS/2 or USB KVM console. A single CL5708 can control up to 8 computer
- Daisy-chain up to 31 extra units - control up to 256 computers from a single console
- Dual Interface - supports computers and console with PS/2 or USB keyboards and mice
- Multiplatform support – Windows, Linux, Mac, and Sun
- Supports multimedia USB keyboards for PC, Mac and Sun
- Auto PS/2 and USB interface detection
- Supports external USB mouse
- Superior video quality - supports resolutions up to 1280 x 1024 at 75 Hz
- No software required
- Hot pluggable
- Beeper on/off via hotkey and OSD

Note the KVM should be supplied with all cabling and accessories needed to connect all 8 ports to servers.

15.4.6. KVM extender VGA

Type:	Extender Pair
Video Connection Type:	VGA
Keyboard/Mouse Connection Type:	USB
Number of Ports:	1
Number of Displays Supported:	1
Transmission Method:	CAT5e

Maximum Resolution:	1920 x 1200
Extension Distance:	Minimum 100m

Extender shall be supplied with all cabling and accessories needed to extend to one remote screen.

15.4.7. UPS

15.4.7.1 3KVA UPS

The ups shall be of the rack mount type 2U or similar. The UPS should have an SNMP network card. UPS should allow for extender options to allow for 2.5hr back up. The extender option can be modular.

15.4.7.2 5KVA UPS

The ups shall be of the rack mount type 2U or similar. The UPS should have an SNMP network card. UPS should allow for extender options to allow for 2.5hr back up. The extender option can be modular.

15.4.7.3 10KVA UPS

The ups shall be of the rack mount type 2U or similar. The UPS should have an SNMP network card. UPS should allow for extender options to allow for 2.5hr back up. The extender option can be modular

15.4.9. Rugged 10” Tablet

The 10 inch needs to conform to the below specification or similar.

OS	Windows 10 or greater
CPU	Intel Z8350 1.8G or similar/greater
RAM/ROM	4GB/64GB
LCD	10.1 inch 1920*1200 450 nits sunshine readable
Touch screen	5 point touch, Glove touch, Water touch
Power and battery	10 500mAh 3.5*1.35 mm, 5V, 3A DC input Magnetic charger
WWAN	4G LTE, 3G, WCDMA, GSM
GPS	Beidou, GPS, Glonass
Wifi	802.11 a b c g n wireless internet,Wireless AP (mobile AP) 2.4G, 5G
Bluetooth	4.0 version
Interface	
in/out ports	Normal USB (1) Micro USB (1) RJ45(1) Microphone & earphone (1) Mini HDMI (1) RS 232 (1)
Proof rate	Waterproof IP66 Drop 1.2 meter

15.4.11 42U 19 inch server rack cabinet

The cabinet shall be able to house the 3KVA UPS as per point 13.4.7 or 5KVA UPS as per point 13.4.8. the cabinet shall offer either perforated or a glass front door. The side shall be removable for the ease of working. The cabinet shall be lockable. The cabinet shall allow for adjusting feet/wheels in order to level cabinet.

16. TELEMETRY

16.1. CPU TYPE 1

The CPU shall be programmable with a basic programming language like C+ or similar. The CPU shall allow for modular expansion. The CPU shall have an on board real time clock and watch dog timer. The CPU shall have on board I/O of which a minimum of 8 shall be Analog inputs, 32 shall be digital inputs and 8 shall be outputs. The unit shall be powered via 12V or 24V. The units shall have at least one RJ45

port,1 RS 485 and 2 RS 232 ports. The unit shall have indication for status and faults.

The unit should allow for configuration via Telebridge OPC server. The unit shall be capable of time stamped data logging. The unit must be capable of digital repeating. The unit shall further be able to handle Modbus RTU protocol being configurable as either Master or Slave. The unit shall further also be able to read the various Teleflex CPU modules. The unit shall allow for communications mediums including but not limited to cell SMS, cell GPRS, RS 232/485, Analog radio, Tetra, Ethernet.

16.2. CPU type 1 power supply

Description:	AC-DC Enclosed power supply with UPS function
Output:	13.8Vdc at 4A +13.4Vdc at 0.23A
Application:	Battery Charging ITE EN/UL/IEC 60950
Technology:	AC/DC
Power Format:	Box Type - Enclosed
Output Power (W):	55
Output Voltage (V):	13.4 - 13.8
Output Current:	0.23 A
Input Voltage:	88 – 264 V
Universal Input:	110/230V

16.3. OPC SERVER TYPE 1

The OPC server shall be open to all OPC compatible SCADA systems. The OPC server shall be compatible with existing Teleflex infrastructure and allow for programming and configuration of devices on the network. The OPC unit shall cater for an unlimited scan point licence.

16.4. I/O TYPE 1

The input and out modules must be expendable from the Teleflex CPU in a modular fashion and be din rail mountable. The units must be able to be addressed via the Telebridge OPC server.

16.4.1. Digital Input for Type 1 CPU

The digital input unit shall allow for a minimum of 32 isolated digital inputs.

16.4.2. Digital Output for Type 1 CPU

The digital output unit shall allow for a minimum of 32 digital outputs.

16.4.3. Analog input for Type 1 CPU

The Analog unit shall allow for 8 Analog signals.

16.5. Complete Telemetry Station Type 1

A complete Type 1 telemetry station shall comprise of a type 1 CPU, at least 8 Analog inputs, 32 digital isolated inputs,32 digital outputs and 4 Analog outputs. The unit station shall allow for surge protection on the antenna and all signals. The station shall further allow for 20m antenna cable with an omni directional antenna or directional antenna where required. The unit shall be supplied in a standard enclosure which will be able to house all the components as specified. The station shall include all accessories needed to interconnect cards and get the system operational.

16.6. ANTENNAS COMPATIBLE WITH TYPE 1 TELEMETRY

The antennas shall be in the 400 MHZ range and allow for a typical receiver signal strength of -90 to -100 dB. Furthermore, the antenna shall be allowed for connection onto the tetra network. The dBi of the antenna shall comply to the Type A (licence free band) and/or Type B (licenced band) as stipulated by ICASA. The antennas must be compatible with Type 1 telemetry. The antennas shall furthermore be omni directional or directional as required by site. Antenna should come with N-type connector. Antenna shall further allow for greater than 2.5dBi gain and greater than 5.5dBi gain respectively.

16.7. CPU TYPE 2

The CPU shall be programmable with a basic PLC language. The CPU shall allow for modular expansion. The CPU shall have an on board real time clock and watch dog timer. The CPU shall have on board I/O of which a minimum of 8 shall be Analog inputs, 8 shall be isolated digital inputs and 8 shall be outputs. The unit shall be powered via 12V or 24V. The units shall have at least one RJ45 port and 2 RS 232 ports. The unit shall have indication for status and faults. The unit should allow for configuration via the Picasso configuration toolbox. The unit shall be capable of time stamped data logging. The unit must be capable of digital repeating. The unit shall further be able to handle Modbus RTU protocol being configurable as either Master or Slave. The unit should be compatible with the SSE- OPC server. The unit shall further also be able to read the various SSE i/o modules. The unit shall allow for communications mediums including but not limited to cell SMS, cell GPRS, RS 232/485, Analog radio, Tetra, Ethernet and fibre optic. The unit shall also be able to handle the DNP3 protocol.

16.8. CPU TYPE 2 POWER SUPPLY

Power supply has to be compatible with the maestro CPU 12 series. It has to meet the following criteria.

- Base PCB designed to support 4.2A panel power output and 3A charger output
- Max measurable voltage: 14V (panel/ Maestro and Battery)
- 5V output: 1A max
- Single 13.8V (12V) SLA battery only

Key features of the power supply are:

- Supports various OEM PSU units
- Monitoring of main power output voltage and current
- Monitoring of battery charge/load voltage and current
- Monitoring of AC and battery status
- Low current 5V output
- Individual output and status indicators
- Separate switches and fuse for Maestro and panel power
- Fused AC input
- Simplified wiring
- Free air convection cooling
- Battery Backup (UPS) capability (using a seal lead-acid battery)
- DIN rail mounted
- Supports old, current and next generation Maestro’s

16.9. OPC SERVER FOR TYPE 2 CPU

The OPC server shall be open to all OPC compatible SCADA systems. The OPC server shall be compatible with existing SSE infrastructure and allow for programming and configuration of all intelligent devices on the network. The OPC should allow for fast exchange of faulty units by storing the backup and loading it onto a replaced device. The OPC unit shall cater for an unlimited scan point licence.

16.10. I/O FOR TYPE 2 CPU

The input and out modules must be expendable from the Maestro RTU 12 in a modular fashion and be din rail mountable. The units must be able to be addressed via the SSE OPC server.

16.10.1. Multi I/O for Type 2 CPU

The Multi I/O unit shall have a minimum of 8 isolated digital inputs, 8 digital outputs of the sinking type and 8 Analog inputs (voltage or current).

16.10.2. Digital Input for Type 2 CPU

The digital input unit shall allow for a minimum of 24 isolated digital inputs. The isolation should be rated to handle up to 2.5 KV rms. The unit should be able to handle am input voltage range of 9 to 15 Volt dc.

16.10.3. Digital output for Type 2 CPU

The digital output unit shall allow for a minimum of 8 channel discrete digital outputs. The unit should be able to handle am input voltage range of 9 to 15 Volt dc, which could be used to drive relays for higher current and voltage requirements.

16.10.4. Analog output for Type 2 CPU

The Analog unit shall be available in and 4 Analog (Type 1) and 8 Analog (Type 2) unit. The unit shall be of the sinking type.

16.10.5. Digital Input Surge Protection

Surge protection units shall cater for 8 (type 1) and 16 (type 2) digital inputs. The unit can connect via terminals or ribbon cable to the CPU. The unit must be able to withstand surges of 10 kA per channel and up to 30Vdc.

16.10.6. Analog Input Surge Protection

Surge protection unit shall cater for 8 Analog input channels. The unit can connect via terminals or ribbon cable to the CPU. The unit must be able to withstand surges of 10 kA per channel and up to 30Vdc.

16.10.7. Interposing Output Relay Unit

The interposing relay unit shall cater for 8 channels. The unit can connect via terminals or ribbon cable to the CPU. The unit shall have a current rating of at least 380 mA and be able to drive 10A loads at 220V AC.

16.11. COMPLETE TELEMETRY STATION TYPE 2

A complete Type 2 telemetry station shall comprise of a type 2 CPU, at least 8 Analog inputs, 32 digital isolated inputs,32 digital outputs and 4 Analog outputs. The unit station shall allow for surge protection on the antenna and all signals. The station shall further allow for 20m antenna cable with an omni directional antenna or directional antenna where required. The unit shall be supplied in a standard enclosure which will be able to house all the components as specified. The station shall include all accessories needed to interconnect cards and get the system operational.

16.12. ANTENNAS COMPATIBLE WITH TYPE 2 TELEMETRY

The antennas shall be in the 400 MHZ range and allow for a typical receiver signal strength of -90 to -100 dB. Furthermore, the antenna shall be allowed for connection onto the tetra network. The dBi of the antenna shall comply to the Type A (licence free band) and/or Type B (licenced band) as stipulated by ICASA. The antennas must be compatible with Type 2 telemetry. The antennas shall furthermore be omni directional or directional as required by site. Antenna should come with N-type connector. Antenna shall further allow for greater than 2.5dBi gain and greater than 5.5dBi gain respectively.

16.13. CPU TYPE 3

The CPU shall be programmable via Web browser by means of a webpage. The CPU shall allow for modular expansion. The CPU shall have on board I/O of which a minimum of 4 shall be Analog inputs, 8 shall be configurable digital input and outputs. The unit shall be powered via 12V or 24V. The unit shall have at least one RJ45 Ethernet port,1 RS 232 and one RS485 port. The unit shall have indication for status and faults.

The unit shall be capable of time stamped data logging. The unit must be capable of digital repeating. The unit shall further be able to handle Modbus RTU protocol being configurable as either Master or Slave. The unit should be compatible with generic Ethernet Driver of various SCADA packages. The unit shall further also be able to read the various Elpro expansion modules. The unit shall allow for communications mediums including but not limited to GPRS, RS 232/485, Ethernet and DNP3. The unit shall be able to auto-mesh to determine automatic path selection. The unit shall use Ethernet protocol over air. The unit shall be able to act as a transparent link enabling various instrumentation to connect seamlessly to the SCADA via Profibus, Modbus TCP/IP, Modbus 485 and Modbus 232. The unit shall also allow for an internal web based dashboard indicating the status of various inputs and outputs. The unit shall provide security in the form of WPA and AES 256 Encryption, IP filtering and multi-level user

authentication.

16.14. CPU TYPE 4

The CPU shall be programmable via Web browser by means of a webpage. The CPU shall have on board I/O of which a minimum of 2 shall be Analog inputs, 4 shall be configurable digital input and outputs. The unit shall be powered via 12V or 24V. The unit shall have at least one RS485 port. The unit shall have indication for status and faults. The CPU shall be of the low powered type able to power instruments and put the loop in sleep mode. The unit shall typically draw 50 micro amps in standby mode The unit shall be able to run on an 18 Amp hour battery for at least 6 months without recharging. The unit shall have an integrated solar charger and come complete in a ip86 rated enclosure.

The unit shall be capable of time stamped data logging. The unit shall further be able to handle Modbus RTU protocol being configurable as either Master or Slave. The unit should be compatible with generic Ethernet Driver of various SCADA packages. The unit shall further also be able to integrate with the various Elpro legacy products. The unit shall be able to auto-mesh to determine automatic path selection. The unit shall use Ethernet protocol over air. The unit shall be able to act as a transparent link enabling various instrumentation to connect seamlessly to the SCADA via Profibus, Modbus TCP/IP, DNP3 and Modbus 485. The unit shall also allow for an internal web based dashboard indicating the status of various inputs and outputs. The unit shall provide security in the form of WPA and AES 256 Encryption, IP filtering and multi-level user authentication.

16.15. CPU TYPE 5

The CPU shall be programmable via Web browser by means of a webpage. The CPU shall allow for modular expansion. The CPU shall have on board I/O. The unit shall be powered via 12V or 24V. The unit shall have at least one RJ45 Ethernet port and one RS 232 port. The unit shall have indication for status and faults.

The unit shall be capable of time stamped data logging an IP routing. The unit shall further be able to handle Modbus RTU protocol being configurable as either Master or Slave. The unit should be compatible with generic Ethernet Driver of various SCADA packages. The unit shall further also be able to read the various expansion modules. The unit shall allow for communications mediums including but not limited to GPRS, RS 232/485, Ethernet. The unit shall use Ethernet protocol over air. The unit shall be able to act as a transparent link enabling various instrumentation to connect seamlessly to the SCADA via Profibus, Modbus TCP/IP, Modbus 485 and Modbus 232. The unit shall also allow for an internal web based dashboard indicating the status of various inputs and outputs. The unit shall provide security in the form of WPA and AES 256 Encryption, IP filtering and multi-level user authentication. The unit shall further be able to handle GRE tunnelling, SNMP, VNP, UDP and Dynamic DNS. The unit shall be expandable in terms of I/O and integrate with the current 115E expansion I/O.

16.16. EXPANSION I/O FOR TYPE 3,4 AND 5 TELEMETRY

The CPU shall be programmable via Web browser by means of a webpage. The CPU shall allow for modular expansion. The CPU shall have on board I/O of which a minimum of 4 shall be Analog inputs, 8 shall be configurable digital input and outputs. The unit shall be powered via 12V or 24V. The unit shall have at least one RJ45 Ethernet port,1 RS 232 and one RS485 port. The unit shall have indication for status and faults.

The unit shall be capable of time stamped data logging. The unit shall further be able to handle Modbus RTU protocol being configurable as either Master or Slave. The unit should be compatible with generic Ethernet Driver of various SCADA packages. The unit shall further also be able to read the various expansion modules. The unit shall allow for communications mediums including but not limited to GPRS, RS 232/485, Ethernet and DNP3. The unit shall use Ethernet protocol. The unit shall be able to act as a transparent link enabling various instrumentation to connect seamlessly to the SCADA via Profibus, Modbus TCP/IP, Modbus 485 and Modbus 232. The unit shall also allow for an internal web based dashboard indicating the status of various inputs and outputs. The unit shall provide security in the form of WPA and AES 256 Encryption, IP filtering and multi-level user authentication.

16.17. COMPLETE TELEMETRY STATION TYPE 3/ TYPE 4

A complete Type 3/Type 4 telemetry station shall comprise of a type 3 or type 4 CPU, at least 8 Analog

inputs, 32 digital isolated inputs,32 digital outputs and 4 Analog outputs. The unit station shall allow for surge protection on the antenna and all signals. The station shall further allow for 20m antenna cable with an omni directional antenna or directional antenna where required. The unit shall be supplied in a standard enclosure which will be able to house all the components as specified. The station shall include all accessories needed to interconnect cards and get the system operational.

16.18. ANTENNAS COMPATIBLE WITH TYPE 3 AD 4 TELEMETRY

The antennas shall be in the 400 MHZ range and allow for a typical receiver signal strength of -90 to -100 dB. Furthermore, the antenna shall be allowed for connection onto the tetra network. The dBi of the antenna shall comply to the Type A (licence free band) and/or Type B (licenced band) as stipulated by ICASA. The antennas must be compatible with Type 3 and 4 Telemetry. The antennas shall furthermore be omni directional or directional as required by site. GSM type antennas will come with 5m prewired antenna. Antenna shall further allow for greater than 2.5dBi gain and greater than 5.5dBi gain respectively.

17. NETWORKING

17.1. FIBER OPTIC

17.1.1. SFP modules

The SFP modules shall be available in 10GB or 1GB single mode G.652 and multi-mode OM3. Typical wavelength for the multimode shall be 850nm and for the single mode shall be 1310nm. The typical distance for single mode shall be 10km, while the typical distance for multimode shall be at least 300m. The SFP units shall have a warranty of at least 5 years.

17.1.1.1. 10GB Multimode SFP

The SFP shall be of the OM3 type capable 0f handling 10GB over 300 m. The unit shall have a LC connector.

17.1.1.2. 10GB Single mode SFP

The SFP shall be of the G.652 type capable 0f handling 10GB over 10 km. The unit shall have a LC connector.

17.1.1.3. 1GB Multimode SFP

The SFP shall be of the OM2 type capable of handling 1GB over 550 m. The unit shall have a LC connector.

17.1.1.4. 1GB Single Mode SFP

The SFP shall be of the G.652 type capable of handling 1 GB over 10 km. The unit shall have a LC connector.

17.1.2. Patch leads

Multi-mode and single mode with orange, yellow and aqua (OM3) colours. The lengths should be 0.5m,1m,5m and 10 meter with various configurations.

17.1.2.1. LC to LC

17.1.2.1.1. 0.5m length

The patch lead shall be 0.5m in length.

17.1.2.1.2. 1m length

The patch lead shall be 1m in length.

17.1.2.1.3. 5m length

The patch lead shall be 5m in length.

17.1.2.1.4. 10m length

The patch lead shall be 10m in length.

17.1.2.2. LC to SC

17.1.2.2.1. 0.5m length

The patch lead shall be 0.5m in length.

17.1.2.2.2. 1m length

The patch lead shall be 1m in length.

17.1.2.2.3. 5m length

The patch lead shall be 5m in length.

17.1.2.2.4. 10m length

The patch lead shall be 10m in length.

17.1.2.3. LC to ST

17.1.2.3.1. 0.5m length

The patch lead shall be 0.5m in length.

17.1.2.3.2. 1m length

The patch lead shall be 1m in length.

17.1.2.3.3. 5m length

The patch lead shall be 5m in length.

17.1.2.3.4. 10m length

The patch lead shall be 10m in length.

17.1.2.4. ST to ST

17.1.2.4.1. 0.5m length

The patch lead shall be 0.5m in length.

17.1.2.4.2. 1m length

The patch lead shall be 1m in length.

17.1.2.4.3. 5m length

The patch lead shall be 5m in length.

17.1.2.4.4. 10m length

The patch lead shall be 10m in length.

17.1.2.5. ST to SC

17.1.2.5.1. 0.5m length

The patch lead shall be 0.5m in length.

17.1.2.5.2. 1m length

The patch lead shall be 1m in length.

17.1.2.5.3. 5m length

The patch lead shall be 5m in length.

17.1.2.5.4. 10m length

The patch lead shall be 10m in length.

17.1.2.6. SC to SC

17.1.2.6.1. 0.5m length

The patch lead shall be 0.5m in length.

17.1.2.6.2. 1m length

The patch lead shall be 1m in length.

17.1.2.6.3. 5m length

The patch lead shall be 5m in length.

17.1.2.6.4. 10m length

The patch lead shall be 10m in length.

17.2. NETWORK SWITCHES

17.2.1. Managed network switch layer2 –Type 1

The network switch shall be din rail mount. The network switch shall have at least 3 combo ports rated at 1GB. The ports should be capable and handling either copper or fibre by means of a SFP module. The unit should further have at least 7copper ports rated at 100MB. All ports should be capable of half or full duplex mode wit auto speed negotiation. The unit should have one alarm relay and a digital input channel. The unit should be able to handle protocols like Ethernet/IP, ProfiNet and Modbus TCP. The unit should allow for redundant power.

The Switch need to integrate into the current turbo ring and turbo chain models. The switch also needs to be configurable via the MX View/MX Studio software for network visualization and auto network layout. The switch shall be of the layer 2 type. The unit should be ATEX rated. The unit shall at least have a 5-year warranty period.

17.2.2. Managed network switch layer2 – Type 2

The network switch shall be din rail mount. The network switch shall have at least 4 combo ports rated at 1GB. The ports should be capable and handling either copper or fibre by means of a SFP module. The unit should further have at least 14 copper ports rated at 100MB. All ports should be capable of half or full duplex mode wit auto speed negotiation. The unit should have one alarm relay and a digital input channel. The unit should be able to handle protocols like Ethernet/IP, ProfiNet and Modbus TCP. The unit should allow for redundant power.

The Switch need to integrate into the current turbo ring and turbo chain models. The switch also needs to be configurable via the MX View/MX Studio software for network visualization and auto network layout.

The switch shall be of the layer 2 type. The unit should be ATEX rated. The unit shall at least have a 5-year warranty period.

17.2.3. Managed network switch layer3

The network switch shall be rack mount of the 1U type. The network switch shall at least have 2 SFP ports rated at 10 GB, 4 combi ports rated at 1GB,8 SFP ports rated at 1GB and 12 copper ports rated at 1GB. All ports should be capable of half or full duplex mode wit auto speed negotiation. The unit should have one alarm relay and a digital input channel. The unit should be able to handle protocols like Ethernet/IP, ProfiNet and Modbus TCP. The unit should have redundant power supplies.

The Switch need to integrate into the current turbo ring and turbo chain models. The switch also needs to be configurable via the MX View/MX Studio software for network visualization and auto network layout. The Switch Shall be of the layer 3 type. The switch shall be able to handle VLAN tagging of up to 256. The unit should allow for IGMP snooping and GMRP for multi cast traffic filtering. The unit should allow for port lock functions for blocking unauthorised access based on mac address. The unit should also allow for port trunking to optimise bandwidth. The unit shall further also be capable of various versions of SNMP in order to manage different levels of the network.The unit shall at least have a 5-year warranty period.

17.2.4. Unmanaged smart network switch

The network switch shall be din rail mount. The unit should further have at least 8 copper ports rated at 100MB. All ports should be capable of half or full duplex mode wit auto speed negotiation. The unit should have one alarm relay and a digital input channel. The unit should be able to handle protocols like Ethernet/IP, ProfiNet and Modbus TCP. The unit shall allow for SNMP of various versions. The unit should allow for time management via the SNTP. The unit should have redundant power input.

The switch also needs to be configurable via the MX View/MX Studio software for network visualization and auto network layout. The switch shall be of the layer 2 type.The unit shall at least have a 5-year warranty period.

17.3. WIRELESS NETWORKING

The wireless unit should be able to operate on the licence free 5.8Ghz band. The unit should be able to handle up to 108 Mbit/ sec throughputs. The unit should be able to provide a clear link by means of Ethernet over air protocol. The unit should be configurable as a client, access point or bridge router. The unit must be capable to allow for 128 bit AES/WPA2 encryption according to IEEE 802.11 standard. The unit must be capable of mac and IP address filtering. The unit must allow for VLAN tagging and over the air diagnostics and configuration. The unit should have an integrated antenna allowing fast installation. The unit must have integrated Modbus server capabilities to allow for seamless integration with third party Modbus applications and expansion I/O. The unit should allow for deterministic Access point to Access point mesh network repeatability and tree spanning for self-recovery support. The unit should be supplied with a POE injector.

18 INSTRUMENTATION

18.1 WATER QUALITY SENSORS AND CONTROLLERS

Water quality sensors and controllers shall be of a type specially developed for application in water and wastewater treatment plants. It shall have high stability properties and shall require negligible maintenance over extended periods.

The meters shall comprise of the following:

- Measuring unit/detector head/probe.
- Control unit/transmitter, with local display. The control unit shall generate a 4 - 20 mA signal proportional to the turbidity, suitable for transmission to the remote PLC.
- A weather proof box, in which the measuring and control units are to be installed.

18.1.1 Multi-parameter controller

The controller shall be modular supporting single or dual channel and shall be compatible with digital sensors and analogue sensors.

The controller shall be microprocessor based. Parameter-specific controllers that do not allow changing parameter configurations in the field are unacceptable.

The change of digital or analogue sensors connected to the controller shall be by unplugging and plugging of the sensors as necessary.

The controller unit shall comply with the system requirements as listed below.

Display:	Graphic LCD with LED backlighting
Operation:	Menu-driven operation system
Time:	Internal real-time clock
Security:	Two security levels
Data capturing:	Data Logger with USB functionality
Power:	230 Vac, 50 Hz
Analogue outputs:	Minimum of two analogue output channels (4-20mA)
Features:	Alarm points configuration Internal PID controller
Communication:	Modbus TCP/IP or Modbus RS-485. Profibus shall also be allowed for as an option.
Ingress:	NEMA 4X enclosure, rated IP66
Accessories:	Weather protection shield and Sun screen
Compatibility:	Need to be compatible with existing HACH LDO2

The controller shall be able to accept digital and analogue sensors in any combination to measure the following:

pH/ORP module
Combination pH/ORP sensor
Conductivity module
Contacting conductivity
Inductive conductivity
Cationic conductivity (Calculated pH)
Dissolved Oxygen/Oxygen Scavengers module
Amperometric dissolved oxygen
Amperometric oxygen scavengers
Analogue mA Input module

18.1.2 pH/ORP sensor module

Measurement range:	pH: -2.00 to 14.00
mV:	-2100 to 2100 mV
Repeatability:	0.1% of range or better
Response time (t90%):	0.5s
Temperature range:	PT100/PT1000 - -20 to 200 °C
Temperature Accuracy:	+/- 0.05 °C
Compatibility:	Need to be compatible with existing HACH SC4500 Controller

18.1.3 Dissolved oxygen sensor module

Measurement range:	0 to 2000 ppb
Repeatability:	+/-0.5 ppb or +/-5% whichever is greater
Response time:	(t90%) for step change between 1-40 ppb: <30s
Temperature range:	0 – 45 °C
Compatibility:	Need to be compatible with existing HACH SC4500 Controller

18.1.4 Oxygen Scavengers sensor module

Measurement range:	0 to 500 ppb of dissolved N2H4 0 to 100 ppb of carbon hydrazide
Repeatability:	<2% of the measured value or <1ppb
Response time:	(t90%): < 60s

Temperature range:	5 – 45 °C
Compatibility:	Need to be compatible with existing HACH SC4500 Controller

18.1.5 Conducting conductivity sensor module

Measurement range:	Conductivity: 0 to 20,000 µS/cm
Resistivity:	0 to 50 Ω·cm
TDS:	0 to 9999 ppm or 0 to 9999 ppb
Repeatability:	±1% of reading or 0.002 µS/cm below 0.2 µS/cm, whichever is higher
Response time (t90%):	0.5s
Temperature range:	-20 to 200 °C
Temperature Accuracy:	+/- 0.05 °C
Compatibility:	Need to be compatible with existing HACH SC4500 Controller

18.1.6 Inductive conductivity sensor module

Measurement range:	Conductivity: 0.5 to 10,000 µS/cm % concentration: 0 to 99.99 or 0 to 200.0%
TDS:	0 to 9999 ppm
Repeatability:	0.5 to 10,000 mS/cm: ± 2%
Response time (t90%):	1s
Temperature range:	-2 to 200 °C
Temperature Accuracy:	+/- 0.05 °C
Compatibility:	Need to be compatible with existing HACH SC4500 Controller

18.1.7 Dissolved Oxygen Probes

DO probes shall be Luminescent Dissolved Oxygen (LDO) sensors for continuous measurement. The method of measuring dissolved oxygen shall be a probe using luminescent sensor technology with a blue LED light that excites platinum based luminescent material in the probe.

Red light is emitted by luminescent material with characteristics that are directly proportional to the amount of dissolved oxygen present. The red light is measured with a photo detector. Red LED light is used to zero the instrument between measuring cycles.

The DO probes shall comply with the following specified requirements:

Measurement range:	0.01 to 20.00 mg/L
Resolution:	0.01 mg/L
Accuracy:	< 5 ppm: +/- 0.1 ppm > 5 ppm: +/- 0.2 ppm
Repeatability:	+/- 0.1 ppm
Response time:	< 40s to 90% at 20 °C < 60s to 95% at 25 °C
Temperature sensor:	PT100 integrated, external sensor
Temperature range:	0 – 50 °C
Temperature accuracy:	+/- 0.2 °C
Operating temperature:	0 to 50 °C
Relative humidity:	95%, non condensing
Immersion depth:	15 meters, maximum
Immersion pressure:	345 kPa, maximum
Sample pH range:	0.0 to 12.0
Distance to analyzer:	1000 meters, maximum
Ingress:	Minimum IP65
Sensor cleaning:	90 days or depending on conditions
Replacement interval:	Sensor cap, once every 2 years
Calibration:	Per regulatory agency schedule, otherwise calibration-free
Compatibility:	Must to be compatible with existing HACH SC4500 Controller

18.1.8 Portable Dissolved Oxygen Meter

The portable meter shall consist of a dedicated Dissolved Oxygen Meter and rugged Luminescent Dissolved Oxygen (LDO) sensor based for DO measurement.

18.1.8.1 Portable Dissolved Oxygen Meter

The portable device shall comply with the following specifications:

Ingress:	IP67 during measurement
Principal of opr:	Luminescent Dissolved Oxygen measurement
Data storage:	5000 data points
Data transfer:	USB data transfer via flash stick or PC
Resolution:	0.01mg/L
Range:	0.05 to 20mg/L
Inputs:	One channel
Required acc:	Hard case protective glove for meter
Features:	Temperature compensation
Power	Internal battery with charging adaptors
Warranty:	12 months

18.1.8.2 Rugged LDO Sensor

The LDO Sensor shall comply with the following specifications:

Ingress:	IP67, waterproof for 24 hours at a depth of 30 meters
Cable Length:	5 m
Electrode Type:	Luminescent Dissolved Oxygen
Accuracy:	±0.1 mg/L from 0 to 8 mg/L
	±0.2 mg/L for greater than 8 mg/L
Resolution:	0.01mg/L
Range:	0.05 to 20mg/L
Temp Range:	0 - 50 °C
Features:	Temperature compensation
Power	Internal battery with charging adaptors
Warranty:	36 months

18.1.9 Suspended Solids Portable device

The portable suspended solids (SS) device shall be a battery powered analyser equipped with an infrared SS sensor. The sensor shall not be damaged by exposure to direct or indirect sunlight nor will exposure to sunlight affect the calibration. The system will automatically compensate for variations in ambient light and process colour changes.

The device shall have a digital display controlled by microprocessor circuitry. All run, programming, and calibration functions shall be accessible without having to open the enclosure.

Unit shall be zero calibrated at the factory.

The portable device shall provide an extended temperature, UV treated LCD digital display. Programming and diagnostics shall also be provided through this display. The display shall continuously display suspended solids in mg/l, time, and date.

The device shall provide self-diagnostics for the sensor and analyser. Analyser shall have error messages in the operating mode for higher of lower than normal sensor output voltage, temperature input outside the 0 - 60 °C range, unstable instrument circuitry; error messages in the calibrate mode for unstable sensor temperature (after a 5-minute wait), unstable S.S. output of the sensor (after a 5-minute wait), and weak sensor output level.

The device shall provide data logging of up to fifty (50) readings. Logged data to include at least SS, location, time, and date.

The portable device shall comply with the following specifications:

Ingress protection:	IP65 during measurement

Range:	0 – 30 000 mg/l
Accuracy:	3% of reading or 20mg/l, whichever is greater
Repeatability:	+/- 0.5%
Temp range:	0 – 65 deg C
Required components:	All components required to perform measurements
Accessories:	Cable to connect to PC and software
Power	Internal battery with charging adaptors

18.1.10 Turbidity Measurement

The instruments shall be of a type specially developed for application in water and wastewater treatment plants. It shall have high stability properties and shall require negligible maintenance over extended periods.

The meters shall comprise of the following:

- Measuring unit/detector head/probe.
- Control unit/transmitter, with local display of turbidity. The control unit shall generate a 4 - 20 mA signal proportional to the turbidity, suitable for transmission to the remote PLC. The unit shall also provide for communications in the form of Modbus TCP/IP or Modbus 485.
- A self-cleaning system.
- A weather proof box, in which the measuring and control units are to be installed.

It is assumed that the self-priming feed water supply pump with all pipework and isolation valves are existing, to draw sample water from the sampling point, transfer it to the measuring unit and back to the main flow.

The meters shall comply with the following specification:

Ingress protection:	IP65
Range:	0.0001 to 1000 NTU
Accuracy:	+/-0.5% or +/- 0.008 NTU of measured value
Response time:	< 60s
Sampling flow rate:	0.2 to 1 L/minute
Power:	230 Vac, 50Hz
Measurement technology:	Infrared pulse scattered light process according to DIN EN ISO 7027

The sensor shall continuously measure turbidity in water suing detectors at 90 and 180 degrees.

The verification of calibration for the sensor shall be by StablCal or dry standard CVM module.

The sensor shall be equipped with a self-cleaning sample chamber that uses a silicon wiper that is held in place magnetically.

Other than the cleaning of the sensor over extended periods (intervals greater than 12 months), no other maintenance should be required.

18.2 RESIDUAL CHLORINE

The residual chlorine analyser shall be of the buffer less type. The unit shall consist of a controller and a probe unit. The unit shall membrane type sensor probe that can be mounted in a variety of flow cells. The unit should function within the 0.05 to 20mg/l of residual chlorine.

18.2.1 Sensor unit complete

The free chlorine measurement sensor should consist of a membrane covered potentiostatic 3-elctrode system with integral temperature sensor for temperature compensation between 5 and 45 degrees Celsius. The sensor unit needs to be compatible with existing MFC/SFC controllers.

18.2.2 Sensor

The sensor should be able to mount in the Variasense or similar flow unit and be able to read a PH of 6 up to 10. The unit should be able to handle a conductivity of greater than 10 micro Siemens per centimetre

to a max of 2500 milli Siemens per centimetre. The sensor shall be 25mm in diameter and have a length of 175mm.

18.2.3 Controller

The controller shall be able to measure at least 4 water quality parameters. The unit shall allow for automatic set point adjustment. The unit shall allow for Modbus TCP/IP communication or Modbus 485.

18.3 FLOW METERS

18.3.1 Electromagnetic Flow meter

Electromagnetic flow meter sensors shall be full bore, in line, double flanged units with remotely mounted transmitters.

Electromagnetic flow meters shall have Ebonite lined stainless steel tubes with either Titanium or Hastelloy C electrodes. The metering tube shall have flanged ends complying with the requirements of SANS 1123-2003. The sensor shall be bi-directional and suitable for measuring rate of flow of raw and treated water to varying standards including potable water. The flow sensor housing shall be such as to permit the unit to be installed in an underground chamber and shall meet the requirements for IP68 protection against environmental conditions. The IP68 protection shall be removable, so as to permit fault finding and the replacement of signal cables in the event of damage.

The flowmeters shall be supplied complete with fasteners (nuts, bolts and washers). Fasteners of 12 mm and smaller shall be of grade 316 stainless steel and fasteners larger than 12 mm shall be hot-dip galvanized.

Calibration shall be in litres per second unless otherwise specified.

The transmitter shall be capable of bi-directional communication via an Industrial Ethernet (Modbus TCP/IP or Modbus 485) network with the programmable logic controller. The transmitter shall be contained in a case designed for wall mounting.

For applications other than for treated water, flow meters shall be provided with an electronically operated electrode cleaning device. Automatic, timed cleaning shall be provided.

Verification of electrically powered meters shall be possible while the meter is in operation by making use of a certified portable verification meter/instrument or self verification function.

The meter shall also be offered in a battery powered option. Modbus could be swopped for pulse and 4-20mA if required.

The meters shall comply with the following specification:

Ingress Protection for Transmitter:	IP67
Ingress Protection for Sensor:	IP68
Sensor Diameter and Pressure rating:	As per BOQ
Accuracy:	+/- 0.5 % of measured flow in flow range 50 – 100 % +/- 0.1 % of full scale in all other ranges
Repeatability:	< 0.1% of full scale deflection
Linearity:	Better than 0.05% of full scale deflection
Power:	230 Vac, 50Hz or 24 Vdc
Transmitter Output:	4 to 20 mA and Ethernet (ModbusTCP)
Compatibility:	With Mass/Mag 6000 indicator or similar

18.3.2 Differential pressure (flow)

The unit shall have a display which can be operated via pushbuttons. The transmitter shall be loop powered. The unit shall allow for fast commissioning via DIP switches. The unit shall be capable of being applied in flow measurement.

18.3.3 Clamp on Ultrasonic

The clamp on flow meter shall consist of a transmitter, one sensor pair and connecting cables. The sensors shall be of stainless steel construction. The clamp on flow meters shall operate on the method of Ultrasonic pulse transit time difference method. The unit shall be programmable via the keypad or computer.

The meters shall comply with the following specification:

Transmitter:	
Display:	Graphical display with backlight
Channels:	Single
Enclosure rating:	IP65
Communication:	Modbus (RTU),
Inputs:	2x digital inputs
Outputs:	1x 4 -20 mA, 1x relay, 1x pulse/frequency
Power supply:	90 - 240 V AC (50 / 60 Hz) or 11.5-28.5 Vdc
Accuracy	1% for velocities ≥ 0.3 m/s
Pipe size range:	51 mm to 610 mm

18.3.4 Thermal mass flow meter

The unit shall consist of a sensor and transmitter. The transmitters and sensor shall allow for various configurations depending on the application.

18.3.4.1 Sensor A

The unit shall be of the Insertion type compatible with t-mass 65 transmitter or similar. The unit shall be suitable for larger pipelines DN 80 to 1500. The unit shall be able to handle process pressures of -0.5 to 20 Bar at -40 to 130 degrees Celsius. Options for DN 80,100,150,200,250,300,400,500,600,700,1000 and 1500 should be allowed for.

18.3.4.2 Sensor B

The unit shall be of the Insertion type compatible with t-mass 150 transmitter or similar. The unit shall be suitable for larger pipelines DN 80 to 1500. The unit shall be able to handle process pressures of -0.5 to 20 Bar at -40 to 100 degrees Celsius. Options for DN 80,100,150,200,250,300,400,500,600,700,1000 and 1500 should be allowed for.

18.3.4.3 Sensor C

The unit shall be of the Inline type compatible with t-mass 65 transmitter or similar. The unit shall be suitable for smaller pipelines DN 15 to 100. The unit shall be able to handle process pressures of 16 to 40 PN at -40 to 100 degrees Celsius. Options for DN 15,25,40,50,80 and 100 should be allowed for. The unit shall be flanged/threaded depending on application.

18.3.4.4 Sensor D

The unit shall be of the Inline type compatible with t-mass 150 transmitter or similar. The unit shall be suitable for smaller pipelines DN 15 to 50. The unit shall be able to handle process pressures of 10 to 40 PN at -40 to 100 degrees Celsius. The unit shall be flanged/threaded depending on application. Options for DN 15,25,40,50,80 and 100 should be allowed for.

18.3.4.5 Transmitter A

The unit shall be compatible with t-mass A, B, and T sensors or similar. The unit shall have a display with pushbuttons for configuration. The unit shall mount directly on the sensor.

18.3.4.6 Transmitter B

The unit shall be compatible with t-mass F and I sensors or similar. The unit shall have a display with pushbuttons for configuration. The unit shall mount directly on the sensor. The unit shall offer a free selection of 20 gases. The unit shall allow for Modbus 485 or Profibus DP depending on the application.

The unit should have output alarming capability.

18.4 LEVEL CONTROL

18.4.1. Ultrasonic

Ultrasonic level detection shall be by means of a transducer and separate transmitter, with the sensor powered via the transmitter. The sensors shall be mounted on suitably sized brackets of glass fibre reinforced construction, stainless steel or similar non-corrosive material directly over the medium being monitored.

The sensor shall be provided with an integrated cable of different lengths as specified in the pricing schedule, with an IP tating of at least IP68 rating. The sensors shall be capable of measuring range as set out in the pricing schedule.

The transmitter shall include a local display and keypad.

The level meter shall conform to the following:

Power supply:	230 Vac or 24 Vdc
Signal Output:	Isolated 4-20 mA or Ethernet (ModbusTCP/IP) or Modbus 485 or a combination of both
Relay Output:	Minimum of 6 discreet relay outputs
Calibration:	Independent adjustments for zero and span
Accuracy:	1% of span or better
Repeatability:	0,2% of span
Resolution:	0,1% of span or 2mm, whichever is greater
Dead band:	- < 0,2% of span
Ambient temperature effect:	< 0,5% of maximum span per 10°C change
Mouting connection:	G/NPT 1”
IP rating:	DIN rail mount: IP20 Panel mount: IP45 Wall mount: IP65

18.4.1.1 Type 1

The Type 1 transducer and transmitter shall be compatible with the existing Mobrey infrastructure

18.4.1.2 Type 2

The Type 2 transducer and transmitter shall be compatible with the existing Siemens infrastructure

18.4.1.3 Type 3

The Type 3 transducer and transmitter shall be compatible with the existing Endress and Hauser infrastructure

18.4.2. Hydrostatic level transmitter

The hydrostatic level transmitter shall be programmable for various levels. The unit must be compatible with the latest PACTware configuration software. The unit should be programmable via software using a laptop or via a hand held programmer. The unit shall further be capable of handling pressures from 0 - 60 Bar. The unit shall be able to achieve accuracies of 0.1%. The unit shall have a cable length of 15 - 20m. the unit shall be capable to operate in temperatures of -20 to 80 degrees Celsius. The wetted parts shall by 316 stainless and have an ip rating of 68. The output should be 4-20mA.

18.4.3. Floats

Floats should have one change over and can be of the micro switch or switch type. The angle of switching should be between 9 degrees and 31 degrees. The floats should be available in type 1 – applicable to emptying and filling of general tanks, type 2 –applicable for turbulent applications with suspended solids like sewer water and Type 3 for EX rated environments. All floats shall have a minimum cable length of 10m.

18.4.4. Point Level Detection

18.4.4.1 Conductive probes

Conductive probes shall be of the 3 rod type. The wetted parts shall be 316 stainless. Conductive probes shall have the option of a threaded connection. The unit shall have an ip rating of at least IP66. The output should be relay or transistor type. A maximum rod length of 4m should be allowed for.

18.4.4.2 Point Level Probe

The unit shall have an operating voltage of 9.6 to 35Vdc. The unit shall be able to accept 2 digital outputs. The unit shall be compatible with water; hydrous media; oils; oil-based media. The unit shall have a probe length of 273mm and an active range of 28mm. The unit shall have a communiations interface compatible with IO-Link. The unit shall be compatible with the existing IFM infrastructure.

18.4.5 Radar

Radar level detection shall be by means of a transducer/sensor and separate transmitter, with the sensor powered via the transmitter. The sensors shall be mounted on suitably sized brackets of glass fibre reinforced construction, stainless steel or similar non-corrosive material directly over the medium being monitored.

The sensor shall be provided with an integrated cable of different lengths as specified in the pricing schedule, with an IP tating of at least IP68 rating. The sensors shall be capable of measuring range as set out in the pricing schedule.

The transmitter shall include a local display and keypad.

The level meter shall conform to the following:

Power supply:	230 Vac or 24 Vdc
Signal Output:	Isolated 4-20 mA or Ethernet (ModbusTCP/IP) or Modbus 485 or a combination of both
Relay Output:	Minimum of 6 discreet relay outputs
Calibration:	Independent adjustments for zero and span
Accuracy:	1% of span or better
Repeatability:	0,2% of span
Resolution:	0,1% of span or 2mm, whichever is greater
Dead band:	- < 0,2% of span
Beam angle:	8 degrees
Ambient temperature effect:	< 0,5% of maximum span per 10°C change
Mouting connection:	G/NPT 1”
Bluetooth standard:	Bluetooth 5.0
Effective range Bluetooth:	25m
IP rating minimum:	DIN rail mount: IP20 Panel mount: IP45 Wall mount: IP65

18.4.5.1 Type 1

The Type 1 transducer and transmitter shall be compatible with the existing Vega infrastructure

18.4.5.2 Type 2

The Type 2 transducer and transmitter shall be compatible with the existing Siemens infrastructure

18.4.5.3 Type 3

The Type 3 transducer and transmitter shall be compatible with the existing Endress and Hauser infrastructure

18.5 PRESSURE

18.5.1. Pressure measurement via capacitance.

Pressure transmitter and gauge shall be separated from the measured fluid by a liquid filled diaphragm chemical seal for measurement using capacitance means. Allowance shall be made for chemical seals that can deal with corrosive gasses and media, like chlorine and sewer media. Chlorine Chemicals seals shall be of the Hasloy C or Monel type. Allowance shall also be made for chemical seals able to withstand oxygen deficient water.

Pressure switches shall be used where the pressure measurement of discrete pressure or no-pressure measurement is required. These switches shall operate by means of piezoelectric sensing complete with a metal type seal, porous seals (i.e. ceramic) shall not be accepted.

In addition to the pressure transmitter a pressure gauge shall also be provided at each of the pressure instruments.

18.5.2. Pressure Measurements for diaphragm type.

A chemical seal shall be used on a pressure gauge, pressure of flow transmitter when the flowing media is viscous, corrosive or contains suspended solids.

The unit shall have a stainless-steel body, bolting and diaphragm.

Unit pressure rating shall be NP10 or higher as application dictates.

Seals and filling liquid shall be suitable for temperatures from 0 to 150°C.

Process and instrument connections shall be ½" BSP or NPT.

Seal diaphragm must be able to withstand twice the maximum pressure range of the system to which it is connected and be corrosive resistant to the process medium.

18.5.3. Pressure Measurements using differential pressure transmitter

Transmitter shall be indicating, electronic type based on capacitance principle.
Preference shall be given to a unit that is "smart" in that calibration and diagnostic checking shall be by hand held calibrator.

Element type:	Diaphragm
Wetted parts:	316 Stainless Steel
Body material:	316 Stainless Steel/ EPDM
Process connection:	½" NPT
Electrical connection:	20 mm ISO conduit
Electronics housing Ingress:	IP55
Overpressure limit pressure:	200% of maximum process static
Mounting:	Pipestand or direct process connection as appropriate to application
Output:	4-20 mA
Power supply:	24 V DC nominal
Calibration adjustment:	Independent Zero and span
Element temperature rating:	100° C
Electronics temperature rating:	70° C
Humidity:	0 - 100% relative humidity
Accuracy:	0.5% of span or better
Repeatability:	0.1 %
Dead band:	not to exceed 0.1% of span

18.5.4. Pressure Gauge

Pressure gauges shall conform to the following minimum specifications:

Housing:	Stainless Steel
Diameter:	63mm or 100mm as per BOQ
Wetted Parts:	Stainless Steel

Dampening:	Glycerine filled
Entry:	Rear or bottom as per request
Tread size:	½" or ¼" as per request
IP Rating:	IP67
Range:	Pressure range as per BOQ

18.5.5. Pressure Transmitter

The pressure transmitter shall be ½" BSP. The pressure shall range between 0 – 20 bar. Transmitters shall be stainless steel. Furthermore, wetted parts shall be stainless steel. Allowance shall be made for chemical seals that can deal with corrosive gasses and media, like chlorine and sewer media. The output shall be 4-20mA. The unit shall be available in loop powered and external powered, with or without display. Chlorine Chemicals seals shall be of the Hasloy C or Monel type. The pressure transmitters are split up for pressure ranges in the pricing schedule.

18.5.6. Pressure switch

The pressure switch shall be as per BOQ.

18.6 PROXIMITY & LIMIT SWITCHES

18.6.1 Proximty Switches

Proximity Switches shall be of the PNP type and allow for various sizes from M5 to M30 as well as rectangular type. The sensors will be of the plug connected version with varies sensing distances from 1.5mm to 40mm. See the BOQ for sizing and sensing distances. The body of the proximity sensors shall be nickel-plated brass. The sensor shall have polarity reversal and short circuit protection.

18.6.2 Limit switches

Limit switches shall have an IP rating of IP66. The body shall be either die cast or plastic depending on the application. The body shall allow for various configurations in order to cater for a top steel roller plunger, roller lever side action, roller lever vertical action, adjustable roller lever action or a wobble stick/flexible spring actuator depending on the application.

18.7 SIGNAL ISOLATORS

18.7.1. Signal isolator/splitter

The signal isolator shall allow for Isolation and 1:1 conversion of current signals within the range 0…20 mA. It shall provide a Splitter function: 1 in – 2 out, with Response time: <7 ms and Accuracy <±0.05% of span. The unit must be able to be powered via terminal or from a busbar system.

18.7.2. Loop powered isolator-2channel

A signal isolator that can handle Isolation and 1:1 conversion of current signals within the range 4…20 mA of which the unit is powered by the input loop shall be made available. The unit shall have 2 channels with a Response time: <5 ms and a Low voltage drop: ≤1.2 V with Accuracy <±0.1% of span.

18.7.3. Signal isolator/converter

A signal isolator that can handle Isolation and conversion of standard dc signals at a response time of less than 7 ms, which is dip - switch configured shall be made available.The unit must be able to be powered via terminal or from a busbar system.

18.7.4. Signal isolator busbar power supply

A power connector unit that can power up to 100 signal isolators via a busbar system. The unit must be able to be powered via terminal with a protective 2.5A fuse.

18.8 CHLORINATOR

The chlorinator shall able to dose a variety of dosing rates by simply changing the plugs and rotameter.

The Chlorinator shall be able to be controlled via a 4-20mA signal with a manual option independent of the 4-20mA signal. The chlorinator shall comply with the criteria as listed below.

Accuracy: Gas feed is ±4% of the indicated flow

Operating Range: Manual 20:1 for any rotameter; Automatic 10:1

Rotameters: Choice of 5” or 10” scale length

Operating Vacuum: 10 to 50” water

Operating Temperature Range: 10° to 130°F (-12° to 55°C)

Mounting: Wall or panel mounted. Panel mounted arrangement can be configured with a panel mounted injector or a panel mounted controller (for automatic control version). An optional vacuum switch can also be mounted on the panel.

Control Modes: Manual control, start-stop or program, flow proportional, direct residual and compound-loop control

Distance, Supply to Control Panel: For flexibility, it is not necessary to install the vacuum regulating valve close to the control panel. They can be a few feet to several hundred feet apart, depending on maximum feed rate, the diameter of the connecting pipe or tubing and system performance requirement.

Injectors: For capacities up to 200 PPD (90 kgs/day), a 3/4” injector is used. For capacities up to 500 PPD (225 kgs/ day), a 1” injector is used. Injectors can be panel mounted or remote. For capacities up to 750 PPD (340 kgs/ day), a 2” injector is used.

Injector Operating Water: This must be reasonable clean. Injectors are fixed-throat differential type. Maximum inlet pressure is 300 psi to 100°F; 150 psi to a maximum of 130°F

Pressure at Application Point: Maximum pressure with hose or polyethylene tubing is 75 psi, but high pressure hose or rigid pipe will allow application against backpressure of 75 to 160 psi.

Electrical Requirements: 120 volts +/- 10% (200 mA) or 230 volts +/- 10% (100 mA),50/60 Hz, single phase.

Preference: Wallace and Tiernan V10K or similar

18.9 LOAD CELL INDICATORS

The load cell indicator shall have an easy to use 5-key waterproof keyboard. The unit shall have Red LED display with 6 8-mm digits and LEDs for showing active functions. The indicator shall have standard dimensions for mounting on DIN bar. The unit shall be able to be calibrated, Set-Up, parameters changed and configurable from keyboard or a PC with DINI TOOLS. The unit shall have at least 2 rs 485 ports, which will be able to handle the Modbus 485 protocol. The unit shall be din rail mountable.

The unit shall further adhere to the following criteria:

- Up to 10.000e or multirange 2 x 3000e @ 0,3 µV/d in CE-M approved version for legal for trade use.
- Up to 1.000.000 displayable divisions with internal resolution up to 3.000.000 points.
- Up to 8 signal linearization points with DINITOOLS (3 from keypad).
- 1 channel A/D 24-bit sigma-delta conversion, up to 3200 conv./sec. auto select.
- Connectable with up to 8 analogue load cells with 350 Ohm input resistance.
- From 12 Vdc to 24 Vdc power supply.
- RS232/C bidirectional port configurable for connection with external units.
- Double RS485 port for a quick network connection.
- 16-bit analogue output (DGT1SAN model) 4-20mA / 0-5Vdc / 0-10Vdc at choice. Maximum load applicable on the output current: 350 Ohm. Minimum load applicable on the output voltage: 10kOhm.
- 2 photo mosfet outputs: 150 mA 48 Vac / 150 mA 60 Vdc (NO), with configurable functions.
- 2 opto-isolator photocoupler inputs: 12÷24 Vdc, 5 mA min - 20 mA max, with configurable functions

18.10 CHLORINE LEAK DETECTORS

The leak detector shall represent a 0-5ppm scale as 4-20mA output.The units should allow for indoor and outdoor applications. An option should be allowed for explosive/flammable atmospheres (ATEX approved). The flammable sensor should be certified to +50°C only. The unit shall be supplied with a pre-wired junction box. The junction box must include a hinged lid to ensure both hands are free to complete electrical connections. Threaded M20 as well as ¾" and ½" NPT clearance entries shall be included as standard, each one fitted with an appropriate seal. Chlorine detectors shall be pre-configured at the factory and shall require no calibration during operation. The unit shall provide a 4-20mA signal output that can be used with a plc or controller/indicator.

18.11 FIXED GAS DETECTORS

Type:	Explosion proof / flameproof enclosed transmitter
Gases:	H2S, O2, CO, LEL
H2S Resolution:	0.5 ppm
H2S Range:	0 – 100 ppm
O2 Resolution:	0.5%
O2 Range:	0 – 25%
CO Resolution:	5 ppm
CO Range:	0 – 1000 ppm
Display:	LCD
Signal output:	Normal operation 4 to 20 mA
	Maintenance Constant 3.4 mA or 4 mA
	Fault: < 3 mA
Power supply:	10 to 30 V DC, 3-wire
	18 to 30 V DC, 2 wire
Relays:	2 alarm relays and 1 fault relay, SPDT 5 A @ 230 VAC
Temperature:	-40 to 65 °C
Humidity:	5 to 95 % r. h., non-condensing
Housing:	Epoxy coated copper-free aluminium
IP rating:	NEMA 4X & 7, IP65/66/67
Cable entry:	M20 cable gland
Dimensions:	approx. 280 x 150 x 130 mm
Approvals:	Class I, Div 1, Groups A, B, C, D
	Class II, Div 1, Groups E, F, G
	Class I, Zone 1, Group IIC
Warranty:	2 years
Calibration:	Includes a 2 year calibration plan from the OEM or an ISO 9001 compliant entity

18.12 PORTABLE GAS DETECTORS

The portable gas detector shall include sensors to monitor H2S, CO, O2 and the LEL for combustible gasses. The unit shall be used for personal air monitoring. Sensors shall be easily exchangeable.

Portable gas detectors shall conform to the following minimum specifications:

H2S Resolution:	1 ppm
H2S Range:	0 – 100 ppm
CO Resolution:	1 ppm
CO Range:	0 – 500 ppm
O2 Resolution:	0.1%
O2 Range:	0 – 30.0%
Combustible Gas Resolution:	1%
Combustible Gas Range:	0 – 100% LEL
Battery Life:	18 hours for a 6 hour charge period. Battery charger included
IP Rating:	IP68 for 45 minutes at 1.2m
Alarm type:	Flashing LED, vibrating, buzzer (95db at 30cm), Alarm display on LCD
Operating temperature:	-20 to +50 degrees Celsius
Warranty:	2 years
Calibration:	Calibration certificate from the OEM or an ISO 9001 compliant entity

18.12.1 Type 1

The Type 1 portable gas monitor and sensors shall be compatible with the existing HW MicroClip XL gas

monitors.

18.12.2 Type 2

The Type 2 portable gas monitor and sensors shall be compatible with the existing RKI GX-3R gas monitors.

18.13 VIBRATION SENSING AND MONITORING

18.13.1 Vibration Sensor

Vibration protection shall be provided by vibration transmitters, of type piezoelectric accelerometers, measuring the tri-axis vibration in the x, y, and z axis of selected motor and pumps.

The vibration sensor should consist of a vibration sensor as well as output electronics, which is embedded in a stainless steel housing. The sensor should monitor mechanical vibrations according to DIN/ISO 10816. The sensor should be configurable to measure velocity (mm/s), acceleration (m/s2) or displacement (mm) and measures in true RMS. The sensor must be compatible with IO-Link and integrate with
Sensor Specifications:

Sensor type: Capacitive accelerometer

Measuring parameter: Velocity (mm/s), Acceleration (m/s^2) or Displacement (mm) Peak-Peak

Measuring accuracy: 0.2 %

Max. measuring range: ± 25 g

Frequency range: 1 Hz - 6000 Hz

Output signal: 0-10 mA

Sensitivity: 142 uA/g

Power supply: 7.2 to 10.8 Vdc

Operating temperature: -30 °C to +125 °C

Protection: IP67, IP68, IP69K

Weight: Approx 50 g

Connector: M 12

Mounting: Threaded stud, M 8 mm

18.13.2 Vibration Monitor

The unit shall be capable of continuous vibration monitoring. The unit shall have an operating voltage of 24Vdc. The unit shall have a total of 8 configurable inputs and outputs. The unit shall have 2 analog inputs, 4 dynamic inputs, 2 digital outputs and 1 analog output. The unit shall have a frequency range of 0.1 to 12000Hz. The unit shall have a communications interface compatible with Ethernet, a transmission rate of 10 MBaud, 100 MBaud and compatible with Modbus TCP. The unit shall be compatible with the existing IFM infrastructure.

18.14 TEMPERATURE SENSOR

The temperature measurement shall be done by means of resistive temperature detector (RTD) type as per the specific to equipment requirements.

Where temperature sensors are not supplied with the equipment from the suppliers but is required,

temperature sensors shall be supplied separately and installed on the related equipment by suitable means for the specific equipment.

A junction box shall be provided for equipment where more than one parameter is monitored. E.g. Temperature, vibration and speed.

Where ambient temperature is required the Supplier shall confirm the location before installation or replacement. The instrument shall be installed in arm's reach from safe suitable standing location for monitoring and maintenance purposes.

The Supplier shall provide all accessories required for a complete installation of the temperature sensor and transmitter. This will include the casing, mounting bracket, glands, screws etc.

The temperature sensor and transmitter shall conform to the following:

Electronics housing Ingress: IP55
Output: 4-20 mA
Power supply: 24 V DC nominal
Element temperature rating: 100° C
Electronics temperature rating: 70° C
Humidity: 0 - 100% relative humidity
Accuracy: 0.5% of span or better
Transmitter: Transmitter with Digital Display

Where a 4 to 20mA output is not possible a signal converter sal be provided.

The signal converter shall be compatible with for Pt100 and Pt1000 measuring elements. The signal converter shall have an operating voltage of 20 to 32Vdc. The signal converter shall have 1 4 to 20mA analog output that is compatible with IO-Link and that is configurable. The signal converter shall have a measuring range of -50 to 300 °C. The unit shall have a frequency range of 0.1 to 12000Hz. The unit shall have a communications interface compatible with IO-Link. The unit shall be compatible with the existing IFM infrastructure

18.15 PAPERLESS CHART RECORDER

The unit shall be able to take up to 12 analog inputs max. and 6 digital inputs max. The unit shall have a 5.7" TFT screen for displaying measured values in a maximum of four groups, with digital, bar graph and curve display.The unit shall have 6 output relays max. and 1 transmitter power supply.The unit shall have communications interface RS232/485 (optional), Ethernet, USB and Modbus RTU/TCP Slave (optional). The unit shall have storage/recording capabilities; Internal memory, SD card and USB flash drive. The unit shall be able to operate form a 100…230 V AC +/-10% power supply or a 24V (-10%, +15%) AC/DC power supply.

18.16 PAPER CHART RECORDERS

The unit shall have a digital display. The unit shall have an accuracy of approx. 0.10% of span. The unit shall be able to take up to 2 inputs. The unit shall be compatible with a 10-inch chart. The unit shall be capable of totalization of the PVs. The unit shall be available in single or dual pen.
Replacement pens shall be available in a variety of colours and be compatible with the DR4300 or equivalent. Replacement charts shall be available in a variety of scales and be compatible with the DR4300 or equivalent.

18.17 PANEL MOUNT PROCESS METERS

18.17.1 96mm x 96mm Process meter

96mm x 96mm Process meters shall conform to the following:
Housing: 96mm x 96mm panel mount
Power Supply: 24 Vdc
Input: 1 x 4 to 20mA
Output: 4 x relay SPDT, 1 x 4 to 20mA
Display: LCD

18.17.2 48mm x 96mm Process meter

48mm x 96mm Process meters shall conform to the following:

Housing:	48mm x 96mm panel mount
Power Supply:	24 Vdc
Input:	Current(4 to 20mA), Voltage, Resistance, RTD, Thermocouples
Output:	2 x relay SPDT, 1 x 4 to 20mA
Display:	LCD

19 CABLING AND ACCESSORIES

19.1 INSTRUMENT CABLING

Instrument cables shall be individually and overall screened with lay schemes to counter static and cross talk noises.

Instrument cables shall conform to the following:

Conductors:	Plain annealed class 4 bunched copper
Conductor size:	1mm
Insulation:	Crosslink polyethylene - Temperature rating 105°C
Identification:	Pairs - Black and White numbered cores
Screening:	Aluminium/Polyester tape with a 0.5mm² tinned copper drainwire.
Outer Sheath:	Flame retardant PVC - Temperature rating 90°C

19.2 COMPRESSION GLANDS

Compression glands shall conform to the following:

Material:	Brass (Nickel Plated)
Cable Type:	Unarmoured
IP Rating:	IP66/68
Entry tread:	M20

19.3 UTILITY BOXES

Utility boxes shall have a cylindrical shaped body with a screw on cover. It shall be compatible with the compression glands and conform to the following:

Material:	Non-metallic
Impact Resistance:	IK10
IP Rating:	IP66/68
Number of entries:	4
Entry tread:	M20

19.4 STAINLESS STEEL WIRE ROPE

Stainless steel wire ropes shall conform to the following:

Material:	AISI 304 Stainless Steel
OD:	1.5mm
Number of cores:	19
SWL:	30 kg

19.5 INSULATED BOOTLACE FERULES

Insulated Bootlace Ferules shall conform to the following:

Insulation Material:	Nylon
Terminal Material:	Copper tube
Surface Treatment:	Tin plating
Ferrule Type:	French

19.6 CABLE TRAYS

Cable trays shall comply to BS EN 61537 Cable Management specifications.

Cable trays shall conform to the following:

Material:	Hard-drawn High Tensile steel wire
Sidewall Height:	50mm
Pitch (Wire Apertures):	100 x 50mm & 50 x 50mm

19.7 SLOTTED TRUNKING

Slotted trunking shall be supplied complete with cover and conform to the following:

Material:	High impact, warp-proof PVC , self-extinguishing
Colour:	Grey
UL Rating:	94V-0
Operating temperature:	-5°C to 60°C

20 PNUEMATICS

20.1 ELECTRONIC VALVE BLOCKS

20.1.1 CPU

The CPU shall have status indication lights and a Ethernet port configurable for Modbus TCP/IP. The CPU shall be programmable via the CPX software. The unit shall be powered from an external 24Vdc plug connector. The 24Vdc shall be distrubited to the I/O and valves via the CPX backplane. The unit shall be able to also communicate via Ethernet/IP where applicabe. The unit shall be able to handle 512 bits input and output. The unit shall also be bale to handle 512 digital inputs and 512 digital outputs. Where applicable the unit shall have the capability to handle 32 Inputs and 18 Outputs.

The CPU module shall further comply to:

Fieldbus interface:	2x M12x1 socket, 4-pin, D-coded
Baud rate [Mbps]:	10/100
Protocol:	EtherNet/IP Modbus TCP
Max. address capacity, inputs [byte]:	64
Max. address volume for outputs [byte]:	64
LED displays (bus-specific):	MS = Module status NS = network status TP1 = Network active port 1 TP2 = Network active port 2
Device-specific diagnostics:	Module and channel-oriented diagnostics Undervoltage of modules Diagnostic memory
Configuration support:	EDS file L5K export with CPX-FMT
Parameterisation:	Diagnostic behaviour Fail-safe response Forcing of channels Idle mode characteristics Signal setup System parameters
Additional functions:	EtherNet/IP Quickconnect Ring topology (DLR) Acyclic data access via "Explicit Message" and Ethernet Integrated switch IP addressing via DHCP, DIL switch or operator unit Channel-oriented diagnostics via fieldbus Start-up parameterisation in plain text via fieldbus System status can be displayed using process data
Operating voltage:	24 Vdc

Permissible range:	18 ... 30 Vdc
Current consumption:	Typically 100mA
IP Rating:	IP65, IP67
Temperature range Operation [°C]:	– 5... +50
Storage/transport [°C]:	–20 ... +70

20.1.2 Input module

The input modules shall further conform to the following:

Number of inputs:	8 or 16
Input debounce time [ms]:	3 (0, 10, 20 parameterisable)
Fuse protection (short circuit):	Internal electronic fuse per channel
Module current consumption:	75 mA
Nominal operating voltage:	24Vdc (reverse polarity protected)
Permissible voltage fluctuations [%]:	±25
Power failure buffering [ms]:	20
Residual ripple [Vss]:	0.4

Channel – internal bus
LED displays Group diagnostics
Channel diagnostics 8
Channel status 8
Diagnostics Wire break per channel
Limit value violation per channel
Parameterisation error
Overload per channel
Input debounce time per channel
Input function per channel
Upper limit value per channel
Signal extension time per channel
Gate time per channel
Monitoring of limit values per channel
Monitoring of short circuit per channel
Monitoring of wire break per channel
Counter configuration per channel

The unit shall also have a connection module which has spring loaded terminals.

20.1.3 Output module

The input modules shall further conform to the following:

Number of outputs:	8
Max. power supply Per module [A]:	4
Per channel [A]:	0.5 (12 W lamp load, 8 channels can be connected in parallel)
Fuse protection (short circuit):	Internal electronic fuse per channel
Module current consumption:	Typically 16mA
Operating voltage:	24 Vdc
Permissible range [V DC]	18 ... 30
Switching logic:	Positive logic (PNP)
LED displays Group diagnostics:	1
Channel diagnostics:	8
Channel status:	8
Diagnostics:	Short circuit/overload, channel x Undervoltage of outputs Parameterisation Module monitoring Behaviour after short circuit Fail-safe channel x Forcing channel x Idle mode channel x

Temperature range Operation [°C]:	–5 ... +50
Materials:	Reinforced PA, PC

20.1.4 5/2 way module

The module shall fit into the valve electronic module as described under 20.1.7. The unit shall have a 5/2 way module, Double solenoid. The operating pressure shall be up to 1Mpa. The unit shall be reversible

20.1.5 5/3 way module

The module shall fit into the valve electronic module as described under 20.17. The unit shall have a 5/3 way module, Mid position pressurized, mechanical spring return. The operating pressur shall be up to 1MPa. The unit shall be reversible

20.1.6 Interlinking module

A metal (individualy linked) and plastic(tie rod) interlinking module shall be provided for the interconnection of modular CPU and I/O units. This unit forms the bus section of the electronic CPX valve module unit.

Pneumatic interface module – Must be able to handle flow up to 700l/min. Sahll be able to connect up to 128 solenoid coils and 16 configurable modules. The unit shall fuuther conform to:

Number of solenoid coils:	128
Pilot air supply:	Internal
Pneumatic connection 1:	G1/4
Operating pressure [bar]:	3 ... 8
Pilot pressure [bar]:	3 ... 8
Nominal operating voltage [V DC]:	24
IP Rating:	IP65
Ambient temperature [°C]	–5 ... +50
Materials:	Cover: PA Housing: Die-cast aluminium

The interlinking module shall be supplied with a silencer

20.1.7 Valve electronic module

The electronic valve module houses the valve catridge and should conform to the following:

Diagnostics Undervoltage of pneumatic valves
Max. no. of valve positions 2
Max. no. of solenoid coils 4
Intrinsic current consumption at load voltage 3 mA
Intrinsic current consumption at operating voltage 8 mA
Nominal pick-up current per solenoid coil 99 mA to 24 ms
Nominal current with current reduction 18 mA after 24 ms
Corrosion resistance class (CRC) 1 - Low corrosion stress (when installed)
LABS (PWIS) conformity VDMA24364-B1/B2-L
Housing material POM
Note on materials RoHS-compliant

20.2 PNUEMATIC VALVES

20.2.1 5/2 Namur valve

5/2 Namur valves shall conform to the following specifications:

Mounting Style:	NAMUR
Function:	5/2
Connection Port Thread:	G 1/4
Actuation Type:	Solenoid/Spring
Solenoid Fitted:	Yes

Flow Rate @ 6 bar:	1100L/min
Min Operating Press	:2.5bar
Min Operating Temp:	-10°C
Max Operating Temp:	+60°C
Thread Standard:	G
Thread Size:	1/4in
Number of Ports:	5/2

20.2.2 5/2 Pneumatic Control Valve

5/2 Pneumatic Control Valves shall conform to the following specifications:

Mounting Style:	Manifold
Function:	5/2
Connection Port:	G 1/8
Actuation Type:	Solenoid/Pilot
Solenoid Fitted:	Yes
Body Material:	Anodised Aluminium
Maximum Flow Rate:	600L/min
Solenoid Voltage:	24V dc
Power Consumption:	1.6W
Min Operating Press:	1.5bar
Min Operating Temp:	+5°C
Max Operating Temp:	+50°C
Number of Ports:	5/2
Thread Size:	1/8in
Thread Standard:	G
Max Operating Press:	8bar
Compatibility:	Must be 100% compatible with the ASCO 355 series manifolds

20.2.3 Sub Base Manifold Type 1

Sub Base Manifolds Type 1 shall conform to the following specifications:

Type:	Multiple Manifold
Body Material:	Light Alloy
Thread Size:	1/8in
Thread Standard:	G
Number of valves:	6
Compatibility:	100% complatible with the ASCO 520 series valves

20.2.4 3/2 Direct-acting solenoid valve

3/2 Direct-acting media-separated valves shall conform to the following specifications:

Function:	3/2 way direct - acting solenoid valve, normally open
Orifice:	2mm
Seal material:	NBR
Body and seat material:	Brass
Voltage/Frequency:	24Vac/50
Compatibility:	Must be 100% compatible with the Burkert 6324 manifolds

20.2.5 Sub Base Manifold Type 2

Sub Base Manifolds Type 2 shall conform to the following specifications:

Length:	143mm
Hole Spacing:	74mm
Material:	Anodized Brass
Compatibility:	100% compatible with the Burkert 41235 solenoid valves

20.2.6 Filter Regulators

Filter Regulators shall conform to the following specifications:

Port Connection:	G 1/4
Drain Type:	Automatic
Filtration Size:	5µm

Pressure Gauge Port:	1/8 in
Port Connection:	1/4 in
Max Operating Press:	10 bar
Min Operating Press:	0.1MPa
Bowl Material:	Polycarbonate
Port Connection:	G

20.3 ACTUATORS AND POSITIONERS

20.3.1 90 Degree actuators

90 Degree actuators shall conform to the following specifications:

Function:	2 Position Spring return
Rotation angle:	90 degrees
Air connection Std:	VDI/VDE 3845
Process Connection Std:	ISO 5211 double square
Body material:	Anodized aluminium

20.3.1.1 Type 1:

Air connection Std:	1/8"
Process Connection Std:	F05+F07
Torque at 5bar:	12.4 Nm

20.3.1.2 Type 2:

Air connection Std:	1/8"
Process Connection Std:	F05+F07
Torque at 5bar:	33.8 Nm

20.3.1.3 Type 3:

Air connection Std:	1/4"
Process Connection Std:	F10+F12
Torque at 5bar:	177 Nm

20.3.2 Switchboxes

Switch boxes shall conform to the following specifications:

Cable entry:	M20
Mounting Standard:	VDI/VDE3845 (NAMUR)
IP Rating:	IP 66/8
Switch Type:	Single Pole Double Throw
Rating:	250V 10A
Temperature:	-20 to 80 °C

Compatibility: must be 100% compatible with the 90 degree actuators

20.3.3 Valve positioners

Valve positioners shall conform to the following specifications:

Function:	Linear actuator, Auto-start with self-calibration
Supply pressure:	1.4 - 6 bar
Operation:	Double acting
Input signal:	4 - 20mA
Power supply:	Loop power
Cable entry:	M20
Pneumatic connection:	G1/4
Stroke:	8 to 260mm
Display:	LCD
Hysteresis:	0.3% FS
Non-linearity:	0.6% FS
Sensitivity:	0.1% FS
Repeatability:	0.2% FS
Dead band:	0,1 - 10% adjustable
Gauges:	3 standard gauges for double acting

Communication: Hart7, DTM for valve diagnostics and predictive maintenance
IP rating: IP66

21 I/O LINK EQUIPMENT

21.1 Master Panel Mount

The unit shall be mountable in a control panel. The unit shall have an operating voltage of 20 to 30Vdc. The unit shall be able to accept 8 digital inputs.The unit shall be able to accept 8 digital outputs. The unit shall have a communiations interface compatible with Ethernet and IO-Link. The unit shall be compatible with Modbus TCP. The unit shall be compatible with the existing IFM infrastructure.

21.2 Master External Mount

The unit shall be wall-mountable. The unit shall have an operating voltage of 20 to 30Vdc. The unit shall be able to accept 8 digital inputs. The unit shall be able to accept 4 digital outputs. The unit shall have a communiations interface compatible with Ethernet and IO-Link. The unit shall be compatible with Modbus TCP. The unit shall be compatible with the existing IFM infrastructure.

21.3 Converter 4 to 20mA Input

The unit shall have an operating voltage of 18 to 30Vdc. The unit shall be able to accept 1 analog 4 to 20mA input. The unit shall be able to accept 1 digital outputs. The unit shall have a communiations interface compatible with IO-Link. The unit shall have a 7-segment LED display. The unit shall be compatible with the existing IFM infrastructure.

21.4 Converter 4 to 20mA Output

The unit shall have an operating voltage of 18 to 30Vdc. The unit shall be able to accept 2 analog 4 to 20mA outputs. The unit shall have a communiations interface compatible with IO-Link. The unit shall be compatible with the existing IFM infrastructure.

21.5 Display Unit External Mount

The unit shall have an operating voltage of 18 to 30Vdc. The unit shall be able to display process values, texts and messages assigned from the controller. The unit shall have a communiations interface compatible with IO-Link. The unit shall have a 1.44-inch LED display. The unit shall be compatible with the existing IFM infrastructure.

22 INSTRUMENT POWER SUPPLY

The Instrument power supply shall include a UPS function and conform to the following specifications:
Input Voltage: 90 – 264 Vac / 127 – 370 Vdc
Output Voltage: 27.6 Vdc
Output Current: 4.5A
Type: DIN Rail Mount

24 LABOUR

Where key staff are not employment of tendering entity a memorandum of undertaking (MOU) is to be provided. Rates to include all incidental costs such as equipment, hand tools, power tools, PPE, safety equipment, medicals and all trade related training to comply with OSH Act 85 0f 1993 etc.

24.1 HMI PROGRAMMER

The requirement for the HMI programmer will be a minimum of a technician with a N6 course qualification or national diploma in Engineering or software related mid level programming. An OEM accredited training certificate will also suffice for the specific HMI on offer. OEM certification can also be in the name of the tendering entity. The individual shall have at least 5 years post qualification experience in HMI Programming. The programmer must have a laptop with the latest licenced software for the product on offer.

24.2 PLC PROGRAMMER

The requirement for the PLC programmer will be a minimum of a technician with a N6 course qualification or national diploma in Engineering or software related mid level programming. An OEM accredited training certificate will also suffice for the specific PLC on offer.OEM certification can also be in the name of the tendering entity The individual shall have at least 5 years post qualification experience in PLC programming. The programmer must have a laptop with the latest licenced software for the product on offer.

24.3 SCADA TECHNICIAN

The requirement for the SCADA technician will be a minimum of a technician with a N6 course qualification or national diploma in Engineering or Computer/software programming related qualification. An OEM accredited training certificate will also suffice for the specific SCADA on offer.OEM certification can also be in the name of the tendering entity. The individual shall have at least 5 years post qualification experience. The programmer must have a laptop with the latest licenced software for the product on offer.

24.4 TELEMETRY TECHNICIAN

The requirement for the Telemetry installation will be a minimum of a technician with a N6 course qualification or national diploma in Engineering or equivalent Communications related qualification. An OEM accredited training certificate will also suffice for the specific telemetry on offer. OEM certification can also be in the name of the tendering entity. The individual shall have at least 5 years post qualification experience in telemtry. The programmer must have a laptop with the latest licenced software for the product on offer where applicable.

24.5 INSTRUMENTATION TECHNICIAN/ARTISAN

The requirement for the Instrumentation technician/artisan will be a minimum of a technician with a N6 course qualification or national diploma in Electrical/Electronic/Instrumentation Engineering or an Instrumentation Mechanician trade. An OEM accredited training certificate will also suffice for the specific instrumentation on offer. OEM certification can also be in the name of the tendering entity. A calibration/verification certificate shall be provided after installation and setup. The individual shall have at least 5 years post qualification experience in Instrumentation installation an set up. The programmer must have a laptop with the latest licenced software for the product on offer where applicable. All instrumentation must be accompanied with a sanas accredited certificate when calibrated.

24.6 ELECTRICAL ARTISAN

Trade tested Electrician or Millwright – Electrical bias, with a minimum of 1 years' experience.

25 TRAINING RATES

25.1 TELEMETRY ONSITE TRAINING

Onsite training will be done by an OEM accredited service provider or OEM for the Telemetry on offer.

25.2 HMI ONSITE TRAINING

Onsite training will be done by an OEM accredited service provider or OEM for the HMI on offer.

25.3 PLC ONSITE TRAINING

Onsite training will be done by an OEM accredited service provider or OEM for the PLC on offer.

25.4 INSTRUMENTATION ONSITE TRAINING

Onsite training will be done by an OEM accredited service provider or OEM for the Instrument on offer.

25.5 SCADA ONSITE TRAINING

Onsite training will be done by an OEM accredited service provider ot the OEM for the SCADA on offer.

26 TASKS

Where key staff are not employment of tendering entity a memorandum of undertaking (MOU) is to be provided.

26.1 PORTABLE GAS MONITOR CALIBRATION

The calibration shall be done as per the OEM calibration procedure, using a calibration gas standard for CO, H2S, LEL and O2. The calibration gas standard shall be ISO/IEC 17025 traceable and the calibration workshop/laboratory must be ISO 9001 accredited for the calibration of gas monitors. Upon completion of calibration, a Certificate of Calibration shall be issued to meet ISO 9001 quality regulations.

26.2 MAGNETIC FLOWMETER VERIFICATION

The verification shall consist of an in-situ performance check to verify: transmitter operation, flowmeter insulation function and sensor magnetism function. The verification shall be performed using an external verification device, which is ISO 17025 traceable. Upon completion of the verification, a verification certificate shall be issued to meet ISO 9001 quality regulations.

26.3 MAGNETIC FLOWMETER QUALIFICATION

The qualification check for battery operated flow meters shall consist of an in-situ performance check to verify: transmitter operation, flowmeter insulation, sensor magnetism, as well as battery function. The qualification check shall be performed using a laptop with the required software. Upon completion of the qualification check, a qualification certificate shall be issued to meet ISO 9001 quality regulations.

26.4 ULTRASONIC OPEN CHANNEL FLOWMETER VERIFICATION

The verification shall consist of an in-situ performance check to verify: transmitter operation and configuration, sensor function and installation as well as flume inspection. The verification shall be performed using an external verification device, which is ISO 17025 traceable. Upon completion of the verification, a verification certificate shall be issued to meet ISO 9001 quality regulations.

27 TRANSPORT

27.1 TRANSPORTATION OF GOODS

The unit of measurement shall be a kilometre rate for the transport and delivery of materials or equipment into storage on site. The rate shall include all charges including overheads such as fuel, maintenance charges, hire and rental cost, insurances, licensing and registration and profit etc. The tenderer may use and base the transport rate per unit on the Automobile Association (AA) transport rates calculator.

27.2 TRAVELING

Traveling shall be quoted separately as a kilometre rate based on AA rates.

28 TRADE NAMES OR PROPRIETARY PRODUCTS

Tenderers/Suppliers must note that wherever this document refers to any particular trade mark, name, patent, design, type, specific origin or producer, such reference shall be deemed to be accompanied by the words “or equivalent”.

29 EMPLOYMENT OF SECURITY PERSONNEL

All security staff employed by the Supplier on behalf of the CCT or at any CCT property must be registered with Private Security Industry Regulatory Authority (PSiRA). Proof of such registration must be made available to the CCT or its agent, upon request.

30 FORMS FOR CONTRACT ADMINISTRATION

The Supplier shall complete, sign and submit with each invoice, the following:

a) Monthly Project Labour Report (described below)

The Monthly Project Labour Report must include details of all labour (including that of sub-contractors) that are South African citizens earning less than **R 460** per day, as adjusted from time to time (excluding any benefits), who are employed on a temporary or contract basis on this contract in the month in question.

In addition to the Monthly Project Labour Report the Supplier shall simultaneously furnish the CCT's Agent with copies of the employment contracts entered into with such labour, together with certified copies of identification documents, proof of attendance in the form of attendance register or timesheets as well as evidence of payments to such labour in the form of copies of payslips or payroll runs. If the worker is paid in cash or by cheque, this information must be recorded on the envelope and the worker must acknowledge receipt of payment by signing for it and proof of such acknowledgement shall be furnished to the CCT's Agent.

C.6 SPECIAL CONDITIONS OF CONTRACT

The following Special Conditions of Contract, referring to the National Treasury – Conditions of Contract (revised July 2010), are applicable to this agreement.

1. Definitions

Insert new clause 1.1A with the following:

1.1A "Commencement Date" means the date the Supplier confirms receipt from the Purchaser of 1 (one) complete, signed copy of the Contract, the *Schedule of Deviations* (if any).

1.1B "Conditions of Contract" means the general conditions of contract and special conditions of contract including all other contract data incorporated by reference.

Delete Clause 1.15 and substitute with the following

1.15 The word 'Goods' is to be replaced everywhere it occurs in the GCC with the phrase 'Goods and / or Services' which means all of the equipment, machinery, materials, services, products, consumables, etc. that the Supplier is required to deliver to the Purchaser under the agreement. This definition shall also be applicable, as the context requires, anywhere where the words "supplies" and "services" occurs in the GCC.

Delete Clause 1.19 and substitute with the following

1.19 The word 'Order' is to be replaced everywhere it occurs in the GCC with the words 'Purchase Order' which means the official purchase order authorised and released on the Purchaser's SAP System.

Delete Clause 1.21 and substitute with the following:

1.21 'Purchaser' means the City of Cape Town. The address of the Purchaser is 12 Hertzog Boulevard, Cape Town, 8001 (chosen domicilium citandi et executandi).

Add the following after Clause 1.25:

1.26 'Supplier' means the provider of Goods and / or Services with whom the Contract is concluded also referred to as "contractor" in the GCC.

1.27 "Intellectual Property" means any and all intellectual property rights of any nature anywhere in the world whether registered, registerable or otherwise, including patents, trademarks, registered designs and domain names, applications for any of the foregoing, trade or business names, copyright and rights in the nature of copyright, design rights, rights in databases, know-how, trade secrets and any other intellectual property rights which subsist in computer software, computer programs, websites, documents, information, techniques, business methods, drawings, logos, instruction manuals, lists and procedures and particulars of customers, marketing methods and procedures and advertising literature, including the "look and feel" of any websites

1.28 "Working Day" means Monday to Friday excluding weekends and Public Holidays (in the Republic of Sotuh Africa).

3. General Obligations

Delete Clause 3.2 in its entirety and replace with the following clauses.

3.2 The Parties will be liable to each other arising out of or in connection with any breach of the obligations detailed or implied in this contract, subject to clause 28.

3.3 If the Supplier is a joint venture, all parties in a joint venture or consortium shall be jointly and severally liable to the Purchaser in terms of the Contract and shall carry individually the minimum levels of insurance stated in the Contract, if any.

3.4 The Parties shall comply with all laws, regulations and bylaws of local or other authorities having jurisdiction regarding the Delivery of the Goods and/or Services and give all notices and pay all charges required by such authorities.

3.4.1 The Parties agree that this Contract shall also be subject to the CCT's Supply Chain Management Policy ("SCM Policy") that was applicable on the date the bid was advertised as amended from time to time. If the Purchaser adopts a new SCM Policy which contemplates that any clause therein would apply to the Contract emanating from this tender, such clause shall also be applicable to the Contract. Please refer to this document contained on the CCT's website.

3.4.2 Abuse of the supply chain management system is not permitted and may result in termination of the Contract, restriction of the Supplier, and/or the exercise by the CCT of any other remedies available to it as described in the SCM Policy or in law.

3.5 The Supplier shall:

3.5.1 Arrange for the documents listed below to be provided to the Purchaser prior to the issuing of the Purchase Order by the Purchaser and no later than the periods as set out in the Contract:

a) Proof of Insurance (Refer to Clause 11) or Insurance Broker's Warrantee,
b) Letter of good standing from the Compensation Commissioner, or a licensed compensation insurer (Refer to Clause 11),
c) Initial delivery programme, and
d) Other requirements as detailed in the Contract.

3.5.2 Only when notified of the acceptance of the bid on the Date of Commencement of Contract, the Supplier shall commence with and carry out the Delivery of the Goods and/or Services in accordance with the Contract, to the satisfaction, of the Purchaser.

3.5.3 Provide all of the necessary materials, labour, plant and equipment required for the delivery of the Goods and/or Servces including any temporary services that may be required.

3.5.4 Insure his workmen and employees against death or injury arising out of the delivery of the Goods.

3.5.5 Be continuously represented during the Delivery of the Goods and/or Services by a competent representative duly authorised to execute instructions.

3.5.6 In the event of a loss resulting in a claim against the insurance policies stated in clause 11, pay the first amount (excess) as required by the insurance policy.

3.5.7 Comply with all written instructions from the Purchaser subject to clause 18.

3.5.8 Complete and Deliver the goods within the period stated in clause 10, or any extensions thereof in terms of clause 21.

3.5.9 Make good at his own expense, all incomplete and defective Goods during the warranty period.

3.5.10 Pay to the Purchaser any penalty for delay as due on demand by the Purchaser. The Supplier hereby consents to such amounts being deducted from any payment due to the Supplier.

3.5.11 Comply with the provisions of the OHAS Act & all relevant regulations.

3.5.12 Comply with all laws relating to wages and conditions generally governing the employment of labour in the Cape Town area and any applicable Bargaining Council agreements.

3.5.13 Deliver the Goods in accordance with the Contract and with all reasonable care, diligence and skill in accordance with generally accepted professional techniques and standards.

3.6 The Purchaser shall:

3.6.1 Issue Purchaser Orders for the Goods and/or Services required under this Contract. No liability for payment will ensue for arising out of the Delivery of the Goods and/or Services, unless a Purchase Order

has been issued to the Supplier.

3.6.2 Make payment to the Supplier for the Goods and/or Services as set out herein.

3.6.3 Take possession of the Goods and /or Services upon Delivery by the Supplier.

3.6.4 Regularly inspect the Goods to establish that it is being delivered in compliance with the Contract.

3.6.5 Give any instructions and/or explanations and/or variations to the Supplier including any relevant advice to assist the Supplier to understand the Contract.

3.6.6 Grant or refuse any extension of time requested by the Supplier of the period stated in clause 10.

3.6.7 Inspect the Goods and/or Services to determine if, in the opinion of the Purchaser, it has been delivered in compliance with the Contract, alternatively in such a state that it can be properly used for the purpose for which it was intended.

3.6.8 Brief the Supplier and issue all documents, information, etc. in accordance with the contract.

5. Use of contract documents and information; inspection, copyright, confidentiality, etc.

Add the following after clause 5.4:

5.5 Copyright of all documents prepared by the Supplier in accordance with the relevant provisions of the Copyright Act (Act 98 of 1978) relating to the Contract shall be vested in the Purchaser. Where copyright is vested in the Supplier, the Purchaser shall be entitled to use the documents or copy them only for the purposes for which they are intended in regard to the agreement and need not obtain the Supplier's permission to copy it for such use. Where copyright is vested in the Purchaser, the Supplier shall not be liable in any way for the use of any of the information other than as originally intended in terms of the agreement and the Purchaser hereby indemnifies the Supplier against any claim which may be made against it by any person / entity, arising from the use of such documentation for other purposes.

The ownership of data and factual information collected by the Supplier and paid for by the Purchaser shall, after payment, vest with the Purchaser.

5.6 Publicity and publication
The Supplier shall not release public or media statements or publish material related to the services or agreement within two (2) years of Delivery of the Goods, without the written approval of the Purchaser, which approval shall not be unreasonably withheld.

5.7 Confidentiality
Both Parties shall keep all information obtained by them in the context of the agreement, confidential and shall not divulge it without the written approval of the other Party.

5.8 Intellectual Property

5.8.1 The Supplier acknowledges that it shall not acquire any right, title or interest in or to the Intellectual Property of the Purchaser.

5.8.2 The Supplier hereby assigns to the Purchaser, all Intellectual Property created, developed or otherwise brought into existence by it for the purposes of the agreement, unless the Parties expressly agree otherwise in writing.

5.8.3 The Supplier shall, and warrants that it shall:

5.8.3.1 Not be entitled to use the Purchaser's Intellectual Property for any purpose other than as contemplated in the agreement;

5.8.3.2 not modify, add to, change or alter the Purchaser's Intellectual Property, or any information or data related thereto, nor may the Supplier produce any product as a result of, including and/or arising from any such information, data and Intellectual Property, and in the event that it does produce any such product, the product shall be, and be deemed in law to be, owned by the Purchaser;

5.8.3.3 Not apply for or obtain registration of any domain name, trademark or design which is similar to any Intellectual Property of the Purchser;

5.8.3.4 Comply with all reasonable directions or instructions given to it by the Purchaser in relation to the form and manner of use of the CCT Intellectual Property, including without limitation, any brand guidelines which the Purchaser may provide to the Supplier from time to time;

5.8.3.5 Ensure that its employees, directors, members and contractors comply strictly with the provisions of this Clasue 5.5.8.4 above unless the Purchaser expressly agrees to the contrary, in writing and only after obtaining due internal authority for such agreement.

5.8.4 The Supplier represents and warrants to the Purchaser that, in providing Goods and/or Services for the duration of the agreement it will not infringe or make unauthorised use of the Intellectual Property rights of any third party and hereby indemnifies the Purchaser from any claims, liability, loss, damages, costs, and expenses arising from the infringement or unauthorised use by the Supplier of any third party's Intellectual Property rights.

5.8.5 Upon expiry of the contract period and in the event that the Contract is terminated, ended or is declared void, any and all of the Purchaser's Intellectual Property, and any and all information and data related thereto, shall be immediately handed over to the Purchaser by the Supplier and no copies thereof shall be retained by the Supplier unless the Purchaser expressly and in writing, after obtaining due internal authority, agrees otherwise.

Add the following after clause 5.8:

5.9 **Protection of Personal Information Act of 2013**

By submitting a tender to the Purchaser, (and by concluding any ensuing related agreement with the City of Cape Town, if applicable), the Tenderer thereby acknowledges and unconditionally agrees:

5.9.1 that the tenderer has been informed of the purpose of the collection and processing of its personal information as defined in the Protection of Personal Information Act of 2013 ("POPIA"), which, for the avoidance of doubt is for, and in relation to, the tender process and the negotiation, conclusion, performance and enforcement of the ensuing agreement, if applicable, as well as for the City of Cape Town's reporting purposes;

5.9.2 to the collection and processing of the tenderer's personal information by the City of Cape Town and agrees to make available to the City of Cape Town, all information reasonably required by the City of Cape Town for the above purposes;

5.9.3 that the personal information the City of Cape Town collects from the tenderer or about the tenderer may be further processed for other activities and/or purposes which are lawful, reasonable, relevant and not excessive in relation to the purposes set out above, for which it was originally collected;

5.9.4 that, the tenderer indemnifies the City of Cape Town and its officials, employees, and directors and undertakes to keep the City of Cape Town and its officials, employees, and directors indemnified in respect of any claim, loss, demands, liability, costs and expenses of whatsoever nature which may be made against the City of Cape Town (including the costs incurred in defending or contesting any such claim) in relation to the tenderer or the tenderer's employees', representatives' and/or sub-Suppliers' non-compliance with POPIA and/or the City of Cape Town's failure to obtain the tenderer's consent or to notify the tenderer of the reason for the processing of the tenderer's personal information;

5.9.5 to the disclosure of the tenderer's personal information by the City of Cape Town to any third party, where the City of Cape Town has a legal or contractual obligation to disclose such personal information to the third party (or a legitimate interest exits therein);

5.9.6 that, under POPIA, the tenderer may request to access, confirm, request the correction, destruction, or deletion of, or request a description of, personal information held by the City of Cape Town in relation to you, subject to applicable law; and

that under POPIA, subject to applicable law, the tenderer also has the right to be notified of a personal information breach and the right to object to, or restrict, the City of Cape Town's processing of its personal information.

5.10 **PERFORMANCE MONITORING**

5.10.1 As required by section 116(2)(b) of the Local Government: Municipal Financial Management Act 56 of 2003, the CCT shall monitor the performance of the Supplier on at least a monthly basis, and the Supplier agrees to provide the CCT with its full cooperation in this regard.

7. Performance Security

Not applicable

8. Inspections, tests and analyses

Delete Clause 8.2 and substitute with the following:

8.2 If it is a bid condition that Goods and/or Services to be produced or services to be rendered should at any stage during production or execution or on completion be subject to inspection, the premises of the bidder or Supplier shall be open, at all reasonable hours, for inspection by a representative of the Purchaser or an organisation acting on behalf of the Purchaser.

10. Delivery and documents

Delete clauses 10.1 and 10.2 and replace with the following:

10.1 Delivery of the goods shall be made by the Supplier in accordance with the terms specified in the contract. The time for Delivery of the goods shall be the date as stated on the Purchase Order. In the case of agreements for Delivery of goods in terms of framework or panel agreements, Purchase Orders for the supply and delivery of goods may be raised up until the expiry of a framework or panel agreement, provided that the goods can be delivered within 30 (thirty) days of expiry of the framework or panel agreement. In this context, the "goods" does not include services and carries its ordinary meaning. All Purchase Orders other than for the supply and Delivery of goods (i.e. supply of services, professional services or constructions works), must be completed prior to the expiry of the contract period.

10.2 The Purchaser shall determine, in its sole discretion, whether the Goods and/or Services have been delivered in compliance with the Contract, alternatively in such a state that it can be properly used for the purpose for which it was intended. When the Purchaser determines that the Goods and/or Services have been satisfactorily delivered, the Purchaser must issue an appropriate certification, or written approval, to that effect. Invoicing may only occur, and must be dated, on or after the date of such written acceptance of the Goods.

11. Insurance

Add the following after clause 11.1:

11.2 Without limiting the obligations of the Supplier in terms of this Contract, the Supplier shall effect and maintain the following additional insurances:

11.2.1 Public liability insurances, in the name of the Supplier, covering the Supplier and the Purchaser against liability for the death of or injury to any person, or loss of or damage to any property, arising out of or in the course of this Contract, in an amount not less than **[R20 million]** for any single claim;

11.2.2 Motor Vehicle Liability Insurance, in respect of all vehicles owned and / or leased by the Supplier, comprising (as a minimum) "Balance of Third Party" Risks including Passenger Liability Indemnity;

11.2.3 Registration / insurance in terms of the Compensation for Occupational Injuries and Disease Act, Act 130 of 1993. This can either take the form of a certified copy of a valid Letter of Good Standing issued by the Compensation Commissioner, or proof of insurance with a licenced compensation insurer, from either the Supplier's broker or the insurance company itself (see the Pro Forma Insurance Broker's Warranty).

11.2.4 In the event of under insurance or the insurer's repudiation of any claim for whatever reason, the Purchaser will retain its right of recourse against the Supplier.

11.3 The Supplier shall be obliged to furnish the Purchaser with proof of such insurance as the Purchaser may require from time to time for the duration of this Contract. Evidence that the insurances have been effected in terms of this clause, shall be either in the form of an insurance broker's warranty worded precisely as per the pro forma version contained in the Pro forma Insurance Broker's Warranty or copies of the insurance policies.

15. Warranty

Add to Clause 15.2:

15.2 The warranty for this Contract shall remain valid for six (6) months from date of Delivery of the Goods and/or Services.

16. Payment

Delete Clause 16.1 in its entirety and replace with the following:

16.1 Payment of invoices will be made:

16.1.1 Within 30 (thirty) days of receiving the relevant invoice or statement from the Supplier, unless otherwise prescribed for certain categories of expenditure or specific contractual requirements in accordance with any other applicable policies of the Purchaser.

16.1.2 Notwithstanding anything contained above, the Purchaser shall not be liable for payment of any invoice that pre-dates the date of delivery of any Goods and/or Services.

Delete Clause 16.2 in its entirety and replace with the following:

16.2 The Supplier shall furnish the purchaser's Accounts Payable Department with an original tax invoice, clearly showing the amount due in respect of each and every claim for payment.

Add the following after clause 16.4

16.5 Notwithstanding any amount stated on the Purchase Order, the Supplier shall only be entitled to payment for Goods and/or Services actually delivered in terms of the Specification and Drawings, or any variations thereof made in accordance with clause 18. Any contingency sum included shall be for the sole use, and at the discretion, of the Purchaser.

16.6 The Purchaser will only make advanced payments to the Supplier in strict compliance with the terms and conditions as contained in the Pro forma Advanced Payment Guarantee and only once the authenticity of such guarantee has been verified by the Purchaser's Treasury Department.

17. Prices

Add the following after clause 17.1

17.2 If as a result of an award of a contract beyond the original tender validity period, the contract execution will be completed beyond a period of twelve (12) months from the expiry of the original tender validity period, then the contract may be subject to contract price adjustment for that period beyond such twelve (12) months. An appropriate contract price adjustment formula will be determined by the Purchaser delegated authority if such was not included in the bid documents.

17.3 If as a result of any extension of time granted, the contract execution will be completed beyond a period of twelve (12) months from the expiry of the original tender validity period, then contract price adjustment may apply to that period beyond such twelve (12) months. An appropriate contract price adjustment formula will be determined by the Director: Supply Chain Management if such was not included in the bid document.

17.4 The prices for the goods and/or Services delivered and services performed shall be subject to contract price adjustment in terms of Schedule F.1 Contract Price Adjustment and/or Rate of Exchange Variations.

18. Contract Amendments

Delete the heading of clause 18 and replace with the following:

18. Contract Amendments and Variations

Add the following to clause 18.1:

Variations means changes to the Goods and/or Services, extension of the contract period or increases in the value of the Contract as a result of written instructions issued by the Purchaser to the Supplier. Such changes are subject to prior approval by the Purchaser's delegated authority. Should the Supplier deliver any Goods not described in a written instruction from the Purchaser, the Purchaser's liability for payment shall no arise until such time as the change has been duly approved and such approval communicated to the Purchaser.

20. Subcontracts

Add the following after clause 20.1:

20.2 The Supplier shall be liable for the acts, defaults and negligence of any subcontractor, his agents or employees as fully as if they were the acts, defaults or negligence of the Supplier.

20.3 Any appointment of a subcontractor shall not amount to a contract between the Purchaser and the subcontractor, or a responsibility or liability on the part of the Purchaser to the subcontractor and shall not relive the Supplier from any liability or obligation under the Contract.

21. Delays in the supplier's performance

Delete Clause 21.2 in its entirety and replace with the following:

21.2 If at any time during the performance of obligations contained in the Contract the Supplier or its subcontractors should encounter conditions beyond their reasonable control which impede the timely delivery of the Goods and/or Services, the Supplier shall notify the Purchaser in writing, within 7 (seven) days of first having become aware of these conditions, of the facts of the delay, its cause(s) and its probable duration. As soon as practicable after receipt of the Supplier's notice, the Purchaser shall evaluate the situation, and may at his discretion extend the time for Delivery.

Where additional time is granted, the Purchaser shall also determine whether or not the Supplier is entitled to payment for additional costs in respect thereof. The principle to be applied in this regard is that where the Purchaser or any of its agents are responsible for the delay, reasonable costs shall be paid. In respect of delays that were beyond the reasonable control of both the Supplier and the Purchaser, additional time only (no costs) will be granted.

The Purchaser shall notify the Supplier in writing of his decision(s) in the above regard.

21.3 No provision in this Contract shall be deemed to prohibit the obtaining of Goods and/or Services from a national department, provincial department, or a local authority.

22. Penalties

Delete clause 22.1 and replace with the following:

22.1 Subject to GCC Clause 25, if the Supplier fails to deliver any or all of the Goods and/or Services within the period(s) specified in the Contract, the Purchaser shall, without prejudice to its other remedies under the Contract, deduct from amounts payable, as a penalty, a sum as stated herein for each day of the delay until actual Delivery or performance.

The penalty for this contract shall be **R1 500 per day, counting from 3 days after the promised delivery date.**

22.2 The Purchaser shall, without prejudice to its other remedies under the contract, deduct from amounts payable, financial penalties as contained on the Preference Schedule for breaches of the conditions upon which preference points were awarded.

23. Termination for default

Delete the heading of clause 23 and replace with the following:

23. Termination

Add the following to the end of clause 23.1:

If the Supplier fails to remedy the breach in terms of such notice.

Add the following after clause 23.7:

23.8 In addition to the grounds for termination due to default by the Supplier, the Contract may also be terminated:

23.8.1 Upon the death of the Supplier who was a Sole Proprietor, or a sole member of a Close Corporation, in which case the contract will terminate forthwith.

23.8.2 If the Parties, by mutual agreement, terminate the Contract.

23.8.3 If a material irregularity vitiates the procurement process leading to the conclusion of the Contract, rendering the procurement process and the conclusion of the resulting Contract unfair, inequitable, non-transparent, uncompetitive or not cost-effective the Contract may be terminated by the Purchaser (upon conclusion of applicable processes by the City Manager as described in the Purchaser's SCM Policy).

23.8.4 Reputational risk or harm to the Purchaser

The Purchaser, without prejudice to any other remedy for breach of contract, by written notice of default sent to the Supplier, may terminate the contract if the implementation of the contract may result in reputational risk or harm to the Purchaser as a result of (inter alia):

a) reports of poor governance and/or unethical behaviour;
b) association with known notorious individuals and family of notorious individuals;
c) poor performance issues, known to the Purchaser
d) negative social media reports;
e) adverse assurance (e.g. due diligence) report outcomes; or
f) circumstances where the relevant vendor has employed, or is directed by, anyone who was previously employed in the service of the state (as defined in clause 1.49), where the person is or was negatively implicated in any SCM irregularity.

By or in relation to the Supplier, the Contract may be terminated by the Purchaser after providing notice to the Supplier.

23.9 If the Contract is terminated in terms of clause 23.8, all obligations that were due and enforceable prior to the date of the termination, must be performed by the relevant Party.

26. Termination for insolvency

Delete clause 26.1 and replace with the following:

26.1 In the event of the Supplier becoming bankrupt or otherwise insolvent the Purchaser may elect to:

26.1.1 At any time, terminate the Contract by giving written notice to the Supplier; or
26.1.2 Accept a Supplier's proposal (via the liquidator) to render delivery utilising the appropriate contractual mechanisms or takes steps to ensure its rights are protected and any negative impact on service delivery is mitigated.

26.2 In the event of the Purchaser electing to cancel the Contract in accordance with clause 26.1.1 above, the Purchaser shall make payment of all verified and signed off invoices. In the event of there being any dispute in respect of any outstanding invoices such dispute shall be dealt with in accordance with the dispute resolution mechanism in the Contract.

27. Settlement of Disputes

Amend clause 27.1 as follows:

27.1 If any dispute or difference of any kind whatsoever, with the exception of termination in terms of clause 23 arises between the Purchaser and the Supplier in connection with or arising out of the Contract, the Parties shall make every effort to resolve such dispute or difference amicably, by mutual consultation.

Delete Clause 27.2 in its entirety and replace with the following:

27.2 Should the Parties fail to resolve any dispute by way of mutual consultation, either party shall be entitled to refer the matter for mediation before an independent and impartial person appointed by the City Manager in accordance with Regulation 50(1) of the Local Government: Municipal Finance Management Act, 56 of 2003 – Municipal Supply Chain Management Regulations (Notice 868 of 2005). Such referral shall be done by either party giving written notice to the other of its intention to commence with mediation. No mediation may be commenced unless such notice is given to the other party.

Irrespective whether the mediation resolves the dispute, the Parties shall bear their own costs concerning the mediation and share the costs of the mediator and related costs equally.

The mediator shall agree the procedures, representation and dates for the mediation process with the Parties. The mediator may meet the Parties together or individually to enable a settlement.

Where the Parties reach settlement of the dispute or any part thereof, the mediator shall record such agreement and on signing thereof by the Parties the agreement shall be final and binding.

Save for reference to any portion of any settlement or decision which has been agreed to be final and binding on the Parties, no reference shall be made by or on behalf of either party in any subsequent court proceedings, to any outcome of an amicable settlement by mutual consultation, or the fact that any particular evidence was given, or to any submission, statement or admission made in the course of amicable settlement by mutual consultation or mediation.

28. Limitation of Liability

Delete clause 28.1 (a) and (b) and replace with the following:

(a) notwithstanding any provision to the contrary contained in this contract, neither the supplier nor any of its officers, directors, employees, agents contractors, consultants or other representatives shall be liable to the purchaser, whether in contract, tort, or otherwise, for any indirect, incidental, special or consequential loss or damage of any kind, including without limitation the loss of use, loss of production, or loss of profits or interest costs, loss of goodwill, lost or damaged data or software, costs of substitute products/services and/or loss of business or business opportunities (whether foreseeable or unforeseeable), provided that this exclusion shall not apply to any obligation of the supplier to pay penalties and/or damages to the purchaser;

(b) the aggregate liability of the Supplier to the Purchaser, whether under the Contract, in tort or otherwise, shall not exceed the sums insured in terms of clause 11 in respect of insurable events,

or where no such amounts are stated, to an amount equal to twice the Contract price, provided that this limitation shall not apply to the cost of repairing or replacing defective equipment.

Add the following after clause 28.1:

28.2 Without detracting from, and in addition to, any of the other indemnities in this Contract, the Supplier shall be solely liable for and hereby indemnifies and holds harmless the Purchaser against all claims, charges, damages, costs, actions, liability, demands and/or proceedings and expense in connection with:

a) personal injury or loss of life to any individual;
b) loss of or damage to property;

arising from, out of, or in connection with the performance by the Supplier in terms of this Contract, save to the extent caused by the gross negligence or wilful misconduct of the Purchaser.

28.3 The Supplier and/or its employees, agents, concessionaires, suppliers, sub-contractors or customers shall not have any claim of any nature against the purchaser for any loss, damage, injury or death which any of them may directly or indirectly suffer, whether or not such loss, damages, injury or death is caused through negligence of the Purchaser or its agents or employees.

28.4 Notwithstanding anything to the contrary contained in this Contract, under no circumstances whatsoever, including as a result of its negligent (including grossly negligent) acts or omissions or those of its servants, agents or contractors or other persons for whom in law it may be liable, shall any party or its servants (in whose favour this constitutes a *stipulatio alteri*) be liable for any indirect, extrinsic, special, penal, punitive, exemplary or consequential loss or damage of any kind whatsoever, whether or not the loss was actually foreseen or reasonably foreseeable), sustained by the other party, its directors and/or servants, including but not limited to any loss of profits, loss of operation time, corruption or loss of information and/or loss of contracts.

28.5 Each party agrees to waive all claims against the other insofar as the aggregate of compensation which might otherwise be payable exceeds the aforesaid maximum amounts payable.

31. Notices

Delete clauses 31.1 and 31.2 and replace with the following:

31.1 Any notice, request, consent, approvals or other communications made between the Parties pursuant to the Contract shall be in writing and forwarded to the addresses specified in the Contract and may be given as set out hereunder and shall be deemed to have been received when:

a) hand delivered – on the day delivery of delivery or the next Working Day,
b) sent by registered mail – five (5) Working Days after mailing,
c) sent by email or telefax – one (1) Working Day after transmission.

32. Taxes and Duties

Delete the final sentence of 32.3 and replace with the following:

. In this regard, it is the responsibility of the Tenderer to submit evidence in the form of a valid Tax Compliance Status PIN issued by SARS to the CCT at the Supplier Management Unit located within the Supplier Management / Registration Office, 2nd Floor (Concourse Level), Civic Centre, 12 Hertzog Boulevard, Cape Town (Tel 021 400 9242/3/4/5), or included with this tender.

Add the following after clause 32.3:

32.4 The VAT registration number of the CCT is 4500193497.

ADDITIONAL CONDITIONS OF CONTRACT

Add the following Clause after Clause 34:

35. Reporting Obligations

35.1 The Supplier shall complete, sign and submit with each delivery note, all the documents as required in the Specifications including Monthly Project Labour Reports (Annexure B). Any failure in this regard may result in a delay in the processing of payments.

36. Local Workshop

36.1 The supplier must within 30 days from commencement of the contract, establish a Workshop/Office Facility within the Geographical Boundaries of the City of Cape which meets the requirements necessary for the supplier to render the services contemplated in this contract and to meet its obligations.

C.7 GENERAL CONDITIONS OF CONTRACT

(National Treasury - General Conditions of Contract (revised July 2010))

TABLE OF CLAUSES

1. Definitions

1. The following terms shall be interpreted as indicated:

1.1 'Closing time' means the date and hour specified in the bidding documents for the receipt of bids.

1.2 'Contract' means the written agreement entered into between the purchaser and the supplier, as recorded in the contract form signed by the Parties, including all attachments and appendices thereto and all documents incorporated by reference therein.

1.3 'Contract price' means the price payable to the supplier under the contract for the full and proper performance of his or her contractual obligations.

1.4 'Corrupt practice' means the offering, giving, receiving, or soliciting of anything of value to influence the action of a public official in the procurement process or in contract execution.

1.5 'Countervailing duties' are imposed in cases in which an enterprise abroad is subsidised by its government and encouraged to market its products internationally.

1.6 'Country of origin' means the place where the goods were mined, grown or produced or from which the services are supplied. Goods are produced when, through manufacturing, processing or substantial and major assembly of components, a commercially recognised new product results that is substantially different in basic characteristics or in purpose or utility from its components.

1.7 'Day' means calendar day.

1.8 'Delivery' means delivery in compliance with the conditions of the contract or order.

1.9 'Delivery ex stock' means immediate delivery directly from stock actually on hand.

1.10 'Delivery into consignee's store or to his site' means delivered and unloaded in the specified store or depot or on the specified site in compliance with the conditions of the contract or order, the supplier bearing all risks and charges involved until the supplies are so delivered and a valid receipt is obtained.

1.11 'Dumping' occurs when a private enterprise abroad markets its goods on its own initiative in the RSA at lower prices than that of the country of origin, and which action has the potential to harm the local industries in the RSA.

1.12 'Force majeure' means an event beyond the control of the supplier, not involving the supplier's fault or negligence, and not foreseeable. Such events may include, but are not restricted to, acts of the purchaser in its sovereign capacity, wars or revolutions, fires, floods, epidemics, quarantine restrictions and freight embargoes.

1.13 'Fraudulent practice' means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of any bidder, and includes collusive practice among bidders (prior to or after bid submission) designed to establish bid prices at artificial, non-competitive levels and to deprive the bidder of the benefits of free and open competition.

1.14 'GCC' means the General Conditions of Contract.

1.15 'Goods' means all of the equipment, machinery, and/or other materials that the supplier is required to supply to the purchaser under the contract.

1.16 'Imported content' means that portion of the bidding price represented by the cost of components, parts or materials which have been or are still to be imported (whether by the supplier or his subcontractors) and
which costs are inclusive of the costs abroad, plus freight and other direct importation costs such as landing costs, dock dues, import duty, sales duty or other similar tax or duty at the South African place of entry as well as transportation and handling charges to the factory in the Republic where the supplies covered by the bid will be manufactured.

1.17 'Local content' means that portion of the bidding price which is not included in the imported content, provided that local manufacture does take place.

1.18 'Manufacture' means the production of products in a factory using labour, materials, components and machinery, and includes other, related value-adding activities.

1.19 'Order' means an official written order issued for the supply of goods or works or the rendering of a service.

1.20 'Project site', where applicable, means the place indicated in bidding documents.

1.21 'Purchaser' means the organisation purchasing the goods.

1.22 'Republic' means the Republic of South Africa.

1.23 'SCC' means the Special Conditions of Contract.

1.24 'Services' means those functional services ancillary to the supply of the goods, such as transportation and any other incidental services, such as installation, commissioning, provision of technical assistance, training, catering, gardening, security, maintenance, and other such obligations of the supplier covered under the contract.

1.25 'Written' or 'in writing' means handwritten in ink or any form of electronic or mechanical writing.

2. Application

2.1 These general conditions are applicable to all bids, contracts and orders, including bids for functional and professional services, sales, hiring, letting and the granting or acquiring of rights, but excluding immovable property, unless otherwise indicated in the bidding documents.

2.2 Where applicable, special conditions of contract are also laid down to cover specific supplies, services or works.

2.3 Where such special conditions of contract are in conflict with these general conditions, the special conditions shall apply.

3. General

3.1 Unless otherwise indicated in the bidding documents, the purchaser shall not be liable for any expense incurred in the preparation and submission of a bid. Where applicable, a non-refundable fee for documents may be charged.

3.2 With certain exceptions, invitations to bid are only published in the Government Tender Bulletin. The Government Tender Bulletin may be obtained directly from the Government Printer, Private Bag X85, Pretoria 0001, or accessed electronically from www.treasury.gov.za.

4. Standards

4.1 The goods supplied shall conform to the standards mentioned in the bidding documents and specifications.

5. Use of contract documents and information; inspection.

5.1 The supplier shall not, without the purchaser's prior written consent, disclose the contract, or any provision thereof, or any specification, plan, drawing, pattern, sample, or information furnished by or on behalf of the purchaser in connection therewith, to any person other than a person employed by the supplier in the performance of the contract. Disclosure to any such employed person shall be made in confidence and shall extend only as far as may be necessary for the purposes of such performance.

5.2 The supplier shall not, without the purchaser's prior written consent, make use of any document or information mentioned in GCC clause 5.1, except for purposes of performing the contract.

5.3 Any document, other than the contract itself, mentioned in GCC clause 5.1 shall remain the property of the purchaser and shall be returned (all copies) to the purchaser on completion of the supplier's performance under the contract if so required by the purchaser.

5.4 The supplier shall permit the purchaser to inspect the supplier's records relating to the performance of the supplier and to have them audited by auditors appointed by the purchaser, if so required by the purchaser.

6. Patent rights

6.1 The supplier shall indemnify the purchaser against all third-party claims of infringement of patent, trademark, or industrial design rights arising from the use of the goods or any part thereof by the purchaser.

7. Performance Security

7.1 Within 30 (thirty) days of receipt of the notification of contract award, the successful bidder shall furnish to the purchaser the performance security of the amount specified in the SCC.

7.2 The proceeds of the performance security shall be payable to the purchaser as compensation for any loss resulting from the supplier's failure to complete his obligations under the contract.

1.3 The performance security shall be denominated in the currency of the contract or in a freely convertible currency acceptable to the purchaser, and shall be in one of the following forms:

a) a bank guarantee or an irrevocable letter of credit issued by a reputable bank located in the purchaser's country or abroad, acceptable to the purchaser, in the form provided in the bidding documents or another form acceptable to the purchaser; or
b) A cashier's or certified cheque.

7.4 The performance security will be discharged by the purchaser and returned to the supplier not later than 30 (thirty) days following the date of completion of the supplier's performance obligations under the contract, including any warranty obligations, unless otherwise specified in the SCC.

8. Inspections, tests and analyses

8.1 All pre-bidding testing will be for the account of the bidder.

8.2 If it is a bid condition that supplies to be produced or services to be rendered should at any stage during production or execution or on completion be subject to inspection, the premises of the bidder or contractor shall be open, at all reasonable hours, for inspection by a representative of the Department or an organisation acting on behalf of the Department.

8.3 If there are no inspection requirements indicated in the bidding documents and no mention of such is made in the contract, but during the contract period it is decided that inspections shall be carried out, the purchaser shall itself make the necessary arrangements, including payment arrangements with the testing authority concerned.

8.4 If the inspections, tests and analyses referred to in clauses 8.2 and 8.3 show the supplies to be in accordance with the contract requirements, the cost of the inspections, tests and analyses shall be defrayed by the purchaser.

8.5 Where the supplies or services referred to in clauses 8.2 and 8.3 do not comply with the contract requirements, irrespective of whether such supplies or services are accepted or not, the cost in connection with these inspections, tests or analyses shall be defrayed by the supplier.

8.6 Supplies and services which are referred to in clauses 8.2 and 8.3 and which do not comply with the contract requirements may be rejected.

8.7 Any contract supplies may on or after delivery be inspected, tested or analysed and may be rejected if found not to comply with the requirements of the contract. Such rejected supplies shall be held at the cost and risk of the supplier, who shall, when called upon, remove them immediately at his own cost and forthwith substitute them with supplies which do comply with the requirements of the contract. Failing such removal, the rejected supplies shall be returned at the suppliers cost and risk. Should the supplier fail to provide the substitute supplies forthwith, the purchaser may, without giving the supplier further opportunity to substitute the rejected supplies, purchase such supplies as may be necessary at the expense of the supplier.

8.8 The provisions of clauses 8.4 to 8.7 shall not prejudice the right of the purchaser to cancel the contract on account of a breach of the conditions thereof, or to act in terms of Clause 23 of the GCC.

9. Packing

9.1 The supplier shall provide such packing of the goods as is required to prevent their damage or deterioration during transit to their final destination, as indicated in the contract. The packing shall be sufficient to withstand, without limitation, rough handling during transit and exposure to extreme temperatures, salt and precipitation during transit, and open storage. Packing, case size and weights shall take into consideration, where appropriate, the remoteness of the goods' final destination and the absence of heavy handling facilities at all points in transit.

9.2 The packing, marking, and documentation within and outside the packages shall comply strictly with such special requirements as shall be expressly provided for in the contract, including additional requirements, if any, specified in the SCC, and in any subsequent instructions ordered by the purchaser.

10. Delivery and documents

10.1 Delivery of the goods shall be made by the supplier in accordance with the terms specified in the contract. The details of shipping and/or other documents to be furnished by the supplier are specified in the SCC.

10.2 Documents to be submitted by the supplier are specified in the SCC.

11. Insurance

11.1 The goods supplied under the contract shall be fully insured, in a freely convertible currency, against loss or damage incidental to manufacture or acquisition, transportation, storage and delivery in the manner specified in the SCC.

12. Transportation

12.1 Should a price other than an all-inclusive delivered price be required, this shall be specified in the SCC.

13. Incidental Services

13.1 The supplier may be required to provide any or all of the following services, including additional services (if any) specified in the SCC:

(a) performance or supervision of on-site assembly, and/or commissioning of the supplied goods;
(b) furnishing of tools required for the assembly and/or maintenance of the supplied goods;
(c) furnishing of a detailed operations and maintenance manual for each appropriate unit of the supplied goods;
(d) performance or supervision or maintenance and/or repair of the supplied goods, for a period of time agreed by the Parties, provided that this service shall not relieve the supplier of any warranty obligations under this contract; and
(e) training of the purchaser's personnel, at the supplier's plant and/or on-site, in assembly, start-up, operation, maintenance, and/or repair of the supplied goods.

13.2 Prices charged by the supplier for incidental services, if not included in the contract price for the goods, shall be agreed upon in advance by the Parties and shall not exceed the prevailing rates charged to other Parties by the supplier for similar services.

14. Spare parts

14.1 As specified in the SCC, the supplier may be required to provide any or all of the following materials, notifications, and information pertaining to spare parts manufactured or distributed by the supplier:

(a) such spare parts as the purchaser may elect to purchase from the supplier, provided that this election shall not relieve the supplier of any warranty obligations under the contract; and
(b) in the event of termination of production of the spare parts:

(i) Advance notification to the purchaser of the pending termination, in sufficient time to permit the purchaser to procure needed requirements; and

(ii) following such termination, furnishing at no cost to the purchaser, the blueprints, drawings, and specifications of the spare parts, if requested.

15. Warranty

15.1 The supplier warrants that the goods supplied under the contract are new, unused, of the most recent or current models, and that they incorporate all recent improvements in design and materials unless provided otherwise in the contract. The supplier further warrants that all goods supplied under this contract shall have no defect arising from design, materials, or workmanship (except when the design and/or material is required by the purchaser's specifications), or from any act or omission of the supplier, that may develop under normal use of the supplied goods in the conditions prevailing in the country of final destination.

15.2 This warranty shall remain valid for 12 (twelve) months after the goods, or any portion thereof, as the case may be, have been delivered to and accepted at the final destination indicated in the contract, or for 18 (eighteen) months after the date of shipment from the port or place of loading in the source country, whichever period concludes earlier, unless specified otherwise in the SCC.

15.3 The purchaser shall notify the supplier promptly, in writing, of any claims arising under this warranty.

15.4 Upon receipt of such notice, the supplier shall, within the period specified in the SCC and with all reasonable speed, repair or replace the defective goods or parts thereof, without costs to the purchaser.

15.5 If the supplier, having been notified, fails to remedy the defect(s) within the period specified in the SCC, the purchaser may proceed to take such remedial action as may be necessary, at the supplier's risk and expense and without prejudice to any other rights which the purchaser may have against the supplier under the contract.

16. Payment

16.1 The method and conditions of payment to be made to the supplier under this contract shall be specified in the SCC.

16.2 The supplier shall furnish the purchaser with an invoice accompanied by a copy of the delivery note and upon fulfilment of any other obligations stipulated in the contract.

16.3 Payments shall be made promptly by the purchaser, but in no case later than 30 (thirty) days after submission of an invoice or claim by the supplier.

16.4 Payment will be made in Rand unless otherwise stipulated in the SCC.

17. Prices

17.1 Prices charged by the supplier for goods delivered and services performed under the contract shall not vary from the prices tendered by the supplier in his bid, with the exception of any price adjustments authorized in the SCC or in the purchaser's request for bid validity extension, as the case may be.

18. Contract Amendments

18.1 No variation in or modification of the terms of the contract shall be made except by written amendment signed by the Parties concerned.

19. Assignment

19.1 The supplier shall not assign, in whole or in part, its obligations to perform under the contract, except with the purchaser's prior written consent.

20. Subcontracts

20.1 The supplier shall notify the purchaser in writing of all subcontracts awarded under this contract if not already specified in the bid. Such notification, in the original bid or later, shall not relieve the supplier from any liability or obligation under the contract.

21. Delays in the supplier's performance

21.1 Delivery of the goods and performance of services shall be made by the supplier in accordance with the time schedule prescribed by the purchaser in the contract.

21.2 If at any time during the performance of the contract, the supplier or its subcontractor(s) should encounter conditions impeding timely delivery of the goods and performance of services, the supplier shall promptly notify the purchaser in writing of the fact of the delay, its likely duration and its cause(s). As soon as practicable after receipt of the supplier's notice, the purchaser shall evaluate the situation and may at his or her discretion extend the supplier's time for performance, with or without the imposition of penalties, in which case the extension shall be ratified by the Parties by amendment of contract.

21.3 No provision in a contract shall be deemed to prohibit the obtaining of supplies or services from a national department, provincial department, or a local authority.

21.4 The right is reserved to procure, outside of the contract, small quantities of supplies; or to have minor essential services executed if an emergency arises, or the supplier's point of supply is not situated at or near the place where the supplies are required, or the supplier's services are not readily available.

21.5 Except as provided under GCC Clause 25, a delay by the supplier in the performance of its delivery obligations shall render the supplier liable to the imposition of penalties, pursuant to GCC Clause 22, unless an extension of time is agreed upon pursuant to GCC Clause 21.2 without the application of penalties.

21.6 Upon any delay beyond the delivery period in the case of a supplies contract, the purchaser shall, without cancelling the contract, be entitled to purchase supplies of a similar quality and up to the same quantity in
substitution of the goods not supplied in conformity with the contract and to return any goods delivered later at the supplier's expense and risk, or to cancel the contract and buy such goods as may be required to complete the contract and, without prejudice to his other rights, be entitled to claim damages from the supplier.

22. Penalties

22.1 Subject to GCC Clause 25, if the supplier fails to deliver any or all of the goods or to perform the services within the period(s) specified in the contract, the purchaser shall, without prejudice to its other remedies under the contract, deduct from the contract price, as a penalty, a sum calculated on the delivered price of the delayed goods or unperformed services, using the current prime interest rate, calculated for each day of the delay until actual delivery or performance. The purchaser may also consider termination of the contract pursuant to GCC Clause 23.

23. Termination for default

23.1 The purchaser, without prejudice to any other remedy for breach of contract, by written notice of default sent to the supplier, may terminate this contract in whole or in part:

(a) if the supplier fails to deliver any or all of the goods within the period(s) specified in the contract, or within any extension thereof granted by the purchaser pursuant to GCC Clause 21.2;
(b) if the supplier fails to perform any other obligation(s) under the contract; or
(c) if the supplier, in the judgment of the purchaser, has engaged in corrupt or fraudulent practices in competing for or in executing the contract.

23.2 In the event the purchaser terminates the contract in whole or in part, the purchaser may procure, upon such terms and in such manner as it deems appropriate, goods, works or services similar to those undelivered, and the supplier shall be liable to the purchaser for any excess costs for such similar goods, works or services. However, the supplier shall continue performance of the contract to the extent not terminated.

23.3 Where the purchaser terminates the contract in whole or in part, the purchaser may decide to impose a restriction penalty on the supplier by prohibiting such supplier from doing business with the public sector for a period not exceeding 10 years.

23.4 If a purchaser intends imposing a restriction on a supplier or any person associated with the supplier, the supplier will be allowed a time period of not more than 14 (fourteen) days to provide reasons why the envisaged restriction should not be imposed. Should the supplier fail to respond within the stipulated 14 (fourteen) days the purchaser may regard the intended penalty as not objected against and may impose it on the supplier.

23.5 Any restriction imposed on any person by the Accounting Officer/Authority will, at the discretion of the Accounting Officer/Authority, also be applicable to any other enterprise or any partner, manager, director or other person who wholly or partly exercises or exercised or may exercise control over the enterprise of the first-mentioned person, and with which enterprise or person the first-mentioned person is or was, in the opinion of the Accounting Officer/Authority, actively associated.

23.6 If a restriction is imposed, the purchaser must, within 5 (five) working days of such imposition, furnish the National Treasury with the following information:
(i) the name and address of the supplier and/or person restricted by the purchaser;
(ii) the date of commencement of the restriction;
(iii) the period of restriction; and
(iv) the reasons for the restriction.

These details will be loaded in the National Treasury's central database of suppliers or persons prohibited from doing business with the public sector.

23.7 If a court of law convicts a person of an offence as contemplated in sections 12 or 13 of the Prevention and Combating of Corrupt Activities Act, Act 12 of 2004, the court may also rule that such person's name be endorsed on the Register for Tender Defaulters. When a person's name has been endorsed on the Register, the person will be prohibited from doing business with the public sector for a period of not less than five years and not more than 10 years. The National Treasury is empowered to determine the period of restriction, and each case will be dealt with on its own merits. According to section 32 of the Act the Register must be open to the public. The Register can be perused on the National Treasury website.

24. Anti-dumping and countervailing duties and rights

24.1 When, after the date of bid, provisional payments are required, or anti-dumping or countervailing duties are imposed, or the amount of a provisional payment or anti-dumping or countervailing right is increased in respect of any dumped or subsidised import, the State is not liable for any amount so required or imposed, or for the amount of any such increase. When, after the said date, such a provisional payment is no longer required or any such anti-dumping or countervailing right is abolished, or where the amount of such provisional payment or any such right is reduced, any such favourable difference shall, on demand, be paid forthwith by the contractor to the State, or the State may deduct such amounts from moneys (if any) which may otherwise be due to the contractor in regard to supplies or services which he or she delivered or rendered, or is to deliver or render in terms of the contract or any other contract or any other amount which may be due to him or her.

25. Force majeure

25.1 Notwithstanding the provisions of GCC Clauses 22 and 23, the supplier shall not be liable for forfeiture of its performance security, damages, or termination for default if, and to the extent that, his delay in performance or other failure to perform his obligations under the contract is the result of an event of force majeure.

25.2 If a force majeure situation arises, the supplier shall notify the purchaser promptly, in writing, of such condition and the cause thereof. Unless otherwise directed by the purchaser in writing, the supplier shall continue to perform its obligations under the contract as far as is reasonably practical, and shall seek all reasonable alternative means for performance not prevented by the force majeure event.

26. Termination for insolvency

26.1 The purchaser may at any time terminate the contract by giving written notice to the supplier if the supplier becomes bankrupt or otherwise insolvent. In this event, termination will be without compensation to the supplier, provided that such termination will not prejudice or affect any right of action or remedy which has accrued or will accrue thereafter to the purchaser.

27. Settlement of Disputes

27.1 If any dispute or difference of any kind whatsoever arises between the purchaser and the supplier in connection with or arising out of the contract, the Parties shall make every effort to resolve such dispute or difference amicably, by mutual consultation.

27.2 If, after 30 (thirty) days, the Parties have failed to resolve their dispute or difference by such mutual consultation, then either the purchaser or the supplier may give notice to the other party of his intention to commence with mediation. No mediation in respect of this matter may be commenced unless such notice is given to the other party.

27.3 Should it not be possible to settle a dispute by means of mediation, it may be settled in a South African court of law.

27.4 Mediation proceedings shall be conducted in accordance with the rules of procedure specified in the SCC.

27.5 Notwithstanding any reference to mediation and/or court proceedings herein,
(a) the Parties shall continue to perform their respective obligations under the contract unless they otherwise agree; and
(b) the purchaser shall pay the supplier any monies due to the supplier.

28. Limitation of Liability

28.1 Except in cases of criminal negligence or wilful misconduct, and in the case of infringement pursuant to Clause 6:
(a) the supplier shall not be liable to the purchaser, whether in contract, tort, or otherwise, for any indirect or consequential loss or damage, loss of use, loss of production, or loss of profits or interest costs, provided that this exclusion shall not apply to any obligation of the supplier to pay penalties and/or damages to the purchaser; and
(b) the aggregate liability of the supplier to the purchaser, whether under the contract, in tort or otherwise, shall not exceed the total contract price, provided that this limitation shall not apply to the cost of repairing or replacing defective equipment.

29. Governing language

29.1 The contract shall be written in English. All correspondence and other documents pertaining to the contract that is exchanged by the Parties shall also be written in English.

30. Applicable Law

30.1 The contract shall be interpreted in accordance with South African laws, unless otherwise specified in the SCC.

31. Notices

31.1 Every written acceptance of a bid shall be posted to the supplier concerned by registered or certified mail, and any other notice to him shall be posted by ordinary mail, to the address furnished in his bid or to the address notified later by him in writing; and such posting shall be deemed to be proper service of such notice.

31.2 The time mentioned in the contract documents for performing any act after such aforesaid notice has been given, shall be reckoned from the date of posting of such notice.

32. Taxes and Duties

32.1 A foreign supplier shall be entirely responsible for all taxes, stamp duties, licence fees, and other such levies imposed outside the purchaser’s country.

32.2 A local supplier shall be entirely responsible for all taxes, duties, licence fees, etc., incurred until delivery of the contracted goods to the purchaser.

32.3 No contract shall be concluded with any bidder whose tax matters are not in order. Prior to the award of a bid the Department must be in possession of a tax clearance certificate submitted by the bidder. This certificate must be an original issued by the South African Revenue Services.

33. National Industrial Participation (NIP) Programme

33.1 The NIP Programme administered by the Department of Trade and Industry shall be applicable to all contracts that are subject to the NIP obligation.

34 Prohibition of Restrictive practices

34.1 In terms of section 4 (1) (b) (iii) of the Competition Act, Act 89 of 1998, as amended, an agreement between or concerted practice by firms, or a decision by an association of firms, is prohibited if it is between Parties in a horizontal relationship and if a bidder(s) is/are or a contractor(s) was/were involved in collusive bidding (or bid rigging).

34.2 If a bidder(s) or contractor(s), based on reasonable grounds or evidence obtained by the purchaser, has/have engaged in the restrictive practice referred to above, the purchaser may refer the matter to the Competition Commission for investigation and possible imposition of administrative penalties as contemplated in the Competition Act, Act 89 of 1998.

34.3 If a bidder(s) or contractor(s) has/have been found guilty by the Competition Commission of the restrictive practice referred to above, the purchaser may, in addition and without prejudice to any other remedy provided for, invalidate the bid(s) for such item(s) offered, and/or terminate the contract in whole or part, and/or restrict the bidder(s) or contractor(s) from conducting business with the public sector for a period not exceeding 10 (ten) years and/or claim damages from the bidder(s) or contractor(s) concerned.

C.8 ANNEXURES

Annexure A – Pro Forma Insurance Broker's Warranty

Broker Logo

Letterhead of supplier's Insurance Broker

Date _____

CCT
City Manager
Civic Centre
12 Hertzog Boulevard
Cape Town
8000

Dear Sir

***TENDER NO.**: 2023/24*

TENDER DESCRIPTION:

NAME OF SUPPLIER: _____

I, the undersigned, do hereby confirm and warrant that all the insurances required in terms of the abovementioned contract have been issued and/or in the case of blanket/umbrella policies, have been endorsed to reflect the interests of the CCT with regard to the abovementioned contract, and that all the insurances and endorsements, etc., are all in accordance with the requirements of the contract.

I furthermore confirm that all premiums in the above regard have been paid.

Yours faithfully

Signed: _____

For: _____ *(Supplier's Insurance Broker)*

Annexure B – Monthly Project Labour Report

ANNEX 1

CITY OF CAPE TOWN
MONTHLY PROJECT LABOUR REPORT

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

Instructions for completing and submitting forms

General

1 The Monthly Project Labour Reports must be completed in full, using typed, proper case characters; alternatively, should a computer not be available, handwritten in black ink.

2 Incomplete / incorrect / illegible forms will not be accepted.

3 Any conditions relating to targeted labour stipulated in the Contract (in the case of contracted out services or works) shall apply to the completion and submission of these forms.

4 This document is available in Microsoft Excel format upon request from the City's EPWP office, tel 021 400 9406, email EPWPLR@capetown.gov.za.

Project Details

5 If a field is not applicable insert the letters: NA

6 Only the Project Number supplied by the Corporate EPWP Office must be inserted. The Project Number can be obtained from the Coordinator or Project Manager or from the e-mail address in point 4 above.

7 On completion of the contract or works project the anticipated end date must be updated to reflect the actual end date.

Beneficiary Details and Work Information

8 Care must be taken to ensure that beneficiary details correspond accurately with the beneficiary's ID document.

9 A new beneficiary is one in respect of which a new employment contract is signed in the current month. A certied ID copy must accompany this labour report on submission.

10 Was the beneficiary sourced from the City's job seeker database?

11 The contract end date as stated in the beneficiary's employment contract.

12 Where a beneficiary has not worked in a particular month, the beneficiary's name shall not be reflected on this form at all for the month in question.

13 Training will be recorded separately from normal working days and together shall not exceed the maximum of 23 days per month

14 Workers earning more than the maximum daily rate (currently R450 excluding any benefits) shall not be reflected on this form at all.

Submission of Forms

15 Signed hardcopy forms must be scanned and submitted to the City's project manager in electronic (.pdf) format, together with the completed form in Microsoft Excel format.

16 Scanned copies of all applicable supporting documentation must be submitted along with each monthly project labour report. Copies of employment contracts and ID documents are only required in respect of new beneficiaries.

17 If a computer is not available hardcopy forms and supporting documentation will be accepted.

PROJECT DETAILS

Numbers in cells below e.g (6) refer to the relevant instruction above for completing and submitting forms

CONTRACT OR WORKS PROJECT NAME: (6)		EPWP SUPPLIED PROJECT NUMBER: (6)	
DIRECTORATE:		DEPARTMENT:	
CONTRACTOR OR VENDOR NAME:		CONTRACTOR OR VENDOR E-MAIL ADDRESS:	
CONTRACTOR OR VENDOR CONTACT PERSON:		CONTRACTOR OR VENDOR TEL. NUMBER:	CELL WORK

PROJECT LABOUR REPORT CURRENT MONTH (mark with "X")

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR

ACTUAL START DATE (yyyy/mm/dd)	ANTICIPATED / ACTUAL END DATE (yyyy/mm/dd) (7)

TOTAL PROJECT EXPENDITURE / VALUE OF WORK DONE TO-DATE (INCLUDING ALL COSTS, BUT EXCLUDING VAT)

R													

ANNEX 1 (continued)

MONTHLY PROJECT LABOUR REPORT

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

BENEFICIARY DETAILS AND WORK INFORMATION

CONTRACT OR WORKS PROJECT NUMBER:		Year	Month

Sheet		
1	of	

	(8)	(8)	(8)	(9)			(10)		(11)	(12)	(13)	(14)
No.	First name	Surname	ID number	New Beneficiary (Y/N)	Gender (M/F)	Disabled (Y/N)	Job seeker database (Y/N)	Contract start date (DDMMYY)	Contract end date (DDMMYY)	No. days worked this month (excl. training)	Training days	Rate of pay per day (R – c)
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
										0	0	R -

Declared by Contractor or Vendor to be true and correct:	Name		Signature	
	Date			

Received by Employer's Agent / Representative:	Name		Signature	
	Date			

Annexure C - Pro Forma Performance Security/ Guarantee

Not applicable

Annexure F - Tender Returnable Documents

Schedule F.1: Contract Price Adjustment

1. TENDER CONDITIONS

1.1 The Contract Price Adjustment (CPA) mechanism and/or provisions relating to Rate of Exchange (RoE) Variation, contained in this schedule is compulsory and binding on all Tenderers/Suppliers and this schedule (the parts relevant to the particular tender) must be completed by all Tenderers / Suppliers.

1.2 Tenderers/Suppliers are not permitted to amend, vary, alter or delete this schedule or any part thereof unless otherwise stated in this schedule.

1.3 Tenderers are not permitted to offer fixed and firm prices except as provided for in the Price Schedule.

2. CPA PROVISIONS SELECTION

2.1 The prices stipulated on the Price Schedule are subject to adjustment as set out below.

2.2 Tenderer to indicate the specific CPA and/or RoE provisions applicable to their bid by marking the relevant checkboxes below. Tenderers to note that the CPA and/or RoE provisions are not exclusive and multiple CPA Types can exist if the bid contains both local and foreign exchange based pricing. In such cases the CPA and/or ROE provision applies only to that particular portion of the tendered price.

2.3 The CPA and/or RoE provisions applicable to this tender and resulting contract are to be indicated below by checking the relevant boxes (with multiple selections only where indicated permissible):

	Indicate option	CPA Type	Period	Refer to Section
A	N/a	**FIRM PRICES** as per Pricing Schedule	Annual	*Pricing Schedule C.4 and Schedule F.1 (A)*
		LOCAL (RSA) TENDER CONTENT:		
		EITHER		
B	N/a	SEIFSA Index based CPA	Monthly / Quarterly	*Schedule F.1 (B)*
		OR		
C	N/a	Pricelist / Quotation Based CPA	Ad-Hoc	*Schedule F.1 (C)*
		OR		
D		STATS SA CPI Index Based CPA	Annually	*Schedule F.1 (D)*
		OR/AND		
E	N/a	Sectorial Determination 1:Contract Cleaning Sector	Annually	*Schedule F.1 (E)*
		OR		
E	N/a	Sectorial Determination 6: Private Security Sector	Annually	*Schedule F.1 (E)*
		IMPORTED GOODS AND / OR COMPONENTS (IF APPLICABLE		

F		ROE based CPA	Ad-Hoc	*Schedule F.1 (F)*
		AND (IF REQUIRED), EITHER		
G		Pricelist / Quotation based CPA	Ad-Hoc / Periodic	*Schedule F.1 (G)*
		OR		
H		Overseas CPI / PPI index based CPA	Ad-Hoc / Periodic	*Schedule F.1 (H)*

2.4 CPA and/or RoE provisions marked as **not applicable** is not relevant and will not apply to this tender and resulting contract.

3. CONTRACT CPA APPLICATIONS AND ADMINISTRATION

3.1 Any claim for variation in the contract price (either CPA or RoE adjustments) must be submitted in writing:

i. By letter to: Director (**INSERT Directorate Director/Contract Owner**), City of Cape Town, P O Box 655, Cape Town, 8000 or
ii. By email to: **[INSERT Contract Manager's e-mail address]**

at least 14 days prior to the month upon which the adjustment would become effective in the case of prices being set in advance, and as soon as relevant indices are available and no later than 60 days after the date of delivery of goods or the completion of the project (i.e. date of issue of the Taking-Over Certificate, if applicable) in the case of adjustments being claimed retrospectively for Goods or Services. The latter case is only applicable where specifically provided for in the CPA provisions.

3.2 When submitting a request for CPA and/or RoE adjustment the Supplier shall indicate the Rand Value claimed for each item listed on C.4 - Price Schedule, clearly indicating the item number as per C.4 - Price Schedule. Percentage increases will not be considered. A mere notification of a request for CPA without stating the new price claimed for each item shall, for the purpose of this clause, not be regarded as a valid request.

3.3 The CCT reserves the right to request the Supplier to submit auditor's certificates or such other documentary proof as it may require in order to verify a claim for CPA or RoE adjustments. Price adjustments will not be processed until such time as the Supplier submits such auditor's certificates or other documentary proof to the CCT. Should the Supplier fail to submit the auditor's certificates or other documentary proof to the CCT within 30 days from the written request, it shall be presumed that the Supplier has abandoned his request.

3.4 The CCT reserves the right to withhold payment of any claim for adjustment while only provisional figures are available and until such time as the final (revised) figures are issued by the relevant authority.

3.5 The CCT will confirm in writing once processing of the CPA or RoE adjustments have been completed including the effective date of the adjustments.

3.6 Where pricelist-based and other non-index based CPA requests are investigated and found to be not reasonable and market related, the CCT reserves the right to reject such requests. Where disputes arise with respect to such rejected requests the CCT reserves the right to procure the Goods from other available Suppliers until such time as the dispute is resolved.

3.7 Unless indicated otherwise in the relevant schedule below, all Purchase Orders issued on or after the effective date of the adjustment shall be issued at, and the Goods or Services supplied, invoiced and paid for at the adjusted prices. The relevant adjustment will not be applied to Purchase Orders issued prior to the effective date.

F.1 (A) – FIRM PRICES

NOT APPLICABLE

F.1 (B) LOCAL SOUTH AFRICAN CONTENT – SEIFSA INDICES

NOT APPLICABLE

F.1 (C) LOCAL SOUTH AFRICAN CONTENT - SUPPLIER/ MANUFACTURER PRICE LIST/QUOTATIONS

NOT APPLICABLE

F.1 (D) LOCAL SOUTH AFRICAN CONTENT - STATS SA CONSUMER PRICE INDEX

Applicable where the Tenderer/Suppliers has indicated their tendered prices are subject to adjustment based on changes in the Statistics South Africa (STATS SA) Consumer Price Indices.

1. A minimum of 10% of the tender price as per C.4 Pricing Schedule shall be fixed and free of variation for the duration of the contract.

2. A total of 90% of the tender price as per C.4 Pricing Schedule shall be adjusted annually in accordance with clause 5 below.

3. The Contract Price(s) shall remain FIRM for the first 12 calendar months from date of Commencement Date of Contract and Suppliers are not permitted to requests CPA during this period.

4. The Contract Price(s) will thereafter be subject to adjustment annually based on the average percentage of change over 12 months as published by STATS SA: Consumer Price Index (P0141–Table B2 – CPI headline year-on-year rates) as follows:

    5.1 CPA applicable from the start of the 13th month to the end of the 24th month calculated as follows:
        a) The base month for the price adjustment being three (3) calendar months prior to Commencement Date of Contract; and
        b) The end month shall be three (3) calendar months prior to the 12th month.

    5.2 CPA applicable from the start of the 25th month to end of the 36th month calculated as follows:
        a) The base month for the price adjustment shall be three (3) calendar months prior to the 13th month; and
        b) The end month shall be three (3) calendar months prior to 24th month.

    5.3 The average CPI percentage will be calculated using the base month to the end month (both included) divided by the number of months. (12 months totalled/12 to achieve the average CPI)

6 Subject to prior approval by the CCT delegated authority, in the event of any extension of the contract period, the CPA applicable beyond month 36th of the contract will follow the same principle in determining the base month (i.e. 3 calendar months prior to 25th month) and end date (3 calendar months prior to 36th month) as outlined above.

F.1. (E) LOCAL SOUTH AFRICAN CONTENT – SECTORIAL DETERMINATION

NOT APPLICABLE

F.1. (F) GOODS AND/OR COMPONENTS IMPORTED FROM OUTSIDE OF SOUTH AFRICA

1. **RATE OF EXCHANGE PRICE VARIATIONS**

   Subject to the above, when tendered prices of certain items in C.4 Price Schedule are subject to adjustment for changes in the cost of goods and/or components imported from outside of South Africa, the Tenderer must (as part of the bid submission) provide a list of such items and other information as required in Table F.1 (F).2 below and include it in the bid submission.

2. Only tenderers who are the direct importer of the goods may claim rate of exchange price variations.

Table F.1 (F).1: Information required for prices subject to Rate of Exchange adjustments

Exchange Rate on which tender is based:	_____1 : Rand _____
Exchange Rate on which tender is based: (if more than one currency)	_____1 : Rand _____
Exchange Rate on which tender is based: (if more than one currency)	_____1 : Rand _____
Name of Bank	
Date of quoted rate of exchange	
Documentation relevant to calculation of adjustments based on Rate of Exchange (Mark with "x")	
Bill of Lading	
Waybill	
Customs invoice	
Other: _____	

TABLE F.1 (F).2: Price Basis for Imported Resources

C.4 Price Schedule Detail		Rand Value Calculation for Foreign Content (FOB)			Customs Surcharge		Customs Duty			Rand Value for South African Content (FOR)	Total Tender Price in Rand of (C) + (D) + (E) + (F) included in Price Schedule C.4(G)
C.4 Price Schedule Item No.	Description of Resources	Value in Foreign Currency denomination (A)	Rate of Exchange as at Base Date*(B)	Value in Rand for Foreign currency content (A) x (B) (C)	%	Rand(D)	%	Rand(E)	Customs Duty Tariff Reference	Value in Rand for South African Content(F)	

** Base Date: 7 (seven) calendar days before tender closing.*

3. Any items/resources not inserted in Table F.1 (F).2 above, are deemed to be manufactured / supplied in South Africa and is not subject to adjustment in terms of variation in rate of exchange.

4. The price adjustment for variations in the cost of plant and materials imported from outside of South Africa shall be based on the information contained on the schedule titled “Price Basis for Imported Resources” (Table F.1 (F).2). The Rand value of goods and components comprising entirely or partly imported content that is inserted on the Table F.1(F).2 titled “Price Basis for Imported Resources” (column (G)) shall be the rate tendered in the Pricing Schedule C.4, and shall be the value in foreign currency (column (A)) converted to South African Rand (column (C)) by using the closing spot selling rate on the Base Date (seven calendar days before tender closing date) rounded to the second decimal place (column (B)), to which shall be added any Customs Surcharge and Customs Duty applicable at that date (columns (D) and (E)) and any South African manufactured or added content (column (F)). Any mark-up by the Tenderer or other costs not detailed above shall be entirely contained within the South African Content (Column (F)).

5. Column A of Table F.1 (F).2 shall detail the actual quotation for the imported Goods or components, and shall be substantiated by the original source quotation for such Goods or components. (Source quotation from foreign supplier/manufacturer, see Schedule F.1 (G), Table F.1 (G).1 below). No Supplier mark-up on the foreign currency value of such imported Goods or components is permissible. All Supplier mark-up shall be included in the South African content, Column F of Table F.1 (F).2 above.

6. Based on the evidence provided in Clause 5 above, the value in Rand inserted in column (C) on the schedule titled “Price Basis for Imported Resources” shall be recalculated using the forward cover rate obtained, and any increase or decrease in the Rand value defined in this clause shall be adjusted accordingly, subject to Clause 7 below.

7. The adjustments shall be calculated upon the value in foreign currency in the Supplier’s forward cover contract, provided that, should this value exceed the value in foreign currency inserted in column (A) of on the schedule titled “Price Basis for Imported Resources”, then the value in column (A) shall be used (or any adjusted value approved in accordance with Schedule F.1 (G) below).

8. Any increase or decrease in the Rand value between the amounts of Customs Surcharge and Customs Duty inserted in on the schedule titled “Price Basis for Imported Resources” and those amounts actually paid to the Customs and Excise Authorities, which are due to changes in the percentage rates applicable or to the foreign exchange rate used by the authorities, shall be adjusted accordingly.

9. The Tenderer shall state the Customs Duty Tariff Reference applicable to each item and the Supplier shall advise the CCT’s Agent of any changes which occur.

10. Suppliers shall take out Forward Cover covering the foreign exchange component of the cost of any imported portion of the Goods ordered on each purchase order issued by the Employer.

11. The process to be followed by Suppliers for claims for Rate of Exchange Variations shall be as follows:

    a) The Supplier shall within seven working days from the date of receipt of the purchase order arrange for cover or recovering forward by way of a contract with a bank which is an authorised foreign exchange dealer, the foreign exchange component of the cost of any imported goods and components inserted by the Tenderer on the scheduled titled “Price Basis for Imported Resources” (Table F.1 (F).2), and submit such Forward Cover quotation to the City for approval.

    b) Upon receipt of the quotation for Forward Cover from the bank, the Supplier must forward the quote ideally, within 15 minutes of receiving it from their banker to the CCT: CPA.Request@capetown.gov.za and Contract Manager: **[insert e-mail address].** This is to ensure that the time difference from generation of the quotation for Forward Cover to finalising the Forward Cover with the Bank, is kept to a minimum due to the change in the exchange rate throughout the day.

    c) The Contract Manager will forward the quotation to the CCT Treasury Department immediately for their consideration and approval. The cut-off time for receipt of quotations for Forward Cover will be 14h00. It must be noted that if this deadline will not be achieved, it is recommended that the quotation process be undertaken on the following day which should fall within the 7 days of receipt of the purchase order.

    d) Only once the Forward Cover quotation rate has been approved by CCT Treasury Department, may the Supplier finalise the Forward Cover contract with their bank at the rate approved by the CCT Treasury Department for that Purchase Order and forward a copy of the contract to the CCT via

email: CPA.Request@capetown.gov.za and Contract Manager: **[insert e-mail address].**

e) The Forward Cover quotation envisaged above shall have the CCT purchase order number and a Forward Cover Contract (FCC) Value Date that is directly based upon the required delivery date for the imported Goods or components necessary in order to meet the Contract Delivery Period. Future FCC Value Dates beyond the Contract Delivery Period shall not be acceptable.

12. On delivery of the goods to the City the Supplier shall submit the following documentation to the CCT via email: CPA.Request@capetown.gov.za and Contract Manager: **[insert e-mail address].** :

    a) The Bill of Lading/Waybill/Customs Invoice (clearly indicating the items as identified on the purchase order).
    b) Calculations detailing the difference in the rate of exchange at the time of entry and the date of tender. These shall be submitted on a covering letter.

13. The invoice / credit note for the Rate of Exchange adjustment applicable to the specific order.

In exceptional circumstances, and subject to the Employer's explicit approval, Rate of Exchange variations on Goods or components that are imported in bulk in advance in fulfilment of the contract requirements or to create buffer stocks, but not specifically in response to specific purchase orders placed by the Employer in accordance with the contract, shall be based upon whichever of the following two methodologies is more advantageous to the Employer:

a) Methodology 1: A spot quotation for the Forward Cover Contract rate for the imported portion of the Goods, based upon the FCC Value Date for the particular purchase order(s), as outlined in clause 11 above.

b) Methodology 2: The actual Rate of Exchange cost variations incurred in fulfilment of the purchase order(s), fully substantiated by detailed Bills of Lading and Customs Invoice applicable to the particular Goods delivered. The applicable Rate of Exchange shall be the rate as defined on the Customs Invoice for the imported Goods.

c) Determination of the more advantageous methodology shall be conducted and approved following delivery of the imported Goods or components to the Supplier but prior to delivery of the Goods to the Employer.

Approval of the process detailed in Clause 13 and sub-clauses above shall be on an order by order basis and application shall be submitted, with required supporting documents, immediately on receipt of the relevant purchase order(s).

F.1 (G) GOODS AND/OR COMPONENTS IMPORTED FROM OUTSIDE OF SOUTH AFRICA - MANUFACTURER/SUPPLIER PRICE/QUOTATION LIST

1. Tenderers with imported Goods or Components may claim contract price adjustment based on the overseas SUPPLIER'S / MANUFACTURER'S PRICE LISTS/ QUOTATION from the supplier or manufacturer of the tendered items.

2. In such cases the Tenderer is required to submit with his tender a copy of the original overseas Supplier / Manufacturer Pricelist / Quotation upon which his tender prices are based. Such pricelist / Quotation is required to be on the Letterhead of the Supplier / Manufacture, is to be dated, referenced and signed, and is to provide clear reference to the tender number or unambiguously indicate the relevant component.

3. The Tenderer is required to clearly reference each item quoted to the respective Tender Item Number indicated in C.4 Price Schedule by completing Table F.1 (G).1 below.

Table F.1 (G).1: Price Schedule information for Imported Goods or Components - Manufacturers/Suppliers Price List(s)/Quotation

	Price List Information		
Manufacturer/ Supplier Name	**Price List/Quotation Date.**	**Price List/Quotation Reference Number**	**Pricelist applicable to Items as per C.4 Price Schedule**

4. During the contract period, the Tenderer (now Supplier) must submit the request for price adjustment based on increases in pricelists of manufacturers/suppliers prior to the effective date of the increase in the pricelist.

5. The effective date of any price adjustment granted will be the first day of the month following the month during which the fully substantiated application for contract price adjustment is submitted or, by agreement between the Tenderer/Supplier and the CCT, a subsequent date on which the price adjustment will become effective.

6. In instances where the Supplier's price adjustment claimed is less than entitled, the lesser price will be accepted.

7. Only the difference in source supplier / manufacturer pricelist (actual cost, not percentage) may be adjusted and under no circumstances may the Tenderer/Supplier increase their profit margin.

8. The Tenderer/Supplier shall, when submitting claims for contract price adjustment, submit all of the documentation indicated below a minimum of two weeks prior to the effective date of the contract price adjustment:

   8.1 Copies of price lists upon which original tender prices were based (refer to Clause 2, Table F.1 (G).1 above) clearly indicating the item(s) according to C.4 Price Schedule.

   8.2 The new price list (*from the same Supplier / Manufacturer as originally tendered)* on the relevant manufacturer/suppliers letterhead (with pamphlets, brochures and e-mail communication) clearly indicating the item(s) according to C.4 Price Schedule.

8.3 Submit detailed calculations indicating how the "new" price is calculated. The calculations must be submitted in Excel, together with a signed, "PDF" version of the Excel spreadsheet. The example below – Table F.1(G).2, is what is required.

8.4 A covering letter on the Supplier's letterhead requesting the CPA with the effective date of the claim.

9. The CCT will consider the request and either refer the request back for correction or additional information or approve the request.

10. The CCT will assess such pricelist based CPA claims and will only approve such claims that are confirmed to be reasonable and market related with reference to the source pricing information provided with the tender and with the CPA application,

11. Approval of the CPA request including confirmation of the effective date, will be communicated to the Supplier in writing. The effective date will be as per clause 3 above.

12. The successful Tenderer/Supplier shall immediately upon notification of the commencement date of contract submit written application for approval of any adjusted unit prices for the Goods that may have been notified by the Supplier / Manufacturer of the Goods, together with the required supporting documentation. This application will be assessed in accordance with the process laid out above in order to determine approved contract prices at the commencement of the contract.

13. Failure to submit such application within two working weeks of commencement of contract shall result in the tendered unit prices being applied for initial orders placed following commencement of the contract.

In the event of a Supplier changing their Supplier / Manufacturer during the tenure of the contract, no request for price variations will be considered unless the Supplier has obtained prior approval from the City for the change of Supplier / Manufacturer. Such approval shall include technical approval by the Engineer of the goods supplied by the replacement Supplier / Manufacturer. Technical approval by the Engineer shall be a prerequisite for any change of Supplier / Manufacturer.

Table F.1(G).2 – Pro Forma Table for Adjustments in price for Imported Goods or Components - Manufacturers/Suppliers Price List(s)/Quotation

C.4 Price Schedule Item No.	Original Tender Price (A)	Previous and New Price List Information					New Contract Price (Excl. VAT)(A)+(D)
		Manufacturer/ Supplier	Material no.	Price as per previous Manufacturer/ Supplier Price List (Excl. Vat) Price List Date:_____ (B)	Price as per new Supplier/ Manufacturer Price List (Excl. Vat) Price List Date:_____(C)	Difference between the previous and new manufacturer Price list (C)-(B)(D)	

F.1. (H) GOODS AND/OR COMPONENTS IMPORTED FROM OUTSIDE OF SOUTH AFRICA - BASED ON FOREIGN INDICES

NOT APPLICABLE

Schedule F.2: Certificate of Authority for Partnerships/ Joint Ventures/ Consortiums

This schedule is to be completed if the tender is submitted by a partnership/joint venture/ consortium.

1. We, the undersigned, are submitting this tender offer as a partnership/ joint venture/ consortium and hereby authorize Mr/Ms _____, of the authorised entity _____, acting in the capacity of Lead Partner, to sign all documents in connection with the tender offer and any contract resulting from it on the partnership/joint venture/ consortium's behalf.

2. By signing this schedule the partners to the partnership/joint venture/ consortium:

   2.1 warrant that the tender submitted is in accordance with the main business and objectives of the partnership/joint venture/ consortium;

   2.2 agree that the CCT shall make all payments in terms of this Contract into the following bank account of the Lead Partner:

   Account Holder: _____
   Financial Institution: _____
   Branch Code: _____
   Account No.: _____

   2.3 agree that in the event that there is a change in the partnership/ joint venture/ consortium and/or should a dispute arise between the partnership/joint venture/ consortium partners, that the CCT shall continue to make any/all payments due and payable in terms of the Contract into the aforesaid bank account until such time as the CCT is presented with a Court Order or an original agreement (signed by each and every partner of the partnership/joint venture/ consortium) notifying the CCT of the details of the new bank account into which it is required to make payment.

   2.4 agree that they shall be jointly and severally liable to the CCT for the due and proper fulfilment by the successful tenderer/supplier of its obligations in terms of the Contract as well as any damages suffered by the CCT as a result of breach by the successful tenderer/supplier. The partnership/joint venture/ consortium partners hereby renounce the benefits of excussion and division.

SIGNED BY THE PARTNERS OF THE PARTNERSHIP/ JOINT VENTURE/ CONSORTIUM		
NAME OF FIRM	**ADDRESS**	**DULY AUTHORISED SIGNATORY**
Lead partner		Signature……... Name…… Designation……...
		Signature……... Name…… Designation……...
		Signature……... Name…… Designation……...
		Signature……... Name…… Designation……...

Note: A copy of the Joint Venture Agreement shall be appended to *List of Other Documents Attached by Tenderer Schedule.*

Schedule F.3: Declaration for Procurement above R10 million

If the value of the transaction is expected to exceed R10 million (VAT included) the tenderer shall complete the following questionnaire, attach the necessary documents and sign this schedule:

1. Are you by law required to prepare annual financial statements for auditing? (**Please mark with X**)

YES		NO	

If YES, submit audited annual financial statements:
(i) For the past three years, or
(ii) Since the date of establishment of the tenderer (if established during the past three years)
By attaching such audited financial statements to **List of Other Documents Attached by Tenderer Schedule.**

2. Do you have any outstanding undisputed commitments for municipal services towards the CCT or other municipality in respect of which payment is overdue for more than 30 (thirty) days? (**Please mark with X**)

YES		NO	

2.1 If NO, this serves to certify that the tenderer has no undisputed commitments for municipal services towards any municipality for more than three (3) (three) months in respect of which payment is overdue for more than 30 (thirty) days.
2.2 If YES, provide particulars:

3. Has any contract been awarded to you by an organ of state during the past five (5) years? (**Please mark with X**)

YES		NO	

If YES, insert particulars in the table below including particulars of any material non-compliance or dispute concerning the execution of such contract. Alternatively attach the particulars to **List of Other Documents Attached by Tenderer** schedule in the same format as the table below:

Organ of State	Contract Description	Contract Period	Non-compliance/dispute (if any)

4. Will any portion of the goods or services be sourced from outside the Republic, and if so, what portion and whether any portion of payment from the CCT is expected to be transferred out of the Republic? (**Please mark with X**)

YES		NO	

If YES, furnish particulars below

The tenderer hereby certifies that the information set out in this schedule and/or attached hereto is true and correct, and acknowledges that failure to properly and truthfully complete this schedule may result in steps being taken against the tenderer, the tender being disqualified, and/or (in the event that the tenderer is successful) the cancellation of the contract, restriction of the tenderer or the exercise by the CCT of any other remedies available to it.

_____ _____

Signature
Print name: Date
On behalf of the tenderer (duly authorised)

Schedule F.4: Preference Points Claim Form In Terms Of the 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**

The applicable preference point system for this tender is the 90/10 preference point system.

1.3 **To be completed by the organ of state:**

The maximum points for this tender are allocated as follows:

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

1.4 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.

1.5 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

The following definitions shall apply to this schedule:

(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

POINTS AWARDED FOR PRICE

THE 90/10 PREFERENCE POINT SYSTEMS

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

90/10

$$Ps = 90 \times \left(1 - \frac{(Pt - Pmin)}{Pmin}\right)$$

Where

Ps = Points scored for price of tender under consideration

Pt = Price of tender under consideration

Pmin = 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.

Note to tenderers: The tenderer must indicate how they claim points for each preference point system.)

The specific goals allocated points in terms of this tender	To be Completed by the Organ of State	
	Number of points Allocated (90/10 system)	Number of points claimed (90/10 system)
Gender	3	
Race	3	
Disability	1	
Promotion of Micro and Small Enterprises	3	

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 4.1 and 4.2, the Supplier 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 Supplier, 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 of Tenderer	*Date*	*Name and Surname*	*Address*

For official use.		
SIGNATURE OF CCT OFFICIALS AT TENDER OPENING		
1.	2.	3.

Schedule F.5: Declaration of Interest – State Employees (MBD 4 amended)

1. No bid will be accepted from:
   1.1 persons in the service of the state[1], or
   1.2 if the person is not a natural person, of which any director, manager or principal shareholder or stakeholder is in the service of the state, or
   1.3 from persons, or entities of which any director, manager or principal shareholder or stakeholder, has been in the service of the City of Cape Town (CCT) during the previous twelve (12) months, or
   1.4 from an entity who has employed a former CCT employee who was at a level of T14 of higher at the time of leaving the CCT's employ and involved in any of the CCT's bid committees for the bid submitted, if:
      1.4.1 the CCT employee left the CCT's employment voluntarily, during the previous twelve (12) months;
   1.5 a person who was a CCT employee, or an entity that employs a CCT employee, if
      1.5.1 the CCT employee left the CCT's employment whilst under investigation for alleged misconduct, or
      1.5.2 was facing disciplinary action or potential disciplinary action by the CCT, or
      1.5.3 was involved in a dispute against the CCT during the previous thirty six (36) months.

2. Any person, having a kinship with persons in the service of the state, including a blood relationship, may make an offer or offers in terms of this invitation to bid. In view of possible allegations of favouritism, should the resulting bid, or part thereof, be awarded to persons connected with or related to persons in service of the state, it is required that the tenderer or their authorised representative declare their position in relation to the evaluating/adjudicating authority.

3. In order to give effect to the above, the following questionnaire must be completed and submitted with the bid.

   3.1 Full Name of tenderer or his or her representative: _____

   3.2 Identity Number: _____

   3.3 Position occupied in the Company (director, trustee, shareholder[2]): _____

   3.4 Company or Close Corporation Registration Number: _____

   3.5 Tax Reference Number: _____

   3.6 VAT Registration Number: _____

   3.7 The names of all directors / trustees / shareholders members, their individual identity numbers and state employee numbers must be indicated in paragraph 4 below.

   3.8 Are you presently in the service of the state? **YES / NO**
      3.8.1 If yes, furnish particulars: _____

   3.9 Have you been in the service of the state for the past twelve months? **YES / NO**
      3.9.1 If yes, furnish particulars: _____

   3.10 Do you have any relationship (family, friend, other) with persons in the service of the state and who may be involved with the evaluation and or adjudication of this bid? **YES / NO**
      3.10.1 If yes, furnish particulars: _____

   3.11 Are you, aware of any relationship (family, friend, other) between any other tenderer and any persons in the service of the state who may be involved with the evaluation and or adjudication of this bid? **YES / NO**
      3.11.1 If yes, furnish particulars: _____

   3.12 Are any of the company's directors, trustees, managers, principle shareholders or stakeholders in service of the state? **YES / NO**
      3.12.1 If yes, furnish particulars: _____

3.13 Are any spouse, child or parent of the company's directors, trustees, managers, principle shareholders or stakeholders in service of the state? **YES / NO**
3.13.1 If yes, furnish particulars: _____

3.14 Do you or any of the directors, trustees, managers, principle shareholders, or stakeholders of this company have any interest in any other related companies or business whether or not they are bidding for this contract? **YES / NO**
3.14.1 If yes, furnish particulars: _____

3.15 Have you, or any of the directors, trustees, managers, principle shareholders, or stakeholders of this company been in the service of the CCT in the past twelve months? **YES / NO**
3.15.1 If yes, furnish particulars: _____

3.16 Do you have any employees who was in the service of the CCT at a level of T14 or higher at the time they left the employ of the CCT, and who was involved in any of the CCT's bid committees for this bid? **YES / NO**
3.16.1 If yes, furnish particulars: _____

4. Full details of directors / trustees / members / shareholders

Full Name	Identity Number	State Employee Number

If the above table does not sufficient to provide the details of all directors / trustees / shareholders, please append full details to the tender submission.

The tenderer hereby certifies that the information set out in this schedule and/or attached hereto is true and correct, and acknowledges that failure to properly and truthfully complete this schedule may result in steps being taken against the tenderer, the tender being disqualified, and/or (in the event that the tenderer is successful) the cancellation of the contract, restriction of the tenderer or the exercise by the CCT of any other remedies available to it.

_____ _____

Signature
Print name: Date
On behalf of the tenderer (duly authorised)

[1]MSCM Regulations: "in the service of the state" means to be –

(a) a member of –
(i) any municipal council;
(ii) any provincial legislature; or
(iii) the national Assembly or the national Council of provinces;

(b) a member of the board of directors of any municipal entity;
(c) an official of any municipality or municipal entity;
(d) an employee of any national or provincial department, national or provincial public entity or constitutional institution within the meaning of the Public Finance Management Act, 1999 (Act No.1 of 1999);
(e) an executive member of the accounting authority of any national or provincial public entity; or
(f) an employee of Parliament or a provincial legislature.

***[2] Shareholder" means a person who owns shares in the company and is actively involved in the management of the company or business and exercises control over the company*.**

Schedule F.6: Conflict of Interest Declaration

1. The tenderer shall declare whether it has any conflict of interest in the transaction for which the tender is submitted. (**Please mark with X**)

YES		NO	

1.1 If yes, the tenderer is required to set out the particulars in the table below:

2. The tenderer shall declare whether it has directly or through a representative or intermediary promised, offered or granted:

2.1 Any inducement or reward to the CCT for or in connection with the award of this contract; or

2.2 Any reward, gift, favour or hospitality to any official or any other role player involved in the implementation of the supply chain management policy. (**Please mark with X**)

YES		NO	

If yes, the tenderer is required to set out the particulars in the table below:

Should the tenderer be aware of any corrupt or fraudulent transactions relating to the procurement process of the CCT, please contact the following:

The CCT's anti-corruption hotline at 0800 32 31 30 (toll free)

The tenderer hereby certifies that the information set out in this schedule and/or attached hereto is true and correct, and acknowledges that failure to properly and truthfully complete this schedule may result in steps being taken against the tenderer, the tender being disqualified, and/or (in the event that the tenderer is successful) the cancellation of the contract, restriction of the tenderer or the exercise by the CCT of any other remedies available to it.

_____ _____

Signature
Print name:
On behalf of the tenderer (duly authorised)

Date

Schedule F.7: Declaration of Tenderer's Past Supply Chain Management Practices (MBD 8)

Where the entity tendering is a partnership/joint venture/consortium, each party to the partnership/joint venture/consortium must sign a declaration in terms of the Municipal Finance Management Act, Act 56 0f 2003, and attach it to this schedule.

1 The tender offer of any tenderer may be rejected if that tenderer or any of its directors/members have:

a) abused the municipality's / municipal entity's supply chain management system or committed any fraudulent conduct in relation to such system;
b) been convicted for fraud or corruption during the past five years;
c) willfully neglected, reneged on or failed to comply with any government, municipal or other public sector contract during the past five years; or
d) been listed in the Register for Tender Defaulters in terms of section 29 of the Prevention and Combating of Corrupt Activities Act (No 12 of 2004) or Database of Restricted Suppliers.

2 In order to give effect to the above, the following questionnaire must be completed and submitted with the bid.

Item	Question	Yes	No
2.1	**Is the tenderer or any of its directors/members listed on the National Treasury's Database of Restricted Suppliers as companies or persons prohibited from doing business with the public sector?** (Companies or persons who are listed on this Database were informed in writing of this restriction by the Accounting Officer/Authority of the institution that imposed the restriction after the *audi alteram partem* rule was applied). **The Database of Restricted Suppliers now resides on the National Treasury's website (www.treasury.gov.za) and can be accessed by clicking on its link at the bottom of the home page.**	Yes ☐	No ☐
2.1.1	If so, furnish particulars:		
2.2	Is the tenderer or any of its directors/members listed on the Register for Tender Defaulters in terms of section 29 of the Prevention and Combating of Corrupt Activities Act (No 12 of 2004) or Database of Restricted Suppliers? **The Register for Tender Defaulters can be accessed on the National Treasury's website (www.treasury.gov.za) by clicking on its link at the bottom of the home page.**	Yes ☐	No ☐
2.2.1	If so, furnish particulars:		
2.3	Was the tenderer or any of its directors/members convicted by a court of law (including a court of law outside the Republic of South Africa) for fraud or corruption during the past five years?	Yes ☐	No ☐
2.3.1	If so, furnish particulars:		

Item	Question	Yes	No
2.4	Does the tenderer or any of its directors owe any municipal rates and taxes or municipal charges to the municipality / municipal entity, or to any other municipality / municipal entity, that is in arrears for more than three months?	Yes ☐	No ☐
2.4.1	If so, furnish particulars:		
2.5	Was any contract between the tenderer and the municipality / municipal entity or any other organ of state terminated during the past five years on account of failure to perform on or comply with the contract?	Yes ☐	No ☐
2.5.1	If so, furnish particulars:		

The tenderer hereby certifies that the information set out in this schedule and/or attached hereto is true and correct, and acknowledges that failure to properly and truthfully complete this schedule may result in steps being taken against the tenderer, the tender being disqualified, and/or (in the event that the tenderer is successful) the cancellation of the contract,, restriction of the tenderer or the exercise by the CCT of any other remedies available to it.

_____ _____

Signature
Print name:
On behalf of the tenderer (duly authorised)

Date

Schedule F.8: Authorisation for the Deduction of Outstanding Amounts Owed to the CCT

To: THE CITY MANAGER, City of Cape Town

From: _____
(Name of tenderer)

RE: AUTHORISATION FOR THE DEDUCTION OF OUTSTANDING AMOUNTS OWED TO THE CCT

The tenderer:

a) hereby acknowledges that according to SCM Regulation 38(1)(d)(i) the City Manager may reject the tender of the tenderer if any municipal rates and taxes or municipal service charges owed by the tenderer (or any of its directors/members/partners) to the CCT, or to any other municipality or municipal entity, are in arrears for more than 3 (three) months; and
b) therefore hereby agrees and authorises the CCT to deduct the full amount outstanding by the Tenderer or any of its directors/members/partners from any payment due to the tenderer; and
c) confirms the information as set out in the tables below for the purpose of giving effect to b) above;

Physical Business address(es) of the tenderer	Municipal Account number(s)	Inside the CCT municipal boundary (Yes/No)

If there is not enough space for all the names, please attach the information to **List of other documents attached by tenderer** schedule in the same format:

Name of Director / Member / Partner	Identity Number	Physical residential address of Director / Member / Partner	Municipal Account number(s)	Inside the CCT municipal boundary (Yes/No)

The tenderer hereby certifies that the information set out in this schedule and/or attached hereto is true and correct, and acknowledges that failure to properly and truthfully complete this schedule may result in steps being taken against the tenderer, the tender being disqualified, and/or (in the event that the tenderer is successful) the cancellation of the contract, restriction of the tenderer or the exercise by the CCT of any other remedies available to it.

_____ _____
Signature Date
Print name:
On behalf of the tenderer (duly authorised)

Schedule F.9: Certificate of Independent Tender Determination

I, the undersigned, in submitting this tender number **013S/2025/26** and tender description: **SUPPLY, INSTALLATION AND AD HOC MAINTENANCE OF CONTROL SYSTEMS INFRASTRUCTURE AT VARIOUS CITY OF CAPE TOWN SITES** in response to the tender invitation made by THE CCT, do hereby make the following statements, which I certify to be true and complete in every respect:

I certify, on behalf of: _____ (Name of tenderer) that:

1. I have read and I understand the contents of this Certificate;

2. I understand that this tender will be disqualified if this Certificate is found not to be true and complete in every respect;

3. I am authorised by the tenderer to sign this Certificate, and to submit this tender, on behalf of the tenderer;

4. Each person whose signature appears on this tender has been authorised by the tenderer to determine the terms of, and to sign, the tender on behalf of the tenderer;

5. For the purposes of this Certificate and this tender, I understand that the word 'competitor' shall include any individual or organisation other than the tenderer, whether or not affiliated with the tenderer, who:
   (a) has been requested to submit a tender in response to this tender invitation;
   (b) could potentially submit a tender in response to this tender invitation, based on their qualifications, abilities or experience; and
   (c) provides the same goods and services as the tenderer and/or is in the same line of business as the tenderer.

6. The tenderer has arrived at this tender independently from and without consultation, communication, agreement or arrangement with any competitor. However, communication between partners in a joint venture or consortium[1] will not be construed as collusive price quoting.

7. In particular, without limiting the generality of paragraphs 5 and 6 above, there has been no consultation, communication, agreement or arrangement with any competitor regarding:
   (a) prices;
   (b) geographical area where product or service will be rendered (market allocation);
   (c) methods, factors or formulas used to calculate prices;
   (d) the intention or decision to submit or not to submit a tender;
   (e) the submission of a tender which does not meet the specifications and conditions of the tender; or
   (f) tendering with the intention not to win the contract.

8. In addition, there have been no consultations, communications, agreements or arrangements with any competitor regarding the quality, quantity, specifications and conditions or delivery particulars of the products or services to which this tender invitation relates.

9. The terms of this tender have not been and will not be disclosed by the tenderer, directly or indirectly, to any competitor, prior to the date and time of the official tender opening or of the awarding of the contract.

10. I am aware that, in addition and without prejudice to any other remedy provided to combat any restrictive practices related to tenders and contracts, tenders 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, Act 89 of 1998, and/o/r 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 10 (ten) years in terms of the Prevention and Combating of Corrupt Activities Act, Act 12 of 2004, or any other applicable legislation.

_____ _____

Signature
Print name: Date
On behalf of the tenderer (duly authorised)

([1] Consortium: 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.)

Schedule F.10: Proposed Deviations And Qualifications By Tenderer

The Tenderer should record any **proposed** deviations or qualifications they may wish to make to the tender documents in this Returnable Schedule. Alternatively, a tenderer may state such proposed deviations and qualifications in a covering letter attached to his tender and reference such letter in this schedule. Any proposed deviations or qualifications contained in a covering letter which is not referenced in this schedule will not be considered.

The Tenderer's attention is drawn to clause 2.3.7.2 of the Standard Conditions of Tender referenced in the Tender Data regarding the CCT's handling of material deviations and qualifications.

If no deviations or qualifications are proposed, the schedule hereunder is to be marked NIL and signed by the Tenderer.

PAGE	CLAUSE OR ITEM	PROPOSED DEVIATION OR QUALIFICATION

List relevant documentation attached in Schedule F.10 below.

_____ _____

Signature
Print name:
On behalf of the tenderer (duly authorised)

Date

Schedule F.11: List of Other Documents Attached By Tenderer

The tenderer has attached to this schedule, the following additional documentation:		
	Date of Document	**Title of Document or Description (refer to clauses / schedules of this tender document where applicable)**
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		

Attach additional pages if more space is required.

_____ _____

Signature
Print name:
On behalf of the tenderer (duly authorised)

Date

Schedule F.12: Record of Addenda to Tender Documents

We confirm that the following communications received from the CCT before the submission of this tender offer, amending the tender documents, have been taken into account in this tender offer:		
	Date	**Title or Details**
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
Attach additional pages if more space is required.		

_____ _____

Signature
Print name:
On behalf of the tenderer (duly authorised)

Date

Schedule F.13: Information to Be Provided With the Tender

The following information shall be provided with the Tender:

1. The various technical details and data required by the Technical Data Sheets and information required in the Returnable Schedules.

2. Drawings and Samples

3. If the tender is accepted, the drawings shall be re-submitted for approval and after being approved will form part of the contract per purchase order per project.

4. The Schedule of Type Tests completed.

5. Maintenance manual of equipment offered.

6. Quality assurance plan.

7. Occupational Health and Safety Plan for work performed on site.

_____ _____

Signature
Print name:
On behalf of the tenderer (duly authorised)

Date

Schedule F.14: Appeal Application

annexure 'B'

OFFICIAL RECEIPT
(Valid only if printed by official cash receipting machine)

IRISITI ESESIKWENI
(Isemthethweni kuphela xa ishicilelwe ngumatshini wokukhupa irisiti osesikweni.)

AMPTELIKE KWITANSIE
(Geldig alleenlik indien deur amptelike kontantvangs masjien gedruk.)

GL DATA CAPTURE RECEIPT
(CASHIERTO RETAIN A COPY)

RECEIPT NO: _____

DATE: _____

SAP GL:

8	1	0	1	0	0

PROFIT CENTRE:

1	3	0	5	0	0	0	1

NAME/COMPANY NAME:

AMOUNT:

						R	3	0	0	-	0	0

SERVICE DEPARTMENT DETAILS-

DEPARTMENT: LEGAL SERVICES: APPEALS UNIT

CONTACT PERSON: CHARLENE CEBEKHULU / MELANIE CLOETE

PHONE NO: 021 400 2503 / 021 400 3788

OFFICIAL RECEIPT
(Valid only if printed by official cash receipting machine)

IRISITI ESESIKWENI
(Isemthethweni kuphela xa ishicilelwe ngumatshini wokukhupa irisiti osesikweni.)

AMPTELIKE KWITANSIE
(Geldig alleenlik indien deur amptelike kontantvangs masjien gedruk.)

GL DATA CAPTURE RECEIPT
(CASHIERTO RETAIN A COPY)

RECEIPT NO: _____

DATE: _____

SAP GL:

8	1	0	1	0	0

PROFIT CENTRE:

1	3	0	5	0	0	0	1

NAME/COMPANY NAME:

AMOUNT:

						R	3	0	0	-	0	0

SERVICE DEPARTMENT DETAILS-

DEPARTMENT: LEGAL SERVICES: APPEALS UNIT

CONTACT PERSON: CHARLENE CEBEKHULU / MELANIE CLOETE

PHONE NO: 021 400 2503 / 021 400 3788

Schedule F.15A: Key personnel

HMI Programmer: N6 or National Diploma in Electrical/Electronics/Mechatronics Engineering or Software related programming. Minimum of 5 Years Post Qualification experience.			
Name	Qualifications	Type of Experience	No of years – Post Qualification Experience

PLC Programmer: N6 or National Diploma in Electrical/Electronics/Mechatronics Engineering or Software related programming. Minimum of 5 Years Post Qualification experience.			
Name	Qualifications	Type of Experience	No of years – Post Qualification Experience

Instrumentation Technician/Artisan: N6 or National Diploma in Electrical/Electronic Mechatronics or Instrumentation Engineering or Instrumentation Mechanician trade qualification. Minimum of 5 Years Post Qualification experience.			
Name	Qualifications	Type of Experience	No of years – Post Qualification Experience

SCADA Software Programmer: N6 or National Diploma in Electrical/Electronic/ Mechatronics Engineering/Computer/Software Programming. Minimum of 5 Years Post Qualification experience.			
Name	Qualifications	Type of Experience	No of years – Post Qualification Experience

Telemetry Technician: N6 or National Diploma in Electrical/Electronic/ Mechatronics Engineering/Communications related. Minimum of 5 Years Post Qualification experience.			
Name	Qualifications	Type of Experience	No of years – Post Qualification Experience

Schedule F.15B: Tendering Entity Track Record

The tenderer is referred to the Specification and Item 2.2.1.1.4: Tendering Entity Track Record in the Conditions of Tender and shall provide details on the schedule below to prove compliance with the relevant tender requirements. If space is not sufficient, this page may be copied.

The tenderer is referred to the appropriate clause(s) of the Conditions of Tender

Where the entity tendering is a joint venture, the track record of each party to the joint venture must be submitted as part of this schedule (additional pages may be added if necessary).

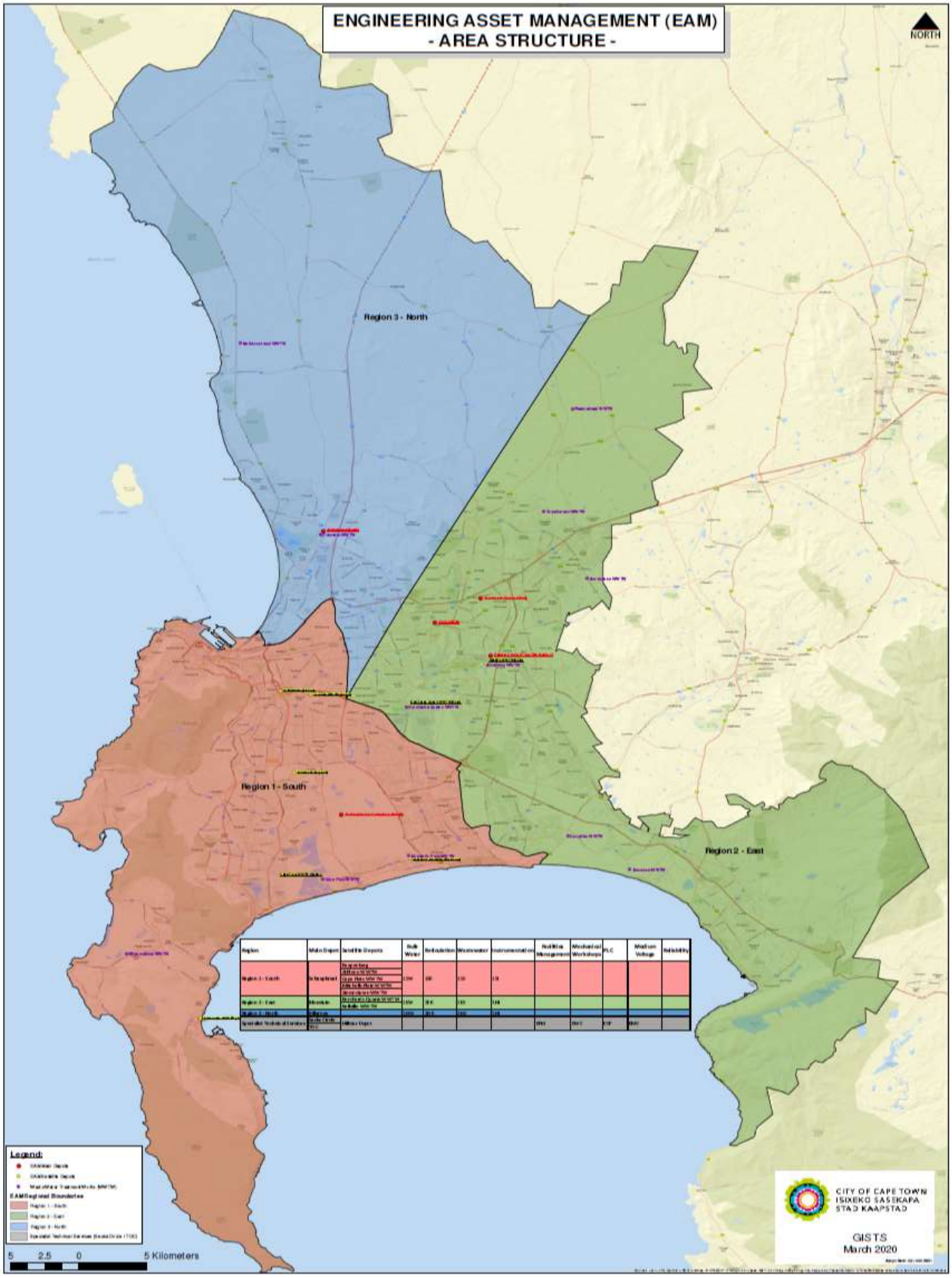
TYPE/DESCRIPTION OF RELEVANT WORK PREVIOUSLY PERFORMED	**CLIENT'S DETAILS** *(Location where work was performed, company name, contact name & phone number)*	**DATE OF PROJECT**	**VALUE OF PROJECT**

Attach additional pages if more space is required.

SIGNED ON BEHALF OF TENDERER: . . . . . .

Schedule F.16: Region Preference

Engineering and Asset Management operate in three Water and Sanitation, Cape Metropolitan operational regions namely Schaapkraal Region 1, Blomtuin Region 2 and Killarney Region 3. In each of the three operational regions there are a number of Bulk water, Wastewater treatment facilities and Reticulation pumping stations.



The CCT intends to appoint two tenderers per Region (the highest ranked tenderer (“the winner”) and in addition an “alternative”) for the allocation of work. Tenderers can only be the “winner” of one Region but can be the “alternative tenderer” of one other Region. If insufficient responsive bids are received, the CCT reserves the right to appoint fewer tenderers, or not to appoint any tenderers at all.

The tenderer must indicate the Region Preference in the table below:

Preference ranking	**Region description:** e.g. Schaapkraal Region 1, Blomtuin Region 2 or Killarney Region 3
1	
2	
3	