 Eskom	Specification	Technology
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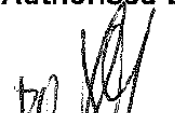
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## **1. INTRODUCTION**

Komati Water Scheme (KWS) supplies raw water to several Power Stations, including third party users. The KWS infrastructure includes the Vygeboom, Bosloop and the Wintershoek/Nooitgedacht pump station sites and all inter-connecting pipelines and servitudes.

KWS pump station sites have been declared National Key Points. A security evaluation conducted by Group Security revealed non-compliance of the energized perimeter fence against the requirements of the National Key Point act and Eskom policies.

This document covers the technical specification for the electric fence upgrade for Komati Water Scheme Pump Station sites to achieve NKP and Eskom specifications compliance. The following upgrades are included:

- Energised fence (Middle Tier fence)

## **2. SUPPORTING CLAUSES**

### **2.1 SCOPE**

#### **2.1.1 Purpose**

This document provides the Civil and Electrical technical specifications for the upgrade of the energised fence.

#### **2.1.2 Applicability**

This document shall apply to the Komati Water Scheme Security Upgrade Project only.

### **2.2 NORMATIVE/INFORMATIVE REFERENCES**

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

#### **2.2.1 Normative**

- [1] ISO 9001 Quality Management Systems.
- [2] 240-53113685: Design Review Procedure.
- [3] Construction Regulations, 2014
- [4] 32-727 - Eskom Safety, Health, Environment and Quality (SHEQ) Policy
- [5] Occupational Health and Safety Act No. 85 of 1993,

#### **2.2.2 Informative**

- [6] 240-53114002: Engineering Change Management Procedure.
- [7] 32-6: Document and Records Management Procedure.

## **2.3 DEFINITIONS**

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Definition	Description
National Key Point	An act of the Parliament of South Africa that provides for the declaration and protection of sites of national strategic importance against sabotage.

### 2.3.1 Disclosure Classification

**Controlled disclosure:** controlled disclosure to external parties (either enforced by law, or discretionary).

## 2.4 ABBREVIATIONS

Abbreviation	Description
AWS	American Welding Society
CoC	Certificate of Compliance
CoE	Centre of Excellence
HT	High Tension
KWS	Komati Water Scheme
MCB	Miniature Circuit Breaker
NKP	National Key Point
QCP	Quality Control Plan
SANS	South African National Standards

## 2.5 ROLES AND RESPONSIBILITIES

**Compiler:** The document compiler is responsible for ensuring that this document is up-to-date and that this document is not a duplication of an existing documentation, regarding the document's objectives and content.

**Functional Responsibility:** The Functional Responsible Person shall determine if the document is fit for purpose, before the document is submitted for authorisation.

**Authoriser:** The document authoriser is a duly delegated person with the responsibility to review the document for alignment to business strategy, policy, objectives and requirements. He/she shall authorise the release and application of the document.

**Lead Discipline Engineer:** The role of the Lead Discipline Engineer is to manage the technical integrity of the design and be accountable for the management of the interfaces within their specific engineering domain. In addition, the Lead Discipline Engineer coordinates the discipline specific activities for the particular system such as Civil and Electrical. In addition, the Lead Engineer is accountable for the provision and establishment of all documentation required for a Design Review. The Lead Discipline Engineer is to ensure that a system of check sheets is being used in the review process and before the design review package is put together for the end of phase design review meeting he reviews and signs off on these documents.

Furthermore, design review procedure 240-53113685 defines roles and responsibilities which are applicable.

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## **2.6 PROCESS FOR MONITORING**

This document will be reviewed and approved in accordance with the Design Review Procedure 240-53113685.

## **2.7 RELATED/SUPPORTING DOCUMENTS**

N/A

## **3. ENGINEERING AND THE *CONTRACTOR'S* DESIGN**

### **3.1 DESCRIPTION OF THE *WORKS***

The *works* includes decommissioning and removal of the existing middle tier fence (energised fence) inclusive of the existing civil works, to a designated area. The *works* also includes the design, manufacturing, procuring, supply, off-loading, installation, construction, quality control and assurance, testing, training, commissioning and handover of the electric fence for Vygeboom, Bosloop and Nootgedacht pump station sites. The civil works are designed by the *Employer* and is executed by the *Contractor*.

Power supply points to the electric fence energisers will be provided by the *Employer* on each pump station site using the existing distribution boards. Cabling from the energisers to the electric fence will be re-used as far as possible, routing of these existing cables are provided by the *Contractor*. The affected pump stations' layouts and approximate perimeter lengths are as per Figure 1, 2 and 3.



**Figure 1: Layout of Fence for Vygeboom Pump Station (Approx. 830m)**

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**Figure 2: Layout of Fence for Bosloop Pump Station (Approx. 1315m)**



**Figure 3: Layout of Fence for Nooitgedacht Pump Station (Approx. 1500m)**

### **3.2 EMPLOYER'S CIVIL DESIGN**

The *Employer* has conducted the detailed design only for the civil works of the fence structure which is constructed by the *Contractor* in accordance with the drawings and specifications included within and referenced in this specification.

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### **3.3 CONTRACTOR'S DESIGN**

1. The *Contractor* takes full professional accountability and liability for the *works* designed by the *Contractor* and provides the following to the *Employer*, for review and acceptance:
  - A Level 4 schedule (schedule with defined activities) for the *works* highlighting all activities involved, major milestones and provision.
  - Detailed Electrical Design report signed by a Professional Engineer/Technologist.
  - Detailed commissioning procedure indicating the tests to be conducted on the electric fence and associated power supply.
  - Detailed Electrical drawings. Drawings are also submitted in CAD formats (.DGN) e.g. drawings showing the energiser connection to the electric fence conductors, conductor spacing etc. and excel format e.g. load schedules.
  - Operating and maintenance manual for the electrical installation. The Operating & Maintenance Manuals describe how the facility is to be operated/maintained and by whom. The operating and maintenance manuals as a minimum, consist of the following:
    - List of Contents (Index)
    - Introduction
    - General description of the functions of each of the systems including detailed description of each element of the electric fence, how it functions, how it operates and how to maintain it.
    - Full alarm descriptions with procedures on the fault finding or clearing of alarms.
    - Full as-built drawings, brochures and catalogues for the system and each component.
    - The format of the O & M documentation shall be A4 and shall be a specially bound document with hard cover and with metal ring binding. (All drawings and details shall be reduced to A3 format and folded into A4 format.)
    - The names, addresses and telephone/fax numbers/email addresses of all responsible persons and manufacturers/suppliers shall be listed in the O& M document.
  - Documentation as per the *Employer's* 240-78980848 standard.
2. Any discrepancy or ambiguity between the *Employer's* Specifications or requirements is immediately brought to the attention of the *Project Manager* for clarification.

#### **3.3.1 Temporary Works**

1. The *Contractor* is mandated in terms of Construction Regulations 2014: Duties of Designer, 6(1) a - j and 6(2) a – d, to fulfil the duties described therein for the detailed and temporary works designs done by the *Contractor*. Any risk associated with the *Contractor's* design is highlighted to the *Employer* together with mitigation measures. The *Contractor* is responsible for construction monitoring at the level required to certify that the *works* have been constructed in accordance with the *Contractor's* design.

#### **3.3.2 Electrical**

The electrical scope is limited to the electric fence, earthing (and/or bonding) and lightning protection system and power supply, inclusive of all necessary cabling works. The *works* described herein is applicable to all affected sites i.e. Nooitgedacht, Vygeboom, and Bosloop pump station sites.

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### **3.3.2.1 Energized Fence**

The *Contractor* is responsible for the design, manufacture/procurement, supply, off-loading, construction, quality control and assurance, testing, provision of training, commissioning and handover of the electric fence around the perimeter of each affected pump station i.e. Vygeboom, Bosloop and Nooitgedacht pump stations in accordance with the following *Employer* Specification.

- 240-78980848 Specification for Non-Lethal Energized Perimeter Detection System (NLEPDS) for Protection of Eskom Installations and its Subsidiaries.

### **3.3.2.2 Power Supply and Cabling works**

1. The existing power supply points, inclusive of MCB's and associated cabling for the existing electric fence shall be used for the new electric fence. The existing distribution boards (DBs) located in the security guard house on each pump station shall be used as an interface/ power supply point to the energized electric fence.
2. The *Contractor* shall isolate the existing power supply to the existing electric fence on decommissioning of the existing electric fence.
3. There are currently 2 energizers on each pump station, with a single phase supply from these DBs (located in the security guard house) with 2 output HT cables per energizer and one common earth cable from these energizers. On installation of the electric fence system, insulation resistance and continuity tests on the cables shall be conducted as part of the commissioning tests. A Certificate of Compliance shall be provided by the *Contractor* and shall be as per the requirements of the *Employer's* 240-78980848.
4. Existing cable routing shall be used as far as practically possible.
5. Handover of the plant (in addition to the documentation requirements of 240-78980848) is done and includes all relevant As-built documentation including but not limited to the following:
  - Cable test certificates,
  - Load schedule, using 240-77301384 LV Load Schedule Template.

### **3.3.2.3 Earthing and Lightning Protection**

1. Earthing and lightning protection design and implementation complies with the requirements of the *Employer's* specification 240-78980848.
2. The *Contractor* provides earthing drawings, reflective of As-built status of the newly installed electric fence. Drawings shall indicate, as a minimum, the connection points on the electric fence and on the earth mat.

## **3.4 PROCEDURE FOR SUBMISSION AND ACCEPTANCE OF *CONTRACTOR'S* DESIGN**

1. The *Contractor* submits all designs to the *Project Manager*.
2. The *Employer* reserves the right to review any design in the detail that is deemed necessary. The *Employer* accepts no accountability and liability due to the review of any designs or if any acceptance is given.

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3. The *Contractor* is the Design Authority as defined in the Design Review Procedure 240-53113685 for the electrical portion of the *works*. The *Employer* conducts the following design reviews as specified in this procedure.
  - a) Design Freeze Review
  - b) System Integrated Design Review
  - c) Pre-commissioning Review
  - d) Acceptance Testing Review
  - e) Handover Review
4. The *Contractor* takes into account this review process during the *works* including in the schedule.

### **3.5 OTHER REQUIREMENTS OF THE *WORKS***

#### **3.5.1 Documentation and Configuration Management**

##### **3.5.1.1 Document identification**

All documents supplied by the *Contractor* are subject to the *Employer's* acceptance. The language of all documentation is required to be in English. The *Contractor* includes the *Employer's* drawing number in the drawing title block. This requirement only applies to design drawings developed by the *Contractor* and his *Subcontractors*. Drawing numbers are assigned by the *Employer* as drawings are developed.

##### **3.5.1.2 Document Submission**

The *Contractor* is required to submit documents as electronic (native and digitally signed PDF's) and ink signed hard copies and both copies must be delivered to the Eskom Representative with a transmittal note. Electronic submissions could be done using the SharePoint Transmittal Site functionality and route. The *Contractor* is provided with the following standard: Technical Documents and Records Management Work Instruction (240-76992014) which must be adhered to. For bulk document submission, the following link can be used <https://zendto.eskom.co.za/>.

##### **3.5.1.3 Drawings Format and Layout**

1. The creation, issuing and control of all Engineering Drawings will be in accordance to the latest revision of 240-86973501 - Engineering drawing Standard.
2. Drawings issued will be a minimum of one hardcopy and an electronic copy.
3. Drawings issued may not be "Right Protected" or encrypted.

#### **3.5.2 Quality Management**

1. The *Contractor* submits a fully detailed Quality Control Plan (QCP) for acceptance within four weeks of the Contract Date.
2. The *Contractor* submits a schedule of unpriced orders to be placed and this is updated regularly.
3. The *Contractor* is responsible for defining the level of QA/QC (intervention Points) or inspection to be imposed on his *Subcontractors* and suppliers of material in the Quality Control Plans (QCPs). This level is based on the criticality of equipment and be submitted to the *Project Manager* for acceptance.
4. The *Contractor* submits on a monthly basis, the following QA returns:
  - A register of Defects with those older than 30 days being flagged and an explanation attached

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- Register of accepted Defects
- A register of Non Conformance Report
- Monthly Project Quality Report
- Monthly updated Site and pre-site programmes
- Inspection dates
- Site Acceptance Tests
- Inspections completed / outstanding

5. All quality control documentation is submitted to the *Project Manager* within 7 days of Contract date.

### **3.5.3 Training Requirements**

1. Product specific training is required to enable the installation, testing, commissioning, fault finding, maintenance and configuration of the equipment by Eskom personnel or appointed contractors.
2. The training shall be a supplier-accredited course to ensure correct installation and use of the equipment within Eskom. The content of the training manual is based on the content of the technical, operating and maintenance manuals for the electric fence.

## **4. CONSTRUCTION**

The *works* described in this scope include the following

### **4.1 GENERAL**

The *Contractor*:

1. Adheres to the South African Environment Protection Act, the waste management code of practice and the South African Occupational Health and Safety Act No. 85 of 1993, the regulations promulgated thereunder and Eskom Safety, Health, Environment and Quality (SHEQ) Policy 32-727 and Waste Management Procedure, as well as the plan from KWS for all *works*.
2. Submits a comprehensive method statement of the entire *works* to the *Project Manager* for acceptance prior to the start of the *works*
3. Submit a project specific safety file to the *Employer* for acceptance, prior to the start of the works.
4. Submit a detailed level 4 schedule for the *works* to the *Project Manager* for acceptance after contract award.
5. Manage his access to the working areas and the site to ensure none of the existing plant that is not in the scope is damaged during removal of the middle tier fence.
6. Manage his activities on Site to ensure that no interference takes place between his work and that of others.
7. Continuously monitor the condition in demolition areas and surrounding areas for any hazardous substances and in such case, the *Contractor* is required to take necessary precautionary measures.
8. Complete "Contract Activities Daily Reports".
9. Liaise with the *Supervisor* regarding utilities and telephone facilities required for his Site establishment.
10. Identifies a registered waste disposal site, outside the pump station for dumping of waste, which must be approved by the *Supervisor*.
11. Maintain and promote labour harmony on the Site and in the working environment.
12. Immediately report any potential labour disharmony to the *Supervisor*.

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13. Not recruit or employ any personnel from the *Employer* and Others, without prior acceptance of the *Project Manager*.

#### **4.2 SURVEYING AND SETTING OUT**

1. The *Contractor* is responsible for the complete surveying and setting out of the *works* including establishment and protection of any benchmarks required to complete the *works*.
2. The *Contractor* is required to consult the Surveyor-General's office to obtain information on available registered beacons near the Site to use for the establishment of any required benchmarks close to the *works*.
3. The *Contractor* is required to submit as-built data for the civil works in the form of redlined marked up drawings to the *Project Manager* upon handover.
4. Signed as-built drawings are submitted for the designs done by the *Contractor* and complies with the requirements indicated in Section 3.5.1.2.
5. The *Contractor* is responsible for the verification of all survey data relating to setting out and to immediately inform the *Project Manager* of any discrepancies as soon as these are discovered.
6. The new middle tier fence is to be erected in the same position of the existing middle fence.

#### **4.3 SCANNING FOR UNDERGROUND SERVICES**

1. Geophysical scanning is done by the *Contractor* to locate sub-surface utilities both metallic and non-metallic prior to any excavations.
2. Scans are required to be conducted for the footprint of the support structure.
3. The type of Geophysical scanning employed is at the discretion of the *Contractor*, taking note of the required output. The *Contractor* therefore considers the working environment prior to selection of test methodology and equipment.
4. The *Contractor* considers possible signal interferences which may be experienced by the geophysical scanning equipment caused by equipment, and services stray current in and around the areas.
5. Scanning is required to be conducted to a minimum depth of 3 m.
6. The *Contractor* submits the results of the scanning to the *Project Manager* and indicates and possible services which may interfere with the *works*.

#### **4.4 ENERGISED FENCE**

1. The *Contractor* is responsible for the construction of the *works*, including all temporary works and design thereof, and all associated services in accordance with the detailed drawings and specifications.
2. The civil works includes the fence posts, struts, foundations, anti-tunnelling beam, anti-vegetation slab and associated works and is constructed in accordance with the *Employer's* detailed drawings 0.80/6133 Sheets 1 – 4
3. The electrical works are in accordance with the *Contractor's* detailed design which is in accordance with the specifications indicated herein.

#### **CONTROLLED DISCLOSURE**

4. The *Contractor* disposes of all demolition waste at a licenced waste disposal site to be accepted by the *Project Manager*. The waste disposal site is selected to suit the classification of the materials to be disposed of. Certificates of disposal are required to be submitted to the *Employer*.
5. The *Contractor* is required to remove existing middle tier fence, and all associated infrastructure (eg. posts, foundations and concrete works). The infrastructure is to be assessed by the *Contractor* together with the *Employer* to determine how much of the existing infrastructure can be reused.
6. The *Contractor* removes the structure with no damage to the steel components that could be reused.
7. The *Contractor* submits an assessment report to the *Project Manager* for review indicating which of the existing infrastructure can be reused to upgrade the fence in accordance with the required specifications in this Works Information.

#### **4.5 COMMISSIONING**

The *Contractor* is required to test, verify and commission the fence according to the manufacturer's specification and approved drawings in the presence of the *Employer* and ensures that zoning is working. The *Contractor* submits all drawings and relevant paper work for the electric fence system to the *Project Manager*.

#### **4.6 HANDOVER**

The *Contractor* compiles data packs progressively for all manufacturing and construction/erection inspection, operating manuals and test records and documents for every piece of plant worked on. The *Contractor* submits data packs to the supervisor and *Project Manager* for their review for all equipment and works undertaken with the applicable requirements and specifications.

Apart from any statutory data packages required, the *Contractor* also compiles and signs off a data package of the relevant drawings, test certificates etc. to the *Project Manager* for acceptance. These include, but are not limited to:

- Surveys;
- Approved ITP's, QCP's;
- Method statements and specifications adhered to;
- Risk assessments;
- Approved Drawings;
- Design Calculation Reports
- Fabrication Drawings;
- Material Certificates;
- Weld Map;
- Weld Matrix Sheet;
- Weld Sequence;
- Welding Consumables Certificates;
- Welding Procedure Specifications;
- Welders' Qualifications;
- ESKOM approved NDT Contractor;
- Approved NDT procedure;
- NDT Technician Qualifications;
- NDT Reports/ Results;
- Weld test certificates
- Certificate of Manufacture;
- Inspection Reports;

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- Corrosion Protection Consumables Certificates;
- Calibration Certificates;
- Notifications;
- Modifications;
- Concessions;
- Technical Queries, Engineering Responses and communications with *Project Manager/ Employer*
- Non-conformance reports;
- Internal Release Notes;
- Transport notifications;
- Calculations for any temporary works that may be required for the safe execution of the works;
- Concrete 7 day and 28 day cube test results;
- Slump test results;
- Concrete mix designs including all required test results e.g. aggregate test results;
- Pre-concrete and post concrete surveys;
- Batch Plant certificates;
- Slump tests certificates;
- Compaction tests;
- Material certificates;
- Certificate of Compliance (CoC) for the electrical installation including energised fence.
- Load schedules
- Wiring drawings inclusive of conductor spacing, energiser connection to the conductors, zoning of the electric fence etc.

## **5. SPECIFICATION FOR THE WORKS**

The *Contractor* is required to adhere to the latest editions of and the normative references within the following SANS standards and other codes of practice, regulations & standards:

<b>Number</b>	<b>Title</b>
240-56364545	Structural Design and Engineering Standard
240-86973501	Engineering drawing Standard
240-66920003	Documentation Management Review and Handover Procedure for Gx Coal Projects
240-76992014	Project / Plant Specific Technical Documents and Records Management Work Instruction
240-78980848	Specification for Non-Lethal Energized Perimeter Detection System (NLEPDS) for Protection of Eskom Installations and its Subsidiaries
AWS D1.1	American Welding Society - Structural Welding Code - Steel
SANS 10044-1	Welding Part 1: Glossary of terms
SANS 2553	Welded, brazed and soldered joints - Symbolic representation on drawings
SANS 9606-1	Approval testing of welders - Fusion welding Part 1: Steels
SANS 10064	The preparation of steel surfaces for coating
SABS 471/ SANS 50413 & SANS 50196	Portland cement (ordinary, rapid hardening and sulphate resisting)
SANS 50196 Series	Methods of testing cement

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Number	Title
SANS 50197-1	Cement Part 1: Composition, specifications and conformity criteria for common cements
SANS 50197-2	Cement Part 2: Conformity evaluation
SANS 1083	Aggregates from natural sources - Aggregates for concrete
SANS 2001-BE1	Construction works Part BE1: Earthworks (general)
SANS 2001-BS1	Construction works Part BS1: Site clearance
SANS 2001-CC1	Construction works Part CC1: Concrete works (structural)
SANS 2001-CS1	Construction works Part CS1: Structural steelwork
SANS 50025 series	Hot rolled products of structural steels Parts 1-6
SANS 5831	Presence of chlorides in aggregates
SANS 5861-2	Concrete tests - Sampling of freshly mixed concrete
SANS 5862-1	Concrete tests - Consistence of freshly mixed concrete - Slump test
SANS 5863	Concrete tests - Compressive strength of hardened concrete
SANS 5864	Concrete tests - Compressive strength of hardened concrete
SANS 10400	The Application of the National Building Regulations
SANS 10142-1	The wiring of premises Part 1: Low-voltage installations

### 5.1.1 Concrete

1. All concrete work is required to be in accordance with SANS 2001-CC1 and SANS 10100-2 unless otherwise stated.
2. All concrete surfaces and cast-in items is required to be inspected and accepted by the *Project Manager* in writing before casting of concrete may commence.
3. The *Contractor* is required to obtain written acceptance from the *Project Manager* for the use of any admixture or the use of ready mixed concrete, to pump concrete, or to use cement or cement blends other than ordinary Portland cement (OPC)
4. Compaction of concrete is required to be done by means of mechanical vibrators only.
5. The *Contractor* is required to submit the concrete mix design to the *Project Manager* for acceptance.
6. The *Contractor* is required to demonstrate, by means of a report from an approved laboratory, that the aggregates do not exhibit excessive shrinking properties in accordance with SANS 1083 and is also required to demonstrate that the aggregates do not have a potential alkali silica reaction.
7. The *Contractor* is required to perform a slump test on the same batch of concrete every time a sample is taken and the result recorded.

The table below indicates particular specifications pertaining to SANS 2001-CC1 and must be read in conjunction with the code.

Clause	Particular Specification
<b>3.5</b>	<b>Concrete – Strength characteristics</b>
3.4.3	Concrete Grade is required to be: <ul style="list-style-type: none"> <li>• Class 15 MPa/ 19 mm for Blinding Concrete (28 days),</li> <li>• Class 35 MPa/ 19 mm for Structural Concrete (28 days).</li> </ul>

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Clause	Particular Specification
<b>4.2</b>	<b>Materials</b>
4.2.7	In general, one of the following types of non-shrink grout are required to be used: <ul style="list-style-type: none"> <li>• Cement-based non-shrink grout, not less than 50 MPa;</li> <li>• Special proprietary non-shrink or expansive grout, not less than 50 MPa.</li> </ul>
<b>4.4</b>	<b>Reinforcement</b>
4.4	Add the following: All reinforcement is stamped with a SANS quality assurance mark
4.4.3.1	Cast in-situ concrete cover is required to be a minimum of: <ul style="list-style-type: none"> <li>• 60 mm for exposed to earth or water;</li> <li>• 40 mm for above ground or not in contact with soil.</li> </ul>
<b>4.7</b>	<b>Quality of Concrete</b>
4.7.1.1	<ul style="list-style-type: none"> <li>• <i>Contractor</i> submits to the <i>Supervisor</i> full details and samples of all materials which he proposes to use for making concrete at least 28 days before the concreting of the works is due to commence.</li> </ul>
4.7.10	Add the following: <ul style="list-style-type: none"> <li>• The <i>Supervisor</i> approves the size, shape and depth of any excavation before concrete is placed.</li> <li>• Unless otherwise approved by the <i>Supervisor</i>, no concrete is placed until the fixed reinforcement has been accepted in writing by the <i>Supervisor</i></li> </ul>
4.7.12.2.3	<ul style="list-style-type: none"> <li>• All angled corners are chamfered 20 mm x 20 mm, unless such other larger size is detailed on the Drawings.</li> </ul>
4.7.19.3	<ul style="list-style-type: none"> <li>• <i>Contractor</i> submits a detailed procedure for acceptance by the <i>Supervisor</i> on how he intends to carry out the repairs of structural concrete defects</li> </ul>
4.7.22	<ul style="list-style-type: none"> <li>• For concrete pour records, the <i>Contractor</i> submits a detailed Quality Control Plan to the <i>Supervisor</i> for acceptance.</li> <li>• In addition the <i>Contractor</i> supplies the <i>Supervisor</i> with two copies of these records each day covering works carried out the preceding day.</li> </ul>
<b>5.1</b>	<b>Testing</b>
5.1.1.4	<ul style="list-style-type: none"> <li>• Six 150 mm cube samples taken from each batch or place of concrete deposition, four cubes are tested at 7 days and four at 28 days.</li> <li>• Strength at 7 days is required to be at least two thirds of 28 day strength.</li> </ul>
5.1.2.1	<ul style="list-style-type: none"> <li>• Any of the cube samples tested indicating a result more than 3 MPa below the specified strength is disregarded.</li> </ul>
<b>5.2</b>	<b>Tolerances</b>
5.2.1	<ul style="list-style-type: none"> <li>• Tolerances on all concrete work is required to be a level II degree of accuracy as specified in SANS 2001-CC1 with and is to be carefully maintained throughout the construction.</li> </ul>

### 5.1.2 Steelwork

1. All work is required to be in accordance with the latest edition of SANS 2001-CS1

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2. The *Contractor* is responsible for the stability of the entire structure and all structural elements during all the erection stages.
3. All dimensions are required to be verified on site by the *Contractor* before any fabrication of steelwork commences.
4. All welding is required to be conducted by coded welders in the workshop only. Supporting documentation is also required to be submitted to the *Project Manager* for acceptance. All welding is required to comply with AWS D1.1.
5. All welds are required to be inspected using visual aids
6. The *Contractor* is required to supply all bolts, washers, nuts etc. for the structural steelwork.
7. All steelwork is required to be hot dipped galvanised.
8. All galvanising is required be done in accordance with SANS 121. Preparation of steel prior to galvanising and coating thickness is also required to be in accordance with SANS 121.

The table below indicates particular specifications pertaining to SANS 2001-CS1 and must be read in conjunction with the code.

Clause	Particular Specification
<b>4.1</b>	<b>Materials</b>
4.1.1	Add the following: <ul style="list-style-type: none"><li>• All structural steelwork is required to be grade S355JR</li></ul>
4.1.4.1	<ul style="list-style-type: none"><li>• Electrodes for electric welding are required to be E7018.</li></ul>
<b>4.6</b>	<b>Workmanship - Erection</b>
4.6.5	<ul style="list-style-type: none"><li>• On site welding is not permitted</li></ul>
<b>5.3</b>	<b>Non-destructive testing of welds</b>
5.3.3	<ul style="list-style-type: none"><li>• Fillet welds are required to undergo magnetic particle inspection (20 % of welds)</li></ul>
5.3.4	<ul style="list-style-type: none"><li>• All butt welds and full penetration welds are required to undergo ultrasonic non-destructive testing (100 % of welds)</li></ul>

### **5.1.3 Excavations**

1. All areas in which excavation is to take place or that are to be covered by terraces, banks or structures, shall be cleared in terms of SANS 2001-BS1 and stripped of all remaining vegetation to a depth of 150 mm.
2. Topsoil shall be conserved for later use. Topsoil together with grass and other suitable vegetation are removed and placed in stock piles not higher than 1.5m within the site.

### **5.2 TENDER RETURNABLES**

The tenderer submits the following as a minimum in the tender submission:

1. High-level method statement for the *works* clearly demonstrating compliance with the full scope of work as detailed in the Works Information.
2. Relevant experience of similar projects. List of at least 3 verifiable relevant references must be provided for electric fence installation in the last 5 years for the projects. References to include contact details for client, description of scope and involvement in the project, start and end dates as well as copies of Certificates of Compliance (CoC's) as a minimum.

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3. CV's of Construction Manager and Site Engineer/Agent each with a minimum of 5 years relevant experience
4. Proof of registration as a Registered Electric Fence Installer by the Chief Inspector as per the Occupational Health and Safety Act (1993)
5. A Level 3 schedule (schedule with defined activities) for the *works* highlighting all activities involved, major milestones and provision.

## 6. DRAWINGS ISSUED BY THE EMPLOYER

The following drawings are issued to the *Contractor* to be used for tender. The *Employer* provides the *Contractor* with drawings issued for construction after contract award. Drawings for Tender are not used for procurement, fabrication or construction.

Document Number / ID	Document Title	Revision	Status
0.80/6133 - Sheet 1	Vygeboom Pump Station - Security Fence Upgrade – Layout and Details	0	For Tender
0.80/6133 - Sheet 2	Bosloop Pump Station - Security Fence Upgrade – Layout and Details	0	For Tender
0.80/6133 - Sheet 3	Nooitgedacht Pump Station - Security Fence Upgrade – Layout and Details	0	For Tender
0.80/6133 - Sheet 4	Komati Water Scheme – Security Fence Upgrade – Energised Fence	0	For Tender
<b>Documents issued for additional information only</b>			
0.52/30115 – Sheet 6	Non-Lethal Electrified Fence - Conductors Looping Arrangement	0	For Information
0.54/393	Earthing Standards	Latest	For Information
240-77301384	Low Voltage Load Schedule	N/A	For Information

## 7. AUTHORISATION

This document has been seen and accepted by:

Name & Surname	Designation
Dan Govender	Client Representative - PED
Fishers Magowa	Group Security Representative
Frits Thuynsma	Chief Electrical Technologist - PED
Zesizwe Ncane	LDE - Electrical CoE
Dirk Maritz	Senior Technician – Protection, Testing and Maintenance
Niloshen Moodley	Engineer: Structural Design CoE

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## **8. REVISIONS**

<b>Date</b>	<b>Rev.</b>	<b>Compiler</b>	<b>Remarks</b>
May 2019	0.1	N. Hoosen	First draft for review
August 2019	1.0	N. Hoosen	Final Document

## **9. DEVELOPMENT TEAM**

The following people were involved in the development of this document:

- Nadia Hoosen
- Zesizwe Ncane

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