


<b>TENDER DOCUMENT GOODS AND SERVICES</b>		 <b>CITY OF CAPE TOWN ISIXEKO SASEKAPA STAD KAAPSTAD</b>	
<b>SUPPLY CHAIN MANAGEMENT</b>			
SCM - 542	Approved by Branch Manager: 03/04/2020	Version: 8	Page 1 of 216

**TENDER NO: 153S/2022/23**

**TENDER DESCRIPTION: SUPPLY, INSTALLATION AND AD HOC MAINTENANCE OF CONTROL SYSTEMS INFRASTRUCTURE AT VARIOUS CITY OF CAPE TOWN SITES**

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

## VOLUME 1: TENDERING PROCEDURES

**CLOSING DATE:** 02 November 2022

**CLOSING TIME:** 10:00 a.m.

**TENDER BOX  
NUMBER:** 168

**TENDER FEE:** R 200 Non-refundable tender fee payable to 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	
<b>NAME of Company/Close Corporation or Partnership / Joint Venture/ Consortium or Sole Proprietor /Individual</b>	
<b>TRADING AS</b> (if different from above)	

NATURE OF TENDER OFFER (please indicate below)	
<b>Main Offer</b> (see clause 2.2.11.1)	
<b>Alternative Offer</b> (see clause 2.2.11.1)	

<b>TENDER SERIAL NO.:</b>
<b>SIGNATURES OF CITY OFFICIALS AT TENDER OPENING</b>
1
2
3

## TABLE OF CONTENTS

<b>VOLUME 1: THE TENDER.....</b>	<b>3</b>
<b>(1) GENERAL TENDER INFORMATION.....</b>	<b>3</b>
<b>(2) CONDITIONS OF TENDER .....</b>	<b>4</b>
<b>VOLUME 2: RETURNABLE DOCUMENTS .....</b>	<b>25</b>
<b>(3) DETAILS OF TENDERER.....</b>	<b>25</b>
<b>(4) FORM OF OFFER AND ACCEPTANCE.....</b>	<b>27</b>
<b>(5) PRICE SCHEDULE.....</b>	<b>30</b>
<b>(6) SUPPORTING SCHEDULES .....</b>	<b>54</b>
SCHEDULE 1: CERTIFICATE OF AUTHORITY FOR PARTNERSHIPS/ JOINT VENTURES/ CONSORTIUMS.....	54
SCHEDULE 2: DECLARATION FOR PROCUREMENT ABOVE R10 MILLION.....	55
SCHEDULE 3: PREFERENCE SCHEDULE .....	57
SCHEDULE 4: DECLARATION OF INTEREST – STATE EMPLOYEES (MBD 4 AMENDED) .....	62
SCHEDULE 5: CONFLICT OF INTEREST DECLARATION .....	65
SCHEDULE 6: DECLARATION OF TENDERER’S PAST SUPPLY CHAIN MANAGEMENT PRACTICES (MBD 8) .....	66
SCHEDULE 7: AUTHORISATION FOR THE DEDUCTION OF OUTSTANDING AMOUNTS OWED TO THE CITY OF CAPE TOWN.....	68
SCHEDULE 8: CONTRACT PRICE ADJUSTMENT AND/OR RATE OF EXCHANGE VARIATION.....	69
SCHEDULE 9: CERTIFICATE OF INDEPENDENT TENDER DETERMINATION .....	75
SCHEDULE 10: LOCAL CONTENT DECLARATION / ANNEXURE C.....	76
SCHEDULE 11: PRICE BASIS FOR IMPORTED RESOURCES.....	82
SCHEDULE 12: SCHEDULE OF PRE-QUALIFICATION CRITERIA SUB-CONTRACTORS.....	ERROR! BOOKMARK NOT DEFINED.
SCHEDULE 13: LIST OF OTHER DOCUMENTS ATTACHED BY TENDERER .....	83
SCHEDULE 14: RECORD OF ADDENDA TO TENDER DOCUMENTS.....	84
SCHEDULE 15: INFORMATION TO BE PROVIDED WITH THE TENDER.....	85
<b>VOLUME 3: DRAFT CONTRACT .....</b>	<b>90</b>
<b>(7) SPECIAL CONDITIONS OF CONTRACT .....</b>	<b>90</b>
<b>(8) GENERAL CONDITIONS OF CONTRACT .....</b>	<b>102</b>
<b>(9) FORM OF GUARANTEE / PERFORMANCE SECURITY .....</b>	<b>115</b>
<b>(10) FORM OF ADVANCE PAYMENT GUARANTEE.....</b>	<b>ERROR! BOOKMARK NOT DEFINED.</b>
<b>(10.1) ADVANCE PAYMENT SCHEDULE.....</b>	<b>ERROR! BOOKMARK NOT DEFINED.</b>
<b>(11) OCCUPATIONAL HEALTH AND SAFETY AGREEMENT .....</b>	<b>118</b>
<b>(12) INSURANCE BROKER’S WARRANTY (PRO FORMA).....</b>	<b>119</b>
<b>(13) SPECIFICATION(S) .....</b>	<b>120</b>
<b>(14.1) MONTHLY PROJECT LABOUR REPORT (EXAMPLE).....</b>	<b>211</b>
<b>(14.2) BBBEE SUB-CONTRACT EXPENDITURE REPORT (PRO FORMA) .....</b>	<b>214</b>
<b>(14.3) PARTNERSHIP/ JOINT VENTURE (JV) / CONSORTIUM/ EXPENDITURE REPORT (PRO FORMA).....</b>	<b>215</b>

## VOLUME 1: THE TENDER

### (1) GENERAL TENDER INFORMATION

TENDER ADVERTISED	:	23 September 2022
SITE VISIT/CLARIFICATION MEETING	:	10h00 on 06 October 2022 (Not compulsory, but strongly recommended)
VENUE FOR SITE VISIT/CLARIFICATION MEETING	:	:A Non - <b>Compulsory but strongly recommended site visit/clarification</b> meeting with the representatives of the Employer will be held virtually via Skype on 6 October 2022 at 10:00. Kindly contact Brian Wyngaard via email at <a href="mailto:Brian.Wyngaard@capetown.gov.za">Brian.Wyngaard@capetown.gov.za</a> or a link to meeting prior to the time and date of the meeting.
TENDER BOX & ADDRESS	:	<b>Tender Box as per front cover</b> at the <b>Tender &amp; Quotation Boxes Office</b> , 2 <sup>nd</sup> Floor (Concourse Level), Civic Centre, 12 Hertzog Boulevard, Cape Town.  : The Tender Document (which includes the Form of Offer and Acceptance) completed 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 <b>"TENDER NO. 1533S/2022/23: SUPPLY, INSTALLATION AND ADHOC MAINTENANCE OF CONTROL SYSTEMS INFRASTRUCTURE AT VARIOUS CITY OF CAPE TOWN SITES"</b>  the tender box No. 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	:	[Name: Robin Maharaj Tel. No.: (021) 400 1029 Email: <a href="mailto:robin.maharaj@capetown.gov.za">robin.maharaj@capetown.gov.za</a>

**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'**

## (2) CONDITIONS OF TENDER

### 2.1 General

#### 2.1.1 Actions

**2.1.1.1** The City of Cape Town (CCT) and each tenderer submitting a tender offer shall comply with these Conditions of Tender. In their dealings with each other, they shall discharge their duties and obligations as set out in these Conditions of Tender, timeously and with integrity, and behave equitably, honestly and transparently, comply with all legal obligations.

**The parties agree that this tender, its evaluation and acceptance and any resulting contract shall also be subject to the Employer's Supply Chain Management Policy ('SCM Policy') that was applicable on the date the bid was advertised, save that if the Employer 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 that contract. Please refer to this document contained on the Employer's website.**

**Abuse of the supply chain management system is not permitted and may result in the tender being rejected, cancellation of the contract, restriction of the supplier, and/or the exercise by the City of any other remedies available to it as described in the SCM Policy.**

**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 the returnable documents are part of these Conditions of Tender.

**2.1.2.2** These Conditions of Tender and returnable schedules which are required for tender evaluation purposes, shall form part of the contract arising from the 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 by its Director: Supply Chain Management or his nominee.

#### 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 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**

Unless otherwise stated in the tender conditions, a contract will be concluded with the tenderer who scores the highest number of tender adjudication points.

The City of Cape Town intends to appoint one or more tenderers (the highest ranked tenderer “the Winner” per Region for the allocation of work in each of the three (3) operational Regions of Engineering and Asset Management (EAM). The *Winner* in a Region may be allocated as the *Standby* in another region subject to tender ranking/preferences, however the City reserves its right not to appoint standby tenderers.

Each tenderer may only be awarded a maximum of one Region as “the Winner”; however, the CCT reserves the right to offer an already successful tenderer more than one region, based on the tender ranking. The tenderer must indicate the Region Preference in **Schedule 16 C: Region Preference**.

If insufficient responsive bids are received, the CCT reserves the right to appoint fewer tenderers, or not to appoint any tenderers at all. 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 next highest ranked tenderer from the standby tenderers.

The contract period shall be for a period of **three years** from the commencement date of the contract.

### **2.1.5.2 Proposal procedure using the two stage-system**

A two-stage system will not be followed.

**2.1.5.2.1** Tenderers shall submit in the first stage only technical proposals. The CCT shall invite all responsive tenderers to submit tender offers in the second stage, following the issuing of procurement documents.

**2.1.5.2.2** The CCT shall evaluate tenders received during the second stage in terms of the method of evaluation stated in the tender conditions, and award the contract in terms of these Conditions of Tender.

### **2.1.5.3 Nomination of Alternative Bidder**

Alternative Bidder means a bidder, identified 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 alternative bidder in terms of the procedures included its SCM Policy.

## **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 City of Cape Town 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 City, 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 City 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, Corporate Services Directorate

**Via hand delivery at:** 20<sup>th</sup> Floor, Tower Block, 12 Hertzog Boulevard, Cape Town 8001

**Via post at:** Private Bag X918, Cape Town, 8000

**Via fax at:** 021 400 5963 or 021 400 5830

**Via email at:** [MSA.Appeals@capetown.gov.za](mailto:MSA.Appeals@capetown.gov.za)

### **2.1.6.5 All requests referring to clause 2.1.6.3 ns must be submitted in writing to:**

**The City Manager** - C/o the Manager: Access to Information Unit, Corporate Services Directorate

**Via hand delivery at:** 20<sup>th</sup> Floor, Tower Block, 12 Hertzog Boulevard, Cape Town 8001

**Via post at:** Private Bag X918, Cape Town, 8000

**Via fax at:** 086 202 9982

**Via email at:** [Access2info.Act@capetown.gov.za](mailto:Access2info.Act@capetown.gov.za)

### **2.1.7 City of Cape Town 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 City of Cape Town's Supplier Database may collect registration forms from the Supplier Management Unit located within the Supplier Management / Registration Office, 2<sup>nd</sup> 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 City of Cape Town's website [www.capetown.gov.za](http://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.

### **2.1.9 POPIA:**

The City of Cape Town (City) respects the privacy rights of all persons who participate in the City's procurement procedures. All personal information of the bidder will be processed in accordance to the Protection of Personal Information Act 4 of 2013 (POPIA). Personal information of bidders will only be processed for purposes of tendering procedures and the associated processing operations, or, for any other legitimate purpose relating to City functions.

Personal information of City employees will only be processed for purposes of executing the obligations of the contract and the associated processing operations, or, for any other legitimate purpose relating to City and/or service provider functions.

All matters will be treated as confidential and in connection with the tender. You may 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.

By submitting a tender to the City of Cape Town, (and by concluding any ensuing related agreement with the City of Cape Town, if applicable), the Tenderer thereby acknowledges and unconditionally agrees:

1.1 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;

1.2 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;

1.3 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;

1.4 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-contractors' 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;

1.5 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 exists therein);

1.6 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

1.7 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.



## 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. Only those tenders that comply in all aspects with the tender conditions, specifications, pricing instructions and contract conditions will be declared to be responsive.**

#### 2.2.1.1.1 Submit a tender offer

Only those tender submissions from which it can be established 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 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 to be completed);
- c) A copy of the partnership / joint venture / consortium agreement to be provided.
- 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 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 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 to be completed);
- g) The tenderer (including any of its 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, involved with the bid specification committee;
- k) A completed **Authorisation for the Deduction of Outstanding Amounts Owed to the City of Cape Town** to be provided and which does not indicate any details that renders the tender non-responsive based on the conditions contained thereon (applicable schedules to be completed);
- l) The tenderer (including any of its 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 directors or members), has not been found guilty on any other basis listed in the Supply Chain Management Policy.

#### 2.2.1.1.3 Key staff Requirements

In order to be declared responsive, the tenderer must have the following key personnel at the close of tender. Alternatively, a signed undertaking from a contractor or consultant having the required personnel, stating that they will undertake the necessary work on behalf of the tenderer, will be acceptable. Such undertaking must be attached to **Schedule 15B: Key Personnel (returnable schedule)**.

Different individuals are to be identified for each of the key personnel listed below and on Schedule 15B: Key Personnel. The tenderer may however propose the same person for the PLC and HMI, provided that such person meet the requirements for each criteria and the tender submission must clearly indicate such compliance. **Copies of qualifications or/and a copy of OEM Certificate must be attached.**

Position	Qualification	Experience
HMI Programmer	N6 or National Diploma in Electrical/Electronics/Mechatronics Engineering or Software related programming or OEM Certification	A minimum of 5 Years Post Qualification
PLC Programmer	N6 or National Diploma in Electrical/Electronics/Mechatronics Engineering or Software related programming or OEM Certification	A minimum of 5 Years Post Qualification
Instrumentation Technician/Artisan	N6 or National Diploma in Electrical/Electronic Mechatronics or Instrumentation Engineering or OEM Certification	A minimum of 5 Years Post Qualification
SCADA Programmer	N6 or National Diploma in Electrical/Electronic/ Mechatronics Engineering/Computer/Software Programming or OEM Certification	A minimum of 5 Years Post Qualification
Telemetry Technician	N6 or National Diploma in Electrical/Electronic/ Mechatronics Engineering/Communications related or OEM Certification	A minimum of 5 Years Post Qualification

#### 2.2.1.1.4 Entity track record

Tenderer must have a proven track record and shall have completed at least 10 projects for integrating various field devices or instrumentation with programmable logic controllers and SCADA/HMI system, utilising various communication medium like fibre wireless and copper coupled with variety of industrial protocols.

Only those tenders submitted by tenderers who with a proven track record as requested will be declared responsive. Tenderers must provide at least three projects across each of the fields/disciplines (PLC; HMI, Telemetry ; SCADA and Instrumentation) as requested. A single project may consist of multiple fields or disciplines.

Tenderers must provide references with active contact details that can validate all information provided in this regard.

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 15C: Tendering Entity Track Record.**

#### 2.2.1.1.5 Local production and content

The City promotes the procurement of goods manufactured by local suppliers. The Department of Trade and Industry and National Treasury has identified specific designated sectors which require local content compliance. The current designated sectors are listed below:

Note: All to be listed including the date that the relevant Sector became effective.

Tenderers are required to ensure that they comply with these designated Sector requirements by ensuring that the products provided to the City are locally manufactured. Failure to meet the minimum stipulated threshold for local production and content will result in a bid being declared non-responsive.

Further details of designated sectors are available on [http://www.thedti.gov.za/industrial\\_development/ip.jsp](http://www.thedti.gov.za/industrial_development/ip.jsp) and [http://ocpo.treasury.gov.za/Buyers\\_Area/Legislation/Pages/Practice-Notes.aspx](http://ocpo.treasury.gov.za/Buyers_Area/Legislation/Pages/Practice-Notes.aspx)

#### In addition to the above:

The supplier shall study the terms and conditions as stated in the **Local Content Declaration / Annexure C** returnable schedule.

The stipulated minimum threshold percentages for local production and content for the **Electrical and Telecom Cables Sector** ("the designated sector") is **90%** and will include all sub-sectors from the applicable National Treasury Instruction Note.

Only tenders with locally produced or locally manufactured Optical Fibre Cables and Component from local raw material or input will be considered.

If the raw material or input to be used for a specific item is not available locally, suppliers should obtain written authorisation from the Department of Trade and Industry (DTI) (Chief Director: Industrial Procurement, tel. 012 394 3927 and fax 012 394 4927) should there be a need to import such raw material or input.

A copy of the authorisation letter must be submitted together with the bid document at the closing date and time of the bid.

The CCT is obliged and must ensure that contracts for the **Electrical and Telecom Cables Sector** are awarded at prices that are market related taking into account, among others, benchmark prices designated by the DTI for the sector, value for money and economies of scale. Where appropriate, prices may be negotiated with preferred bidders in accordance with provisions for Negotiation with Preferred Bidders as set out in the CCT SCM Policy.

A bid will be declared non-responsive / disqualified if the Declaration Certificate for Local Production and Content and Annex C as well as the authorisation letter referred to above (if applicable) are not submitted as part of the bid documentation at the closing date and time of the bid.

For further information relating to the local production and content legislation, suppliers may refer to website [http://www.thedtic.gov.za/industrial\\_development/ip.jsp](http://www.thedtic.gov.za/industrial_development/ip.jsp), or may contact the Chief Director: Industrial Procurement at the DTI at telephone number (012) 394 3927 and fax (012) 394 4927, the Director: Fleet Procurement, Ms Cathrine Matidza, at telephone number (012) 394 3927 and e-mail [CMatidza@thedtic.gov.za](mailto:CMatidza@thedtic.gov.za), or the DTI Contact Centre no 0861 843384.

#### **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**

Treat as 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**

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 documents by reference.

#### **2.2.6 Acknowledge and comply with notices**

Acknowledge receipt of notices to the tender documents, which the CCT may issue, fully comply with all instructions issued in the 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 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.

### **2.2.7 Clarification meeting**

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.

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

### **2.2.8 Seek clarification**

Request clarification of the tender documents, if necessary, by notifying the CCT at least one week before the closing time stated in the General Tender Information, where possible.

### **2.2.9 Pricing the tender offer**

**2.2.9.1** Comply with all pricing instructions as stated on the Price Schedule.

### **2.2.10 Alterations to documents**

Do 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 tender conditions 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 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 of 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.

**2.2.11.2** Accept that an alternative tender offer may be based only on the criteria stated in the tender conditions or criteria otherwise acceptable to the CCT.

### **2.2.12 Submitting a tender offer**

**2.2.12.1** 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 contract conditions and described in the specifications. Only those tenders submitted on the tender documents as issued by the CCT together with all Returnable Schedules duly completed and signed will be declared responsive.

**2.2.12.2** Return the entire 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** Submit the parts of the tender offer communicated on paper as an original with an English translation for any part of the tender submission not made in English.

1 (One) copy(ies) of the following elements of the bid submission must be submitted separately bound in the same envelope where possible:

Part	Heading
5	Pricing Schedules
6	Supporting Schedules
	All other attachments submitted by bidder

**2.2.12.4** Sign the original tender offer where required in terms of the tender conditions. The tender shall be signed by a person duly authorised to do so. Tenders submitted by joint ventures of two or more firms shall be accompanied by the document of formation 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.

**2.2.12.5** Where a two-envelope system is required in terms of the tender conditions, place and seal the returnable documents listed in the tender conditions 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, as well as the tenderer's name and contact address.

**2.2.12.6** 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.

**2.2.12.7** Accept that 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.

**2.2.12.8** Accept that tender offers submitted by facsimile or e-mail will be rejected by the CCT, unless stated otherwise in the tender conditions.

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

**2.2.12.10** Tenders must be properly received and deposited 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.

**2.2.12.12** 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**

Accept that 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** Ensure that the CCT receives the tender offer at the address specified in the General Tender Information prior to the closing time stated on the front page of the tender document.

**2.2.14.2** Accept that, 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** Accept that, 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** Warrants 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 above, bids shall remain valid for acceptance for a period of twelve (12) months after the expiry of the original validity period, unless the City 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 and administrative processes and upon approval by the City Manager.

**2.2.15.3** A tenderer may request in writing, after the closing date, that the 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.

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

Provide clarification of a 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** Provide, on 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** 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 party to a Consortium/Joint Venture shall submit separate certificates/statements in the above regard.

**2.2.17.3** Tenderers 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**

Provide access during working hours to premises for inspections, tests and analysis as provided for in the tender conditions or specifications.

If the **Specification** 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 Broad-Based Black Economic Empowerment Status Level Documentation**

In order to qualify for preference points, it is the responsibility of the tenderer to submit documentary proof, either as certificates, sworn affidavits or any other requirement prescribed in terms of the B-BBEE Act, of its B-BBEE status level of contribution in accordance with the applicable Codes of good practise as issued by the Department of Trade and Industry, 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 the tender submission.

Consortiums/Joint Ventures will qualify for preference points, provided that the **entity** submits the relevant certificate/scorecard in accordance with the applicable codes of good practise. Note that, in the case of unincorporated entities, a verified consolidated B-BBEE scorecard must be submitted in the form of a certificate with the tender.

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

The applicable code for this tender is the **Amended Codes of Good Practise (Generic Scorecard)** unless in possession of a valid sector certificate.

The tenderer shall indicate in Section 4 of the **Preference Schedule** the Level of Contribution in respect of the enterprise status or structure of the tendering entity (the supplier).

##### **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 Clearance Certificate issued by SARS to the CCT at the Supplier Management Unit located within the Supplier Management / Registration Office, 2<sup>nd</sup> 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 also provide 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 Clearance Certificate.

Before making an award the City 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 City, 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 City via CSD or e-Filing. The City 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**

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 Tender Conditions, 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 representative for the purpose of this tender is stated on the General Tender Information page.

### **2.3.2 Issue Notices**

If necessary, 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 Employer 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, open tender submissions in the presence of tenderers' agents who choose to attend at the time and place stated in the tender conditions.

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 and the preferences 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 tender conditions that a two-envelope system is to be followed, 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 tender conditions and announce the name of each tenderer whose technical proposal is opened.

**2.3.4.2** 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. Open only the financial proposals of tenderers, who have submitted responsive technical proposals in accordance with the requirements as stated in the tender conditions, and announce the total price and any preferences claimed. Return unopened financial proposals to tenderers whose technical proposals were non responsive.

### **2.3.5 Non-disclosure**

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**

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** 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 tender conditions.

**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 (Part 5)**:

- based on the sum of the prices/rates in relation to a typical project/job.

**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 over 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 scored as follows:

Points will be awarded to tenderers who are eligible for preferences in respect of the B-BBEE level of contributor attained in terms of **Preference Schedule**.

A maximum of 10 tender adjudication points will be awarded for preference to tenderers with responsive tenders who are eligible for such preference, in accordance with the criteria listed below.

Up to **10** adjudication points (N<sub>P</sub>) will be awarded for the level of B-BBEE contribution, in accordance with the tables below:

B-BBEE Status Level of Contributor	Number of Points for Preference
1	10
2	9
3	6
4	5
5	4
6	3
7	2
8	1
Non-compliant contributor	0

*\*A non-compliant contributor is one who does not meet the minimum score for a level 8 contributor.*

or, in respect of Exempted Micro Enterprises (EMEs):

Black Ownership of EME	Deemed Status Contributor	B-BBEE Level of	Number of Points for Preference
less than 51%	4		5
at least 51% but less than 100%	2		9
100%	1		10

or, in respect of Qualifying Small Enterprises (QSEs):

Black Ownership of QSE	Deemed Status Contributor	B-BBEE Level of	Number of Points for Preference
at least 51% but less than 100%	2		9
100%	1		10

**The total number of adjudication points ( $N_T$ ) shall be calculated as follows:**

$$N_T = P_S + N_P$$

Where:  $P_S$  is the number of points scored for price;  
 $N_P$  is the number of points scored for preference.

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

#### **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:

- reasonableness of the financial offer
- reasonableness of unit rates and prices
- 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
- 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:

- does not allow any preferred tenderer a second or unfair opportunity;
- is not to the detriment of any other tenderer; and
- 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 PPPFA Regulations, 2017, 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 employer'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 employer, to perform the contract free of conflicts of interest.

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

**2.3.12.4** 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 City as a result of (inter alia):

- a) reports of poor governance and/or unethical behaviour;
- b) association with known family of notorious individuals;
- c) poor performance issues, known to the City;
- d) negative social media reports; and
- e) adverse assurance (e.g. due diligence) report outcomes.

**2.3.12.5** The CCT reserves the right to nominate an alternative bidder 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 alternative 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.

<b>TENDER DOCUMENT GOODS AND SERVICES</b>		 <b>CITY OF CAPE TOWN ISIXEKO SASEKAPA STAD KAAPSTAD</b>	
<b>SUPPLY CHAIN MANAGEMENT</b>			
SCM - 542	Approved by Branch Manager: 03/04/2020	Version: 8	Page 24 of 66

**TENDER NO: 153S/2022/23**

**TENDER DESCRIPTION: SUPPLY, INSTALLATION AND AD HOC MAINTENANCE OF CONTROL SYSTEMS INFRASTRUCTURE AT VARIOUS CITY OF CAPE TOWN SITES**

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

## VOLUME 2: RETURNABLE DOCUMENTS

TENDERER	
<b>NAME of</b> Company/Close Corporation or Partnership / Joint Venture/ Consortium or Sole Proprietor /Individual	
<b>TRADING AS</b> (if different from above)	

NATURE OF TENDER OFFER (please indicate below)	
<b>Main Offer</b> (see clause 2.2.11.1)	
<b>Alternative Offer</b> (see clause 2.2.11.1)	



## VOLUME 2: RETURNABLE DOCUMENTS

### (3) DETAILS OF TENDERER

#### 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):

<b>Name of Company / Close Corporation or Partnership / Joint Venture / Consortium or Individual /Sole Proprietor</b>	
<b>Trading as</b> (if different from above)	
<b>Company / Close Corporation registration number</b> (if applicable)	
<b>Postal address</b>	Postal Code _____
<b>Physical address</b> (Chosen domicilium citandi et executandi)	Postal Code _____
<b>Contact details of the person duly authorised to represent the tenderer</b>	Name: Mr/Ms _____ (Name & Surname)  Telephone:( ____ ) _____ Fax:( ____ ) _____ Cellular Telephone: _____ E-mail address: _____
<b>Income tax number</b>	
<b>VAT registration number</b>	
<b>SARS Tax Compliance Status PIN</b>	
<b>City of Cape Town Supplier Database Registration Number</b> (See Conditions of Tender)	
<b>National Treasury Central Supplier Database registration number</b> (See Conditions of Tender)	

Is tenderer the accredited representative in South Africa for the Goods / Services / Works offered?	<input type="checkbox"/> Yes <input type="checkbox"/> No If yes, enclose proof
Is tenderer a foreign based supplier for the Goods / Services / Works offered?	<input type="checkbox"/> Yes <input type="checkbox"/> No If yes, answer the Questionnaire to Bidding Foreign Suppliers (below)
<b>Questionnaire to Bidding Foreign Suppliers</b>	a) Is the tenderer a resident of the Republic of South Africa or an entity registered in South Africa?  <input type="checkbox"/> Yes <input type="checkbox"/> No
	b) Does the tenderer have a permanent establishment in the Republic of South Africa?  <input type="checkbox"/> Yes <input type="checkbox"/> No
	c) Does the tenderer have any source of income in the Republic of South Africa?  <input type="checkbox"/> Yes <input type="checkbox"/> No
	d) Is the tenderer liable in the Republic of South Africa for any form of taxation?  <input type="checkbox"/> Yes <input type="checkbox"/> No
<b>Other Required registration numbers</b>	

## (4) FORM OF OFFER AND ACCEPTANCE

### TENDER 153S/2022/23 : SUPPLY, INSTALLATION AND ADHOC MAINTENANCE OF CONTROL SYSTEMS INFRASTRUCTURE AT VARIOUS CITY OF CAPE TOWN SITES]

#### OFFER: (TO BE FILLED IN BY TENDERER):

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

<b>Name of Tendering Entity*</b> ("the tenderer")	
<b>Trading as</b> (if different from above)	

**AND WHO IS** represented herein by: (full names of signatory)

duly authorised to act on behalf of the tenderer in his capacity as: (title/ designation)

**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.

Signature(s)

Print name(s):  
On behalf of the tenderer (duly authorised)

Date

INITIALS OF CITY OFFICIALS		
1	2	3

## FORM OF OFFER AND ACCEPTANCE (continued)

### TENDER 153S/2022/23 : SUPPLY, INSTALLATION AND ADHOC MAINTENANCE OF CONTROL SYSTEMS INFRASTRUCTURE AT VARIOUS CITY OF CAPE TOWN SITES

#### ACCEPTANCE (TO BE FILLED IN BY THE CITY OF CAPE TOWN)

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

The terms of the contract are contained in:

- (7) & (8): Special and General Conditions of Tender
- (5) Price schedule
- 13: Specifications

and drawings and documents or parts thereof, which may be incorporated by reference into the above listed Parts.

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

The tenderer shall within two weeks after receiving a completed copy of this agreement, including the schedule of deviations (if any), contact the employer to arrange the delivery of any securities, bonds, guarantees, proof of insurance and any other documents to be provided in terms of the conditions of contract identified in the special contract conditions. Failure to fulfil any of these obligations in accordance with those terms shall constitute a repudiation of this agreement.

Notwithstanding anything contained herein, this agreement comes into effect on the date when the parties have signed the table below and confirms receipt from the employer of one fully completed original copy of this agreement, including the schedule of deviations (if any). The tenderer (now supplier) shall within five working days of the agreement coming into effect notify the employer in writing of any reason why he cannot accept the contents of this agreement as a complete and accurate memorandum thereof, failing which the agreement presented to the contractor shall constitute the binding contract between the parties.

The Parties	Employer	Supplier
Business Name		
Business Registration		
Tax number (VAT)		
Physical Address		
Accepted contract sum including tax		
Accepted contract duration		
Signed – who by signature hereto warrants authority		
Name of signatory		
Signed: Date		
Signed: Location		
Signed: Witness		
Name of Witness		

## FORM OF OFFER AND ACCEPTANCE (continued)

(TO BE FILLED IN BY THE CITY OF CAPE TOWN)

### Schedule of Deviations

#### 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 becomes an obligation of the contract shall also be recorded here.
4. Any change or addition to the tender documents arising from the above agreements and recorded here, shall also be incorporated into the final draft of the Contract.

1 Subject .....

Details .....

.....  
.....  
.....

2 Subject .....

Details .....

.....  
.....  
.....

3 Subject .....

Details .....

.....  
.....  
.....

4 Subject .....

Details .....

.....  
.....  
.....

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 returnable schedules, 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 receipt by the tenderer of a completed signed copy of this Agreement shall have any meaning or effect in the contract between the parties arising from this agreement.

## **(5) 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
		<b><u>SCHEDULE A: SUPPLY OF ITEMS</u></b>		
	<b>1</b>	<b>PLC TYPE 1</b>		
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/EtherNet/IP) Card Type 2	each	
	<b>2</b>	<b>PLC TYPE 2</b>		
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.	2.10	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	
	<b>3</b>	<b>PLC TYPE 3</b>		
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	

Item No	Payment Refers	Short Description	Unit	Total Rate R c
25.	3.7	CPU Level 4B	each	
	<b>4</b>	<b>PLC TYPE 4</b>		
26.	4.1	CPU 4.1	each	
27.	4.2	CPU 4.2	each	
28.	4.3	CPU 4.3	each	
	<b>5</b>	<b>Remote input/output modules</b>	each	
29.	5.1	Ethernet remote I/O drop adaptor	each	
30.	5.2	Ethernet remote I/O station	each	
	<b>6</b>	<b>INPUT/OUTPUT MODULES</b>	each	
	<b>6.1</b>	<b>Digital input modules</b>	each	
31.	6.1.1.1	16 Digital input module	each	
32.	6.1.1.2	32 Digital input module	each	
33.	6.1.1.3	64 Digital input module	each	
34.	6.1.2.1	16 Digital input module	each	
35.	6.1.2.2	32 Digital input module	each	
	<b>6.2</b>	<b>Digital output modules</b>	each	
36.	6.2.1.1	16 Digital output module		
37.	6.2.1.2	32 Digital output module	each	
38.	6.2.1.3	64 Digital output module	each	
39.	6.2.2.1	16 Digital output module	each	
40.	6.2.2.2	32 Digital output module	each	
	<b>6.3</b>	<b>Analog input modules</b>	each	
41.	6.3.1.1	4 Channel input	each	
42.	6.3.1.2	8 Channel input	each	
43.	6.3.1.3	4 Channel input	each	
44.	6.3.1.4	8 Channel input	each	



Item No	Payment Refers	Short Description	Unit	Total Rate R c
	<b>6.4</b>	<b>Analog output modules</b>		
45.	6.4.1.1	4 Channel output	each	
46.	6.4.1.2	8 Channel output	each	
47.	6.4.1.3	2 Channel output	each	
48.	6.4.1.4	4 Channel output	each	
	<b>6.5</b>	<b>Input/Output Connector</b>		
	<b>6.5.1</b>	<b>Removable terminal blocks</b>		
49.	6.5.1.1	20-way Removable terminal block - Screw	each	
50.	6.5.1.2	28-way Removable terminal blocks - Screw	each	
51.	6.5.1.3	20-way Removable terminal blocks - Spring type	each	
52.	6.5.1.4	28-way Removable terminal blocks - Spring type	each	
	<b>6.5.3</b>	<b>Preformed cord</b>		
53.	6.5.3.1	40-way Preformed cord set with one end with flying leads - 3m	each	
54.	6.5.3.2	40-way Preformed cord set with one end with flying leads - 5m	each	

Item No	Payment Refers	Short Description	Unit	Total Rate R c
	<b>6.5.4</b>	<b>Removable terminal prewired cord</b>		
55.	6.5.4.1	20-way Removable terminal pre-wired cord for 4 Analogue card	each	
56.	6.5.4.2	28-way Removable terminal pre-wired cord for 8 Analogue card	each	
	<b>6.5.5</b>	<b>Cords and terminals for CPU 4</b>	each	
57.	6.5.5.1	Front connector module	each	
58.	6.5.5.2	Front connector 35mm with screw terminals	each	
59.	6.5.5.3	Front connector 35mm with push-in terminals	each	
60.	6.5.5.4	Front connector 25mm with push-in terminals	each	
61.	6.5.5.5	Terminal module	each	
62.	6.5.5.6	Terminal module screw-type terminals	each	
63.	6.5.5.7	Terminal module push-in system	each	
64.	6.5.5.8	Connecting cord	each	
65.	6.5.5.9	16-pin round cord (shielded or unshielded) max. 10m	each	
66.	6.5.5.10	50-pin round cord (shielded or unshielded) max. 10m	each	
67.	6.5.5.11	16-pin round-sheath ribbon cord (shielded or unshielded) max. 30m	each	
68.	6.5.5.12	2x16-pin round-sheath ribbon cord (unshielded) max. 30m	each	
69.	6.5.5.13	Front connector with single wires	each	
	<b>7</b>	<b>BACKPLANE MODULES</b>		
	<b>7.1</b>	<b>Backplanes</b>		
70.	7.1.1	4-slot Ethernet + X-bus backplane	each	
71.	7.1.2	8-slot Ethernet + X-bus backplane	each	
72.	7.1.3	12-slot Ethernet + X-bus backplane	each	
	<b>7.2</b>	<b>Backplane extender</b>		
73.	7.2.1	I/O Rack expansion module	each	
	<b>7.3</b>	<b>Backplane extender cord set</b>		
74.	7.3.1	X-Bus Extension cord sets - 0.8m	each	
75.	7.3.2	X-Bus Extension cord sets - 3m	each	
76.	7.3.3	X-Bus Extension cord sets - 5m	each	

Item No	Payment Refers	Short Description	Unit	Total Rate R c
	<b>7.4</b>	<b>Backplane end terminator</b>		
77.	7.4.1	X-Bus line terminator set	each	
78.	7.5.1	CPU 4 mounting rail 830mm width	each	
	<b>8</b>	<b>POWER SUPPLY MODULE</b>		
79.	8.1.1	220Vac Module	each	
80.	8.1.2	24Vdc Module	each	
81.	8.2.1	CPU 4 - 220Vac Module	each	
82.	8.2.2	CPU 4 - 24Vdc Module	each	
	<b>9</b>	<b>FIELDBUS MODULES</b>		
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	
	<b>9.9</b>	<b>PLC PROGRAMMING TOOLBOX</b>		
91.	9.9.1	Single user licence PLC type 3	each	
92.	9.9.2	Single licence for PLC type 4	each	
	<b>10</b>	<b>PLC TYPE 5</b>		
93.	10.1	Plc type 5 cpu 1	each	
94.	10.4.	Power supply	each	

Item No	Payment Refers	Short Description	Unit	Total Rate R c
95.	10.5	Ethernet card(ip adapter) type1, plc type5 cpu1	each	
96.	10.6	Ethernet card(ip adapter) type1, plc type5 cpu1	each	
97.	10.7	Plc programming toolbox plc type 5	each	
98.	10.8.1	16 Digital input module for plc type 5 cpu1	each	
99.	10.8.2	32 Digital input module for plc type 5 cpu1	each	
100.	10.9.1	16 Digital output module for plc type 5 cpu1	each	
101.	10.9.2	32 Digital output module for plc type 5 cpu1	each	
102.	10.10.1	4 Analog input modules for plc type 5 cpu1	each	
103.	10.10.2	8 Analog input modules for plc type 5 cpu1	each	
104.	10.11.1	4 Analog output modules for plc type 5 cpu 1	each	
105.	10.11.2	8 Analog output modules for plc type 5 cpu 1	each	
106.	10.12	Input / output modules connectors for plc type 5 cpu 1	each	
	<b>10.13</b>	<b>BACKPLANE MODULES</b>		
107.	10.13.1	Backplanes(4 slots chassis) for plc type5 cpu 1	each	
108.	10.13.2	Backplanes (7 slots chassis) for plc type 5 cpu 1	each	
109.	10.13.3	Backplanes(13 slots chassis) for plc type 5 cpu 1	each	
110.	10.14	Backplane extender for plc type 5 cpu 1	each	
111.	10.15	Communications module for serial rs422/rs485 type5 cpu1	each	
112.	10.16.	Plc type 5 cpu 2	each	
113.	10.16.8	Power supply	each	
114.	10.16.9	Ethernet card (ip adapter) type 1 , plc type 5 cpu 2	each	
115.	10.16.16	Ethernet card (ip adapter) type 2 , plc type 5 cpu 2	each	
116.	10.16.23	Plc programming toolbox type cpu 2	each	
117.	10.16.24	Communications module for serial rs422/rs485 plc5 cpu2	each	
118.	10.17.1	16 Digital input modules for plc type 5, cpu 2	each	
119.	10.17.2	32 Digital input modules for plc type 5, cpu 2	each	
120.	10.18.1	16 Digital output modules for plc type5, cpu 2	each	
121.	10.18.2	32 Digital output modules for plc type5, cpu 2	each	
122.	10.19.1	4 Analog input modules for plc type 5 cpu 2	each	
123.	10.19.2	8 Analog input modules for plc type 5 cpu 2	each	

124.	10.20.1	4 Analog output modules for plc type 5 cpu 2	each	
Item No	Payment Refers	Short Description	Unit	Total Rate R c
125.	10.20.2	8 Analog output modules for plc type 5 cpu 2	each	
126.	10.21	Plc type 5 cpu 3	each	
127.	10.21.8	Power supply	each	
128.	10.21.9	Ethernet card (ip adapter) type1 , plc type 5 cpu 3	each	
129.	10.21.16	Ethernet card (ip adapter) type2 plc type 5 cpu 3	each	
130.	10.21 23	PLC programming toolbox	each	
131.	10.22.1	32 Digital input modules for plc type 5 cpu 3	each	
132.	10.22.2	16 Digital input modules for plc type 5 cpu 3	each	
133.	10.23.1	32 Digital output modules for plc type 5 cpu 3	each	
134.	10.23.2	16 Digital output modules for plc type 5 cpu 3	each	
135.	10.24.1	4 Analog input modules for plc type 5 cpu 3	each	
136.	10.24.2	8 Analog input modules for plc type 5 cpu 3	each	
137.	10.25.1	4 Analog output modules for plc type 5 cpu 3	each	
138.	10.25.2	8 Analog output modules for plc type 5 cpu 3	each	
	<b>11</b>	<b>PLC TYPE 6</b>		
139.	11.1	CPU PLC type 6	each	
140.	11.9	Plc programming toolbox for plc type 6	each	
141.	11.10.1	8 Digital input modules for plc type 6	each	
142.	11.10.2	16 Digital input modules for plc type 6	each	
143.	11.11.1	8 Digital output modules for plc type 6	each	
144.	11.11.2	16 Digital output modules for plc type 6	each	
145.	11.12.1	4 Analog input modules for plc type 6	each	
146.	11.12.2	8 Analog input modules for plc type 6	each	
147.	11.13	4 Analog output modules for plc type 6	each	
	<b>12</b>	<b>PLC TYPE 7</b>		
148.	12.1	CPU type 7 with integrated I/O	each	
149.	12.9	PLC programming toolbox for PLC type 7	each	
150.	12.10	Electronic Programmable Motor protection relay	each	
152.	12.11	Electronic Programmable Feeder protection relay	each	

Item No	Payment Refers	Short Description	Unit	Total Rate R c
153	12.12	Electronic Programmbale Transformer protection relay	each	
154	12.13	Electronic Programmbale Generator protection relay	each	
155	12.14	Electronic Programmbale Capacitor bank protection relay	each	
156	12.15	Electronic Programmbale Line Differential protection relay	each	
	<b>13</b>	<b>HMI Type 1</b>		
157	13.1	HMI 12.1 inch	each	
158	13.2	HMI 15 inch	each	
159	13.4	Open BOX for Universal Panel	each	
160	13.5	Memory card	each	
161	13.6	12.1" IPC screen	each	
162	13.7	15" IPC screen	each	
163	13.8	IPC modular pc box	each	
	<b>12</b>	<b>HMI programming toolbox</b>		
164	12.1	Single user licence for HMI and IPC	each	
165	12.2	Run time licence for IPC	each	
	<b>14</b>	<b>HMI Type 2</b>		
166	14.1	HMI 10.1 inch	each	
167	14.2	HMI 7.0 inch	each	
168	14.3	Memory card	each	
	<b>15</b>	<b>SCADA</b>		
	<b>15.1</b>	<b>New scada licence (single designer with 3 operators)</b>		
169	15.1.1	300 Tag/Object Point	each	
170	15.1.2	750 Tag/Object Point	each	
171	15.1.3	1500 Tag/Object Point	each	
172	15.1.4	2500 Tag/Object Point	each	
173	15.1.5	5000 Tag/Object Point	each	
174	15.1.6	Unlimited Tag/Object Point	each	
	<b>15.2</b>	<b>Upgrade of licence (single designer with 3 operators)</b>		
175	15.2.1	300 Tag Point	each	
176	15.2.2	750 Tag Point	each	

177.	15.2.3	1500 Tag Point	each	
178.	15.2.4	2500 Tag Point	each	
179.	15.2.5	5000 Tag Point	each	
180.	15.2.6	Unlimited Tag Point	each	

Item No	Payment Refers	Short Description	Unit	Total Rate R c
	<b>15.3</b>	<b>Alarm management licence</b>		
181.	15.3.1	300 Tag Point	each	
182.	15.3.2	750 Tag Point	each	
183.	15.3.3	1500 Tag Point	each	
184.	15.3.4	2500 Tag Point	each	
185.	15.3.5	5000 Tag Point	each	
	<b>15.4</b>	<b>SCADA HARDWARE</b>		
186.	15.4.1	SCADA & SQL Server with operating system.	each	
187.	15.4.2	Desktop PC small form	each	
188.	13.4.3.1	Programming Laptop A	each	
189.	13.4.3.2	Programming Laptop B	each	
	<b>15.4.4</b>	<b>Monitors</b>		
190.	15.4.4.1	55 inch 24/7 display	each	
191.	15.4.4.2	49 inch 24/7 display	each	
192.	15.4.4.3	43 inch 24/7 display	each	
193.	15.4.4.4	32 inch computer monitor	each	
194.	15.4.4.5	27-inch computer monitor	each	
195.	15.4.5	KVM with foldable screen rack mount	each	
196.	15.4.6	KVM extender VGA	each	
197.	15.4.7.1	3KVA UPS	each	
198.	15.4.7.2	5KVA UPS	each	
199.	15.4.7.3	10KVA UPS		
200.	15.4.9	UPS battery extender module for 3/5 KVA	each	
201.	15.4.10	Rugged tablet 10 " or greater	each	
202.	15.4.11	42U 19 inch server rack cabinet	each	
		<b>Telemetry Type 1</b>		
203.	16.1	CPU Type 1	each	
204.	16.2	CPU Type 1 Power supply	each	
205.	16.3	OPC Server for CPU Type 1	each	



	<b>16.4</b>	<b>I/O for Type 1 CPU</b>		
206.	16.4.1	Digital Input Type 1	each	
<b>Item No</b>	<b>Payment Refers</b>	<b>Short Description</b>	<b>Unit</b>	<b>Total Rate R c</b>
207.	16.4.2	Digital Output Type 1	each	
208.	16.4.3	Analog input Type 1	each	
209.	16.5	Complete Telemetry Station Type 1	each	
	<b>16.6</b>	<b>Antennas compatible with TYPE1 RTU</b>		
210.	16.6.1	Omni directional type	each	
211.	16.6.2	Directional type	each	
212.	16.6.3	Rubber duck type for Tetra	each	
		<b>Telemetry Type 2</b>		
213.	16.7	CPU Type 2	each	
214.	16.8	CPU Type 2 Power supply	each	
215.	16.9	OPC Server for CPU Type 2	each	
	<b>16.10</b>	<b>I/O for Type 2 CPU</b>		
216.	16.10.1	Digital Input Type 2	each	
217.	16.10.2	Digital Output Type 2	each	
218.	16.10.3	Analog input Type 2	each	
219.	16.10.4	Analog output for Type 2	each	
220.	16.10.5	Digital input Surge protection Type 2	each	
221.	16.10.6	Analog input surge protection Type 2	each	
222.	16.10.7	Interposing output relay unit type 2	each	
223.	16.11	Complete Telemetry Station Type 2	each	
	<b>16.12</b>	<b>Antennas compatible with TYPE2 RTU</b>		
224.	16.12.1	Omni directional type	each	
225.	16.12.2	Directional type	each	
226.	16.12.3	Rubber duck type for Tetra	each	
		<b>Telemetry Type 3,4 and 5</b>		
227.	16.13	CPU TYPE 3	each	
228.	16.14	CPU TYPE 4	each	
229.	16.15	CPU TYPE 5	each	

230.	16.16	Expansion I/O for Type3,4 & 5	each	
231.	16.17	Complete telemetry station type 3 or 4	each	
	<b>16.18</b>	<b>Antennas compatible with TYPE3,4,5 RTU</b>		
232.	16.18.1	Omni directional type	each	
233.	16.18.2	Directional type	each	
234.	16.18.3	GSM Type	each	
		<b>NETWORKING</b>		
235.	17.1.1.1	10GB Multi mode	each	
236.	17.1.1.2	10GB Single mode	each	
237.	17.1.1.3	1GB Multi mode	each	
238.	17.1.1.4	1GB Single mode	each	
	<b>17.1.2</b>	<b>Patch Leads</b>		
	<b>17.1.2.1</b>	<b>LC-LC</b>		
239.	17.1.2.1.1	0.5m	each	
240.	17.1.2.1.2	1m	each	
241.	17.1.2.1.3	5m	each	
242.	17.1.2.1.4	10m	each	

Item No	Payment Refers	Short Description	Unit	Total Rate R c
	<b>17.1.2.2</b>	<b>LC-SC</b>		
243.	17.1.2.2.1	0.5m	each	
244.	17.1.2.2.2	1m	each	
245.	17.1.2.2.3	5m	each	
246.	17.1.2.2.4	10m	each	
	<b>17.1.2.3</b>	<b>LC-ST</b>		
247.	17.1.2.3.1	0.5m	each	
248.	17.1.2.3.2	1m	each	
249.	17.1.2.3.3	5m	each	
250.	17.1.2.3.4	10m	each	
	<b>17.1.2.4</b>	<b>ST-ST</b>		
251.	17.1.2.4.1	0.5m	each	
252.	17.1.2.4.2	1m	each	
253.	17.1.2.4.3	5m	each	
254.	17.1.2.4.4	10m	each	
	<b>17.1.2.5</b>	<b>ST-SC</b>		
255.	17.1.2.5.1	0.5m	each	
256.	17.1.2.5.2	1m	each	
257.	17.1.2.5.3	5m	each	
258.	17.1.2.5.4	10m	each	
	<b>17.1.2.6</b>	<b>SC-SC</b>		
259.	17.1.2.6.1	0.5m	each	
260.	17.1.2.6.2	1m	each	

Item No	Payment Refers	Short Description	Unit	Total Rate R c
261.	17.1.2.6.1	5m	each	
262.	17.1.2.6.2	10m	each	
	<b>17.2</b>	<b>Network Switches</b>		
			each	
263.	17.2.1	Managed Network Switch Layer 2 Type1	each	
264.	17.2.2	Managed Network Switch Layer 2 Type2	each	
265.	17.2.3	Managed Network Switch Layer 3	each	
266.	17.2.4	Unmanaged Network Switch Layer 2		
	<b>17.3</b>	<b>Wireless Network</b>		
267.	17.3.1	Wireless network modem	each	
	<b>18</b>	<b>INSTRUMENTATION</b>		
	<b>18.1</b>	<b>Multi Parameter Controller</b>		
268.	18.1.1	Multi Parameter Controller	each	
269.	18.1.2	PH/ORP Sensor compatible with Controller	each	
270.	18.1.3	Dissolved Oxygen Probe Caps	each	
271.	18.1.4	Oxygen Scavenger sensor module	each	
272.	18.1.5	Conducting Conductivity Sensor compatible with Controller	each	
273.	18.1.6	Inductive Conductivity Sensor compatible with Controller	each	
274.	18.1.7	Dissolved Oxygen probe	each	
275.	18.1.8	Portable Dissolved Oxygen device	each	
276.	18.1.9	Portable Suspended Solids device	each	
277.	18.1.10	Turbidity Meter Controller	each	
278.	18.1.10	Turbidity probe	each	
	<b>18.2</b>	<b>Residual Chlorine Analyser</b>		
279.	18.2.1	Residual chlorine sensor unit complete	each	
280.	18.2.2	Residual chlorine analyser controller	each	
281.	18.2.3	Residual chlorine analyser probe	each	
	<b>18.3</b>	<b>Flow Meters</b>		
	<b>18.3.1</b>	<b>Electromagnetic Flow meters</b>		
282.	18.3.1.1	Electromagnetic flow meter transmitter remote mount	each	

Item No	Payment Refers	Short Description	Unit	Total Rate R c
	18.3.1.2	Electromagnetic Flow Sensor with the following DN and PN ratings:		
283.	18.3.1.2.1	DN 40 PN 40	each	
284.	18.3.1.2.2	DN 50 PN 40	each	
285.	18.3.1.2.3	DN 80 PN 16	each	
286.	18.3.1.2.4	DN 80 PN 20	each	
287.	18.3.1.2.5	DN 100 PN 16	each	
288.	18.3.1.2.6	DN 100 PN 20	each	
289.	18.3.1.2.7	DN 125 PN 16	each	
290.	18.3.1.2.8	DN 125 PN 20	each	
291.	18.3.1.2.9	DN 150 PN 16	each	
292.	18.3.1.2.10	DN 150 PN 20	each	
293.	18.3.1.2.11	DN 200 PN 16	each	
294.	18.3.1.2.12	DN 200 PN 20	each	
295.	18.3.1.2.13	DN 250 PN 10	each	
296.	18.3.1.2.14	DN 250 PN 20	each	
297.	18.3.1.2.15	DN 300 PN 10	each	
298.	18.3.1.2.16	DN 300 PN 20	each	
299.	18.3.1.2.17	DN 350 PN 10	each	
300.	18.3.1.2.18	DN 350 PN 20	each	
301.	18.3.1.2.19	DN 400 PN 10	each	
302.	18.3.1.2.20	DN 400 PN 20	each	
303.	18.3.1.2.21	DN 450 PN 10	each	
304.	18.3.1.2.22	DN 450 PN 20	each	
305.	18.3.1.2.23	DN 500 PN 10	each	
306.	18.3.1.2.24	DN 500 PN 20	each	
307.	18.3.1.2.25	DN 600 PN 10	each	
308.	18.3.1.2.26	DN 600 PN 20	each	
309.	18.3.1.2.27	DN 700 PN 10	each	
310.	18.3.1.2.28	DN 700 PN 20	each	
311.	18.3.1.2.29	DN 800 PN 10	each	

Item No	Payment Refers	Short Description	Unit	Total Rate R c
312.	18.3.1.2.30	DN 800 PN 20	each	
313.	18.3.1.2.31	DN 900 PN 10	each	
314.	18.3.1.2.32	DN 900 PN 20	each	
315.	18.3.1.2.33	DN 1000 PN 10	each	
316.	18.3.1.2.34	DN 1000 PN 20	each	
317.	18.3.1.2.35	Flow meter cord and potting kit for remote mount units	each	
318.	18.3.1.2.36	DN 40 PN 16 Battery	each	
319.	18.3.1.2.37	DN 50 PN 16 Battery	each	
320.	18.3.1.2.38	DN 80 PN 16 Battery	each	
321.	18.3.1.2.39	DN 100 PN 16 Battery	each	
322.	18.3.1.2.40	DN 125 PN 16 Battery	each	
323.	18.3.1.2.41	DN 150 PN 16 Battery	each	
324.	18.3.1.2.42	DN 250 PN 16 Battery	each	
325.	18.3.1.2.43	DN 300 PN 16 Battery	each	
326.	18.3.1.2.44	Battery Electromagnetic flow meter transmitter/display	each	
	<b>18.3.2</b>	<b>Open Channel Flow meters (ultrasonic)</b>		
327.	18.3.2.1	Ultrasonic Controller	each	
328.	18.3.2.2	Ultrasonic Sensor	each	
	<b>18.3.3</b>	<b>Differential Pressure Flow</b>		
329.	18.3.3.1	Controller/Transmitter	each	
	<b>18.3.4</b>	<b>Clamp on flow meter</b>		
330.	18.3.4.1	Clamp on flow meter controller	each	
331.	18.3.4.2	Clamp on flow meter transducers	each	
	<b>18.3.5</b>	<b>Mass flow meter</b>		
	<b>18.3.5.1</b>	<b>Coriolis mass flow meter</b>		
332.	18.3.5.1.1	Di1.5	each	
333.	18.3.5.1.2	Di3	each	
334.	18.3.5.1.3	Di6	each	
335.	18.3.5.1.4	Di15	each	
336.	18.3.5.1.5	Di25	each	

337.	18.3.5.1.6	Di40	each	
Item No	Payment Refers	Short Description	Unit	Total Rate R c
338.	18.3.5.1.7	Di1.5 Monel or Hasloy C for corrosive applications	each	
339.	18.3.5.1.7	Di3 Monel or Hasloy C for corrosive applications	each	
340.	18.3.5.1.7	Di6 Monel or Hasloy C for corrosive applications	each	
341.	18.3.5.1.7	Di15 Monel or Hasloy C for corrosive applications	each	
342.	18.3.5.1.7	Di25 Monel or Hasloy C for corrosive applications	each	
343.	18.3.5.1.7	Di40 Monel or Hasloy C for corrosive applications	each	
	<b>18.3.5.2</b>	<b>Coriolis mass flow transmitter</b>		
344.	18.3.5.2.1	Remote mount transmitter	each	
345.	18.3.5.2.2	Compact mounted on meter	each	
346.	18.3.5.2.3	Compact mounted Ex rated	each	
	<b>18.3.5.3</b>	<b>Thermal mass flow</b>		
347.	18.3.5.3.1	Sensor A	each	
348.	18.3.5.3.2	Sensor B	each	
349.	18.3.5.3.3	Sensor C	each	
350.	18.3.5.3.4	Sensor D	each	
351.	18.3.5.3.5	Transmitter A	each	
352.	18.3.5.3.6	Transmitter B	each	
	<b>18.4</b>	<b>Level control</b>		
	<b>18.4.1</b>	<b>Ultrasonic</b>		
353.	18.4.1.1	Type 1 - Transducer	each	
354.		Type 1 - Transmitter	each	
355.	18.4.1.2	Type 2 - Transducer	each	
356.		Type 2 - Transmitter	each	
357.	18.4.1.3	Type 3 - Transducer	each	
358.		Type 3 - Transmitter	each	
359.	18.4.1.4	Type 4 - Transducer	each	
360.		Type 4 - Transmitter	each	
361.	18.4.1.5	Type 5 - 6m Transducer	each	

Item No	Payment Refers	Short Description	Unit	Total Rate R c
362.	18.4.1.6	Type 5 I/O Link Master (panel mount)	each	
363.	18.4.1.7	Type 5 I/O Link Master (external mount)	each	
364.	18.4.1.8	4-20ma (input) to i/o link converter	each	
365.	18.4.1.9	i/o link to 4-20ma (output)converter	each	
366.	18.4.1.10	i/o link display	each	
	<b>18.4.2</b>	<b>Hydrostatic</b>		
367.	18.4.2.1	Hydrostatic Level Transmitter	each	
	<b>18.4.3</b>	<b>Floats</b>		
368.	18.4.3.1	Floats Type 1	each	
369.	18.4.3.2	Floats Type 2	each	
370.	18.4.3.3	Floats Type 3	each	
	<b>18.4.4</b>	<b>Point Level Detection</b>		
371.	18.4.4.1	Conductive Probes	each	
372.	18.4.4.2	Point level probe	each	
	<b>18.4.5</b>	<b>Radar</b>		
373.	18.4..5.1	Type 1	each	
374.	18.4.5.2	Type 2	each	
375.	18.4.5.3	Type 3	each	
	<b>18.5</b>	<b>Pressure</b>		
376.	18.5.1	Differential Pressure Transmitter	each	
377.	18.5.2	Pressure Gauge (0 to 10)	each	
378.		Pressure Gauge B (0 to 16)	each	
379.		Pressure Gauge C (-1 to 16)	each	
380.		Pressure Gauge D (0 to 20 bar)	each	
381.	18.5.3.1	Pressure Transmitter (loop powered with display) 10 Bar	each	
382.		Pressure Transmitter (loop powered with display) 20 Bar	each	
383.	18.5.3.2	Pressure Transmitter (loop powered without display) 10 Bar	each	
384.		Pressure Transmitter (loop powered without display) 20 Bar	each	



Item No	Payment Refers	Short Description	Unit	Total Rate R c
385.	18.5.3.3	Pressure Transmitter (external powered with display) 10 Bar	each	
386.		Pressure Transmitter (external powered with display) 20 Bar	each	
387.	18.5.3.4	Pressure Transmitter (external powered without display) 10 Bar	each	
388.		Pressure Transmitter (external powered without display) 20 Bar	each	
389.	18.5.4	Pressure switch 10 Bar	each	
390.	18.5.5	Chemical seal for corrosive applications.(Monel or Hasloy C)	each	
391.	18.5.6	Chemical seal for oxygen deficient applications (Ceramic)	each	
	<b>18.6.1</b>	<b>Proximity switches PNP Type</b>		
392.	18.6.1.1	M5 sensing distance 1.5mm with plug	each	
393.	18.6.1.2	M12 sensing distance 2mm with plug	each	
394.	18.6.1.3	M12 sensing distance 4mm with plug	each	
395.	18.6.1.4	M12 sensing distance 8mm with plug	each	
396.	18.6.1.5	M18 sensing distance 5mm with plug	each	
397.	18.6.1.6	M18 sensing distance 8mm with plug	each	
398.	18.6.1.7	M18 sensing distance 12mm with plug	each	
399.	18.6.1.8	M30 sensing distance 10mm with plug	each	
400.	18.6.1.9	M30 sensing distance 15mm with plug	each	
401.	18.6.1.10	M30 sensing distance 20mm with plug	each	
402.	18.6.1.11	Right angled plug for proximity with 5m pre formed connection	each	
403.	18.6.1.12	Straight connector plug for proximity with 5m pre formed connection	each	
404.	18.6.1.13	25m pre formed cord with 5 pin angle connector for sensor	each	
405.	18.6.1.14	20m pre formed cord,one 5 pin angle connector for I/O link sensor	each	
406.	18.6.1.15	10m pre formed cord,one 5 pin angle connector for I/O link sensor	each	
407.	18.6.1.16	Preformed power cord for i/o link master	each	
408.	18.6.1.17	20m pre formed i/o link cord with 2 plugs	each	

409.	18.6.1.18	10m preformed cord i/o link with 2 plugs	each	
410.	18.6.1.19	5m preformed cord i/o link with 2 plugs	each	
411.	<b>18.6.2</b>	<b>Limit switches</b>		
412.	18.6.2.1	IP 66 body with normally close and open contacts insert	each	
Item No	Payment Refers	Short Description	Unit	Total Rate R c
413.	18.6.2.2	Top steel roller plunger	each	
414.	18.6.2.3	Roller lever side action	each	
415.	18.6.2.4	Roller lever vertical action	each	
416.	18.6.2.5	Adjustable roller lever action	each	
417.	18.6.2.6	Wobble stick/flexible spring	each	
	<b>18.7</b>	<b>Signal isolators</b>		
418.	18.7.1	Signal isolator/splitter	each	
419.	18.7.2	Loop powered isolator 2 channel	each	
420.	18.7.3	Signal isolator/converter	each	
421.	18.7.4	Signal isolator busbar power supply	each	
	<b>18.8</b>	<b>Chlorinator</b>		
422.	18.8.1	15kg/h chlorinator	each	
	<b>18.9</b>	<b>Load cell indicators</b>		
423.	18.9.1	Load cell indicators	each	
	<b>18.10</b>	<b>Chlorine leak detectors</b>		
424.	18.10.1	Chlorine leak detector 0-5ppm	each	
425.	18.10.2	ATEX Chlorine leak detector 0-5ppm	each	
	<b>18.11</b>	<b>Co2 leak detectors (Oxygen deficiency sensors)</b>		
426.	18.11.1	Co2 leak detector complete (Oxygen deficiency detector)	each	
	<b>18.12</b>	<b>Residual Aluminium Analyser</b>		
427.	18.12.1	Complete Online Aluminium analyser	each	
	<b>18.13</b>	<b>Residual iron Analyser</b>		
428.	18.13.1	Complete Online Iron analyser	each	

Item No	Payment Refers	Short Description	Unit	Total Rate R c
	<b>18.14</b>	<b>Portable gas detector</b>		
429.	18.14.1	Portable gas detector	each	
430.		Portable gas detector oxygen cell	each	
431.		Portable gas detector CH4 cell	each	
432.		Portable gas detector H2S cell	each	
433.		Portable gas detector CO cell	each	
434.		Portable gas detector CL cell	each	
435.		Portable gas detector Battery	each	
436.		Portable gas detector pump for manholes	each	
437.		Potable gas detector extension tube for manhole	m	
	<b>18.15</b>	<b>Vibration sensing</b>		
438.	18.15.1	Vibration sensor/transmitter	each	
439.	18.15.2	Vibration monitor	each	
	<b>18.16</b>	<b>Temperature</b>		
440.	18.16.1	Thermowell socket for PT100	each	
441.	18.16.2	PT100	each	
442.	18.16.3	4-20ma insert	each	
443.	18.16.4	Resistance to I/O link converter	each	
	<b>18.17</b>	<b>Paperless Chart Recorder</b>		
444.	18.17.1	6 channel	each	
445.	18.17.2	12 channel	each	
	<b>18.18</b>	<b>Controller bus sytems for valves</b>		
446.	18.18.1	CPU	each	
447.	18.18.2	Input Module	each	
448.	18.18.3	Ouput Module	each	
449.	18.18.4	5/2 way cartridge	each	
450.	18.18.5	5/3 way cartridge	each	
451.	18.18.6	Interlinking module	each	
	18.18.7	Valve electronic module	each	

	<b>18.19</b>	<b>Paper Chart Recorders</b>		
452.	18.19.1	Circular Chart recoder single pen	each	
453.	18.19.2	Circular Chart recoder dual pen	each	
454.	18.19.3	Circular Charts ( 0-50) 7 day	each	
455.	18.19.4	Circular Charts ( 0-100) 7 day	each	
456.	18.19.5	Circular Charts ( 0-200) 7 day	each	
457.	18.19.6	Circular Charts ( 0-300) 7 day	each	
458.	18.19.7	Circular Charts ( 0-600) 7 day	each	
459.	18.19.8	Circular Chart recorder pens (various colours)	each	
460.	18.19.9	Paperless Chart recoder 6 channel	each	
461.	18.19.10	Paperless chart recorder 12 channel	each	
462.	18.19.11	<i>Provisional sum</i>		R 200 000.00
463.	18.19.11.1	Mark up on provisional sum	15%	

Item No	Payment Refers	Short Description	Unit	Total Rate R c
	<b>18</b>	<b>LABOUR RATES</b>		
464.	18.1	HMI Technician	Hour	
465.	18.2	HMI Training Facilitator	Day	
466.	18.3	PLC Technician	Hour	
467.	18.4	PLC Training Facilitator	Day	
468.	18.5	Instrumentation Technician	Hour	
469.	18.6	Instrumentation Training Facilitator	Day	
470.	18.7	SCADA Technician	Hour	
471.	18.8	SCADA Training Facilitator	Day	
472.	18.9	Telemetry Technician	Hour	
473.	18.10	Telemetry Training Facilitator	Day	

## Pricing Instructions:

- 5.1 State the rates and prices in Rand unless instructed otherwise in the tender conditions.
- 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 Employer 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 **Provisional sum**  
*Provisional sum* is an allowance for fittings, 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 (including VAT)*, the Contractor 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 Employer's Agent. The evaluation of the quotations received must include a preference points system as described in the Tender Data.

## (6) SUPPORTING SCHEDULES

### Schedule 1: 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 2: 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	
-----	--	----	--

1.1 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	
-----	--	----	--

3.1 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	
-----	--	----	--

4.1 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 employer of any other remedies available to it.

\_\_\_\_\_  
Signature  
Print name:  
On behalf of the tenderer (duly authorised)

\_\_\_\_\_  
Date



## Schedule 3: Preference Schedule

### 1 Definitions

The following definitions shall apply to this schedule:

**All applicable taxes:** Includes value-added tax, pay as you earn, income tax, unemployment insurance fund contributions and skills development levies.

**Applicable Code:** Shall be either the Amended Codes of Good Practise (published on 11 October 2013) or Sector Specific Codes as indicated in the tender conditions

**B-BBEE:** Broad-based black economic empowerment as defined in section 1 of the Broad-Based Black Economic Empowerment Act.

**B-BBEE status level of contributor:** The B-BBEE status of an entity in terms of a code of good practice on black economic empowerment issued in terms of section 9(1) of the Broad-Based Black Economic Empowerment Act

**Bid (Tender):** A written offer in a prescribed or stipulated form in response to an invitation by an organ of state for the provision of services, works or goods, through price quotations, advertised competitive bidding processes or proposals.

**Black Designated Groups:** The meaning assigned to it in the codes of good practice issued in terms of section 9(1) of the Broad-Based Black Economic Empowerment Act, 2003, (Act 53 of 2003).

**Black People:** The meaning assigned to it in section 1 of the Broad-Based Black Economic Empowerment Act.

**Broad-Based Black Economic Empowerment Act:** The Broad-Based Black Economic Empowerment Act, Act 53 of 2003.

**Consortium or Joint Venture:** 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.

**Contract** The agreement that results from the acceptance of a bid by an organ of state.

**Co-operative:** A co-operative registered in terms of section 7 of the Co-operatives Act, 2005 (Act no. 14 of 2005).

**Designated Group:** Black designated groups, black people, women, people with disabilities or small enterprises as defined in section 1 of the National Small Enterprises Act, 1996 (act no. 102 of 1996)

**Designated Sector:** A sector, sub-sector or industry or product that has been designated in terms of any relevant regulation of the Preferential Procurement Regulations, 2017.

**Exempted Micro Enterprise (EME):** An exempted micro enterprise in terms of a code of good practice on black economic empowerment issued in terms of section 9(1) of the Broad-Based Black Economic Empowerment Act

**Firm Price:** The price that is only subject to adjustments in accordance with the actual increase or decrease resulting from the change, imposition, or abolition of customs or excise duty and any other duty, levy, or tax, which, in terms of the law or regulation, is binding on the contractor and demonstrably has an influence on the price of any supplies, or the rendering costs of any service, for the execution of the contract.

**Functionality:** The ability of a tenderer to provide goods or services in accordance with specifications as set out in the tender documents.

**Military Veteran:** The meaning assigned to it in section 1 of the Military Veterans Act, 2011 (Act No. 18 of 2011).

**National Treasury:** The meaning assigned to it in section 1 of the Public Finance Management Act, 1999 (Act No. 18 of 1999).

**Non-firm prices:** All prices other than "firm" prices.

**Person:** Includes a juristic person.

**People with disabilities:** The meaning assigned to it in section 1 of the Employment Equity Act, 1998 (Act No. 55 of 1998).

**Price:** Includes all applicable taxes less unconditional discounts.

**Proof of B-BBEE status level of contributor:** The B-BBEE status level certificate issued by an authorised body or person, a sworn affidavit as prescribed by the B-BBEE Codes of good Practice or any other requirement prescribed in terms of the Broad-Based Black Economic Empowerment Act.

**Qualifying Small Enterprise (QSE):** A qualifying small enterprise in terms of a code of good practice on black economic empowerment issued in terms of section 9(1) of the Broad-Based Black Economic Empowerment Act.

**Rand Value:** means the total estimated value of a contract in Rand, calculated at the time of bid invitations.

**Rural Area:** A sparsely populated area in which people farm or depend on natural resources, including villages and small towns that are dispersed through the area or an area including a large settlement which depends on migratory labour and remittances and government social grants for survival, and may have a traditional land tenure system.

**Stipulated Minimum Threshold:** The minimum threshold stipulated in terms of any relevant regulation of the Preferential Procurement Regulations, 2017.

**Sub-contract:** The primary contractor's assigning, leasing, making out work to, or employing, another person to support such primary contractor in the execution of part of a project in terms of the contract.

**The Act:** The Preferential Procurement Policy Framework Act, 2000 (Act No 5 of 2000).

**Total Revenue:** Bears the same meaning assigned to this expression in the Codes of Good Practice on Black Economic Empowerment, issued in terms of section 9(1) of the Broad-Based Black Economic Empowerment Act and promulgated in the *Government Gazette* on 9 February 2007.

**Township:** An urban living area that at any time from the late 19<sup>th</sup> century until 27 April 1994, was reserved for black people, including areas developed for historically disadvantaged individuals post 27 April 1994.

**Treasury:** The meaning assigned to it in section 1 of the Public Finance Management Act, 1999 (Act No. 18 of 1999).

**Trust:** The arrangement through which the property of one person is made over or bequeathed to a trustee to administer such property for the benefit of another person.

**Trustee:** Any person, including the founder of a trust, to whom property is bequeathed in order for such property to be administered for the benefit of another person.

**Youth:** The meaning assigned to it in section 1 of the National Youth Development Agency Act, 2008 (Act No. 54 of 2008).

## **2 Conditions associated with the granting of preferences**

A supplier that is granted a preference undertakes to:

- 1) accept that the number of preference points allocated will be based on the B-BBEE status level of contributor of the supplier as at the closing date for submission of tender offers;
- 2) not sub-contract more than 25% of the value of the contract to sub-contractors that do not have an equal or higher B-BBEE status level of contributor than the supplier, unless the intended sub-contractors are exempted micro enterprises that have the capability and ability to execute the sub-contract works or unless otherwise declared in terms of Section 5 below;
- 3) accept that a contract may not be awarded if the price offered is not market related;
- 4) accept the sanctions set out in Section 3 below should Condition 2(2) be breached, or should the tenderer have submitted any false information regarding its B-BBEE status level of contributor, local production and content, or any other matter required in terms of this bid that will affect, or has affected the bid evaluation;
- 5) accept that, in order to qualify for preference points, it is the responsibility of the supplier to submit documentary proof of its BBBEE level of contribution in accordance with the Codes of Good Practise, 2013, to the CCT at the Supplier Management Unit located within the Tender Distribution Office, 2<sup>nd</sup> Floor (Concourse Level), Civic Centre, 12 Hertzog Boulevard, Cape Town (Tel 021 400 9242/3/4/5);
- 6) accept that, further to 5) above, Consortiums/Joint Ventures will qualify for preference points, provided that the entity submits the relevant certificate/scorecard in terms of the Preferential Procurement Regulations, 2017. Note that, in the case of unincorporated entities, a verified scorecard in the name of the consortium/Joint Venture must be submitted with the quotation (attached to this schedule);
- 7) accept that if it is found that, in the performance of the contract, the participation of the various partners in a Consortium/ Joint Venture differs substantially from that upon which the consolidated scorecard submitted in terms of 5) above was based, and the impact of which is that the Joint Venture would not have been awarded the contract in terms of the actual B-BBEE level of contribution achieved by the Joint Venture, then a financial penalty shall be applied (in addition to any other remedies that the CCT may have) in accordance with Section 3 below;

- 8) accept that the CCT will verify the B-BBEE level of contributor of the supplier as at the closing date for submission of tender offers, to determine the number of preference points to be awarded to the supplier. In the case of Consortiums/Joint Ventures which tender as unincorporated entities, a verified scorecard submitted with the tender and valid as at the closing date will be used to determine the number of preference points to be awarded to the supplier;
- 9) accept that, notwithstanding 8) above, a supplier will **not** be awarded points for B-BBEE status level of contributor if he indicates in his tender that he intends sub-contracting more than 25% of the value of the contract to sub-contractors that do not qualify for at least the points that the supplier qualifies for unless the intended sub-contractors are exempted micro enterprises that have the capability and ability to execute the sub-contract works;
- 10) accept that any subcontracting arrangements after the award of the tender may only be entered into upon the prior approval of the City of Cape Town; and
- 11) immediately inform the City of Cape Town of any change that may affect the tenderer's B-BBEE level of contribution upon which preference points will be or have been allocated.

### **3 Sanctions relating to breaches of preference conditions**

The sanctions for breaching the conditions associated with the granting of preferences are:

- 1) disqualify the supplier from the tender process;
- 2) recover costs, losses or damages the CCT has incurred or suffered as a result of the supplier's or contractor's conduct;
- 3) cancel the contract in whole or in part and claim any damages which the CCT has suffered as a result of having to make less favourable arrangements due to such cancellation;
- 4) restrict the supplier, its shareholders and directors, or only the shareholders and directors who acted on a fraudulent basis, from obtaining business from the CCT for a period not exceeding 10 years, after the *audi alteram partem* (hear the other side) rule has been applied and inform the National Treasury accordingly;
- 5) forward the matter for criminal prosecution; and/or
- 6) financial penalties payable to the CCT, as set out below.

#### **Financial penalty for breach of Condition 2 in Section 2 above:**

The penalty to be applied for sub-contracting more than 25% of the value of the contract to sub-contractors that do not qualify for at least the preference points that the supplier qualified for (unless so declared or proven to be beyond the control of the supplier, or the sub-contractors are EMEs that have the capability and ability to execute the sub-contract works) shall be as provided for in the following formula:

$$\text{Penalty} = 0.5 \times E(\%) \times P^*$$

where:

E = The value of work (excluding VAT) executed by sub-contractors that do not qualify for at least the preference points that the supplier qualified for, expressed as a percentage of P\*, less 25%

P\* = Value of the contract

**Financial penalty for breach in terms of condition 6 in Section 2 above:**

The penalty to be applied where, in the performance of the contract, the participation of the various partners in a Consortium/ Joint Venture differs substantially from that upon which the consolidated scorecard submitted in terms of 5) in Section 2 above was based, and the impact of which is that the Joint Venture would not have been awarded that contract in terms of the actual B-BBEE level of contribution achieved by the Joint Venture, shall be as provided for in the following formula:

$$\text{Penalty} = 5/100 \times (\text{B-BBEE}^a - \text{B-BBEE}^t) \times P^*$$

where:

B-BBEE<sup>a</sup> = The B-BBEE level of contribution that is achieved, determined in accordance with the actual participation of the Joint Venture partners in the performance of the contract

B-BBEE<sup>t</sup> = The B-BBEE level of contribution that was used to determine the number of preference points granted to the Joint Venture at the time of tender evaluation

P\* = Value of the contract

**Financial penalty for breach in terms of condition 10 in Section 2 above:**

The penalty to be applied where the supplier fails to disclose subcontracting arrangement after the award of the tender is up to a maximum of 10% of the value of the contract.

**4 Level of Contribution in respect of enterprise status or structure of the tendering entity (the supplier)**

In the interest of transparency, suppliers are required to complete Table 1: Level of Contribution below.

**Table 1: Level of Contribution**

Type of B-BBEE Contributor	Status (tick box(es) below as applicable)
Exempted Micro Enterprise (EME), 100% black-owned	<input type="checkbox"/>
Exempted Micro Enterprise (EME), at least 51% but less than 100% black-owned	<input type="checkbox"/>
Exempted Micro Enterprise (EME), less than 51% black-owned	<input type="checkbox"/>
Qualifying Small Enterprise (QSE), 100% black-owned	<input type="checkbox"/>
Qualifying Small Enterprise (QSE), at least 51% but less than 100% black-owned	<input type="checkbox"/>
Qualifying Small Enterprise (QSE), less than 51% black-owned	<input type="checkbox"/>
Verified B-BBEE contributor <input type="checkbox"/> B-BBEE Status Level of Contributor <sup>1</sup>	<input type="checkbox"/>
Non-compliant contributor	<input type="checkbox"/>

<sup>1</sup> If it is indicated that the company/firm/entity is a verified B-BBEE contributor, then the verified status level of contributor must be inserted in the box provided (insert a number from 1 to 8 as applicable)

## 5 Declarations

- 1) With reference to Condition 8 in Section 2 above, the supplier declares that:

**I/we hereby forfeit my preference points because I /we DO intend sub-contracting more than 25% of the value of the contract to sub-contractors that do not qualify for at least the points that I/we as supplier qualify for or are not exempted micro enterprises that have the capability and ability to execute the sub-contract works**

☐

### Note:

**Suppliers who do not tick this box will be allocated preference points but the sanctions relating to breaches of preference conditions in Section 3 will be applicable if the supplier contravenes the conditions in Section 2.**

- 2) The undersigned, who warrants that he/she is duly authorised to do so on behalf of the supplier, hereby certifies that the preference claimed based on the B-BBEE status level of contribution indicated in Table 1, qualifies the supplier, subject to condition 8 in Section 2 above, for such preference claimed, and acknowledges that:
- (i) the information furnished is true and correct;
  - (ii) the preference claimed is in accordance with the conditions of this schedule;
  - (iii) the supplier may be required to furnish documentary proof to the satisfaction of the CCT that the BBBEE level of contributor as at the closing date is correct; and
  - iv) he/she understands the conditions under which preferences are granted, and confirms that the supplier will satisfy the conditions pertaining to the granting of preferences.

\_\_\_\_\_  
**Signature**

\_\_\_\_\_  
**Date**

\_\_\_\_\_  
**Name (PRINT)**

(For and on behalf of the Supplier (duly authorised))

**For official use.**

**SIGNATURE OF CITY OFFICIALS AT  
TENDER OPENING**

**1.**

**2.**

**3.**

## Schedule 4: Declaration of Interest – State Employees (MBD 4 amended)

1. No bid will be accepted from:
  - 1.1 persons in the service of the state<sup>1</sup>, 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 during the twelve months after the City employee has left the employ of the City, or
  - 1.4 from an entity who has employed a former City employee who was at a level of T14 or higher at the time of leaving the City's employ and involved in any of the City's bid committees for the bid submitted, if:
    - 1.4.1 the City employee left the City's employment voluntarily, during a period of 12 months after the City employee has left the employ of the City;
    - 1.4.2 the City employee left the City's employment whilst facing disciplinary action by the City, during a period of 24 months after the City employee has left the employ of the City, or any other period prescribed by applicable legislative provisions, after having left the City's employ.
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<sup>2</sup>)......
  - 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 City of Cape Town 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 City of Cape Town at a level of T14 or higher at the time they left the employ of the City, and who was involved in any of the City'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 employer of any other remedies available to it.

\_\_\_\_\_  
Signature

Print name:

Date

On behalf of the tenderer (duly authorised)

**<sup>1</sup>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.**

**<sup>2</sup> 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 5: 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 City of Cape Town, please contact the following:***

***the City'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 employer of any other remedies available to it.

\_\_\_\_\_  
Signature  
Print name:  
On behalf of the tenderer (duly authorised)

\_\_\_\_\_  
Date

## Schedule 6: 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 of 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	<p><b>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?</b></p> <p>(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 <i>audi alteram partem</i> rule was applied).</p> <p><b>The Database of Restricted Suppliers now resides on the National Treasury's website(<a href="http://www.treasury.gov.za">www.treasury.gov.za</a>) and can be accessed by clicking on its link at the bottom of the home page.</b></p>	<p>Yes <input type="checkbox"/></p>	<p>No <input type="checkbox"/></p>
2.1.1	If so, furnish particulars:		
2.2	<p><b>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?</b></p> <p><b>The Register for Tender Defaulters can be accessed on the National Treasury's website (<a href="http://www.treasury.gov.za">www.treasury.gov.za</a>) by clicking on its link at the bottom of the home page.</b></p>	<p>Yes <input type="checkbox"/></p>	<p>No <input type="checkbox"/></p>
2.2.1	If so, furnish particulars:		
2.3	<p><b>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?</b></p>	<p>Yes <input type="checkbox"/></p>	<p>No <input type="checkbox"/></p>

2.3.1	If so, furnish particulars:		
<b>Item</b>	<b>Question</b>	<b>Yes</b>	<b>No</b>
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 <input type="checkbox"/>	No <input type="checkbox"/>
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 <input type="checkbox"/>	No <input type="checkbox"/>
2.7.1	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 employer of any other remedies available to it.

\_\_\_\_\_  
Signature  
Print name:  
On behalf of the tenderer (duly authorised)

\_\_\_\_\_  
Date

## Schedule 7: Authorisation for the Deduction of Outstanding Amounts Owed to the City of Cape Town

To: THE CITY MANAGER, CITY OF CAPE TOWN

From: \_\_\_\_\_  
(Name of tenderer)

### RE: AUTHORISATION FOR THE DEDUCTION OF OUTSTANDING AMOUNTS OWED TO THE CITY OF CAPE TOWN

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;
- d) 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 employer of any other remedies available to it.

Physical <b>Business</b> address(es) of the tenderer	Municipal Account number(s)

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 <b>residential</b> address of Director / Member / Partner	Municipal Account number(s)

\_\_\_\_\_  
Signature  
Print name:  
On behalf of the tenderer (duly authorised)

\_\_\_\_\_  
Date

## Schedule 8: Contract Price Adjustment and/or Rate of Exchange Variation

### Pricing Instructions

- 8.1. The Contract Price Adjustment mechanism and/or provisions relating to Rate of Exchange Variation, contained in this schedule is compulsory and binding on all tenderers.
- 8.2. Failure to complete this schedule or any part thereof may result in the tender offer being declared non-responsive.
- 8.3. Tenderers are not permitted to amend, vary, alter or delete this schedule or any part thereof unless otherwise stated in this schedule, failing which the tender offer shall be declared non-responsive.
- 8.4. Tenderers are not permitted to offer firm prices except as provided for in the Price Schedule, and if the Tenderer offers firm prices in contravention of this clause the tender offer shall be declared non - responsive.
- 8.5. Any claim for an increase in the Contract price shall be submitted in writing to [CPA.Request@capetown.gov.za](mailto:CPA.Request@capetown.gov.za) prior to the date upon which the price adjustment would become effective.
- 8.6. The CCT reserves the right to withhold payment of any claim for contract price adjustment while only provisional figures are available and until the final (revised) figures are issued by the relevant authority.
- 8.7. When submitting a claim for contract price adjustment a supplier shall indicate the actual amount claimed for each item. A mere notification of a claim for contract price adjustment without stating the new price claimed for each item shall, for the purpose of this clause, not be regarded as a valid claim.
- 8.8. 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 contract price adjustment. Should the supplier fail to submit such auditor's certificates or other documentary proof to the CCT within a period of 30 (thirty) days from the date of the request, it shall be presumed that the supplier has abandoned their claim.
- 8.9. The effective date of any price increases granted will be the date on which the abovementioned documentation is submitted or, by agreement between the Contractor and the City, a subsequent date on which the price increase will be effective.
- 8.10 In instances where the Contractor's price claimed is less than entitled, the lesser price will be accepted.

#### 8.11 **CONTRACT PRICE ADJUSTMENT MECHANISM:**

Tenderers must choose the Contract Price Adjustment (CPA) mechanism as listed in the table below and adhere to the CPA instructions dictated by the mechanism chosen by the Tenderer. Tenderers to note that the CPA mechanism chosen by the tenderer, will be binding at contract phase, for the duration of the contract period.

SECTION APPLICABLE	CPA MECHANISM	TICK THE APPROPRIATE BOX
A	Producer Price Index or CPI	
B	Rate of Exchange	
C	Supplier/Manufacturer Price List Variations	

#### **A. CPA BASED ON PRODUCER PRICE INDEX (PPI) or CPI - FINAL MANUFACTURED PRODUCT**

##### **1. First Year**

**The Contract Price as per GCC shall remain FIRM for the first 12 months from date of commencement of contract and no claims for contract price adjustment will be considered during this period.**

**90%** of the tendered price will be subject to adjustment **annually** based on the **average** Producer Price Index (PPI) or CPI as follows:

##### **2. Second Year:**

- 2.1 12 months period following the first year.
- 2.2 Prices will be subject to adjustment in accordance with the **Producer Price Index [P0142.1–Table C1 – Final manufactured goods (Rates)] or Average CPI**
- 2.3 Base month for price adjustment shall be the month of commencement of the 1st year and end date shall be 12 months of the first year.

##### **3. Third Year:**

- 3.1 12 months period following the 2nd year.
- 3.2 Prices will be subject to adjustment in accordance with the **Producer Price Index [P0142.1–Table C1 – Final manufactured goods (Rates)] or Average CPI**
- 3.3 Base month for price adjustment shall be the month of commencement of the 2nd year and end date shall be 12 months of the 2nd year.

4. **The claim will be based on the average between the “base month” and the “end month” e.g.:  $7+6+9+6 = 28$  ( $28/4$ ) = 7 therefore the claim will be 7%. Tenderers must note that 10% of the contract tendered price will remain firm for the term of the contract.**

## B. CPA BASED ON RATE OF EXCHANGE (ROE) FOR IMPORTED CONTENT

The Contract Price as per GCC shall remain FIRM for the first 12 months from date of commencement of contract and no claims for contract price adjustment will be considered during this period.

### 1. Rate of Exchange Variations

If the Contract price is subject to variations in **RATE OF EXCHANGE**, the tenderer SHALL complete the table on Schedule 12, failing which no claim for contract price adjustment on the basis of rate of exchange variations will be granted. **Only Contractors that are directly importing the goods may claim rate of exchange variations. Contractors must take out Forward Cover on each purchase order and this must be forwarded to [CPA.Request@capetown.gov.za](mailto:CPA.Request@capetown.gov.za)**

#### 1.1. Process that will be followed:

- On receipt of a purchase order, the contractor must arrange for a quotation for Forward Cover from their banking institution.
- This Forward Cover quotation must be submitted to the City within seven days from date of receipt of the purchase order.
- Only if the Forward Cover rate is approved, may the Contractor engage in a formalised contract with their banking institution and submit the Forward Cover contract to the City. This must be done within two days from the City's approval.
- On delivery of the product, the Contractor must submit the following documentation:
- The Bill of Lading/Waybill/Customs Invoice (**clearly indicating the items as identified on the purchase order**).
- Calculations detailing the difference in the rate of exchange at the time of entry and the date of tender. This must be submitted on a covering letter.

### 2. Rate of Exchange Variations (FOR TENDERERS DIRECTLY IMPORTING THE PRODUCTS)

2.1 Exchange Rate on which Tender is based-----1RSA Rand-----

2.2 Name of Bank.....

2.3 Date of Quote of Rate of Exchange.....

2.4 The end date applicable for variation will be the Bill of Lading/Waybill/Customs Invoice.....

2.5 Tenderer to indicate which documentation (Bill of Lading/Waybill/Customs Invoice) will be applicable:

2.6 If any other documentation other than these are applicable, the tenderer must clearly indicate so above.

2.7 Tenderers must include a table of foreign currency content per item. Tenderers are required to give a breakdown of each item's exchange rate variation in the table on Schedule 12.

2.8 The actual rates and the dates on which these items are based must be quoted. Merely to state 'ruling rates' at a particular date is not acceptable. If more than one tendered item is affected, the relevant information shall be stated in the table attached hereto.

- 2.9 Where prices are subject to a rate of exchange, suppliers must indicate on their exchange the rate of applicable, as well as the date and method of the foreign payment (for example, against L/C on date of shipment, or upon receipt, etc.).
- 2.10 CCT will require a supplier to purchase Forward Cover for each individual order at the time of placing the order during the contract period, and to supply the CCT with a copy of the foreign contract and such other documentation as the CCT may deem necessary.
- 2.11 If Forward Cover has not been obtained yet, it is a condition of this contract that at the time when the final confirmation of the award is communicated to the supplier (successful Tenderer), the supplier must immediately make appropriate arrangements to take out Forward Cover to avoid further fluctuations in the Rand value of the contract.
- 2.12 In the event of 2.11 above, the supplier must ensure that the Director: Supply Chain Management is furnished with a full set of supporting documents (e.g. Bill of Entry, Proof of Purchase of Foreign Exchange from Bank, and Foreign Invoice) before payment for the imported goods can be claimed.
- 2.13 This condition may be varied by a written instruction attached to the Form of Offer and Acceptance, which will be signed on confirmation of the contract award to the successful Tenderer.

#### **C. SUPPLIER/MANUFACTURER PRICE LIST VARIATIONS:**

**The Contract Price as per GCC shall remain FIRM for the first 12 months from date of commencement of contract and no claims for contract price adjustment will be considered during this period.**

If the contract is subject to variation based on **SUPPLIER/MANUFACTURER PRICE LIST VARIATIONS**, the following will be applicable:

1. Tenderers must supply the following documentation when applying for a price variation:
  - 1.1. The price list that the tender was based upon **clearly indicating the item numbered according to the tender pricing schedule.**
  - 1.2. The new price list **clearly indicating the item according to the tender pricing schedule** from the same supplier/manufacturer from date of tender.
  - 1.3. **Detailed calculations** indicating how the “new” price is established
  - 1.4. Covering letter on a letterhead from contractor requesting the variation.
  - 1.5. All documentation to be signed by relevant parties.
2. **Prior** to the date upon which the price variation would become effective. The effective date of any price increases granted will be at the date when all the abovementioned documentation is submitted. In instances where the contractors price claimed is less than entitled, the lesser price will be accepted. Orders placed prior to the effective date will not be allowed to be varied. Only the difference in cost will be allowed to be varied and under no circumstances may the contractor increase their profit margin.
3. In the event of a contractor changing their supplier/manufacturer during the tenure of the contract, any request for price variations will not be considered unless the contractor obtains prior approval from the City.
4. Process that will be followed:



- 4.1. Contractor submits all the documentation indicated above prior to the effective date of the variation.
- 4.2. The City will consider the variation and based on the documentary evidence, the City may approve the variation.
- 4.3. Letters authorising the price variation will be communicated to the contractor.
- 4.4. All purchase orders from the effective date will be generated at the approved contract price.

**TENDERERS THAT ARE NOT THE MANUFACTURER/SUPPLIER**

**Note: TENDERERS ARE REQUIRED TO COMPLETE BELOW.**

**Increase using Supplier/Manufacturer Price Lists**

The tender price shall be subject to adjustment based on Supplier's/Manufacturer's Price Lists.

Supplier/Manufacturer \_\_\_\_\_

\_\_\_\_\_

Date of Price List/Quotation upon which tender is based

\_\_\_\_\_

Price List/Quotation Reference

Number \_\_\_\_\_

**N.B.**

The above information must be provided for each item supplied to the Tenderer.

Copies of price lists on which tender prices are based must be enclosed for all items. The items referenced to the Pricing Schedule must be clearly identified on the price list.

Tenderers will be entitled to claim only the difference between the cost of the product at the time of tendering and the new cost. Documentation together with detailed calculations to this effect must be submitted with the request.

**If different items have different manufacturers/suppliers, then tenderer's must indicate so above and then submit the information on a covering letter.**

## Schedule 9: Certificate of Independent Tender Determination

I, the undersigned, in submitting this tender [SUPPLY, INSTALLATION AND ADHOC MAINTENANCE OF CONTROL SYSTEMS INFRASTRUCTURE AT VARIOUS CITY OF CAPE TOWN SITES] in response to the tender invitation made by THE CITY OF CAPE TOWN, 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<sup>1</sup> 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/or may be reported to the National Prosecuting Authority (NPA) for criminal investigation, and/or may be restricted from conducting business with the public sector for a period not exceeding 10 (ten) years in terms of the Prevention and Combating of Corrupt Activities Act, Act 12 of 2004, or any other applicable legislation.

\_\_\_\_\_  
Signature

Date

\_\_\_\_\_  
Name (PRINT)  
(For and on behalf of the Tenderer (duly authorised))

<sup>1</sup> 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 10: Local Content Declaration / Annexure C

**[Drafters Note:** If Local Content is not required for this tender, then delete all text related to it on this schedule(s) and insert "Not Used" under the page heading

### **DECLARATION CERTIFICATE FOR LOCAL PRODUCTION AND CONTENT FOR DESIGNATED SECTORS**

#### **Preamble**

This declaration is based on and replaces Municipal Bid Document 6.2 (MBD 6.2).

The amendments made to the MBD 6.2 document have been necessary to clarify this standard document as it relates to local production and content in the Electrical and Telecom Cable sector.

Before completing this declaration, bidders must study the General Conditions, Definitions, Directives applicable in respect of Local Content as prescribed in the Preferential Procurement Regulations, 2017 and the South African Bureau of Standards (SABS) approved technical specification number SATS 1286:2011 (Edition 1) and the Guidance on the Calculation of Local Content together with the Local Content Declaration Templates [Annex C (Local Content Declaration: Summary Schedule), D (Imported Content Declaration: Supporting Schedule to Annex C) and E (Local Content Declaration: Supporting Schedule to Annex C)].

Documents listed herein are downloadable from the dti's official website, <http://www.thedti.gov.za>.

**This schedule must be completed by tenderers and returned with their tender at the closing date and time for this tender.**

#### **1. General Conditions**

- 1.1 Preferential Procurement Regulations, 2017 (Regulation 8) makes provision for the promotion of local production and content.
- 1.2 Regulation 8(2) prescribes that in the case of designated sectors, organs of state must advertise such bids with the specific bidding condition that only locally produced goods with a stipulated minimum threshold for local production and content will be considered.
- 1.3 Where necessary, for tenders referred to in paragraph 1.2 above, a two stage bidding process may be followed, where the first stage involves a minimum threshold for local production and content and the second stage price and B-BBEE.
- 1.4 A person awarded a contract in relation to a designated sector, may not sub-contract in such a manner that the local production and content of the overall value of the contract is reduced to below the stipulated minimum threshold.
- 1.5 The local content (LC) expressed as a percentage of the bid price must be calculated in accordance with the SABS approved technical specification number SATS 1286: 2011 as follows:

$$LC = [1 - x / y] * 100$$

Where

x is the imported content in Rand

y is the bid price in Rand excluding value added tax (VAT)

Prices referred to in the determination of x must be converted to Rand (ZAR) by using the exchange rate published by Nedbank at close of business on the date of advertisement of the bid as required in paragraph 4.1 below.

**The SABS approved technical specification number SATS 1286:2011 is accessible on [http://www.thedti.gov.za/industrial\\_development/ip.jsp](http://www.thedti.gov.za/industrial_development/ip.jsp) at no cost.**

- 1.6 A bid may be disqualified/declared non-responsive if this Declaration Certificate and Annex C (Local Content Declaration: Summary Schedule) are not submitted as part of the bid documentation.

**DECLARATION CERTIFICATE FOR LOCAL PRODUCTION AND CONTENT FOR DESIGNATED SECTORS (Cont'd)**

2. The stipulated minimum threshold(s) for local production and content (refer to Annex A of SATS 1286:2011) for this bid is/are as follows:

Description of services, works or goods

Stipulated minimum threshold

**Electrical and Telecom Cables Sector**

**90%**

3. Does any portion of the services, works or goods offered for Items as detailed in Annexure C have any imported content?

**(Tick applicable box)**

YES		NO	
-----	--	----	--

3.1 If yes, the rate(s) of exchange to be used in this bid to calculate the local content as prescribed in paragraph 1.5 of the above General Conditions must be the rate(s) published by Nedbank at close of business on the date of advertisement of the bid.

Indicate the rate(s) of exchange against the appropriate currency in the table below (refer to Annex A of SATS 1286:2011):

Currency	Rates of exchange
US Dollar	
Pound Sterling	
Euro	
Yen	
Other	

NB: Tenderers must submit proof of the Nedbank rate(s) of exchange used.

4. Where, after the award of a bid, challenges are experienced in meeting the stipulated minimum threshold for local content the dti must be informed accordingly in order for the dti to verify and in consultation with the CCT provide directives in this regard.

**DECLARATION CERTIFICATE FOR LOCAL PRODUCTION AND CONTENT FOR DESIGNATED SECTORS  
(Cont'd)(AS PER ANNEX B OF SATS 1286:2011)**

**LOCAL CONTENT DECLARATION BY CHIEF FINANCIAL OFFICER OR OTHER LEGALLY RESPONSIBLE PERSON NOMINATED IN WRITING BY THE CHIEF EXECUTIVE OR SENIOR MEMBER/PERSON WITH MANAGEMENT RESPONSIBILITY (CLOSE CORPORATION, PARTNERSHIP OR INDIVIDUAL)**

**IN RESPECT OF BID NO. ....**

**ISSUED BY:** (Procurement Authority / Name of Municipality / Municipal Entity):  
.....

**NB**

- 1 The obligation to complete, duly sign and submit this declaration cannot be transferred to an external authorized representative, auditor or any other third party acting on behalf of the bidder.
- 2 Guidance on the Calculation of Local Content together with Local Content Declaration Templates (Annex C, D and E) is accessible on [http://www.thedti.gov.za/industrial\\_development/ip.jsp](http://www.thedti.gov.za/industrial_development/ip.jsp). Bidders should first complete Declaration D. After completing Declaration D, bidders should complete Declaration E and then consolidate the information on Declaration C. **Declaration C should be submitted with the bid documentation at the closing date and time of the bid in order to substantiate the declaration made in paragraph (c) below.** Declarations D and E should be kept by the bidders for verification purposes for a period of at least 5 years. The successful bidder is required to continuously update Declarations C, D and E with the actual values for the duration of the contract.

I, the undersigned, ..... (full names),

do hereby declare, in my capacity as .....

of .....(name of bidder entity), the following:

- (a) The facts contained herein are within my own personal knowledge.
- (b) I have satisfied myself that:
  - (i) the goods to be delivered in terms of the above-specified bid comply with the minimum local content requirements as specified in the bid, and as measured in terms of SATS 1286:2011;
- (c) The local content percentages (%) indicated below has been calculated using the formula given in clause 3 of SATS 1286:2011, the rates of exchange indicated in paragraph 4.1 above and the information contained in Declaration D and E which has been consolidated in Declaration C;

Bid price, excluding VAT (y)	R
Imported content (x), as calculated in terms of SATS 1286:2011	R
Stipulated minimum threshold for local content (paragraph 2 above)	<b>90 %</b>
Local content %, as calculated in terms of SATS 1286:2011	

**If the bid is for more than one product, the local content percentages for each product contained in Declaration C shall be used instead of the table above. The local content percentages for each product has been calculated using the formula given in clause 3 of SATS 1286:2011, the rates of exchange indicated in paragraph 3.1 above and the information contained in Declaration D and E.**

- (d) I accept that the Procurement Authority / Municipality /Municipal Entity has the right to request that the local content be verified in terms of the requirements of SATS 1286:2011.
- (e) I understand that the awarding of the bid is dependent on the accuracy of the information furnished in this application. I also understand that the submission of incorrect data, or data that are not verifiable as described in SATS 1286:2011, may result in the Procurement Authority / Municipal / Municipal Entity imposing any or all of the remedies as provided for in Regulation 14 of the Preferential Procurement Regulations, 2017 promulgated under the Preferential Policy Framework Act (PPPFA), 2000 (Act No. 5 of 2000).

SIGNATURE:

DATE: \_\_\_\_\_

WITNESS No. 1

DATE: \_\_\_\_\_

WITNESS No. 2

DATE: \_\_\_\_\_

## Annex C

## Local Content Declaration - Summary Schedule

(C1)	Tender No.						
(C2)	Tender description:	SUPPLY, INSTALLATION AND ADHOC MAINTENANCE OF CONTROL SYSTEMS INFRASTRUCTURE AT VARIOUS CITY OF CAPE TOWN SITES					
(C3)	Designated product(s)	Electrical and Telecom Cables Sector					
(C4)	Tender Authority:						
(C5)	Tenderer Entity name:						
(C6)	Tender Exchange Rate:	Pula		EU		GBP	
(C7)	Specified local content %	90%					

**Note:** VAT to be excluded from all calculations

		Calculation of local content					
Tender item no's	List of items	Tender price per UoM (excl VAT)	Exempted imported value	Tender value net of exempted imported content	Imported value	Local value	Local content % (per item)
(C8)	(C9)	(C10)	(C11)	(C12)	(C13)	(C14)	(C15)
	Patch Leads						
	LC-LC						
17.1.2.1.1	0.5m						

Tender summary			
Anticipated Annual Tender Qty (m)	Total Tender value	Total exempted imported content	Total Imported content
(C16)	(C17)	(C18)	(C19)

## TENDER NO:153S/2022/23

Calculation of local content								Tender summary			
Tender item no's	List of items	Tender price per UoM (excl VAT)	Exempted imported value	Tender value of net exempted imported content	Imported value	Local value	Local content % (per item)	Anticipated Annual Tender Qty (m)	Total Tender value	Total exempted imported content	Total Imported content
(C8)	(C9)	(C10)	(C11)	(C12)	(C13)	(C14)	(C15)	(C16)	(C17)	(C18)	(C19)
17.1.2.1.2	1m										
17.1.2.1.3	5m										
17.1.2.1.4	10m										
	<b>LC-SC</b>										
17.1.2.2.1	0.5m										
17.1.2.2.2	1m										
17.1.2.2.3	5m										
17.1.2.2.4	10m										
	<b>LC-ST</b>										
17.1.2.3.1	0.5m										
17.1.2.3.2	1m										
17.1.2.3.3	5m										
17.1.2.3.4	10m										
	<b>ST-ST</b>										
17.1.2.4.1	0.5m										
17.1.2.4.2	1m										
17.1.2.4.3	5m										
17.1.2.4.4	10m										
	<b>ST-SC</b>										



## TENDER NO:153S/2022/23

## Calculation of local content

Tender item no's	List of items	Tender price per UoM (excl VAT)	Exempted imported value	Tender value of net exempted imported content	Imported value	Local value	Local content % (per item)
(C8)	(C9)	(C10)	(C11)	(C12)	(C13)	(C14)	(C15)
17.1.2.5.1	0.5m						
17.1.2.5.2	1m						
17.1.2.5.3	5m						
17.1.2.5.4	10m						
	<b>SC-SC</b>						
17.1.2.6.1	0.5m						
17.1.2.6.2	1m						
17.1.2.6.3	5m						
17.1.2.6.4	10m						

## Tender summary

Anticipated Annual Tender Qty (m)	Total Tender value	Total exempted imported content	Total Imported content
(C16)	(C17)	(C18)	(C19)

(C20) Total tender value

R

Signature of tenderer from Annex B

(C21) Total Exempt imported content

R

(C22) Total tender value net of exempt imported content

R

(C23) Total Imported content

R

(C24) Total local content

R

(C25) Average local content % of tender

Date:

## Schedule 11: Price Basis for Imported Resources

[illegible]

**\* State Customs Duty Tariff Reference for each item**

**Note:**

Note that any Resources not inserted in this Returnable Schedule shall be deemed to be manufactured / supplied in South Africa for the purposes of Contract Price Adjustment. The BASE DATE referred to in column (B) will be 7 calendar days before tender closing.

**SIGNED ON BEHALF OF TENDER:**

<b>Schedule 13: List of other documents attached by tenderer</b>
--

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 14: Record of Addenda to Tender Documents**

We confirm that the following communications received from the Employer before the submission of this tender offer, amending the tender documents, have been taken into account in this tender offer:

	Date	Title or Details
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

Attach additional pages if more space is required.

**SIGNED ON BEHALF OF TENDERER:** .....

**Schedule 15: Information to be provided with the tender**

The following information shall be provided with the Tender:

- a) Schedule 15A: Region Preference
- b) Schedule 15B: Key Personnel together with required CVs.
- c) Schedule 15C: Tendering Entity Track Record

**SIGNED ON BEHALF OF TENDERER:** .....

<b>Schedule 15 A: Region Preference</b>
---

Tenderers are required to indicate which Region they would prefer to work by marking 1 to 3, with 1 being most preferable and 3 being least preferable, in the table below.

REGION OF PREFERENCE	
REGIONS	ORDER OF PREFERENCE (Eg, 1 <sup>st</sup> , 2 <sup>nd</sup> , 3 <sup>rd</sup> )
REGION 1 – NORTH	
REGION 2 – SOUTH	
REGION 3 – EAST	

Number of sheets appended by the tenderer to this Schedule ..... (If nil, enter NIL).

### Schedule 15B: Key Personnel

The tenderer is referred to the Specification and Tender Conditions and shall insert in the spaces provided below (if space is not sufficient this page may be copied):

- a) Details of the key personnel required to be in the employment of the tenderer or a specialist consultant/firm, in order for the tenderer to be responsive;
- b) the Curriculum Vitae of each individual must be attached to this schedule; and
- c) a statement for each of the individuals identified, which indicates any fields of specialization and any recent experience that is relevant to this tender (which may or may not form part of the individual's curriculum vitae). Tenderers should indicate to which part of this tender, the field of specialization is relevant to.
- d) the same individual may not be used more than once, except for the PLC Programmer and HMI Programmer which may be the same person.

HMI Programmer		
Name and ID	Qualifications	No. of Years Specified Work Experience

PLC Programmer		
Name and ID	Qualifications	No. of Years Specified Work Experience

Instrumentation Technician/Artisan		
Name and ID	Qualifications	No. of Years Specified Work Experience

SCADA Programmer		
Name and ID	Qualifications	No. of Years Specified Work Experience

Telemetry Technician		
Name and ID	Qualifications	No. of Years Specified Work Experience

**SIGNED ON BEHALF OF TENDERER:** .....

### Schedule 15C: Tendering Entity Track Record


The tenderer is referred to the appropriate clause(s) of the Tender Conditions and shall provide details on the schedule below to proof compliance with the relevant tender requirements.

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 OF RELEVANT WORK PREVIOUSLY PERFORMED	CLIENT'S DETAILS <i>(Location where work was performed, company name, contact name &amp; phone number)</i>	DATE OF CONTRACT	VALUE OF CONTRACT

**SIGNED ON BEHALF OF TENDERER:** .....



<b>TENDER DOCUMENT GOODS AND SERVICES</b>		 <b>CITY OF CAPE TOWN ISIXEKO SASEKAPA STAD KAAPSTAD</b>	
<b>SUPPLY CHAIN MANAGEMENT</b>			
SCM - 542	Approved by Branch Manager: 03/04/2020	Version: 8	Page 89 of 66

**TENDER NO: 153S/2022/23**

**TENDER DESCRIPTION: SUPPLY, INSTALLATION AND AD HOC MAINTENANCE OF CONTROL SYSTEMS INFRASTRUCTURE AT VARIOUS CITY OF CAPE TOWN SITES**

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

## VOLUME 3: DRAFT CONTRACT

TENDERER	
<b>NAME of Company/Close Corporation or Partnership / Joint Venture/ Consortium or Sole Proprietor /Individual</b>	
<b>TRADING AS</b> (if different from above)	

NATURE OF TENDER OFFER (please indicate below)	
<b>Main Offer</b> (see clause 2.2.11.1)	
<b>Alternative Offer</b> (see clause 2.2.11.1)	

## VOLUME 3: DRAFT CONTRACT (7) 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 Contract:

### 1. Definitions

*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 contract. 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**.

*Add the following after Clause 1.25:*

- 1.26 'Supplier' means any provider of goods and / or services with whom the contract is concluded
- 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

### 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 All parties in a joint venture or consortium shall be jointly and severally liable to the purchaser in terms of this 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 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, **save that if the Employer 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 that 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 cancellation of the contract, restriction of the supplier, and/or the exercise by the City of any other remedies available to it as described in the SCM Policy.

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 order:

- 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
- d) Other requirements as detailed in the tender documents

3.5.2 Only when notified of the acceptance of the bid by the issuing of the order, the supplier shall commence with and carry out the delivery of the goods 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 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 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 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 orders for the goods required under this Contract. No liability for payment will ensue for any work done if an official purchase order has not been issued to the supplier.

3.6.2 Make payment to the **supplier** for the goods as set out herein.

3.6.3 Take possession of the goods 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 documents.
- 3.6.6 Grant or refuse any extension of time requested by the supplier to the period stated in clause 10.
- 3.6.7 Inspect the goods 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 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 contract and need not obtain the supplier's permission to copy 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 for the contract and the purchaser hereby indemnifies the supplier against any claim which may be made against him by any party 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 contract within two (2) years of completion of the services 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 contract 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 Employer.
  - 5.8.2 The supplier hereby assigns to the Employer, all Intellectual Property created, developed or otherwise brought into existence by it for the purposes of the contract, 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 Employer's Intellectual Property for any purpose other than as contemplated in this contract;
    - 5.8.3.2 not modify, add to, change or alter the Employer'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 Employer;

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 Employer;

5.8.3.4 comply with all reasonable directions or instructions given to it by the Employer in relation to the form and manner of use of the Employer Intellectual Property, including without limitation, any brand guidelines which the Employer may provide to the supplier from time to time;

5.8.3.5 procure that its employees, directors, members and contractors comply strictly with the provisions of clauses 5.8.3.1 to 5.8.3.3 above;

unless the Employer expressly agrees thereto in writing after obtaining due internal authority.

5.8.4 The supplier represents and warrants to the Employer that, in providing goods, services or both, as the case may be, for the duration of the contract, it will not infringe or make unauthorised use of the Intellectual Property rights of any third party and hereby indemnifies the Employer 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 In the event that the contract is cancelled, terminated, ended or is declared void, any and all of the Employer's Intellectual Property, and any and all information and data related thereto, shall be immediately handed over to the Employer by the supplier and no copies thereof shall be retained by the supplier unless the Employer expressly and in writing, after obtaining due internal authority, agrees otherwise.

## **7. Performance Security**

*Delete clause 7.1 and replace with the following:*

7.1

**'Not Applicable.** Tenderers must disregard **Form of Guarantee / Performance Security** and are not required to complete same.

## **8. Inspections, tests and analyses**

*Delete Clause 8.2 and substitute with the following:*

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 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 order. Orders for the supply and delivery of goods may be raised up until the expiry of a framework agreement bid, provided that the goods can be delivered within 30 days of expiry of the framework contract. All orders, other than for the supply and delivery of goods, must be completed prior to the expiry of the contract period.

10.2 The purchaser shall determine, in its sole discretion, whether the goods 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 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 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:

- a) 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;
- b) 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;
- c) 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 bidder's broker or the insurance company itself (see **Proof of Insurance / Insurance Broker's Warranty** section in document for a pro forma version).

In the event of under insurance or the insurer's repudiation of any claim for whatever reason, the CCT will retain its right of recourse against the supplier.

11.3 The supplier shall be obliged to furnish the CCT with proof of such insurance as the CCT 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 **Proof of Insurance / Insurance Broker's Warranty** section of the document or copies of the insurance policies.

**15. Warranty**

*Add to Clause 15.2:*

15.2 This warranty for this contract shall remain valid for 12 (twelve) after the goods have been delivered.

**16. Payment**

*Delete Clause 16.1 in its entirety and replace with the following:*

16.1 A monthly payment cycle will be the norm. All invoices which are dated on or before the 20th of a particular month will typically be paid between the 23rd and 26th of the following month. The supplier may submit a fully motivated application regarding more frequent payment to the Employer's Director: Expenditure for consideration. Requests for more frequent payments will be considered at the sole discretion of the Employer and is not a right in terms of this contract.

*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 order, the supplier shall only be entitled to payment for goods actually delivered in terms of the Project Specification and Drawings, or any variations in accordance with clause 18. Any contingency sum included shall be for the sole use, and at the discretion, of the purchaser.

The CCT is not liable for payment of any invoice that pre-dates the date of delivery of the goods.

- 16.6 The purchaser will only make advanced payments to the supplier in strict compliance with the terms and details as contained on **Proforma Advanced Payment Guarantee** and only once the authenticity of such guarantee has been verified by the City'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 Director: Supply Chain Management 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 documents.
- 17.4 The prices for the goods delivered and services performed shall be subject to contract price adjustment as specified on **Schedule 8: Contract Price Adjustment and/or Rate of Exchange Variation**
- 17.5 If price adjustment for variations in the cost of plant and materials imported from outside of South Africa is provided for in the contract, such adjustment shall be based on the information contained on the schedule titled "**Price Basis for Imported Resources**" and as below. For the purposes of this clause the Rand value of imported Plant and Materials inserted on the schedule titled "**Price Basis for Imported Resources**" (column (F)) shall be the value in foreign currency (column (A)) converted to South African Rand (column (C)) by using the closing spot selling rate quoted by **CCT's** main banker, NEDBANK, 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)).
- 17.5.1 Adjustment for variations in rates of exchange:
- (a) The value in foreign currency inserted in column (A) shall be subject to clause (h) below when recalculating the Rand value.
  - (b) The rate of exchange inserted in column (B) shall be the closing spot selling rate quoted by Council's main banker, NEDBANK, on the Base Date, rounded to the second decimal place, subject to sub-paragraph (c) below.
  - (c) If the rate of exchange inserted by the Tenderer differs from the NEDBANK rate referred to above, then the NEDBANK rate shall apply and the Rand value in columns (C) and (F) shall be recalculated accordingly, without altering the price in the Price Schedule for the relevant items.
  - (d) If a tender from a supplier or sub-contractor provides for variations in rates of exchange, the Supplier may **only** claim for variations in rates of exchange if he binds the supplier or sub-contractor to the same provision to take out forward cover as described in sub-paragraph (e) below.
  - (e) The Supplier (or sub-contractor) shall within five working days from the date of placing a firm order on an overseas supplier, cover or recover 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 Plant and Materials inserted by the Tenderer on the scheduled titled "**Price Basis for Imported Resources**".
  - (f) When the Supplier (or sub-contractor) so obtains forward cover, the Supplier shall immediately notify the CCT of the rate obtained and furnish the CCT with a copy of the foreign exchange contract note.

(g) Based on the evidence provided in sub-paragraph (f) above, the value in Rand inserted in column (C) of 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 sub-paragraph (h) below.

(h) The adjustments shall be calculated upon the value in foreign currency in the Supplier's (or sub-contractor'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.

#### 17.5.2 Adjustment for variations in customs surcharge and customs duty

(a) 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.

(b) 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.

#### 17.5.3 Adjustment for variation in labour and material Costs

If the prices for imported Plant and Materials are not fixed, the Supplier shall in his Tender specify the formula for calculating Contract Price Adjustments normally used in the country of manufacture and the indices and relative proportions of labour and material on which his Tender prices are based. Evidence of the indices applicable shall be provided with each claim. The indices applicable 42 days before contractual dispatch date from the factory will be used for the purposes of Contract Price Adjustment.

Failure to specify a formula in the Tender shall mean that the prices are fixed or shall be deemed to be fixed.

### **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, extension of the duration or expansion of the value of the contract that the purchaser issues to the supplier as instructions in writing, 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, such work will not become due and payable until amended order has been issued by 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 the were the acts, defaults or negligence of the supplier.

20.3 Any appointment of a subcontractor shall not amount to a contract between the CCT and the subcontractor, or a responsibility or liability on the part of the CCT to the subcontractor and shall not relieve 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 the contract the supplier or its sub-contractors should encounter conditions beyond their reasonable control which impede the timely delivery of the goods, the supplier shall notify the purchaser in writing, within 7 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 a contract shall be deemed to prohibit the obtaining of goods 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 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 as stated herein for each day of the delay until actual delivery or performance.

The penalty for this contract shall be **[R 2000 per works package where the service provider fail to comply with the agreed timelines]**

- 22.2 The purchaser shall, without prejudice to its other remedies under the contract, deduct from the contract price, financial penalties as contained on the **Preference Schedule** relating to 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 The parties by mutual agreement terminate the contract.
- 23.8.3 If an Order has been issued incorrectly, or to the incorrect recipient, the resulting contract may be terminated by the purchaser by written notice

- 23.8.4 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, provided the City Manager follows the processes as described in the purchasers SCM Policy.
- 23.8.5 After providing notice to the supplier, if the implementation of the contract may result in reputational risk or harm to the City as a result of (inter alia):
- 23.8.5.1 reports of poor governance and/or unethical behaviour;
  - 23.8.5.2 association with known family of notorious individuals;
  - 23.8.5.3 poor performance issues, known to the Employer;
  - 23.8.5.4 negative social media reports; or
  - 23.8.5.5 adverse assurance (e.g. due diligence) report outcomes..
- 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 The purchaser may make either of the following elections to ensure its rights are protected and any negative impact on service delivery is mitigated:
- 26.1.1 accept a supplier proposal (via the liquidator) to render delivery utilising the appropriate contractual mechanisms; or
- 26.1.2 terminate the contract, as the liquidator proposed supplier is deemed unacceptable to the purchaser, at any time by giving written notice to the supplier (via the liquidator).
- 26.2 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**

*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 23.1(c), 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 (b) and replace with the following:*

- (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 working day of delivery
  - 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 supplier to submit documentary evidence in the form of a valid Tax Clearance Certificate issued by SARS to the CCT at the Supplier Management Unit located within the Supplier Management / Registration Office, 2<sup>nd</sup> Floor (Concourse Level), Civic Centre, 12 Hertzog Boulevard, Cape Town (Tel 021 400 9242/3/4/5).

*Add the following after clause 32.3:*

32.4 The **VAT registration** number of the City of Cape Town 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. Any failure in this regard may result in a delay in the processing of any payments.

**36. Protection of Personal Information Act 4 of 2013 (POPIA)**

The City of Cape Town (City) respects the privacy rights of all persons who participate in the City's procurement procedures. All personal information of the bidder will be processed in accordance to the Protection of Personal Information Act 4 of 2013 (POPIA). Personal information of bidders will only be processed for purposes of tendering procedures and the associated processing operations, or, for any other legitimate purpose relating to City functions.

Personal information of City employees will only be processed for purposes of executing the obligations of the contract and the associated processing operations, or, for any other legitimate purpose relating to City and/or service provider functions.

All matters will be treated as confidential and in connection with the tender. You may 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.

By submitting a tender to the City of Cape Town, (and by concluding any ensuing related agreement with the City of Cape Town, if applicable), the Tenderer thereby acknowledges and unconditionally agrees:

1.1 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;

1.2 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;

1.3 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;

1.4 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-contractors' 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;

1.5 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 exists therein);

1.6 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

1.7 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.

## (8) GENERAL CONDITIONS OF CONTRACT

(National Treasury - General Conditions of Contract (revised July 2010))

### TABLE OF CLAUSES

1. Definitions
2. Application
3. General
4. Standards
5. Use of contract documents and information; inspection
6. Patent rights
7. Performance security
8. Inspections, tests and analysis
9. Packing
10. Delivery and documents
11. Insurance
12. Transportation
13. Incidental services
14. Spare parts
15. Warranty
16. Payment
17. Prices
18. Contract amendments
19. Assignment
20. Subcontracts
21. Delays in the supplier's performance
22. Penalties
23. Termination for default
24. Dumping and countervailing duties
25. Force majeure
26. Termination for insolvency
27. Settlement of disputes
28. Limitation of liability
29. Governing language
30. Applicable law
31. Notices
32. Taxes and duties
33. National Industrial Participation Programme (NIPP)
34. Prohibition of restrictive practices

### 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](http://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 so 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.
- 7.2 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 even

## **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.

**(9) FORM OF GUARANTEE / PERFORMANCE SECURITY****FORM OF GUARANTEE / PERFORMANCE SECURITY****GUARANTOR DETAILS AND DEFINITIONS**

"Guarantor" means: .....

Physical address of Guarantor: .....

"Supplier" means: .....

"Contract Sum" means: The accepted tender amount (INCLUSIVE OF VAT) of R.....

Amount in words: .....

"Guaranteed Sum" means: The maximum amount of R .....

Amount in words: .....

"Contract" means: The agreement made in terms of the Form of Offer and Acceptance for tender no \_\_\_\_\_: \_\_\_\_\_ and such amendments or additions to the contract as may be agreed in writing between the parties.

**PERFORMANCE GUARANTEE**

1. The Guarantor's liability shall be limited to the amount of the Guaranteed Sum.
2. The Guarantor's period of liability shall be from and including the date of issue of this Guarantee/Performance Security up to and including the termination of the Contract or the date of payment in full of the Guaranteed Sum, whichever occurs first.
3. The Guarantor hereby acknowledges that:
  - 3.1 any reference in this Guarantee/Performance to "Contract" is made for the purpose of convenience and shall not be construed as any intention whatsoever to create an accessory obligation or any intention whatsoever to create a suretyship;
  - 3.2 its obligation under this Guarantee/Performance Security is restricted to the payment of money.
4. Subject to the Guarantor's maximum liability referred to in 1, the Guarantor hereby undertakes to pay the City of Cape Town the sum due and payable upon receipt of the documents identified in 4.1 to 4.2:
  - 4.1 A copy of a first written demand issued by the City of Cape Town to the Supplier stating that payment of a sum which is due and payable has not been made by the Supplier in terms of the Contract and failing such payment within seven (7) calendar days, the City of Cape Town intends to call upon the Guarantor to make payment in terms of 4.2;
  - 4.2 A first written demand issued by the City of Cape Town to the Guarantor at the Guarantor's physical address with a copy to the Supplier stating that a period of seven (7) days has elapsed since the first written demand in terms of 4.1 and the sum has still not been paid.
5. Subject to the Guarantor's maximum liability referred to in 1, the Guarantor undertakes to pay to the City of Cape Town the Guaranteed Sum or the full outstanding balance upon receipt of a first written demand from the City of Cape Town to the Guarantor at the Guarantor's physical address calling up this Guarantee / Performance Security, such demand stating that:
  - 5.1 the Contract has been terminated due to the Supplier's default and that urity is called up in terms of 5; or

5.2 a provisional or final sequestration or liquidation court order has been granted against the Supplier and that the Guarantee/Performance Guarantee is called up in terms of 5; and

5.3 the aforesaid written demand is accompanied by a copy of the notice of termination and/or the provisional/final sequestration and/or the provisional liquidation court order.

6. It is recorded that the aggregate amount of payments required to be made by the Guarantor in terms of 4 and 5 shall not exceed the Guarantor's maximum liability in terms of 1.
7. Where the Guarantor has made payment in terms of 5, the City of Cape Town shall upon the termination date of the Contract, submit an expense account to the Guarantor showing how all monies received in terms of this Guarantee/Performance Security have been expended and shall refund to the Guarantor any resulting surplus. All monies refunded to the Guarantor in terms of this Guarantee/Performance Security shall bear interest at the prime overdraft rate of the City of Cape Town's bank compounded monthly and calculated from the date payment was made by the Guarantor to the City of Cape Town until the date of refund.
8. Payment by the Guarantor in terms of 4 or 5 shall be made within seven (7) calendar days upon receipt of the first written demand to the Guarantor.
9. The City of Cape Town shall have the absolute right to arrange its affairs with the Supplier in any manner which the City of Cape Town may deem fit and the Guarantor shall not have the right to claim his release from this Guarantee /Performance Security on account of any conduct alleged to be prejudicial to the Guarantor.
10. The Guarantor chooses the physical address as stated above for the service of all notices for all purposes in connection herewith.
11. This Guarantee/Performance Security is neither negotiable nor transferable and shall expire in terms of 2, where after no claims will be considered by the Guarantor. The original of this Guarantee / Performance Security shall be returned to the Guarantor after it has expired.
12. This Guarantee/Performance Security, with the required demand notices in terms of 4 or 5, shall be regarded as a liquid document for the purposes of obtaining a court order.
13. Where this Guarantee/Performance Security is issued in the Republic of South Africa the Guarantor hereby consents in terms of Section 45 of the Magistrate's Courts Act No 32 of 1944, as amended, to the jurisdiction of the Magistrate's Court of any district having jurisdiction in terms of Section 28 of the said Act, notwithstanding that the amount of the claim may exceed the jurisdiction of the Magistrate's Court.

Signed at .....

Date .....

Guarantor's signatory (1) .....

Capacity .....

Guarantor's signatory (2) .....

Capacity .....

Witness signatory (1) .....

Witness signatory (2) .....

**ANNEXURE****LIST OF APPROVED FINANCIAL INSTITUTIONS**

The following financial institutions are currently (as at 12 October 2021) approved for issue of contract guarantees to the City:

**1) National Banks**

ABSA Bank Limited  
 Firststrand Bank Limited  
 Investec Bank Limited  
 Nedbank Limited  
 Standard Bank of South Africa Limited

**2) International Banks (with branches in South Africa)**

Barclays Bank PLC  
 Citibank NA  
 Credit Agricole Corporate and Investment Bank  
 HSBC Bank PLC  
 JPMorgan Chase Bank  
 Societe Generale  
 Standard Chartered Bank

**3) Insurance Companies**

American International Group Inc (AIG)  
 Bryte Insurance Company Limited  
 Coface SA  
 Compass Insurance Company Limited  
 Credit Guarantee Insurance Corporation of Africa  
 Limited Guardrisk Insurance Company Limited  
 Hollard Insurance Company Limited  
 Infiniti Insurance Limited  
 Lombard Insurance Company Limited  
 New National Assurance Company Limited  
 PSG Konsult Ltd (previously Absa Insurance)  
 Regent Insurance Company Limited  
 Renasa Insurance

**(11) OCCUPATIONAL HEALTH AND SAFETY AGREEMENT****AGREEMENT MADE AND ENTERED INTO BETWEEN THE CITY OF CAPE TOWN (HEREINAFTER CALLED THE "CCT") AND**

..... ,  
 (Supplier/Mandatar/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, 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 (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**

\_\_\_\_\_  
**Mandatar**

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

\_\_\_\_\_  
 Witness

\_\_\_\_\_  
 for and on behalf of  
 City of Cape Town

**(12) INSURANCE BROKER'S WARRANTY (PRO FORMA)**

*Logo*

*Letterhead of supplier's Insurance Broker*

Date \_\_\_\_\_

CITY OF CAPE TOWN  
City Manager  
Civic Centre  
12 Hertzog Boulevard  
Cape Town  
8000

Dear Sir

**TENDER NO.:** 153S/2022/23

**TENDER DESCRIPTION: SUPPLY, INSTALLATION AND ADHOC MAINTENANCE OF CONTROL SYSTEMS INFRASTRUCTURE AT VARIOUS CITY OF CAPE TOWN SITES**

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 CITY OF CAPE TOWN 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)

**(13) 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 EtherNet/IP.

**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. Indication**

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 (Applications with medium requirements)

###### 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 (Applications with medium to high requirements)

###### 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 (Applications with high requirements)**

**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 equivalent 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.

**6.2.4. 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.

**6.2.5. 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.

### 6.5.5 INPUT / OUTPUT MODULES CONNECTORS CPU 4

#### 6.5.5.1. 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 available for digital input/output modules (power supply with push-in or screw-type terminals) and for analog modules.

#### 6.5.5.2. 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.

#### 6.5.5.3. 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.

#### 6.5.5.4. 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 compliant 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 to 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.

**10.2 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.

**10.3 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.

**10.4. Power supply**

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

**10.5. ETHERNET CARD (IP ADAPTER) TYPE1 , PLC TYPE 5 CPU1**

**10.5.1. Number of ports**

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

**10.5.3. Power supply**

The unit shall be powered via the backplane or rack of a typical 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 backplanes. The card must be able to handle the Modbus TCP/IP protocol.

**10.5.6. 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 ControlLogix 5580 or equivalent CPU's.

**10.6. ETHERNET CARD (IP ADAPTER) TYPE 2 , PLC TYPE 5 CPU 1**

**10.6.1. Number of ports**

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

**10.6.2. 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.

**10.6.3. Power supply**

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

**10.6.4. Indication**

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

**10.6.5. Compatibility**

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

**10.6.6. 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.

**10.7 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.

## **10.8 DIGITAL INPUT MODULES FOR PLC TYPE 5 CPU 1**

### **10.8.1. 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.

### **10.8.2. Communication**

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

### **10.8.3. Indication**

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

### **10.8.4. 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.

### **10.8.5. Protection**

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

## **10.9. DIGITAL 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 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.

### **10.9.2. 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).

### **10.9.3. Indication**

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

### **10.9.4. 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.

### **10.9.5. 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.

**10.10. ANALOG INPUT MODULES FOR PLC TYPE 5 CPU 1****10.10.1. 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.

**10.10.2 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

**10.10.3 Indication**

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

**10.10.4 Power consumption**

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

**10.10.4 Protection**

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

**10.11 ANALOG OUTPUT MODULES FOR PLC TYPE 5 CPU 1****10.11.1 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).

**10.11.2 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.

**10.11.3 Indication**

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

**10.11.4 Power consumption**

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

**10.11.5 Protection**

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

**10.12. INPUT / OUTPUT MODULES CONNECTORS FOR PLC TYPE 5 CPU 1****10.12.1. Removable Terminal blocks**

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

**10.12.2. Preformed cord**



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

**10.12.3. 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. .

**10.13 BACKPLANE MODULES**

**10.13.1 BACKPLANES(CHASSIS) FOR PLC TYPE 5 CPU 1**

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

**10.13.1 BACKPLANES (CHASSIS) FOR PLC TYPE 5 CPU 1**

The backplane modules must be capable of housing the ControlLogix 5580 or equivalent type modules with 4slots available (1756-A7K ).

**10.13.1 BACKPLANES(CHASSIS) FOR PLC TYPE 5 CPU 1**

The backplane modules must be capable of housing the ControlLogix 5580 or equivalent type modules with 4slots available (1756-A7K ).

**10.14. BACKPLANE EXTENDER FOR PLC TYPE 5 CPU 1**

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

**10.15 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.

**10.16. PLC TYPE 5 CPU 2**

**10.16.1. 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.

**10.16.2.CPU memory**

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

**10.16.3.Compatibility**

The CPU must be compatible with CompactLogix 5480 Controllers.

**10.16.4. 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.

**10.16.5. Indication**

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

## 10.16.6 I/O Card Compatibility

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

## 10.16.7 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.

## 10.16.8 Power supply

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

## 10.16.9 ETHERNET CARD (IP ADAPTER) PLC TYPE 1

## 10.16.10. Number of ports

The card must at least have one Ethernet port .

## 10.16.11. 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

## 10.16.12. Power supply

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

## 10.16.13. Indication

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

## 10.16.14. 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.

## 10.16.15. 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.

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

## 10.16.17. Number of ports

The card must at least have 2 Ethernet ports .

## 10.16.18. 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.

## 10.16.19. Power supply

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

10.16.20. Indication

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

10.16.21. Compatibility

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

10.16.22. 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.

10.16.23 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.

10.16.24 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.

10.17 DIGITAL INPUT MODULES FOR PLC TYPE 5, CPU 2

10.17.1. 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.

10.17.2. Communication

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

10.17.3. Indication

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

10.17.4. 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.

10.17.5. Protection

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

10.18. DIGITAL OUTPUT MODULES FOR PLC TYPE 5 CPU 2

## 10.18.1. 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.

## 10.18.2 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).

## 10.18.3 Indication

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

## 10.18.4. 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.

## 10.18.5. 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.

## 10.19. ANALOG INPUT MODULES FOR PLC TYPE 5 CPU 2

## 10.19.1. 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.

## 10.19.2 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

## 10.19.3 Indication

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

## 10.19.4 Power consumption

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

## 10.19.5 Protection

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

**10.20 ANALOG 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 5480 or equivalent Controllers. The 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).

**10.20.1 Communication**

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

**10.20.2 Indication**

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

**10.20.3 Power consumption**

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

**10.20.4 Protection**

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

**10.21. PLC TYPE 5 CPU 3****10.21.1. 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

**10.21.2.CPU memory**

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

**10.21.3.Compatibility**

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

**10.21.4. 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.

**10.21.5. Indication**

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

**10.21.6 I/O Card Compatibility**

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

**10.21.7 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.

**10.21.8 Power supply**

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

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

**10.21.10. Number of ports**

The card must at least have one Ethernet port .

**10.21.11. 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

**10.21.12. Power supply**

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

**10.21.13. Indication**

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

**10.21.14. 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.

**10.21.15. 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.

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

**10.21.17. Number of ports**

The card must at least have 2 Ethernet ports .

**10.21.18. 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.

**10.21.19. Power supply**

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

**10.21.20. Indication**

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

**10.21.21. Compatibility**

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

**10.21.22. 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.

**10.21.23 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.

**10.22 DIGITAL INPUT MODULES FOR PLC TYPE 5 CPU 3**

**10.22.1. 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.

**10.22.2. 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.

**10.22.3. Indication**

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

**10.22.4. 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.

**10.22.5 Protection**

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

**10.23. DIGITAL OUTPUT MODULES FOR PLC TYPE 5 CPU 3**

**10.23.1. 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.

**10.23.2 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).

#### 10.23.3 Indication

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

#### 10.23.4. 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.

#### 10.23.5. 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.

### 10.24. ANALOG INPUT MODULES FOR PLC TYPE 5 CPU 3

#### 10.24.1. 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.

#### 10.24.2 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

#### 10.24.3 Indication

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

#### 10.24.4 Power consumption

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

#### 10.24.5 Protection

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

### 10.25 ANALOG OUTPUT MODULES FOR PLC TYPE 5 CPU 3

#### 10.25.1 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).

**10.25.2 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.

**10.25.3 Indication**

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

**10.25.4 Power consumption**

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

**10.25.5 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. 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

**11.2. CPU memory**

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

**11.3. Compatibility**

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

**11.4. 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.

**11.5. Indication**

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

**11.6 I/O Card Compatibility**

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

**11.7 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.

**11.8 Power supply**

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

#### **11.9 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.

#### **11.10 DIGITAL INPUT MODULES FOR PLC TYPE 6**

##### **11.10.1. 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.

##### **11.10.2. Communication**

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

##### **11.10.3. Indication**

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

##### **11.10.4. 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.

##### **11.10.5 Protection**

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

#### **11.11 DIGITAL OUTPUT MODULES FOR PLC TYPE 6**

##### **11.11.1 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.

##### **11.11.2 Communication**

The unit shall be able to communicate with Modbus devices

##### **11.11.3 Indication**

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

##### **11.11.4. 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.

##### **11.11.5. 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.

#### 11.12. ANALOG INPUT MODULES FOR PLC TYPE 6

##### 11.12.1. 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.

##### 11.12.2 Communication

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

##### 11.12.3 Indication

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

##### 11.12.4 Power consumption

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

##### 11.12.5 Protection

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

#### 11.13 ANALOG OUTPUT MODULES FOR PLC TYPE 6

##### 11.13.1 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).

##### 11.13.2 Communication

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

##### 11.13.3 Indication

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

##### 11.13.4 Power consumption

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

##### 11.13.5 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.

#### 12.2. CPU memory

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

#### 12.3. Compatibility

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

#### 12.4. 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.

#### 12.5. Indication

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

#### 12.6 I/O Card Compatibility

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.

#### 12.7 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.

#### 12.8 Power supply

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

#### 12.9 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.

#### 12.10. MOTOR PROTECTION (ABB REM 615) or Equivalent

##### 12.10.1. Protection functions

##### 12.10.1.1. 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.

#### 12.10.1.2. 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.

#### 12.10.1.3. 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  $\pm 0.5\%$  and zero, negative and positive-sequence current and voltage measurement functionality with an accuracy of  $\pm 1\%$  within the range of  $\pm 2\text{Hz}$  of the nominal frequency.

#### 12.10.1.4. 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  $\geq 1 \text{ A (L/R < 40 ms)}$ .
- To enable fast direct tripping of the circuit breaker, the relay must have 3 optional high-speed binary outputs with an operate time of  $\leq 1 \text{ ms}$ . The binary output contacts shall be rated to make and carry 30 A for 0.5 s with a breaking capacity of  $\geq 1 \text{ A (L/R < 40 ms)}$ . 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.

#### 12.10.1.5. 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.

#### 12.10.1.6. 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.

#### 12.10.1.7. 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.

#### 12.10.1.8. 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.

#### 12.10.1.9. 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.

#### 12.10.1.10. Type tests and other compliance requirements

- The relay shall have an operational temperature range of -25 ... +55°C and transport/storage temperature range of -40...+85°C.
- 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.

### 12.11. FEEDER PROTECTION (ABB REF 615) or Equivalent

#### 12.11.1. 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.

#### 12.11.1.1. 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.  $I_0$  and  $U_0$  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.

## 12.11.1.2. 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  $\geq 1$  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  $\leq 1$  ms. The binary output contacts shall be rated to make and carry 30 A for 0.5 s with a breaking capacity of  $\geq 1$  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.

## 12.11.1.3. 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  $\pm 0.5\%$  and zero, negative and positive-sequence current and voltage measurement with an accuracy of  $\pm 1\%$  within the range of  $\pm 2$  Hz 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.

## 12.11.1.4. 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.

## 12.11.1.5. Real time clock and time synchronization

- The relay must support IEEE 1588 v2 for high accuracy time synchronization ( $< 4$   $\mu$ s) 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.



## 12.11.1.6. 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.

## 12.11.1.7. 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.

## 12.11.1.8. Type tests and other compliance requirements

- The relay shall have an operating temperature range of -25 ... +55°C and transport/storage temperature range of -40...+85°C.
- 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.

## 12.12. TRANSFORMER PROTECTION (ABB RET 615) or Equivalent

## 12.12.1. Protection functions

## 12.12.1.1. 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.

## 12.12.1.2. 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.

## 12.12.1.3. 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.

## 12.12.1.4. 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.

## 12.12.1.5. 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  $\geq 1$  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  $\leq 1$  ms. The binary output contacts shall be rated to make and carry 30 A for 0.5 s with a breaking capacity of  $\geq 1$  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.

## 12.12.1.6. 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  $\pm 0.5\%$  and zero, negative and positive-sequence current and voltage measurement functionality with an accuracy of  $\pm 1\%$  within the range of  $\pm 2$  Hz 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.

## 12.12.1.7. 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.

## 12.12.1.8. Real time clock and time synchronization

- The relay must support IEEE 1588 v2 for high accuracy time synchronization ( $< 4$   $\mu$ s) 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.

## 12.12.1.9. 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.

## 12.12.1.10. 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.

## 12.12.1.11. Type tests and other compliance requirements

- The relay shall have an operating temperature range of -25 ... +55°C and transport/storage temperature range of -40...+85°C.
- 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.

## 12.13. GENERATOR PROTECTION (ABB REG 615) or Equivalent

## 12.13.1. Protection functions

## 12.13.1.1. 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  $U_0$  shall 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.

## 12.13.1.2. 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 options 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 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.

#### 12.13.1.3. 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.

#### 12.13.1.4. 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.

#### 12.13.1.5. 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  $\geq 1$  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  $\leq 1$  ms. The binary output contacts shall be rated to make and carry 30 A for 0.5 s with a breaking capacity of  $\geq 1$  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.

## 12.13.1.6. 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  $\pm 0.5\%$  and zero, negative and positive-sequence current and voltage measurement functionality with an accuracy of  $\pm 1\%$  within the range of  $\pm 2\text{Hz}$  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.

## 12.13.1.7. 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 ( $< 10\text{ ms}$ ) 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.

## 12.13.1.8. Real time clock and time synchronization

- The relay must support IEEE 1588 v2 for high accuracy time synchronization ( $< 4\text{ }\mu\text{s}$ ) 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.

## 12.13.1.9. 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.

#### 12.13.1.10. Arc flash 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.

#### 12.13.1.11. Type tests and other compliance requirements

- The relay shall have an operating temperature range of -25 ... +55°C and transport/storage temperature range of -40...+85°C.
- 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.

### 12.14. CAPACITOR BANK PROTECTION (ABB REV 615) or Equivalent

#### 12.14.1. 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.

#### 12.14.1.1. 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.  $I_0$  and  $U_0$  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.

#### 12.14.1.2. 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  $\geq 1$  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  $\leq 1$  ms. The binary output contacts shall be rated to make and carry 30 A for 0.5 s with a breaking capacity of  $\geq 1$  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.

#### 12.14.1.3. 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  $\pm 0.5\%$  and zero, negative and positive-sequence voltage measurement functionality with an accuracy of  $\pm 1\%$  within the range of  $\pm 2$ Hz 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.

#### 12.14.1.4. 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.

#### 12.14.1.5. Real time clock and time synchronization

- The relay must support IEEE 1588 v2 for high accuracy time synchronization (<4  $\mu$ s) 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.

#### 12.14.1.6. 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.

#### 12.14.1.7. Type tests and other compliance requirements

- The relay shall have an operating temperature range of -25 ... +55°C and transport/storage temperature range of -40...+85°C.
- 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.

### 12.15. LINE DIFFERENTIAL PROTECTION (ABB RED 615) or Equivalent

#### 12.15.1. 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.

#### 12.15.1.1. 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.  $I_0$  and  $U_0$  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  $\pm 2.5\%$  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.

#### 12.15.1.2. 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  $\geq 1$  A ( $L/R < 40$ ms).
- 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.

#### 12.15.1.3. 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  $\pm 0.5\%$  and zero, negative and positive-sequence current and voltage measurement functionality with an accuracy of  $\pm 1\%$  within the range of  $\pm 2$ Hz 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.

#### 12.15.1.4. 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.

#### 12.15.1.5. Real time clock and time synchronization

- The relay must support IEEE 1588 v2 for high accuracy time synchronization (<4  $\mu$ s) 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.

#### 12.15.1.6. 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.

#### 12.15.1.7. Type tests and other compliance requirements

- The relay shall have an operating temperature range of -25 ... +55°C and transport/storage temperature range of -40...+85°C.
- 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. Resolution 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. Resolution 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 windows 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

15.2.4. 5000 Tag Point

15.3.2.6. 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) 178

Backlight Technology:	LED edge light system
Brightness:	400 cd/m <sup>2</sup> (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 mm <sup>2</sup> (311.67 inches <sup>2</sup> )
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/m <sup>2</sup> (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

#### 15.4.10. Rugged 10" Tablet

The 10 inch needs to conform to the below specification or similar. Please note that it is important for the unit to have a usb/RJ45 or where not a usb to RJ45 converter shall be provided.

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 IP65 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 an 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 an 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 AND 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 of 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 of 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. DISSOLVED OXYGEN

The DO 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. 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. Dissolved oxygen controller

The controllers 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 RS-232 capability
Memory card:	SD card reader for data download and controller software upload
Power:	230 Vac, 50 Hz
Analogue outputs:	Two analogue output channels (0/4-20mA)
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 4 different analogue sensor modules 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

The controller sensor modules shall comply with the performance requirements as listed below.

#### 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 SC200 Controller

#### 16.1.3. 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 SC200 Controller

#### 18.1.4. Oxygen Scavengers sensor module

Measurement range: 0 to 500 ppb of dissolved N<sub>2</sub>H<sub>4</sub>  
0 to 100 ppb of carbon hydrazide  
Repeatability: <2% of the measured value or <1ppb  
Response time: (t90%): < 60s  
Temperature range: 5 – 45 °C

## 18.1.5. Conducting conductivity sensor module

Measurement range: Conductivity: 0 to 20,000  $\mu\text{S}/\text{cm}$   
 Resistivity: 0 to 50  $\Omega\cdot\text{cm}$   
 TDS: 0 to 9999 ppm or 0 to 9999 ppb  
 Repeatability:  $\pm 1\%$  of reading or 0.002  $\mu\text{S}/\text{cm}$  below 0.2  $\mu\text{S}/\text{cm}$ ,  
 whichever is higher  
 Response time ( $t_{90\%}$ ): 0.5s  
 Temperature range: -20 to 200  $^{\circ}\text{C}$   
 Temperature Accuracy:  $\pm 0.05$   $^{\circ}\text{C}$   
 Compatibility: Need to be compatible with existing HACH  
 SC200 Controller

## 18.1.6. Inductive conductivity sensor module

Measurement range: Conductivity: 0.5 to 10,000  $\mu\text{S}/\text{cm}$   
 % concentration: 0 to 99.99 or 0 to 200.0%  
 TDS: 0 to 9999 ppm  
 Repeatability: 0.5 to 10,000  $\text{mS}/\text{cm}$ :  $\pm 2\%$   
 Response time ( $t_{90\%}$ ): 1s  
 Temperature range: -2 to 200  $^{\circ}\text{C}$   
 Temperature Accuracy:  $\pm 0.05$   $^{\circ}\text{C}$   
 Compatibility: Need to be compatible with existing HACH  
 SC200 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.

## 18.1.7.1. Performance Requirements

Measurement range: 0.01 to 20.00  $\text{mg}/\text{L}$   
 Resolution: 0.01  $\text{mg}/\text{L}$   
 Accuracy :  $< 5$  ppm:  $\pm 0.1$  ppm  
 $> 5$  ppm:  $\pm 0.2$  ppm  
 Repeatability:  $\pm 0.1$  ppm  
 Response time:  $< 40\text{s}$  to 90% at 20  $^{\circ}\text{C}$   
 $< 60\text{s}$  to 95% at 25  $^{\circ}\text{C}$   
 Temperature sensor: PT100 integrated, external sensor  
 Temperature range: 0 – 50  $^{\circ}\text{C}$   
 Temperature accuracy:  $\pm 0.2$   $^{\circ}\text{C}$

## 18.1.7.2. Operational Criteria

Operating temperature: 0 to 50  $^{\circ}\text{C}$   
 Relative humidity: 95%, non condensing  
 Immersion depth: 15 meters, maximum  
 Immersion pressure: 345 kPa, maximum  
 Sample pH range: 0.0 to 12.0  
 Distance, analyzer to sensor: 1000 meters, maximum  
 Ingress: Minimum IP65

## 18.1.7.3. Maintenance Service

Sensor cleaning: 90 days or depending on conditions  
 Sensor and sensor cap inspection: 90 days  
 Sensor cap replacement: once every 2 years  
 Calibration: per regulatory agency schedule, otherwise calibration-free

#### 18.1.7.4. General

Compatibility: Need to be compatible with existing HACH SC 200 Controller

#### 18.1.8. Dissolved Oxygen Portable device

The portable device shall be Luminescent Dissolved Oxygen (LDO) sensor based for DO measurement.

The portable device shall comply with the following specifications:

Ingress: IP67 during measurement  
 Principal of operation: Luminescent Dissolved Oxygen measurement  
 Data storage: Internal calibration data and data storage  
 Data transfer: USB data transfer via flash stick or PC  
 Resolution: 0.01mg/L  
 Range: 0.05 to 20mg/L  
 Inputs: Two channel  
 Required accessories: Hard case protective glove for meter  
 Features: Temperature compensation  
 Power: Internal battery with charging adaptors

#### 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 or 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: IP65 during measurement  
 Measuring range: 0 – 30 000 mg/l  
 Accuracy: 3% of reading or 20mg/l, whichever is greater  
 Repeatability: +/- 0.5%  
 Temperature range: 0 – 65 deg C  
 Required components: All components required to perform measurements  
 Required 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:	IP65
Measuring 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 using 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-electrode 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 polyurethane lined stainless steel tubes with either Titanium or Hastelloy C electrodes.

Calibration shall be in litres per second unless otherwise specified.

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 shall be suitable for indefinite immersion in water transmitted within pipelines being buried underground. The cable connections at the flow sensor shall be factory sealed.

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.

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 shall be possible while the meter is in operation by making use of a portable verification meter/instrument or self verification function.

The meter shall be offered in a battery powered option. Modbus could be swapped 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
Transmitter Output:	4 to 20 mA and Ethernet (ModbusTCP)
Compatibility:	With Mass/Mag 6000 indicator or similar

#### 18.3.2. Ultrasonic (open channel flow measurement)

The controller shall have menu-driven parameters, and Wizard support for key applications. The unit shall have easy removable terminals blocks for ease of wiring. The unit should cater for a backup digital for level override. The unit shall be capable of handling Modbus RTU 485. The unit shall make use of standard flow curves but not be limited by it.

- Communication using built-in Modbus RTU via RS 485 and SIMATIC PDM configuration software
- Compatible with SmartLinx system: PROFIBUS DP, ProfiNet (cyclic access of process values only), DeviceNET, Modbus TCP/IP, and Ethernet/IP
- Single or dual point level monitoring
- Auto False-Echo Suppression for fixed obstruction avoidance
- Differential amplifier transceiver for common mode noise reduction and improved signal-to-noise ratio
- Level, volume, and flow measurements in open channels, differential control, extended pump control, and alarm functions
- Wall and panel mounting options

### 18.3.3. 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.

### 18.3.4. Clamp on Ultrasonic

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. Verification shall be possible by using the software via a computer. The diagnostic software shall be able to trend the data graphically. The unit shall be able to measure with stability through linings tar, epoxy and mortar. The unit should further be able to function on various of pipe materials including but not limited to steel, castings and PVC. The meter shall be able to run from battery backup under load shedding conditions.

Relay output: 4 ports  
 Digital outputs: 2 ports  
 Sensor Diameter and Pressure rating: 25mm up to 6000mm  
 Accuracy: +/- 1 % of measured flow  $V > 0.8\text{m/s}$  @  $\text{DN} > 300\text{mm}$   
 Repeatability: 0.5%  
 Multi Path Measurement: 4 Path  
 Protection rating: IEC 60529 IP65  
 Output: 4 to 20 mA and Modbus 232  
 Environment Class: IEC 60529 I67 or IP68

### 18.3.5. Mass flow meter

#### 18.3.5.1. Coriolis mass flow meter

The Coriolis mass flow meter shall be compatible with the existing SITRANS FC MASS 6000 transmitter. The Coriolis mass flow meter shall be available in a variety of sizes ranging from DI3 to a DI40. There should also be allowed for a lower flow unit in the form of a DI1.5. The meter shall be able to handle pressures up to 410bar. The temperature range of operation should allow for range of -50 degrees Celsius to 180 degrees Celsius. The sensor design shall be of the one bended tube type. The housing shall be IP65 rated. The unit shall have ATEX EEx approval. The Coriolis mass flow meter shall allow for the Mass 6000 controller to be installed remotely or directly on the meter in case of dosing skids. The meter can typically be of the 2100 series or similar. The Coriolis flow meter should further more cater for special applications where the wetted parts of the meter shall be manufactured of Hasloy C material in order to withstand chlorine gas in specific. The principle of operation shall be based on the Coriolis effect.

#### 18.3.5.2. Coriolis flow meter transmitter

The transmitter shall be able to deliver true multi parameters in the form of mass flow, volume flow, density, temperature and totalizers based on the mass flow and volume flow. The transmitter shall be compatible with the current 2100 series and be able to mount on the meter or remotely. The transmitter shall allow for or Modbus TCP/IP. If Modbus TCP/IP is unavailable; Modbus 485 shall be used for communication to the transmitter.

#### 18.3.5.3. 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.

##### 18.3.5.3.1. 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.

## 18.3.5.3.2. 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.

## 18.3.5.3.3. 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.

## 18.3.5.3.4. 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.

## 18.3.5.3.5. 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.

## 18.3.5.3.6. 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 integral cable of 10m length, with the complete unit of at least IP65 rating. The sensors shall be capable of measuring range as set out below.

The transmitter shall be of minimum IP65 rating, or alternately, housing in a protective enclosure providing this rating. The transmitter shall be provided with a weatherproof protective housing and the local display shall be visible with the protective housing closed.

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 level meter shall conform to the following:

Power supply:	230 V AC
Output:	Isolated 4-20 mA and Ethernet (ModbusTCP/IP) or Modbus 485, Relay (discreet outputs) as detailed
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

**18.4.1.1. Type 1**

The Type 1 transducer and transmitter shall be compatible with the existing Emmerson infrastructure

**18.4.1.2. Type 2**

The Type 2 transducer and transmitter shall be compatible with the existing Mobrey infrastructure

**18.4.1.3. Type 3**

The Type 3 transducer and transmitter shall be compatible with the existing Siemens infrastructure

**18.4.1.4. Type 4**

The Type 4 transducer and transmitter shall be compatible with the existing Endress and Hauser infrastructure

**18.4.1.5 Type 5**

The unit shall have sensing range of 350mm to 6000mm. The unit shall have an operating voltage of 10 to 30Vdc. The unit shall have a 4 to 20mA output. The unit shall have a communications interface compatible with IO-Link. The Type 5 transducer shall be compatible with the existing IFM infrastructure.

**18.4.1.6 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 communications 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.

**18.4.1.7 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 communications 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.

**18.4.1.8 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 communications interface compatible with IO-Link. The unit shall have a 7-segment LED display. The unit shall be compatible with the existing IFM infrastructure.

**18.4.1.9 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 communications interface compatible with IO-Link. The unit shall be compatible with the existing IFM infrastructure.

**18.4.1.10 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 communications 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.

#### 18.4.2. Hydrostatic level transmitter

The hydrostatic level transmitter shall be programmable for various levels. 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 be 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 communications interface compatible with IO-Link. The unit shall be compatible with the existing IFM infrastructure.

#### 18.4.5 Radar

##### 18.4.5.1. Type 1

The Type 1 radar sensor shall have a measuring range up to 8m. The radar sensor shall have a PVC cable of length 10m. An output signal of 4 to 20mA. The radar sensor shall be Bluetooth capable with an effective range of 25m. The radar sensor shall have an operating voltage of 12 to 35Vdc. The radar sensor shall be supplied with all required accessories. The radar sensor shall be compatible with the existing Vega infrastructure.

##### 18.4.5.1. Type 2

The Type 2 radar sensor shall have a measuring range up to 15m. The radar sensor shall have a cable of length 10m, 30m, 50m or 100m. The radar sensor shall be to communicate via 4 to 20mA HART 7.0 or Modbus RTU. The radar sensor shall be Bluetooth capable. The radar sensor shall have a supply voltage of 12 to 35Vdc (HART) or 8 to 30Vdc (Modbus). The radar sensor shall be supplied with all required accessories. The radar sensor shall be compatible with the existing Siemens infrastructure.

##### 18.4.5.1. Type 3

The Type 3 radar sensor shall have a measuring range up to 8m. The radar sensor shall have a cable of length 10m. An output signal of 4 to 20mA. The radar sensor shall be Bluetooth capable. The radar sensor shall have a supply voltage of 10 to 30Vdc. The radar sensor shall be supplied with all required accessories. The radar sensor shall be compatible with the existing Endress+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.

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.

Where diaphragm seals require capillary extensions, the capillary shall be 316 stainless steel and be shielded by flexible stainless steel tubing with a neoprene or PVC cover.

Length of the capillary shall suit the application, but should be at least 1,0 m. For differential pressure applications the capillary tubing shall be the same length.

### 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

The pressure gauge shall be 100mm bottom entry liquid filled. The gauge shall be ½" BSP or NPT depending on the application. The pressure shall range between -1 – 20 bar. Gauges 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. 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. The gauges are split up for pressure ranges in the pricing schedule.

#### 18.5.5. Pressure Transmitter

The pressure transmitter shall be ½" BSP or NPT depending on the application. 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 of the Diaphragm type pressure switch suitable for corrosive environments which complies to the following criteria:

- No power supply needed for switching of electrical loads
- Robust switch enclosure from aluminium alloy, IP 66, NEMA 4X
- Setting ranges from 0 ...16 mbar to 0 ... 600 bar, vacuum ranges
- Repeatability of the set point  $\leq 1\%$  of span
- 1 or 2 independent set points, SPDT or DPDT, high switching power up to AC 250 V, 20

Furthermore, there shall also be allowed for a pressure switch for non-corrosive media used in industrial control, monitoring and alarm applications, which has the following features:

- Adjustable on site
- Protection cap for switch point setting
- Setting ranges:
  - 0.4 ... +7 to 6 ... 30 bar
  - 6 ...100 to 85 ... 425 psi
  - 0.04 ... +0.7 to 0.6 ... 3 MPa
- Electrical rating up to AC 230 V, 10 A

#### 18.6. PROXIMITY & LIMIT SWITCHES

Proximity Switches shall be of the PNP type and allow for various sizes from M5 to M30. The sensors will be of the plug connected version with varies sensing distances from 1.5mm to 15mm. 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.

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  $\leq \pm 0.05\%$  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:  $\leq 1.2$  V with Accuracy  $\leq \pm 0.1\%$  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 be 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  $\pm 4\%$  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  $\mu\text{V/d}$  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 DINI TOOLS (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  $\frac{3}{4}$ " and  $\frac{1}{2}$ " 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. GAS DETECTORS

The unit shall be able to cater for 4-20mA and RS485 MODBUS outputs. The unit shall further have a fixed point detector with in-built alarm and fault relays for the protection of personnel and plant from flammable, toxic and Oxygen hazards. Incorporates a transmitter with local display and fully configurable via non-intrusive magnetic switch interface. The unit shall have an Input Voltage Range 12 to 32VDC (24VDC nominal). The power consumption of the unit shall be in the following ranges depending on sensor used: Electrochemical cells = 3.7W, IR = 3.7W and catalytic = 4.9W. Maximum inrush current = 800mA at 24VDC. The current output shall be of the type, sink or source Relays 3 x 5A@250VAC. The unit shall have selectable normally open or normally closed (switch) and energized/de-energised (programmable) Alarm relays default normally open/de-energized. There shall also be a fault relay default normally open/energized. Communication shall be available via RS 485 with the Modbus RTU protocol. The unit

shall cater for Methane and Carbon using infrared sensors. The unit shall also cater for Oxygen and carbon monoxide using Electrochemical sensors. The housing of the unit shall be made of Epoxy painted aluminium alloy ADC12 or 316 stainless steel, while the sensor shall be 316 stainless steel. The unit shall further have a IP66 in accordance with EN60529:1992. The unit shall allow for class ratings of IEC Ex d IIC Gb T6 (Ta -40°C to +65°C) Ex tb IIIC T85°C Db IP66.

#### 18.12. RESIDUAL ALUMINIUM ANALYSER

The Analyser shall use colorimetric analysis to measure dissolved and total Aluminium. The unit shall measure Aluminium, total & Aluminium Al(III), dissolved. The standard measuring range shall be 0-150  $\mu\text{g/L}$ . The analyser should at least allow for calibration to 50% of the standard range. The unit should allow for multiple stream analysis. The unit shall further allow for internal dilution where applicable. The unit shall be capable of analogue and digital outputs. The unit shall offer communication in the form of Modbus TCP/IP or Modbus 485 where TCP/IP is not available.

#### 18.13. RESIDUAL IRON ANALYSER

The Analyser shall use colorimetric analysis to measure Iron. The unit shall measure Iron, total & Iron Fe(II+III), total dissolved & Iron Fe(II), dissolved & Iron Fe(III), dissolved. The standard measuring range

shall be 0-1 mg/L. The analyser should allow for calibration to 10,25 or 50% of the standard range. The unit should allow for multiple stream analysis. The unit shall further allow for internal dilution where applicable. The unit shall be capable of analogue and digital outputs. The unit shall offer communication in the form of Modbus TCP/IP or Modbus 485 where TCP/IP is not available.

#### 18.14. PORTABLE GAS DETECTORS

The portable gas detector shall be able to measure up to 4 different gasses. The unit shall be used for personal air monitoring. The unit shall be capable of detecting flammable and toxic gases and organic vapours, oxygen and harmful concentrations.

The unit shall have easy exchangeable sensors to cater for a variety of gasses. The unit should be light weight and comfortable to carry. Sensors must be capable of operating over a 4-year period before replacement is needed.

The unit shall further be water and dust resistant in accordance with the IP 67 standards. The unit shall be provided with a shock proof rubber protection and shock proof sensors to provide protection to impact and vibration. The unit should also provide resistance against electromagnetic interferences.

The optional external pump, which operates with a hose up to 45 meters long, shall be made available for pre-entry measurements into confined spaces such as tanks, shafts, etc. The pump shall start automatically when the detector is attached.

#### 18.15. Vibration Sensing and Monitoring

##### 18.15.1 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/s<sup>2</sup>) 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<sup>2</sup>) or Displacement (mm) Peak-Peak

Measuring accuracy: 0.2 %

Max. measuring range:  $\pm 25$  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

## 18.15.2. 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.

## 18.16. 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 shall 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

## 18.17. 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 from a 100...230 V AC +/-10% power supply or a 24V (-10%, +15%) AC/DC power supply.

## 18.18. Electronic valve block

## 18.18.1 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 distributed to the I/O and valves via the CPX backplane. The unit shall be able to also communicate via Ethernet/IP where applicable. The unit shall be able to handle 512 bits input and output. The unit shall also be able 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 Nominal value [V DC]	24
Permissible range [V DC]	18 ... 30
Current consumption at nominal voltage [mA]	Typically 100
Degree of protection to EN 60529	IP65, IP67
Temperature range Operation [°C]	– 5... +50
Storage/transport [°C]	–20 ... +70

#### 18.18.2 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 (power supply for electronics) [mA]	Typically 75
Nominal operating voltage [V DC]	24 (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.

#### 18.18.3 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 (power supply for electronics) [mA]	Typically 16
Operating voltage Nominal value [V DC]	24
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

#### 18.18.4 5/2 way module

The module shall fit into the valve electronic module as described under 16.18.7. The unit shall have a 5/2 way module, Double solenoid. The operating pressure shall be up to 1Mpa. The unit shall be reversible

#### 18.18.5 5/3 way module

The module shall fit into the valve electronic module as described under 16.18.7. The unit shall have a 5/3 way module, Mid position pressurized, mechanical spring return. The operating pressure shall be up to 1MPa. The unit shall be reversible

#### 18.18.6 Interlinking module

A metal (individually 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. Shall be able to connect up to

128 solenoid coils and 16 configurable modules. The unit shall further 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
Degree of protection to EN 60529	IP65
Ambient temperature [°C]	-5 ... +50
Materials Cover PA	
Housing Die-cast aluminium	

The interlinking module shall be supplied with a silencer

#### 18.18.7 Valve electronic module

The electronic valve module houses the valve cartridge 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

#### 18.19. 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.

#### 19. LABOUR

Where key staff are not employment of tendering entity a memorandum of undertaking (MOU) is to be provided.

##### 19.1. HMI PROGRAMMING

The requirement for HMI programming 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.

##### 19.2. HMI ONSITE TRAINING

Onsite training will be done by an OEM accredited service provider or OEM for the HMI on offer.

##### 19.3. PLC PROGRAMMING

The requirement for PLC programming 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.

**19.4. PLC ONSITE TRAINING**

Onsite training will be done by an OEM accredited service provider or OEM for the PLC on offer.

**19.5. INSTRUMENTATION INSTALLATION AND SETUP**

The requirement for Instrumentation programming will be a minimum of a technician with a N6 course qualification or national diploma in Electrical/Electronic/Instrumentation Engineering. 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 and 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.

**19.6. INSTRUMENTATION ONSITE TRAINING**

Onsite training will be done by an OEM accredited service provider or OEM for the Instrument on offer.

**19.9. SCADA SETUP AND IMPLEMENTATION**

The requirement for SCADA installation 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.

**19.10. SCADA ONSITE TRAINING**

Onsite training will be done by an OEM accredited service provider or the OEM for the SCADA on offer.

**19.11. TELEMETRY INSTALLATION AND SETUP**

The requirement for 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 telemetry. The programmer must have a laptop with the latest licenced software for the product on offer where applicable.

**19.12. TELEMETRY ONSITE TRAINING**

Onsite training will be done by an OEM accredited service provider or OEM for the Telemetry on offer.

**19.13. TRAVELING**

Traveling shall be quoted separately as a kilometre rate based on AA rates.

**20. TRADE NAMES OR PROPRIETARY PRODUCTS**

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".



## 21. 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's agent upon request.

## 22. FORMS FOR CONTRACT ADMINISTRATION

The supplier shall complete, sign and submit with each invoice, the following:

- a) Monthly Project Labour Report ( **Annex 3**).
- b) B-BBEE Sub-Contract Expenditure Report ( **Annex 4**).
- c) Joint Venture Expenditure Report ( **Annex 5**).

The Monthly Project Labour Report must include details of all labour (including that of sub-contractors) that are South African citizens earning less than R350.00 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.

The Monthly Project Labour Reports shall be completed and submitted in accordance with the instructions therein.

The **B-BBEE Sub-Contract Expenditure Report** is required for monitoring the supplier's compliance with the sub-contracting conditions of the **Preference Schedule**.

The Joint Venture Expenditure Report is required for monitoring the joint venture's/consortium/partnership compliance with the percentage contributions of the partners as tendered, where the joint venture/consortium/partnership has been awarded preference points in respect of its consolidated B-BBEE scorecard.

**(14.1) MONTHLY PROJECT LABOUR REPORT (EXAMPLE)**

## ANNEX 1

CITY OF CAPE TOWN  
MONTHLY PROJECT LABOUR REPORT

## 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 certified 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

## BENEFICIARY DETAILS AND WORK INFORMATION

CITY OF CAPE TOWN  
ISIXEKO SASEKAPA  
STAD KAAPSTAD

CONTRACT OR WORKS PROJECT NUMBER:				Year    Month		Sheet 1    of		
--------------------------------------	--	--	--	---------------	--	------------------	--	--

No.	(8) First name	(8) Surname	(8) ID number	(9) New Beneficiary (Y/N)	Gender (M/F)	Disabled (Y/N)	(10) Job seeker database (Y/N)	Contract start date (DDMMYY)	Contract end date (DDMMYY)	(12) No. days worked this month (excl. training)	(13) Training days	(14) 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			

**(14.2) BBBEE SUB-CONTRACT EXPENDITURE REPORT (PRO FORMA)**

TENDER NO. AND DESCRIPTION: .....

SUPPLIER: .....

**B-BBEE SUB-CONTRACT EXPENDITURE REPORT**

Rand Value of the contract (as defined in Schedule 4: Preference Schedule) ( <b>P*</b> )	R	B-BBEE Status Level of Prime Supplier	
--	---	---------------------------------------	--

Name of Sub-contractor (list all)	B-BBEE Status Level of supplier <sup>1</sup>	Total value of Sub-contract (excl. VAT) <sup>1</sup>	Value of Sub-contract work to date (excl. VAT) <sup>1</sup>	Value of Sub-contract work to Sub-contractors with a lower B-BBEE Status Level than supplier
Sub-contractor A		R	R	R
Sub-contractor B		R	R	R
Sub-contractor C		R	R	R
<sup>1</sup> Documentary evidence to be provided				Total: R
Expressed as a percentage of <b>P*</b>				%

**Signatures**

Declared by supplier to be true and correct: .....

Date: .....

Verified by CCT Project Manager: .....

Date: .....

**(14.3) PARTNERSHIP/ JOINT VENTURE (JV) / CONSORTIUM/ EXPENDITURE REPORT (PRO FORMA)**

TENDER NO. AND DESCRIPTION: .....

SUPPLIER: .....

**PARTNERSHIP/ JOINT VENTURE (JV)/ CONSORTIUM EXPENDITURE REPORT**

Rand value of the contract (as defined in Schedule 4: Preference Schedule) (P*)		R		B-BBEE Status Level of Partnership/ Joint Venture (JV)/ Consortium	
Name of partners to the Partnership/ JV / Consortium (list all)	B-BBEE Status Level of each partner at contract award	Percentage contribution of each partner as per the Partnership/ JV/ Consortium Agreement <sup>1</sup>	Total value of partner's contribution (excl. VAT) <sup>1</sup> B = A% x P*	Value of partner's contribution to date (excl. VAT) <sup>1</sup> C	Value of partner's contribution as a percentage of the work executed to date D = C/P*x100
		A			
Partner A		%	R	R	%
Partner B		%	R	R	%
Partner C		%	R	R	%

<sup>1</sup>Documentary evidence to be provided**Signatures**Declared by supplier  
to be true and correct: .....

Date: .....

Verified by CCT  
Project Manager: .....

Date: .....

## APPENDIX A

