



**CONTRACT RW10395951/21 (R)**

**WORKS PACKAGE 1**

**Elec-SysSpec-01**

**DESIGN, MANUFACTURE, SUPPLY, DELIVERY, INSTALLATION, COMMISSIONING AND PUTTING  
INTO SERVICE OF A LIGHTING SYSTEM**

**FOR**

**WORK PACKAGE ONE (1) - CONSTRUCTION OF TWO FILTER SAND STORAGE FACILITIES WORKS  
AREA1 AND WORKS AREA AT ZUIKERBOSCH PUMPING STATION**

**ELECTRICAL SYSTEM SPECIFICATION**

**CONTENTS**

1.	ELECTRICAL SCOPE.....	2
2.	DESIGN REQUIREMENTS.....	2
3.	POWER SUPPLY POINTS .....	4
4.	FILTER SAND STORAGE DISTRIBUTION BOARDS .....	5
4.1.	DISTRIBUTION BOARD SPECIFICATION .....	5
4.2.	CIRCUIT REQUIREMENTS .....	6
4.3.	INSTALLATION REQUIREMENTS .....	7
5.	CABLE INSTALLATION .....	7
6.	FILTER SAND STORAGE LIGHTING INSTALLATIONS .....	8
7.	EARTHING SYSTEMS.....	9
8.	APPLICABLE STANDARDS AND DRAWINGS.....	9
8.1.	LIST OF APPLICABLE DRAWINGS.....	9
8.2.	RAND WATER STANDARDS.....	9
8.3.	NATIONAL AND INTERNATIONAL STANDARDS .....	10

## 1. ELECTRICAL SCOPE

The purpose of the contract is to provide an interior and exterior lighting system and associated works for the proposed Filter Sand Storage facilities at Works Areas 1 and 2 Zuikerbosch pumping station.

The Contractor shall provide all labour, supervision, installed and consumable materials, equipment, tools, services and every permanent or temporary item necessary for the design, manufacture, supply, delivery, unloading, installation, commissioning and putting into service of the specified deliverables.

The work comprises of the following items as a minimum:

- a) Design of the lighting installations as per criteria described in this document, including calculations, simulations and the preparation of detailed lighting layout drawings.
- b) The investigation and planning of 32 A, 400V, 3 phase and neutral supply points for the storage lighting installations.
- c) The equipping of the two source low voltage supply circuits to supply the distribution boards.
- d) Planning and excavation of cable trenches, preparation of trenches for the installation of cables, laying of cables and backfilling of trenches to Rand Water's requirements.
- e) Cable entries into the storage areas and the selected source of supply point structures or buildings, cable support systems, sleeves and cable route road crossing where applicable.
- f) Design of the distribution boards for each storage facility, supply, manufacture, testing, installation and commissioning of distribution boards.
- g) Supply, deliver, install, test and commission the designed lighting installations at each storage facility.
- h) Measurement of lighting levels at night to verify compliance to the design requirements, after completion of the installations.
- i) Earthing of installations.
- j) Certification of the installations.
- k) As built documentation.

## 2. DESIGN REQUIREMENTS

The Contractor shall execute the electrical design requirements as follows:

- (a) Carry out design calculations, simulations for main items as set out in the Functional Specification and the Detail Engineering Package Deliverables Document, read in conjunction with Rand Water design criteria, Rand Water generic design drawings, Rand Water specifications, legal requirements and national and international specifications (SANS/IEC/IEEE).
- (b) Select equipment and vendors and prepare detail design drawings and schedules, suitable for the construction of equipment and installations, as indicated in the Functional Specification and the Detail Engineering Package Deliverables Document. Equipment selected shall comply with Rand

**DESIGN, MANUFACTURE, SUPPLY, DELIVERY, INSTALLATION, COMMISSIONING AND PUTTING INTO SERVICE  
OF A LIGHTING SYSTEM FOR WORK PACKAGE ONE (1) - CONSTRUCTION OF TWO FILTER SAND STORAGE  
FACILITIES WORKS AREA1 AND WORKS AREA AT ZUIKERBOSCH PUMPING STATION**

Water design criteria, Rand Water generic design drawings, Rand Water specifications, legal requirements and national and international specifications (SANS/IEC/IEEE).

The Contractor shall provide the following design deliverables:

1)	<b><i>Low Voltage Distribution Boards</i></b>
a)	LV Load Flow analysis (Current flows)
b)	LV Short Circuit Analysis (Fault levels: Three phase symmetrical, Single phase to earth)
c)	Final LV Distribution Board design basis, requirements and equipment specification as per SANS IEC 60439 and 60947
d)	Final LV Distribution Board General Arrangement
e)	Final LV Distribution Board Single Line Diagram
f)	Final LV Distribution Board Schematic and Wiring Diagrams of each circuit
g)	Final LV Distribution Board Construction Requirements
h)	Final LV Distribution Board Labelling
2)	
3)	<b><i>Building Small Power and Lighting System</i></b>
b)	Lighting design and selection of fittings to achieve design criteria, meet SANS standards and legal requirements
c)	Circuit Conductor Design and Specification
d)	Lighting Layout Drawings (Plan and Elevation, Interior and Exterior)
e)	Lighting Conduiting Layout (Plan and Elevation), Cable Access Requirements, Maintenance requirements
4)	
5)	<b><i>Cable reticulation and plant cabling</i></b>
b)	LV supply points from within the existing reticulation in the plant, including available capacity
c)	Assessment of reliability of existing supplies and operational requirements e g effect of new plant when supply is shut down for maintenance
d)	Cable installation philosophy (ducts, trenches, sleeves, protection from other services, cable transit system, road crossings)
e)	Detailed cable route design
f)	Interface to other services (buildings, pipes, roads, valve chambers, sewerage lines, telecommunications and data)
g)	Cable Design Schedules for low voltage power cables (Voltage, Size, De-Rating, Volt Drop, Fault Withstand etc) where required

**DESIGN, MANUFACTURE, SUPPLY, DELIVERY, INSTALLATION, COMMISSIONING AND PUTTING INTO SERVICE  
OF A LIGHTING SYSTEM FOR WORK PACKAGE ONE (1) - CONSTRUCTION OF TWO FILTER SAND STORAGE  
FACILITIES WORKS AREA1 AND WORKS AREA AT ZUIKERBOSCH PUMPING STATION**

h)	Cable Route Drawings with detailed dimensions where required and update of proposed cable route drawings.
i)	Determination of core drilling positions sizing of core drill holes to accommodate expected cables entering buildings. Included is detection of reinforcing and planning entry to minimize destruction of reinforcement.
j)	Cable Trench/Duct Cross- Sectional Layout Drawings with detailed dimensions and installation specifications
k)	Cable road crossing design
l)	Cable support system design calculations (mechanical loading)
m)	Cable Design Schedules for Power Cables (Voltage, Size, De-Rating, Volt Drop, Fault Withstand etc)
n)	Cable Schedules (Detailed Design with full cable termination details of each core of the cable)
o)	Cable Trench/Duct Cross- Sectional Layout Drawings
6)	
7)	<b><i>Electrical interface with Civil, Architectural, Mechanical, Process, Pipelines and Automation Requirements</i></b>
i)	
b)	Cable access to the storage facility (Cable slots, sleeves, cable transit systems, water ingress control)
c)	Earthing system (connection to roofs, tie-in to rebar system, sleeves for earthing/down conductors)

### 3. POWER SUPPLY POINTS

The contractor shall investigate and determine the most suitable supply point **source** for the Filter Sand Storage lighting installations at Works Areas 1 and 2. A number of possible supply point are available in the vicinity

The most suitable supply point not exceeding 100 m in distance away from the storage facility, to reduce volt drops and to prevent the selection of an excessively sized cable. The supply point shall also be selected, based on the reliability of the supply, spare circuits in distribution boards, available capacity at source, access to the supply point within the building and possible external obstructions, such as major roads, to running a cable to the point to the destination.

A 32 A, 3 phase circuit breaker with neutral and with 300mA IDMT earth leakage protection shall be fitted at the supply point to feed the storage facility. Labelling shall be provided and existing drawings updated for the supply.

#### 4. FILTER SAND STORAGE DISTRIBUTION BOARDS

Function: The distribution boards shall be utilized for distributing power to interior and exterior lighting and for provision for spare future circuits.

##### 4.1. Distribution Board Specification

Distribution Board Specifications for Works Area 1 and 2				
Supply details:	400	V a.c.	*TBD	
Power supply Details	As per Rand Water Specification RW/00320/491/Rev E			
Current rating:	32	A		
Short Circuit Rating	6	kA	3	secs
Busbars	TBC			
Busbar Rating	32 A, 6 kA 3 seconds			
Rated voltage Ue	400	V	RWBN	
Insulation Ui	2500	V		
Ambient temperature	40	°C		
Place of installation	Indoors in open storage area			
Form	1b			
IP	IP 65 (Double Door)			
Type of access:	Front Access Only			
Type of entry:	Cable bottom			
Type of mounting:	Wall or Pedestal Mounted			
Surge protection and circuit protection design	Combined 8/20 $\mu$ s 10/350 $\mu$ s	3 phase		
System earthing required	TNC-S			
Neutral circuit	Half size			
Enclosure materials:	3CR12			
Steelwork Thickness:	1.6	mm minimum		
Normal/Emergency changeover to SANS 60947-6-1	No			

**DESIGN, MANUFACTURE, SUPPLY, DELIVERY, INSTALLATION, COMMISSIONING AND PUTTING INTO SERVICE  
OF A LIGHTING SYSTEM FOR WORK PACKAGE ONE (1) - CONSTRUCTION OF TWO FILTER SAND STORAGE  
FACILITIES WORKS AREA1 AND WORKS AREA AT ZUIKERBOSCH PUMPING STATION**

Finish	Powder coated, structured, As per the RW specifications (Minimum 70µm paint thickness)		
Colours:	B26 to SANS 1091		
Certification required	Approved performance to SANS 1973-1		
Special environmental conditions:	Humid, Dusty		
Humidity	80	%	
Altitude	1590 m	aMSL	
Rapid temperature variations	No		
Pollution level:	Vapour, Dust		
Exposure to magnetic fields	Normal		
Direct radiation from the sun/furnaces	Yes		
Attacks by fungi /Small creatures	Yes, Vermin		
Fire / Explosive environment	No		
EMC environmental requirements	No		
Labelling	As per Rand Water requirements		
Fixed MCCBs	Yes		
Circuits:	As per requirements in Section 2.2 below		

#### 4.2. Circuit Requirements

Circuit Requirements for Works Area 1 and 2			
Circuit Description	Rating (6 kA)	Type of Circuit	Additional Requirement (C/B's 6 kA)
Incoming Isolator	32 A	3 Phase and Neutral	4 pole Isolator
Interior Lighting Supply 1	6 A	1 Phase and Neutral	Circuit Breaker
Interior Lighting Supply 2	6 A	1 Phase and Neutral	Circuit Breaker
Exterior Lighting Supply 1	6 A	1 Phase and Neutral	Circuit Breaker
Distribution Board Anti Condensation Heater	10 A	1 Phase and Neutral	Circuit Breaker
Spare Circuit	20 A	3 Phase and Neutral	Circuit Breaker
Spare Circuit	10 A	1 Phase and Neutral	Circuit Breaker
3 Phase Surge Arrestor	Rating to be	3 Phase	



DESIGN, MANUFACTURE, SUPPLY, DELIVERY, INSTALLATION, COMMISSIONING AND PUTTING INTO SERVICE  
OF A LIGHTING SYSTEM FOR WORK PACKAGE ONE (1) - CONSTRUCTION OF TWO FILTER SAND STORAGE  
FACILITIES WORKS AREA1 AND WORKS AREA AT ZUIKERBOSCH PUMPING STATION

	supplied by surge arrestor supplier		
--	---	--	--

#### 4.3. Installation Requirements

4.3.1. Each distribution board shall be fixed onto, on a galvanised Unistrut P1000 mounting frame that will present the panel at a height of 1 500 mm above finished ground for operation.

### 5. CABLE INSTALLATION

Function: To provide for supply cables for the lighting installations on the facility and cable support and cable protection.

Applicable typical RW drawings:

RB 6443	Typical Cable Trench Cross Sectional Layout
B6477	Re-instatement details for black top road
RB_20146	Typical Cable Schedule, Electrical Cable Numbers and Details

5.1. The contractor shall be responsible for providing all cable trenches as required.

5.2. All cable trenches shall be prepared and cables installed as per the typical cross-section RB 6443 above. This shall include the specified selected backfill, cable danger tape and concrete cable markers to indicate the cable routes.

5.3. Where existing tar roads are to be crossed cable sleeves shall be installed as per the typical cross-section above and the road then re-instated as per drawing B6477.

5.4. The cable installation will be as per the cable routes and termination points indicated on the applicable drawings above.

#### Cable Sleeves

5.5. The contractor shall be responsible for providing heavy duty PVC sleeves under paved areas, roads or in the vicinity of any pipelines which may be excavated for maintenance purposes. The size of sleeve shall be selected to ensure that it is not more than 70% occupied, after all cables have been installed.

#### Cable Sealing System

DESIGN, MANUFACTURE, SUPPLY, DELIVERY, INSTALLATION, COMMISSIONING AND PUTTING INTO SERVICE  
OF A LIGHTING SYSTEM FOR WORK PACKAGE ONE (1) - CONSTRUCTION OF TWO FILTER SAND STORAGE  
FACILITIES WORKS AREA1 AND WORKS AREA AT ZUIKERBOSCH PUMPING STATION

---

- 5.6. The contractor shall plan the cable entry into valve chambers by selecting the points where cable entry holes will be core drilled with due consideration for minimizing the cutting of reinforcing bars. To this end the contractor shall employ reinforcing bar detection techniques to locate reinforcing bars.
- 5.7. To prevent the ingress of water and other liquids and gases into buildings or structures the final installation will be sealed with expandable foam.

#### Cable Racking System

- 5.8. The contractor shall be responsible for the design, supply, delivery and installation of a cable racking system where cable support is required e g against concrete structures.
- 5.9. The system shall allow for any unistrut supports, straight lengths, bends, elbows, tees, reducers, fixing brackets, fixing materials and touch up cold galvanizing painting.

## 6. FILTER SAND STORAGE LIGHTING INSTALLATIONS

- 6.1. The lighting installations shall be designed in accordance with SANS 10114-1, SANS 10389-1 and The Occupational Safety and Health Act.
- 6.2. The lighting specification shall be as follows:

#### Exterior lighting:

Minimum maintained average illuminance level (lux)(E horizontal average)	20 lux
Minimum uniformity ratio: E minimum horizontal/ E horizontal average	0,25
Minimum uniformity ratio: E minimum horizontal/ E maximum horizontal	0,125
Maximum glare rating:	55

#### Interior lighting:

Minimum maintained illuminance, $E_m$ :	50 lux
Maximum Unified Glare rating, UGR max:	28
Minimum Colour Rendering Index, $R_a$ min	60

- 6.3. A maintenance factor of 0,8 shall be applied when designing the installation.
- 6.4. The entire installation shall be controlled by a photocell/daylight switch to switch on the installation under dark conditions. A manual bypass facility shall be provided to override the photocell when required.
- 6.5. Light fittings shall be of the energy efficient, long life LED type. The fitting application shall be of the bulkhead or low bay type, with the following requirements:
- 6.5.1. SABS approved.
  - 6.5.2. Corrosion resistant fitting, IP 65 rated
  - 6.5.3. Minimum lamp design life of 50 000 hours
  - 6.5.4. LED Wattage rating to suit the overall lighting design
  - 6.5.5. Internal protection circuits to safeguard the fittings against fluctuating voltages
  - 6.5.6. Powder coated, die cast aluminium, non-corrosive body



**DESIGN, MANUFACTURE, SUPPLY, DELIVERY, INSTALLATION, COMMISSIONING AND PUTTING INTO SERVICE  
OF A LIGHTING SYSTEM FOR WORK PACKAGE ONE (1) - CONSTRUCTION OF TWO FILTER SAND STORAGE  
FACILITIES WORKS AREA1 AND WORKS AREA AT ZUIKERBOSCH PUMPING STATION**

6.5.7. Non-discolouring, impact resistant diffuser attached to body with stainless steel screws

6.6. The installation shall be so planned that maintenance can be carried out efficiently and safely on the installation.

## **7. EARTHING SYSTEMS**

7.1. The Contractor shall connect all electrical equipment e.g. distribution boards, fittings, cable racking etc to the earthing system as applicable. All electrical equipment shall be earthed utilizing black insulated copper wire or copper coated steel conductor. No bare copper earth wire will be accepted.

7.2. The surge arrestors in the distribution boards shall be connected to earthing system.

7.3. The contractor shall assess the earth resistance at the installation to ensure that the earth resistance meets the minimum standards required from Rand Water and national standards.

## **8. APPLICABLE STANDARDS AND DRAWINGS**

### **8.1. LIST OF APPLICABLE DRAWINGS**

RB 6443	Typical Cable Trench Cross Sectional Layout
B 6477	Re-instatement details for black top road
RB_20146	Typical Cable Schedule, Electrical Cable Numbers and Details

### **8.2. RAND WATER STANDARDS**

DESCRIPTION	DETAILS
Electrical Engineering Standards For Electrical Drawings	RW-EES-002
General Electrical Specification For The Design And Selection Of Electrical Plant And Equipment	RW-00320-S-001
Rand Water Electrical Engineering Standard For Earthing and Suppression.	RW-00320-AS-116
Engineering Standard for the Control of Plant and Equipment	RW-00320-AS-488
Rand Water Standard Specification for Factory Built Assemblies of Low Voltage Switchgear and Control gear	SAM EAM 00001 Spec Rev 1
Rand Water General Specification for the Installation of Electrical Plant and Equipment	RW-00320-AS-496
General Electrical Specification For Building Lighting And Small Power Installations	SAM EAM 00003 Rev 1

### 8.3. NATIONAL AND INTERNATIONAL STANDARDS

#### 8.3.1. GENERAL

No	Standard No	Description
1.	SANS 1019	Standard voltages, currents and insulation levels for electricity supply
2.	SANS IEC 60529	Degrees of protection provided by enclosures (IP code)
3.	SANS 60050	International Electro technical vocabulary. Chapter 441: Switchgear, controlgear and fuses
4.	SABS ISO 9001, Parts I, II and III.	Quality systems
5.	SANS 1091	National colour standard for paint
6.	OHS Act	Occupational Health and Safety Act (Act 85 Of 1993)
7.	SANS 10142-1	The wiring of premises Part 1: Low-voltage installations

#### 8.3.2. CABLES AND CABLE INSTALLATION (LV, MV & EARTHING)

No	Standard No	Description
1.	SANS 1507	Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1900/3300 V)
2.	SANS 1507-1:	Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1900/3300 V) Part 1: General
3.	SABS 1507-2:	Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1900/3300 V) Part 2: Wiring cables
4.	SANS 1507-3:	Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1900/3300 V) Part 3: PVC distribution cables
5.	SANS 1507-4:	Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1900/3300 V) Part 4: XLPE cables
6.	SANS 1507-5:	Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1900/3300 V) Part 5: Halogen free distribution cables
7.	SANS 1507-6:	Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1900/3300 V) Part 6: Service cables
8.	SANS 10198-1	The selection, handling and installation of electric power cables of rating not exceeding 33 kV Part 1: Definitions and statutory requirements
9.	SANS 10198-2	The selection, handling and installation of electric power cables of rating not exceeding 33 kV Part 2: Selection of cable type and methods of installation
10.	SANS 10198-3	The selection, handling and installation of electric power cables of rating not exceeding 33 kV Part 3: Earthing systems - general provisions

**DESIGN, MANUFACTURE, SUPPLY, DELIVERY, INSTALLATION, COMMISSIONING AND PUTTING INTO SERVICE  
OF A LIGHTING SYSTEM FOR WORK PACKAGE ONE (1) - CONSTRUCTION OF TWO FILTER SAND STORAGE  
FACILITIES WORKS AREA1 AND WORKS AREA AT ZUIKERBOSCH PUMPING STATION**

11.	SANS 10198-4	The selection, handling and installation of electric power cables of rating not exceeding 33 kV Part 4: Current ratings
12.	SANS 10198-5	The selection, handling and installation of electric power cables of rating not exceeding 33 kV Part 5: Determination of thermal and electrical resistivity of soil
13.	SANS 10198-6	The selection, handling and installation of electric power cables of rating not exceeding 33 kV Part 6: Transportation and storage
14.	SANS 10198-7	The selection, handling and installation of electric power cables of rating not exceeding 33 kV Part 7: Safety precautions
15.	SANS 10198-8	The selection, handling and installation of electric power cables of rating not exceeding 33 kV Part 8: Cable laying and installation
16.	SANS 10198-9	The selection, handling and installation of electric power cables of rating not exceeding 33 kV Part 9: Jointing and termination of extruded solid dielectric-insulated cables up to 3,3 kV
17.	SANS 10198-10	The selection, handling and installation of electric power cables of rating not exceeding 33 kV Part 10: Jointing and termination of paper-insulated cables
18.	SANS 10198-11	The selection, handling and installation of electric power cables of rating not exceeding 33 kV Part 10: Jointing and termination of screened polymeric-insulated cables
19.	SANS 10198-12	The selection, handling and installation of electric power cables of rating not exceeding 33 kV Part 12: Installation of earthing system
20.	SANS 10198-13	The selection, handling and installation of electric power cables of rating not exceeding 33 kV Part 13: Testing, commissioning and fault location
21.	NRS 028	Cable lugs and ferrules for copper and aluminium conductors - Preferred requirements for applications in the electricity supply industry
22.	NRS 053	Accessories for medium-voltage power cables (3,8/6,6 kV to 19/33 kV)
23.	VC 8075	Safety of electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1 900/3 300 V)
24.	SANS 1574	Electric cables- Flexible cords and flexible cables

### 8.3.3.LOW VOLTAGE SWITCHGEAR

No	Standard No	Description
1.	SANS IEC 60439-1	Low voltage switchgear and controlgear assemblies Part 1: Type-tested and partially type-tested assemblies
2.	SANS IEC 60439-2	Low voltage switchgear and controlgear assemblies Part 2: Particular requirements for busbar trunking systems (busways)

**DESIGN, MANUFACTURE, SUPPLY, DELIVERY, INSTALLATION, COMMISSIONING AND PUTTING INTO SERVICE  
OF A LIGHTING SYSTEM FOR WORK PACKAGE ONE (1) - CONSTRUCTION OF TWO FILTER SAND STORAGE  
FACILITIES WORKS AREA1 AND WORKS AREA AT ZUIKERBOSCH PUMPING STATION**

3.	SANS IEC 60439-3	Low voltage switchgear and controlgear assemblies Part 3: Particular requirements for low voltage switchgear and controlgear assemblies intended to be installed in places where unskilled persons have access to their use- Distribution boards
4.	SANS IEC 60439-4	Low voltage switchgear and controlgear assemblies Part 4: Particular requirements for assemblies for construction sites (ACS)
5.	SANS IEC 60439-5	Low voltage switchgear and controlgear assemblies Part 5: Particular requirements for assemblies intended to be installed outdoors in public places- Cable distribution cabinets (CDC's) for power distribution in networks
6.	BS 5486-12:1989	Low-voltage switchgear and controlgear assemblies. Specification for particular requirements of type tested miniature circuit- breaker boards
7.	SANS IEC 60947-1	Low Voltage Switchgear and Control Gear Part 1: General Rules
8.	SANS IEC 60947-2	Low Voltage Switchgear and Control Gear Part 2: Circuit Breakers
9.	SANS IEC 60947-3	Low Voltage Switchgear and Control Gear Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units
10.	SANS IEC 60947-4-1	Low Voltage Switchgear and Control Gear Part 4: Contactors and motor-starters Section 1: Electromechanical contactors and motor-starters
11.	SANS IEC 60947-4-2	Low Voltage Switchgear and Control Gear Part 4: Contactors and motor-starters Section 2: A C semiconductor motor controllers and starters
12.	SANS IEC 60947-4-3	Low Voltage Switchgear and Control Gear Part 4: Contactors and motor-starters Section 3: A C semiconductor controllers and contactors for non motor starters
13.	SANS IEC 60947-5-1	Low Voltage Switchgear and Control Gear Part 5: Control Circuit devices and switching elements- Electromechanical control circuit devices
14.	SABS 763-1988	Hot dip (galvanized) zinc coating
15.	SABS 1473-1	Low-voltage switchgear and controlgear assemblies Part 1: Type-tested and partially type-tested assemblies
16.	SABS 1473-2	Low-voltage switchgear and controlgear assemblies Part 2: Busbar trunking systems
17.	SABS 1973-3	Safety of assemblies with a rated prospective short-circuit current of up to and including 10 kA
18.	SANS 1973-1	Low-Voltage Switchgear And Control Gear ASSEMBLIES Part 1: Type-Tested ASSEMBLIES With Stated Deviations And A Rated Short-Circuit Withstand Strength Above 10 kA Use with: SANS 60439-1:2004
19.	SANS 1973-3	Low-Voltage Switchgear And Control Gear ASSEMBLIES Part 3: Safety Of ASSEMBLIES With A Rated Prospective Short-Circuit Current Of Up To And Including 10 kA

**DESIGN, MANUFACTURE, SUPPLY, DELIVERY, INSTALLATION, COMMISSIONING AND PUTTING INTO SERVICE  
OF A LIGHTING SYSTEM FOR WORK PACKAGE ONE (1) - CONSTRUCTION OF TWO FILTER SAND STORAGE  
FACILITIES WORKS AREA1 AND WORKS AREA AT ZUIKERBOSCH PUMPING STATION**

20.	SANS 1973-7	Low-Voltage Switchgear And Control Gear ASSEMBLIES Part 7: Requirements For Testing Under Conditions Of Arcing Due To Internal Fault Use with: SANS 60439-1:2004
-----	-------------	---

#### 8.3.4. BUSBARS

No	Standard No	Description
1	SANS 1195	Busbars and Busbar Connections

#### 8.3.5. CIRCUIT BREAKERS & EARTH LEAKAGE PROTECTION

No	Standard No	Description
1.	VC 8035	Compulsory Specification for Earth Leakage Units
2.	VC 8036	Compulsory Specification for Circuit Breakers
3.	SANS 156	Moulded-case Circuit-Breakers
4.	SANS 767-1	Earth leakage protection units Part 1: Fixed earth leakage protection circuit-breakers
5.	SANS 767-2	Earth leakage protection units Part 1: Single phase, portable units

#### 8.3.6. SURGE ARRESTORS AND PROTECTION

No	Standard No	Description
1.	SANS 60099-4	Surge Arresters Part 4: Metal-Oxide Surge Arresters Without Gaps For A.C. Systems
2.	SANS 61643-1	Low-voltage surge protective devices Part 1: Surge protective devices connected to low-voltage power distribution systems - Requirements and tests
3.	SANS 61643-11	Low-voltage surge protective devices Part 11: Surge protective devices connected to low-voltage power systems - Requirements and test methods
4.	SANS 61643-12	Low-voltage surge protective devices Part 12: Surge protective devices connected to low-voltage power distribution systems - Selection and application principles
5.	SANS 61643-21	Low voltage surge protective devices Part 21: Surge protective devices connected to telecommunications and signalling networks - Performance requirements and testing methods
6.	SANS 61643-22	Low-voltage surge protective devices Part 22: Surge protective devices connected to telecommunications and signaling networks - Selection and application principles
7.	SANS 61643-321	Components for low-voltage surge protective devices Part 321: Specification for avalanche breakdown diode (ABD)

**DESIGN, MANUFACTURE, SUPPLY, DELIVERY, INSTALLATION, COMMISSIONING AND PUTTING INTO SERVICE  
OF A LIGHTING SYSTEM FOR WORK PACKAGE ONE (1) - CONSTRUCTION OF TWO FILTER SAND STORAGE  
FACILITIES WORKS AREA1 AND WORKS AREA AT ZUIKERBOSCH PUMPING STATION**

8.	SANS 61643-341	Components for low-voltage surge protective devices Part 341: Specification for thyristor surge suppressors (TSS)
9.	SANS 60099-1	Surge Arresters Part 1: Non-Linear Resistor Type Gapped Surge Arresters For A.C Systems
10.	SANS 60099-5	Surge arresters Part 5: Selection and application recommendations

#### 8.3.7.EARTHING

No	Standard No	Description
1.	SANS 0292	Earthing of low-voltage (LV) distribution systems
2.	SANS 0199	The design and installation of an earth electrode
3.	SANS 1063	Earth rods and couplers

#### 8.3.8.LIGHTING

No	Standard No	Description
1.	SANS 10114-1	Interior lighting Part 1: Artificial lighting of interiors
2.	SANS 10398-1	Exterior lighting Part 1: Artificial lighting of exteriors

#### 8.3.9.BUILDING ELECTRICAL INSTALLATIONS

No	Standard No	Description
1.	SANS 10142-1	The wiring of premises Part 1: Low-voltage installations
2.	SANS 1239	Plugs, socket outlets and couplers for industrial purposes