

WS 15 2024/25

Tender for the appointment of a contractor for the replacement and completion of the electrical and mechanical components of Temba Wastewater Treatment Works and upgrading of Babelegi Wastewater Treatment Plant for construction duration of 24 months from the commencement date

Works and upgrading of Babelegi Wastewater Treatment Plant for construction duration of 24 months from the commencement date

Volume 1: General Clauses, Tender Procedures, Contract Data, Pricing Data, Schedule of Quantities and Scope of Works

Portion T1: Tender

Part T2: Returnable Documents

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***CITY OF TSHWANE***  
***WATER AND SANITATION DEPARTMENT***

**CONTRACT NO: WS15 2024/25**

**TENDER FOR THE APPOINTMENT OF A CONTRACTOR FOR THE  
REPLACEMENT AND COMPLETION OF THE ELECTRICAL AND MECHANICAL  
COMPONENTS OF TEMBA WASTE WATER TREATMENT WORKS AND  
UPGRADING OF BABELEGI WASTE WATER TREATMENT PLANT FOR  
CONSTRUCTION DURATION OF 24 MONTHS FROM THE COMMENCEMENT  
DATE**

**T2.3. TECHNICAL SCHEDULES**

## PART T2.3: TECHNICAL SCHEDULES

The proper completion of the technical schedules under this section is critical.

Once the Contract has been awarded to the successful bidder, equipment shall be supplied as recorded in the technical schedules and the Contractor's Proposal, unless written acceptance of any variances thereto is issued by the Engineer.

Tenderers shall note that equipment in accordance with the relevant Specifications and with a proven track record with local operational installations shall be proposed as required. Failure to adhere to this requirement implies that the equipment offered does not meet tender prescriptions and may lead to disqualification of the bid.

### **SCHEDULES:**

#### T2.3.1 TECHNICAL SCHEDULES – ELETRICAL & ELECTRONIC WORK

### **T2.3.1 TECHNICAL SCHEDULES (ELECTRCAL WORKS)**

| Section | Description                                                                                | Page |
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**1. RING MAIN UNITS**

| No      | Item description                                                                                           | Units               | Specified                                      | Offered |
|---------|------------------------------------------------------------------------------------------------------------|---------------------|------------------------------------------------|---------|
| 2.      | RING MAIN UNITS                                                                                            |                     |                                                |         |
| 2.1     | General Information                                                                                        | xxxxxxxxxxx         |                                                |         |
| 2.1.1   | Country of origin                                                                                          | xxxxxxxxxxx         |                                                |         |
| 2.1.2   | Manufacturer                                                                                               | xxxxxxxxxxx         |                                                |         |
| 2.1.3   | Compliance Standard (latest edition)                                                                       | xxxxxxxxxxx         | IEC 62271-200                                  |         |
| 2.1.4   | Manufacturers type designation                                                                             | xxxxxxxxxxx         | CVV                                            |         |
| 2.1.5   | Internal arc test requirements                                                                             | xxxxxxxxxxx         | YES                                            |         |
| 2.1.5.1 | Current Rating (Ip)                                                                                        | kA                  | 52.5                                           |         |
| 2.1.5.2 | Voltage Rating (Ur)                                                                                        | kV                  | 12                                             |         |
| 2.1.5.3 | Duration                                                                                                   | sec                 | 3                                              |         |
| 2.1.5.4 | Accessibility                                                                                              | Type A              |                                                |         |
| 2.1.5.5 | Arc Classification                                                                                         | IAC AFL             | 20kA, 0.5s                                     |         |
| 2.2     | Dimensions & Information                                                                                   |                     |                                                |         |
| 2.2.1   | Dimensions (Maximum)                                                                                       | mm                  | (765 mm (D))<br>(1021 mm (W))<br>(1336 mm (H)) |         |
| 2.2.2   | Weight                                                                                                     | kg                  |                                                |         |
| 2.3     | Tests Results                                                                                              | xxxxxxxxxxx         | YES                                            |         |
| 2.3.1   | Is an indoor or outdoor unit required?                                                                     | Outdoor /<br>Indoor | Indoor                                         |         |
| 2.3.2   | Extensible or non-extensible unit                                                                          | xxxxxxxxxxx         | Non-extensible                                 |         |
| 2.3.3   | Is an extensible or non- extensible unit offered?                                                          | xxxxxxxxxxx         |                                                |         |
| 2.3.4   | Degree of protection of unit offered?<br>11kV live parts SF6 tank<br>Front cover mechanism<br>Cable covers | xxxxxxxxxxx         | IP67<br>IP2X<br>IP 3X                          |         |
| 2.3.5   | Cable test facility requirements.                                                                          | xxxxxxxxxxx         | Integral cable test facilities                 |         |
| 2.3.7   | Type of cable test facility offered?                                                                       | xxxxxxxxxxx         |                                                |         |
| 2.3.8   | Rated normal current (Ir)                                                                                  | A                   | 630                                            |         |
| 2.3.9   | The insulating and/or interrupting medium of switch disconnectors                                          | xxxxxxxxxxx         | SF6                                            |         |
| 2.3.10  | The insulating and/or interrupting medium of switch disconnectors offered?                                 | xxxxxxxxxxx         |                                                |         |
| 2.3.11  | Circuit Breakers status indication.                                                                        | xxxxxxxxxxx         | Direct on moving contact                       |         |
| 2.3.12  | Interruption medium of circuit breakers                                                                    | xxxxxxxxxxx         | Vacuum                                         |         |

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Portion 1: Tender

Section T2.3: Technical Schedules – Electrical and Electronic Work

| No     | Item description                                                                                                          | Units       | Specified              | Offered |
|--------|---------------------------------------------------------------------------------------------------------------------------|-------------|------------------------|---------|
| 2.3.13 | Method of providing reliable indication of the main circuit breaker contact position in the case of non-visible contacts? | xxxxxxxxxxx |                        |         |
| 2.3.14 | Does the circuit breaker panel include in-line off-load disconnectors?                                                    | xxxxxxxxxxx | YES                    |         |
| 2.3.15 | Is the circuit breaker (for the tee-off) connected in series with a three-position disconnector-earthing switch?          | xxxxxxxxxxx | YES                    |         |
| 2.3.16 | Is the operation between the circuit breaker and disconnector-earthing switch interlocked?                                | xxxxxxxxxxx | YES                    |         |
| 2.3.17 | Rated normal current of the circuit breaker                                                                               | A           | 630                    |         |
| 2.3.18 | Type of protection tripping of circuit breaker required                                                                   | xxxxxxxxxxx | Battery powered relays |         |
|        |                                                                                                                           |             |                        |         |

**2. MOTOR CONTROL CENTRES AND FLOOR STANDING DISTRIBUTION BOARDS**

| No | Item description                                            | Units      | Specified                                                                    | Offered |
|----|-------------------------------------------------------------|------------|------------------------------------------------------------------------------|---------|
|    | <b>General</b>                                              |            |                                                                              |         |
|    | Manufacturer                                                |            |                                                                              |         |
|    | Type                                                        |            |                                                                              |         |
|    | Supplier                                                    |            |                                                                              |         |
|    | Panel Material                                              |            | 3CR12                                                                        |         |
|    | Access                                                      | Back/Front | Front                                                                        |         |
|    | Gland Plate                                                 |            | 3CR12 Unpainted                                                              |         |
|    | Form of Separation                                          |            | Form 3B                                                                      |         |
|    | Type test certificate to IEC/ SANS 61439 – Copy Attached    | Yes/No     | Yes                                                                          |         |
|    | Measuring instrumentation compliant to IEC 60051            | Yes/No     | Yes                                                                          |         |
|    | Minimum thickness of assembly material of construction (mm) |            | 2 mm                                                                         |         |
|    | Exterior paint colour                                       | All        | "LIGHT ORANGE"<br>B26 of SANS 1091                                           |         |
|    | Exterior paint colour for standby power section             | All        | "SIGNAL RED",<br>SANS 1091                                                   |         |
|    | Exterior paint colour for UPS sections                      | All        | "DARK VIOLET",<br>colour F06                                                 |         |
|    | Interior paint colour                                       |            | "LIGHT ORANGE"<br>B26 of SANS 1091,<br>with white equipment<br>chassis plate |         |
|    | <b>Electrical System</b>                                    |            |                                                                              |         |
|    | Earthing system                                             |            | TNS                                                                          |         |
|    | Rated voltage $U_n$ (Volts)                                 |            | 400/230 $\pm$ 10%<br>3/N/PE                                                  |         |
|    | Control voltage (Volts)                                     |            | 230 VAC $\pm$ 10%<br>1/N/PE                                                  |         |
|    | Rated frequency $f_n$ (Hz)                                  |            | 50 Hz $\pm$ 2%                                                               |         |
|    | Fault Level Rating                                          |            |                                                                              |         |
|    | MCCs (Main Works)                                           | kA         | 25                                                                           |         |
|    | MCC1 (Inlet Works)                                          | kA         | 25                                                                           |         |
|    | MCC2 (Inlet Works)                                          | kA         | 25                                                                           |         |
|    | <b>Electrical Equipment</b>                                 |            |                                                                              |         |
|    | <u>Busbar</u>                                               |            |                                                                              |         |
|    | Material                                                    |            | Copper                                                                       |         |

|  |                                                                  |                   |                            |  |
|--|------------------------------------------------------------------|-------------------|----------------------------|--|
|  | Current Density                                                  | A/mm <sup>2</sup> | 1.3                        |  |
|  | Dimensions                                                       | mm                |                            |  |
|  | .... Auxiliary Busbar                                            |                   | One set (Live and Neutral) |  |
|  | <u>Air Circuit Break</u>                                         |                   |                            |  |
|  | Manufacturer                                                     |                   |                            |  |
|  | Type                                                             |                   |                            |  |
|  | Compliant to IEC/ SANS 60947-2                                   |                   | Yes                        |  |
|  | ..... Type test certificate                                      |                   | Attached                   |  |
|  | Withdrawable                                                     | Yes/No            | Yes                        |  |
|  | Auxiliary Contacts for remote monitoring                         | Yes/No            | Yes                        |  |
|  | <u>Moulded case circuit breakers</u>                             |                   |                            |  |
|  | Manufacturer                                                     |                   |                            |  |
|  | Model                                                            |                   |                            |  |
|  | Compliant to IEC/ SANS 60947-2                                   |                   | Yes                        |  |
|  | Quick break under overload or short circuit conditions           |                   | Yes                        |  |
|  | Temperature rise under full load conditions as per specification |                   | Yes                        |  |
|  | <u>Combination fuse switches</u>                                 |                   |                            |  |
|  | Manufacturer                                                     |                   |                            |  |
|  | Model                                                            |                   |                            |  |
|  | Compliant to IEC/ SANS 60947-2                                   |                   | Yes                        |  |
|  | Independent manual operation                                     |                   | Yes                        |  |
|  | IP Rating as per IEC/ SANS 60529                                 |                   | IP21                       |  |
|  | <u>Switch operators</u>                                          |                   |                            |  |
|  | Manufacturer                                                     |                   |                            |  |
|  | Model                                                            |                   |                            |  |
|  | Pad lockable to "off" position                                   |                   | Yes                        |  |
|  | <u>HRC fuse links</u>                                            |                   |                            |  |
|  | Manufacturer                                                     |                   |                            |  |
|  | Model                                                            |                   |                            |  |
|  | Compliant to IEC/ SANS 60269                                     |                   | Yes                        |  |
|  | <u>Contactors</u>                                                |                   |                            |  |
|  | Manufacturer                                                     |                   |                            |  |
|  | Model                                                            |                   |                            |  |
|  | Compliant to IEC/ SANS 60947-4                                   |                   | Yes                        |  |
|  | <u>Auxiliary relays</u>                                          |                   |                            |  |
|  | Manufacturer                                                     |                   |                            |  |

|  |                                                   |  |                   |  |
|--|---------------------------------------------------|--|-------------------|--|
|  | Model                                             |  |                   |  |
|  | Field convertible contact configuration           |  | Yes               |  |
|  | Compliant to IEC/ SANS 60947-5-1                  |  | Yes               |  |
|  | <u>Current transformers</u>                       |  |                   |  |
|  | Manufacturer                                      |  |                   |  |
|  | Model                                             |  |                   |  |
|  | Compliant to IEC/ SANS 60044-1                    |  | Yes               |  |
|  | Test blocks for Ammeter CTs                       |  | Yes               |  |
|  | <u>Voltage transformers</u>                       |  |                   |  |
|  | Manufacturer                                      |  |                   |  |
|  | Model                                             |  |                   |  |
|  | Compliant to IEC/ SANS 60044-2                    |  | Yes               |  |
|  | <u>Pushbuttons and selector switches</u>          |  |                   |  |
|  | Manufacturer                                      |  |                   |  |
|  | Model                                             |  |                   |  |
|  | Contact Rating                                    |  | 10 A, 230 VAC     |  |
|  | <u>Indicator lamps</u>                            |  |                   |  |
|  | Manufacturer                                      |  |                   |  |
|  | Model                                             |  |                   |  |
|  | Type                                              |  | LED               |  |
|  | Voltage Rating                                    |  | 230 VAC $\pm$ 10% |  |
|  | <u>Control circuit and auxiliary transformer</u>  |  |                   |  |
|  | Manufacturer                                      |  |                   |  |
|  | Model                                             |  |                   |  |
|  | Type                                              |  |                   |  |
|  | <u>Surge Protection Devices (Power Circuit)</u>   |  |                   |  |
|  | Manufacturer                                      |  |                   |  |
|  | Model                                             |  |                   |  |
|  | Type                                              |  | 1+2               |  |
|  | Compliant to IEC/ SANS 61643                      |  |                   |  |
|  | <u>Surge Protection Devices (Control Circuit)</u> |  |                   |  |
|  | Manufacturer                                      |  |                   |  |
|  | Model                                             |  |                   |  |
|  | Type                                              |  | 2                 |  |
|  | Compliant to IEC/ SANS 61643                      |  | Yes               |  |
|  | <u>Surge Protection Devices (Instrumentation)</u> |  |                   |  |
|  | Manufacturer                                      |  |                   |  |

|  |                                           |        |             |  |
|--|-------------------------------------------|--------|-------------|--|
|  | Model                                     |        |             |  |
|  | Compliant to IEC/ SANS 61643              |        | Yes         |  |
|  | <b>Power Factor Correction Panel</b>      |        |             |  |
|  | Manufacturer                              |        |             |  |
|  | Rating                                    |        |             |  |
|  | Number of steps                           |        |             |  |
|  | Type of capacitors                        |        |             |  |
|  | Power factor meter                        |        |             |  |
|  | Type pf monitor relay                     |        |             |  |
|  | Maximum capacitor voltage                 |        |             |  |
|  | Capacitor Protection                      |        |             |  |
|  | <b>Variable Speed Drive</b>               |        |             |  |
|  | Manufacturer                              |        |             |  |
|  | Model                                     |        |             |  |
|  | Rated supply Voltage                      | Volt   | 380....480V |  |
|  | Output frequency                          | Hz     | Up to 500Hz |  |
|  | Prospective line Isc                      | kA     | 50          |  |
|  | Integrated safety function                | Yes/No | Yes         |  |
|  | Modular Design                            | Yes/No | Yes         |  |
|  | Number of Analog inputs                   | No.    | 3           |  |
|  | Number of Analog outputs                  | No.    | 2           |  |
|  | Number of Digital Inputs                  | No.    | 6           |  |
|  | Number of Relay outputs                   | No.    | 3           |  |
|  | Communication module                      |        | Ethernet    |  |
|  | Data sheets must be provided with tender  | Yes/No | Yes         |  |
|  | <b>Direct On Line: All in one Starter</b> |        |             |  |
|  | Manufacturer                              |        |             |  |
|  | Model                                     |        |             |  |
|  | Short-Circuit protection at 400V          | kA     | 50          |  |
|  | Control Voltage                           | Volt   | 230         |  |
|  | Communication Module                      |        | Modbus      |  |
|  | Data sheets must be provided with tender  | Yes/No | Yes         |  |

### 3. FLUSH / SURFACE MOUNTED DISTRIBUTION BOARDS

| No | Item description | Units | Specified | Offered |
|----|------------------|-------|-----------|---------|
|    | Manufacturer     |       |           |         |

|  |                |       |                 |  |
|--|----------------|-------|-----------------|--|
|  | Type           |       |                 |  |
|  | Supplier       |       |                 |  |
|  | Panel Material |       | 3CR12           |  |
|  | Access         | Front | Front           |  |
|  | Gland Plate    |       | 3CR12 Unpainted |  |

#### 4. PROGRAMMABLE LOGIC CONTROLLERS

| No | Item description                                                  | Units    | Specified                                               | Offered |
|----|-------------------------------------------------------------------|----------|---------------------------------------------------------|---------|
|    | Manufacturer                                                      |          |                                                         |         |
|    | Model                                                             |          |                                                         |         |
|    | Central Processing Unit                                           |          |                                                         |         |
|    | Embedded communication service                                    |          | Ethernet TCP/IP                                         |         |
|    | Memory description internal RAM                                   | kB       | 4096                                                    |         |
|    | Memory description internal RAM for data                          | kB       | 256                                                     |         |
|    | Memory description internal RAM for program constants and symbols | kB       | 3584                                                    |         |
|    | Standards                                                         |          | EN 61000-6-2, EN 61000-6-4, EN 61131-2 & EN 61010-2-201 |         |
|    | Programming Language                                              |          | IEC 61131                                               |         |
|    | Spare I/O                                                         | %        | 25%                                                     |         |
|    | Data sheets must be provided with tender                          | Yes / No | Yes                                                     |         |
|    |                                                                   |          |                                                         |         |
|    | <u>Power Supply Unit</u>                                          |          |                                                         |         |
|    | Model                                                             |          |                                                         |         |
|    | Type                                                              |          |                                                         |         |
|    | Rated output current                                              | Amp      |                                                         |         |
|    | Rated output power                                                | W        |                                                         |         |
|    | Rated output voltage                                              | V        |                                                         |         |
|    | Rated input power [full load]                                     | W        |                                                         |         |
|    | Efficiency Factor                                                 | %        |                                                         |         |
|    | Mains voltage variation                                           | %        |                                                         |         |
|    | Primary peak current                                              | A        |                                                         |         |
|    | Heat dissipation                                                  | W        |                                                         |         |

|  | Protective Rating                        |                       | IP20 according to EN60529, IEC 529 |  |
|--|------------------------------------------|-----------------------|------------------------------------|--|
|  | Data sheets must be provided with tender | Yes / No              | Yes                                |  |
|  |                                          |                       |                                    |  |
|  | <u>Digital Input Modules</u>             |                       |                                    |  |
|  | Model                                    |                       |                                    |  |
|  | Type                                     |                       | Current Sink                       |  |
|  | Isolation                                | Yes/No                | Yes                                |  |
|  | Input Voltage                            | VDC                   | 24                                 |  |
|  | Data sheets must be provided with tender | Yes / No              | Yes                                |  |
|  | <u>Digital Output Modules</u>            |                       |                                    |  |
|  | Model                                    |                       |                                    |  |
|  | Type                                     |                       | Solid State                        |  |
|  | Output Logic                             | Positive/<br>Negative | Positive                           |  |
|  | Output Voltage                           | VDC                   | 24                                 |  |
|  | Data sheets must be provided with tender | Yes / No              | Yes                                |  |
|  | <u>Analogue Input Modules</u>            |                       |                                    |  |
|  | Model                                    |                       |                                    |  |
|  | Type                                     | Current               | 4...20 mA                          |  |
|  | Isolation between channels               | Yes/No                | Yes                                |  |
|  | Data sheets must be provided with tender | Yes / No              | Yes                                |  |
|  | <u>Analogue Output Modules</u>           |                       |                                    |  |
|  | Model                                    |                       |                                    |  |
|  | Type                                     | Current               | 4...20 mA                          |  |
|  | Isolation between channels               | Yes/No                | Yes                                |  |
|  | Data sheets must be provided with tender | Yes / No              | Yes                                |  |
|  | <u>Ethernet Module</u>                   |                       |                                    |  |
|  | Model                                    |                       |                                    |  |
|  | Type                                     |                       |                                    |  |
|  | Port Ethernet                            |                       | 10BASE-T/100BASE-TX                |  |
|  | Integrated connection type               |                       | Ethernet RJ45<br>10/100 Mbit/s 4   |  |

|  |                                          |                          |                                                 |  |
|--|------------------------------------------|--------------------------|-------------------------------------------------|--|
|  |                                          |                          | twisted pairs<br>transparent ready<br>class B30 |  |
|  | Data sheets must be provided with tender | Yes / No                 | Yes                                             |  |
|  | <u>Managed Switch</u>                    |                          |                                                 |  |
|  | Manufacturer                             |                          |                                                 |  |
|  | Model                                    |                          |                                                 |  |
|  | Security features based on IEC 62443     | Yes / No                 | Yes                                             |  |
|  | Ports                                    | No                       |                                                 |  |
|  | Speed                                    | Mbit                     | 100/1000                                        |  |
|  | Protocols Supported                      |                          | EtherNet/IP,<br>PROFINET,<br>Modbus TCP         |  |
|  | Power Supply                             | VDC                      | 24VDC                                           |  |
|  | Warranty                                 | Years                    | 5                                               |  |
|  | Data sheets must be provided with tender | Yes / No                 | Yes                                             |  |
|  |                                          |                          |                                                 |  |
|  | Human Machine Interface                  |                          |                                                 |  |
|  | Manufacturer                             |                          |                                                 |  |
|  | Supplier                                 |                          |                                                 |  |
|  | Rated input voltage                      |                          |                                                 |  |
|  | Screen type                              |                          | Colour TFT                                      |  |
|  | Display size                             |                          | 15 inches                                       |  |
|  | Resolution                               | Pixels                   | 1280x1024                                       |  |
|  | Type of touch screen                     | Capacitive/<br>Resistive | Capacitive                                      |  |
|  | Integrated connection type               |                          | Ethernet RJ45                                   |  |
|  | Protocol                                 |                          | Modbus, TCP/IP,<br>Ethernet                     |  |
|  | SD Card Slot                             | Yes / No                 | Yes                                             |  |
|  | Position of Installation                 |                          | Flush Fronted                                   |  |
|  | Operating System                         |                          |                                                 |  |
|  | Data sheets must be provided with tender | Yes / No                 | Yes                                             |  |

## 5. UNINTERRUPTABLE POWER SUPPLIES

| No | Item description                         | Units    | Specified     | Offered |
|----|------------------------------------------|----------|---------------|---------|
|    | Manufacturer                             |          |               |         |
|    | Model                                    |          |               |         |
|    | Supplier                                 |          |               |         |
|    | Rated Power                              | VA       | 2000          |         |
|    | Input voltage                            | Volt     | 230           |         |
|    | Output voltage                           | Volt     | 230           |         |
|    | Standby time on full load                | Minutes  | 15            |         |
|    | Rack mount                               | Yes/No   | Yes           |         |
|    | Communication                            |          | Modbus TCP/IP |         |
|    | Data sheets must be provided with tender | Yes / No | Yes           |         |

## 6. INSTRUMENTATION

| No                                 | Item description                         | Units    | Specified | Offered |
|------------------------------------|------------------------------------------|----------|-----------|---------|
| Ultrasonic Open channel Flow meter |                                          |          |           |         |
|                                    | Manufacturer                             |          |           |         |
|                                    | Model                                    |          |           |         |
|                                    | Data sheets must be provided with tender | Yes / No | Yes       |         |
|                                    |                                          |          |           |         |
| Electromagnetic Flow meter         |                                          |          |           |         |
|                                    | Manufacturer                             |          |           |         |
|                                    | Model                                    |          |           |         |
|                                    | Data sheets must be provided with tender | Yes / No | Yes       |         |
|                                    |                                          |          |           |         |
| pH meter                           |                                          |          |           |         |
|                                    | Manufacturer                             |          |           |         |
|                                    | Model                                    |          |           |         |
|                                    | Data sheets must be provided with tender | Yes / No | Yes       |         |
|                                    |                                          |          |           |         |
| Dissolved Oxygen Meters            |                                          |          |           |         |
|                                    | Manufacturer                             |          |           |         |
|                                    | Model                                    |          |           |         |

|                           |                                          |          |     |  |
|---------------------------|------------------------------------------|----------|-----|--|
|                           | Type                                     |          |     |  |
|                           | Data sheets must be provided with tender | Yes / No | Yes |  |
|                           |                                          |          |     |  |
| Area Velocity Flow Meters |                                          | 6        |     |  |
|                           | Manufacturer                             |          |     |  |
|                           | Model                                    |          |     |  |
|                           | Type                                     |          |     |  |
|                           | Data sheets must be provided with tender | Yes / No | Yes |  |
|                           |                                          |          |     |  |

## 7. MEDIUM VOLTAGE CABLES

| No | Item description        | Units | Specified                                                                                                                                                                   | Offered |
|----|-------------------------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
|    | Manufacturer            |       |                                                                                                                                                                             |         |
|    | Supplier                |       |                                                                                                                                                                             |         |
|    | Installation contractor |       |                                                                                                                                                                             |         |
|    | Paper insulated Cables  | PILC  | 11kV - Table 18<br>[11kV / 11kV] or<br>22kV Table 20<br>[12.7kV / 22kV]                                                                                                     |         |
|    | XLPE                    | XLPE  | XLPE insulated,<br>copper tape<br>screened, PVC<br>bedded, galvanised<br>steel wire armoured,<br>and PVC sheathed<br>11kV - [6.35kV /<br>11kV] or 22kV -<br>[12.7kV / 22kV] |         |

## 8. MULTI CORE CABLES & INSTRUMENTATION CABLE

| No | Item description        | Units | Specified                                             | Offered |
|----|-------------------------|-------|-------------------------------------------------------|---------|
|    | Manufacturer            |       |                                                       |         |
|    | Supplier                |       |                                                       |         |
|    | Installation contractor |       |                                                       |         |
|    | Instrument cables       | Make  | Plain annealed class<br>4 bunched copper<br>Crosslink |         |

|  |                       |      |                                                                                                                                                                                                                                                                                                                                                       |  |
|--|-----------------------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  |                       |      | polyethylene -<br>Temperature rating<br>105°C White Cores,<br>Black numbered.<br><br>Aluminium Mylar<br>Screen Over<br>Individual Pairs,<br>Tinned Copper<br>Drain Wire, Overall<br>Aluminium Mylar<br>Screen, PVC LH<br>Bedding, Steel Wire<br>Armour, and PVC<br>LH Sheath.                                                                         |  |
|  | CAT 6 Cables [4 Pair] | Make | 4pr twisted PVC,<br>Non-Woven Tape +<br>alu Foil (Industrial<br>CAT6)                                                                                                                                                                                                                                                                                 |  |
|  | Profibus PVC          | Make | Flame retardant and<br>self-extinguishing.<br>Largely resistant to<br>grease, coolant<br>fluids and lubricants,<br>resistant to oil.                                                                                                                                                                                                                  |  |
|  | Fibre Cables          | Make | In Sleeves / Aerial-<br>High quality optical<br>fibres suitable for<br>operation at 850nm<br>& 1300nm. The<br>fibres conform to<br>international<br>standard ITU-T<br>G651.<br><br>Not in Sleeves /<br>Ground - Made with<br>high quality optical<br>fibres suitable for<br>operation at 850nm<br>& 1300nm. The<br>fibres conform to<br>international |  |

|  |                        |      |                                                                                                                                                                                                       |  |
|--|------------------------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  |                        |      | standard ITU-T G651 armoured.                                                                                                                                                                         |  |
|  | Submersible Pump Cable | Make | High conductivity bunch plain flexible copper conductors to SANS 1411-1. Cores insulated and bedded with Flexible PVC Grade. Final protection is given by a flexible PVC outer sheath to SANS 1411-2. |  |

## 9. LOW VOLTAGE CABLES

| No | Item description        | Units | Specified                                                                                                                                                                                         | Offered |
|----|-------------------------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
|    | Manufacturer            |       |                                                                                                                                                                                                   |         |
|    | Supplier                |       |                                                                                                                                                                                                   |         |
|    | Installation contractor |       |                                                                                                                                                                                                   |         |
|    | 600/1000V Armoured      | Make  | SANS 1507/3 - Plain copper conductors to SANS 1411 Part 1, Class 5. Three or four cores insulated with XLPE PVC bedded, steel wire armoured and sheathed with general purpose fire retardant PVC. |         |
|    | 300/500V Surfex         | Make  | SANS 1507-2 - Copper conductors to SANS 1411-1, PVC insulated to SANS 1411-2, laid up with a bare copper earth conductor between them, UV stable PVC sheathed to SANS 1411-2.                     |         |

|  |                                                 |  |                                                                                                                                                                                                                                 |  |
|--|-------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  | 300/500V Surfex with aluminium / vinyl laminate |  | SANS 1507-2 -<br>Copper conductors to SANS 1411-1, PVC insulated to SANS 1411-2, laid up with a bare tinned copper earth wire in contact with a longitudinal aluminium / vinyl laminate, UV stable PVC sheathed to SANS 1411-2. |  |
|  | 600/1000V Single Core Wiring                    |  | SANS 1574-3 - High conductivity bunched plain flexible copper conductors to SANS 1411-1. Insulated with general purpose flexible grade PVC in all colours to SANS 1411-2.                                                       |  |

## 10. SCHEDULE OF PRICES FOR VARIATIONS TO THE ELECTRICAL AND ELECTRONIC ENGINEERING WORKS

This schedule must be completed by all Tenderers and only provides for amounts to be added to or deducted from the contract amount depending on whether the relevant item is to be supplied and installed as an extra to or has to be omitted from the contract.

All items provided for in this schedule shall comply in all respects with the requirements laid down in the specification and all unit prices shall provide for the complete supply and installation including all the necessary material, accessories, labour and transport but excluding VAT.

### CONDUIT (GALVANISED)

Supply and installation of welded, galvanised, screwed conduit per meter length, including waste, couplings and sets.

| Conduit Size | Cast in concrete (R/m) | Fixed on surface (R/m) | Built into brick (R/m) | Chased into concrete (R/m) |
|--------------|------------------------|------------------------|------------------------|----------------------------|
| 20 mm        |                        |                        |                        |                            |

| Conduit Size | Cast in concrete (R/m) | Fixed on surface (R/m) | Built into brick (R/m) | Chased into concrete (R/m) |
|--------------|------------------------|------------------------|------------------------|----------------------------|
| 25 mm        |                        |                        |                        |                            |
| 40 mm        |                        |                        |                        |                            |
| 50 mm        |                        |                        |                        |                            |

**PAIR OF ENDS (CONDUIT)**

Terminate one pair of ends, including 2 locknuts and bush at one end and one box, either round or 100 x 100 mm or 100 x 50 mm and locknuts and bush at the other end:

| Description                      | Completely installed (R each) |
|----------------------------------|-------------------------------|
| 20 mm (Including box)            |                               |
| 25 mm (Including box)            |                               |
| 32 mm (Bushes and locknuts only) |                               |
| 40 mm (Bushes and locknuts only) |                               |
| 50 mm (Bushes and locknuts only) |                               |

**LIGHT FITTINGS**

Supply and installation of the following light fittings complete with lamps:

| Description         | Completely installed (R each) |
|---------------------|-------------------------------|
| Type A as specified |                               |
| Type B as specified |                               |
| Type C as specified |                               |
| Type D as specified |                               |
| Type E as specified |                               |
| Type F as specified |                               |
| Type G as specified |                               |
| Type H as specified |                               |

| Description         | Completely installed (R each) |
|---------------------|-------------------------------|
| Type I as specified |                               |
| Type J as specified |                               |
| Type K as specified |                               |
| Type L as specified |                               |
| Type M as specified |                               |
| Type N as specified |                               |
| Type O as specified |                               |

**WIRING**

PVC Insulated and bare copper conductors in conduit:

Supply and installation of one meter of PVC insulated or bare copper conductor including for wastage.

(Measured from point to point).

| Earth wire conductor Size (mm <sup>2</sup> ) | PVC Insulated conductor (R/m) | Bare copper (R/m) |
|----------------------------------------------|-------------------------------|-------------------|
| 1,5                                          |                               |                   |
| 2,5                                          |                               |                   |
| 4                                            |                               |                   |
| 6                                            |                               |                   |
| 10                                           |                               |                   |
| 16                                           |                               |                   |
| 25                                           |                               |                   |
| 50                                           |                               |                   |
| 70                                           |                               |                   |

**PVC SWA PVC CABLES**

Supply and installation of multicore PVC SWA PVC or 11 kV cable as specified per meter length, including wastage. Measurements must include tails. Also unit price for making off of cable ends complete with glands, lugs and connecting up of cores.

| Cable Size (mm <sup>2</sup> ) | No of cores | Laid in ducts (R/m) | Laid in ground (R/m) | Cable fixed on trays (R/m) | Cable ends each (R/m) | Cable joints complete (R/m) |
|-------------------------------|-------------|---------------------|----------------------|----------------------------|-----------------------|-----------------------------|
| 2,5                           | 3           |                     |                      |                            |                       |                             |
| 2,5                           | 4           |                     |                      |                            |                       |                             |
| 4                             | 4           |                     |                      |                            |                       |                             |
| 1,0                           | 2pr         |                     |                      |                            |                       |                             |
| 1,0                           | 4pr         |                     |                      |                            |                       |                             |
| 1,0                           | 8pr         |                     |                      |                            |                       |                             |
| 1,0                           | 18pr        |                     |                      |                            |                       |                             |
| 1,0                           | 24pr        |                     |                      |                            |                       |                             |
| 6                             | 4           |                     |                      |                            |                       |                             |
| 10                            | 4           |                     |                      |                            |                       |                             |
| 16                            | 4           |                     |                      |                            |                       |                             |
| 25                            | 4           |                     |                      |                            |                       |                             |
| 35                            | 4           |                     |                      |                            |                       |                             |
| 50                            | 4           |                     |                      |                            |                       |                             |
| 70                            | 4           |                     |                      |                            |                       |                             |
| 95                            | 4           |                     |                      |                            |                       |                             |
| 150                           | 3           |                     |                      |                            |                       |                             |
| 240                           | 4           |                     |                      |                            |                       |                             |

| Cable Size (mm <sup>2</sup> ) | No of cores | Laid in ducts (R/m) | Laid in ground (R/m) | Cable fixed on trays (R/m) | Cable ends each (R/m) | Cable joints complete (R/m) |
|-------------------------------|-------------|---------------------|----------------------|----------------------------|-----------------------|-----------------------------|
| 70 PILC 11kV                  | 3           |                     |                      |                            |                       |                             |
| Fibre Optic (Single Mode)     | 4           |                     |                      |                            |                       |                             |
| Fibre Optic (Multi mode)      | 4           |                     |                      |                            |                       |                             |

## SOCKET OUTLETS

Supply, fitting and connecting of the following complete with box, cover plate and plug top where applicable per unit:

| Unit Box                                                              | Flush mounted (R/m) | Surface Mounted (R/m) |
|-----------------------------------------------------------------------|---------------------|-----------------------|
| 20 Amp 3-pin single phase switched socket outlet                      |                     |                       |
| 40 Amp 5-pin 3-phase welding plug complete with isolator and plug top |                     |                       |

## CIRCUIT BREAKERS

Supply, mounting and connecting in a pre-fitted distribution board per unit:

| Description                   | Completely installed (R each) |
|-------------------------------|-------------------------------|
| Up to 30 Amp SP (5 kA)        |                               |
| Up to 20 Amp TP (5 kA)        |                               |
| 20 Amp up to 60 Amp TP (5 kA) |                               |
| 50 Amp MCB                    |                               |
| 225Amp MCCB                   |                               |
| 250Amp MCCB                   |                               |
| 320Amp MCCB                   |                               |
| 400Amp MCCB                   |                               |
| 630Amp MCCB                   |                               |

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| Description                | Completely installed (R each) |
|----------------------------|-------------------------------|
|                            |                               |
| Digital time switch        |                               |
|                            |                               |
| 20Amp SP + N Earth Leakage |                               |
|                            |                               |
| 40Amp SP + N Earth Leakage |                               |
|                            |                               |
| 63Amp SP + N Earth Leakage |                               |
|                            |                               |
| 40Amp TP Earth Leakage     |                               |
|                            |                               |
| 63Amp TP Earth Leakage     |                               |

## ISOLATORS

Supply, mounting and connecting in a pre-fitted distribution board per unit:

| Description | Completely installed (R each) |
|-------------|-------------------------------|
| 80Amp TP    |                               |
|             |                               |
| 100Amp TP   |                               |
|             |                               |
| 200Amp TP   |                               |
|             |                               |
| 320Amp TP   |                               |
|             |                               |
| 400Amp TP   |                               |
|             |                               |
| 630Amp TP   |                               |

## MISCELLANEOUS EQUIPMENT

Supply, installation and connecting up of the following:

| Description                                     | Completely installed (R each) |
|-------------------------------------------------|-------------------------------|
| Grade 304 S/S pedestal for lock stop switch     |                               |
|                                                 |                               |
| Lock stop switch with Grade 304 S/S pedestal    |                               |
|                                                 |                               |
| Weatherproof isolator with pillar               |                               |
|                                                 |                               |
| Complete 1-4 kW DOL starter panel as specified  |                               |
|                                                 |                               |
| Complete 5-11 kW DOL starter panel as specified |                               |
|                                                 |                               |

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| Description                                    | Completely installed (R each) |
|------------------------------------------------|-------------------------------|
| 15 kW DOL starter panel as specified           |                               |
|                                                |                               |
| 18,5 kW DOL starter panel as specified         |                               |
|                                                |                               |
| 22kW Direct-on-line starter panel as specified |                               |
|                                                |                               |
| 55kW Variable Speed Drive panel as specified   |                               |
|                                                |                               |
| 45kW Variable Speed Drive panel as specified   |                               |
|                                                |                               |
| 22kW Variable Speed Drive panel as specified   |                               |
|                                                |                               |
| 15kW Soft Starter panel as specified           |                               |
|                                                |                               |
| 22kW Soft Starter panel as specified           |                               |
|                                                |                               |
|                                                |                               |
| 30kW Soft Starter panel as specified           |                               |
|                                                |                               |
| 45kW Soft Starter panel as specified           |                               |
|                                                |                               |
| ISonic-A level transmitter                     |                               |
|                                                |                               |
| Ultrasonic level MSP900SH sensor               |                               |
|                                                |                               |
| NewElec KC motor protection relay              |                               |
|                                                |                               |
| NewElec KE motor protection relay              |                               |
|                                                |                               |
| NewElec Newcode motor protection relay         |                               |
|                                                |                               |
| NewElec Newcode LCD Display Unit               |                               |

## PLC EQUIPMENT

Supply, installation and connecting up of the following:

| Description                | Completely installed (R each) |
|----------------------------|-------------------------------|
| Processor High Performance |                               |
|                            |                               |
| Power supply Module        |                               |
|                            |                               |

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| Description                                  | Completely installed (R each) |
|----------------------------------------------|-------------------------------|
| Ethernet TCP/IP Network Communication Module |                               |
| 24V DC input module (16 inputs)              |                               |
| 24V DC input module(32 outputs)              |                               |
| 24V DC input module (64 inputs)              |                               |
| 24V DC output module(16 outputs)             |                               |
| 24V DC output module(32 outputs)             |                               |
| 24V DC output module(64 outputs)             |                               |
| 24V AC Input module(16 outputs)              |                               |
| 24V DC output module(16 outputs)             |                               |
| Analog input module (4 channel)              |                               |
| Analog input module (8 channel)              |                               |
| Analog output module (4 channel)             |                               |
| Analog output module (8 channel)             |                               |
| RTD module (8 Channel)                       |                               |
| RTD module (16 Channel)                      |                               |
| Managed Switch (2x 2fiber Ports)             |                               |

## **SURGE ARRESTORS**

Supply, installation and connecting up of the following:

| Description                              | Completely installed (R each) |
|------------------------------------------|-------------------------------|
| DEHN guards CAT No. DV M TT 255 FM       |                               |
| DEHN guards CAT No. DG M TT 275          |                               |
| DEHN Blitzductor Cat No. BXT ML4 BE HF 5 |                               |

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| Description                               | Completely installed (R each) |
|-------------------------------------------|-------------------------------|
|                                           |                               |
| DEHN Blitzductor Cat No. BXT ML4 BC EX 24 |                               |

## DAYWORK

The following rates are for work not covered by any scheduled rates:

|                            | Normal time (R/Hour) | Overtime (R/Hour) |
|----------------------------|----------------------|-------------------|
| Electrician and Labourer   |                      |                   |
|                            |                      |                   |
| Electrician and apprentice |                      |                   |
|                            |                      |                   |
| Labourer                   |                      |                   |

## TRANSPORT, MATERIALS AND EXCAVATIONS

The following rates are for work not covered by any scheduled rates:

|                                                          | Per unit           |
|----------------------------------------------------------|--------------------|
| Traveling for vehicles not exceeding 1000 kg capacity    | R/Km               |
|                                                          |                    |
| Materials, nett cost plus                                | %                  |
|                                                          |                    |
| Excavations:                                             |                    |
|                                                          |                    |
| i) In soft pickable soil.                                | per m <sup>3</sup> |
|                                                          |                    |
| ii) In soft rock (use of power tools)                    | per m <sup>3</sup> |
|                                                          |                    |
| iii) In hard rock per m <sup>3</sup> (use of explosives) | per m <sup>3</sup> |

TENDERER

Signature : .....

Name : .....

Duly authorised to sign on behalf of :  
.....

Telephone : .....

Fax : .....

Date : .....