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TITLE SPECIFICATION FOR EARTH RODS AND COUPLERS

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**SPECIFICATION FOR EARTH RODS AND  
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## **FOREWORD**

Recommendations for corrections, additions or deletions should be addressed to the:

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2016

## **1 INTRODUCTION**

Earthing of power systems is an essential and integral part of City Power's electrical infrastructure. Failure of any part of the earthing system results in serious and potentially catastrophic consequences. It is therefore important to ensure that all earthing components comply with the required specifications and are of acceptable quality.

## **2 SCOPE**

This specification covers City Power's requirements for earth rods, couplers and associated bonding equipment as part of an earthing system in accordance with SANS 1063.

## **3 NORMATIVE REFERENCES**

The following documents contain provisions that, through reference in the text, constitute requirements of this specification. At the time of publication, the editions indicated were valid. All standards and specifications are subject to revision, and parties to agreements based on this specification are encouraged to investigate the possibility of applying the most recent editions of the documents listed below.

SANS 0199	Code of Practice for the design and installation of an earth electrode
SANS 1063	Earth rods, couplers and connections
IEEE 80	Guide for safety in AC substation grounding
SANS 807	Unwrought tough pitch coppers: Grade B tough pitch copper

## **4 DEFINITIONS AND ABBREVIATIONS**

The definitions and abbreviations in the normative reference documents shall apply to this specification.

## **5 REQUIREMENTS**

### **5.1 General**

- 5.1.1 The methods of coupling shall be mechanical coupling; and welded coupling.
- 5.1.2 The equipment shall be able to withstand corrosion for a period of up to 40 years.
- 5.1.3 The components shall be designed for use in a system that may be either solidly or resistively earthed.
- 5.1.4 The components will be installed in areas subject to frequent high intensity lightning storms and shall be able to carry lightning and fault currents adequately.
- 5.1.5 The earth rods shall be suitable for use with an exothermic welding system, as described in IEEE 80.

## **5.2 Mechanical requirements**

### **5.2.1 Percussion strength**

The rod shall not show any evidence of cracking of the rod, belling or splitting of the coupler, loosening of tapered joints, or, stripping of threads.

### **5.2.2 Tensile strength**

The rod or the coupler and the rod shall withstand, without breaking or separating, at a load of 10 kN.

### **5.2.3 Bending strength**

When an extended rod is bent there shall be no evidence of cracking of the rod, cracking, belling or splitting of the coupler, loosening of tapered joints, or stripping of threads.

## **5.3 Earth Rods**

5.3.1 The steel-cored copper rods (copper-sheathed steel rods) shall comply fully with SANS 1063 and shall bear the SANS mark.

5.3.2 These rods shall have 250 micron layer of 99.9% electrolytic copper. A low carbon steel core shall be used with a high tensile strength.

5.3.3 The earth rods shall have a nominal length of 1,5m and 3m as per schedule A in Annexure C.

5.3.4 Any deviation from straight of an earth rod shall not exceed 2 mm per metre of length.

5.3.5 The ends of an earth rod shall be chamfered to between 45° to 60° to the vertical. The driven end shall be chamfered over a length of 1 mm to 2 mm, and the other end, which is intended to be driven into the ground, over a length of 4 mm to 6 mm.

5.3.6 The earth rods shall have a nominal diameter of 16 mm.

5.3.7 Both ends of each earth rod shall be provided with M16 rolled threads which shall be suitable for coupling with another earth rod using the coupler specified in clause 4.3 of this specification.

5.3.8 The average thickness of the copper coating on the earth rod (except for the threaded portions and on the chamfered and cut-off ends) shall be at least 250 µm, and the thickness of the copper coating shall at no point be less than 200 µm.

## **5.4 Couplers**

5.4.1 The couplers shall comply fully with SANS 1063 and shall bear the SANS mark.

5.4.2 Couplers shall be made of bronze material.

5.4.3 The couplers shall have an M16 internal thread that allows connection to the threaded ends of the earth rods.

## **6 TESTS**

6.1. The earth rods and couplers shall have been tested in accordance with the requirements of SANS 1063:2011 which details the following:

- 6.1.1        Percussion strength test;
- 6.1.2        Tensile strength test and
- 6.1.3        Bending strength test

## **7 PACKAGING AND MARKING**

### **7.1 Packaging**

- 7.1.1.        Earth rods shall be securely strapped or bound together in bundles of ten.
- 7.1.2.        The ends of each rod shall be wrapped or covered in protective material to prevent damage during handling, transportation and storage.
- 7.1.3.        Couplers shall be delivered in suitable cardboard boxes containing fifty couplers each.

### **7.2 Marking**

Each rod and coupler shall be legibly and indelibly marked with the manufacturer's name or tradename or trade mark (or any combination of these).

## **8 DOCUMENTATION**

- 8.1. Certification that the accessories provided are suitable for use with the exothermic welding system shall be provided.
- 8.2. Detailed test reports confirming compliance with SANS 1063 shall be provided.
- 8.3. In addition to the documentation required above, full technical information relating to the performance, construction, installation, etc of the earth rods and couplers shall be supplied.

## **9 TRAINING**

- 9.1. The following training courses shall be offered to City Power's staff:
  - 9.1.1. Correct handling and installation of the earth rods, copper-clad conductors and couplers.
  - 9.1.2. Correct use of the bending tool.
- 9.2. The associated costs for the certified training courses in 8.1 shall be given per person and shall be fixed for the period of the contract.

## **10 QUALITY MANAGEMENT**

A quality management system shall be set up in order to assure the quality during manufacture, installation, removal, transportation and disposal. Guidance on the requirements for a quality management system may be found in the following standards: ISO 9001:2015. The details shall be subject to agreement between the purchaser and supplier.

## **11 HEALTH AND SAFETY**

A health and safety plan shall be set up in order to ensure proper management and compliance during manufacture, installation, removal, transportation and disposal. Guidance on the requirements of a health and safety plan shall be found in OHSAS 18001:2007/ ISO 45001:2018 standards. The details shall be subject to agreement between City Power and the Supplier.

## **12 ENVIRONMENTAL MANAGEMENT**

An environmental management plan shall be set up in order to ensure the proper environmental management and compliance is adhered to during manufacture, installation, removal, transportation and disposal. Guidance on the requirements for an environmental management system shall be found in ISO 14001:2015 standards. The details shall be subject to agreement between City Power and the Supplier. This is to ensure that the asset created conforms to environmental standards and City Power SHERQ Policy.

### **Annexure A - Bibliography**

SCSASACH1: 2001, ESKOM STANDARD FOR UTILIZING COPPER CLAD STEEL AS EARTH TAILS FOR DISTRIBUTION SUBSTATIONS IN HIGH COPPER THEFT AREAS.

EThekwini Electricity specification for earth rods, couplers and clamps

**Annexure B - Revision information**

<b>DATE</b>	<b>REV. NO.</b>	<b>NOTES</b>
Mar 2003	0	First issue
November 2012	1	Updated logos and Title edited  Introduction updated(SABS to SANS)  <b>Scope edited</b>  Normative references updated  Definition and abbreviations edited  4.1 Requirements updated  Tests edited  Packaging and marking updated  Documentation edited  Training edited  Quality management edited  Environmental management included
August	2	Introduction updated  Quality management edited  Health and Safety Included  Environmental management edited

**Annexure C - Technical schedules A and B for Earth Rods 1.5m (SAP 7088)**

Schedule A: Purchaser's specific requirements

Schedule B: Guarantees and technical particulars of equipment offered

Item	Subclause of CP_TSSPEC_056	Description	Schedule A	Schedule B
1		Name of manufacturer	XXXX	
2		Place of manufacture	XXXX	
3		Manufacturer's identification reference	XXXX	
4	5.3.1	Specification to which earth rod complies	SANS 1063	
		<b>General</b>		
5	5.1.1	Method of coupling	Mechanical and weld	
6	5.1.2	Corrosion withstand	40	Years
7	5.1.5	Earth rods compatible to exothermic welding	Yes	Yes/No
		<b>Mechanical requirements</b>		
8	5.2.1	Comply to percussion strength (Test report included)	Required	
9	5.2.2	Comply to tensile strength	10 kN	
10	5.2.3	Comply to bending strength (Test report included)	Required	
11	5.3.2	Thickness copper on steel core	250	micron
12	5.3.3	Length of earth rod	1.5	m
13	5.3.5	Comply to angle requirements in clues 4.3.5	Yes	Yes/No
14	5.3.6	Earth rod diameter	16	mm
15	5.3.7	Nominal diameter of thread earth rod	M16	
16	6	Tests comply to SANS 1063 (Report)	Required	Yes/No

**Note: Ticks, Cross [√, X], Astrick [\*], Word [Noted] or TBA ["To Be Advice"] will not be accepted.**

Tender Number: \_\_\_\_\_

Tenderer's Authorised Signatory: \_\_\_\_\_

Name in block letters Signature

**SPECIFICATION FOR EARTH RODS AND  
COUPLERS**

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Full name of company: \_\_\_\_\_

**Annexure C - Technical schedules A and B for Earth Rods 1.5m (SAP 7088)  
Continues**

Item	Sub clause of CP_TSSPEC_056	Description	Schedule A	Schedule B
		<b>Packaging and Marking</b>		
17	7.1	Comply to packaging requirements      Yes/No	Yes	
18	7.2	Comply to marking requirements      Yes/No	Yes	
19	8	Documentation provided      Yes/No	Yes	
20	9	Training required      Yes/No	Yes	
21	10	Quality management accreditation      Yes/No	Yes	
22	12	Environmental management accreditation      Yes/No	Yes	

**Note: Ticks, Cross [√, X], Astrick [\*], Word [Noted] or TBA ["To Be Advice"] will not be accepted.**

Tender Number: \_\_\_\_\_

Tenderer's Authorised Signatory: \_\_\_\_\_  
Name in block letters Signature

Full name of company: \_\_\_\_\_

**Technical schedules A and B**

**Deviation schedule**

**Any deviations offered to this specification shall be listed below with reasons for deviation. In addition, evidence shall be provided that the proposed deviation will at least be more cost-effective than that specified by City Power.**

Item	Sub-clause of CP_TSSPEC_056	Proposed deviation

Tender Number: \_\_\_\_\_

Tenderer's Authorised Signatory: \_\_\_\_\_  
Name in block letters Signature

Full name of company: \_\_\_\_\_

**Annexure C - Technical schedules A and B for Earth Rods 3m (SAP 496)**

**Schedule A: Purchaser's specific requirements**

**Schedule B: Guarantees and technical particulars of equipment offered**

Item	Sub clause of CP_TSSPEC_056	Description	Schedule A	Schedule B
1		Name of manufacturer	XXXX	
2		Place of manufacture	XXXX	
3		Manufacturer's identification reference	XXXX	
4	5.3.1	Specification to which earth rod complies	SANS 1063	
		<b>General</b>		
5	5.1.1	Method of coupling	Mechanical and weld	
6	5.1.2	Corrosion withstand	40	Years
7	5.1.5	Earth rods compatible to exothermic welding	Yes	Yes/No
		<b>Mechanical requirements</b>		
8	5.2.1	Comply to percussion strength (Test report included)	Required	
9	5.2.2	Comply to tensile strength	10 kN	
10	5.2.3	Comply to bending strength (Test report included)	Required	
11	5.3.2	Thickness copper on steel core	250	micron
12	5.3.3	Length of earth rod	3	m
13	5.3.5	Comply to angle requirements in clues	Yes	Yes/No
14	5.3.6	Earth rod diameter	16	mm
15	5.3.7	Nominal diameter of thread earth rod	M16	
16	6	Tests comply to SANS 1063 (Report)	Required	Yes/No

**Note: Ticks, Cross [√, X], Astrick [\*], Word [Noted] or TBA ["To Be Advice"] will not be accepted.**

Tender Number: \_\_\_\_\_

Tenderer's Authorised Signatory: \_\_\_\_\_  
Name in block letters Signature

Full name of company: \_\_\_\_\_

**Annexure C - Technical schedules A and B for  
Earth Rods 3m (SAP 496) Continues**

**Schedule A: Purchaser's specific requirements**

**Schedule B: Guarantees and technical particulars of equipment offered**

Item	Sub clause of CP_TSSPEC_056	Description		Schedule A	Schedule B
		<b>Packaging and Marking</b>			
17	7.1	Comply to packaging requirements	Yes/No	Yes	
18	7.2	Comply to marking requirements	Yes/No	Yes	
19	8	Documentation provided	Yes/No	Yes	
20	9	Training required	Yes/No	Yes	
21	10	Quality management accreditation	Yes/No	Yes	
22	12	Environmental management accreditation	Yes/No	Yes	

**Note: Ticks, Cross [√, X], Astrick [\*], Word [Noted] or TBA ["To Be Advice"] will not be accepted.**

Tender Number: \_\_\_\_\_

Tenderer's Authorised Signatory: \_\_\_\_\_  
Name in block letters Signature

Full name of company: \_\_\_\_\_

**Technical schedules A and B**

**Deviation schedule**

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Item	Sub-clause of CP_TSSPEC_056	Proposed deviation

Tender Number: \_\_\_\_\_

Tenderer's Authorised Signatory: \_\_\_\_\_  
Name in block letters Signature

Full name of company: \_\_\_\_\_

**Annexure C - Technical schedules A and B for Couplers (SAP 497)**

**Schedule A: Purchaser's specific requirements**

**Schedule B: Guarantees and technical particulars of equipment offered**

Item	Sub-clause of CP_TSSPEC_056	Description	Schedule A	Schedule B
1		Name of manufacturer	XXXX	
2		Place of manufacture	XXXX	
3		Manufacturer's identification reference	XXXX	
4	5.4.1	Specification to which coupler complies	SABS 1063	
6	5.4.2	Material of coupler	Bronze	
7	5.4.3	Internal diameter of coupler	M16	
8	6	Tests comply to SANS 1063 (Report)                      Yes/No	Required	
<b>Packaging and Marking</b>				
9	7.1	Comply to packaging requirements                      Yes/No	Yes	
10	7.2	Comply to marking requirements                      Yes/No	Yes	
11	8	Documentation provided                      Yes/No	Yes	
12	9	Training required                      Yes/No	Yes	
13	10	Quality management accreditation                      Yes/No	Yes	
14	12	Environmental management accreditation                      Yes/No	Yes	

**Note: Ticks, Cross [√, X], Astrick [\*], Word [Noted] or TBA ["To Be Advice"] will not be accepted.**

Tender Number: \_\_\_\_\_

Tenderer's Authorised Signatory: \_\_\_\_\_  
Name in block letters Signature

Full name of company: \_\_\_\_\_

**Technical schedules A and B**

**Deviation schedule**

**Any deviations offered to this specification shall be listed below with reasons for deviation. In addition, evidence shall be provided that the proposed deviation will at least be more cost-effective than that specified by City Power.**

Item	Sub-clause of CP_TSSPEC_056	Proposed deviation

Tender Number: \_\_\_\_\_

Tenderer's Authorised Signatory: \_\_\_\_\_  
Name in block letters Signature

Full name of company: \_\_\_\_\_

**Annexure D – Stock Items**

**Material Group: NET-ACCS**

<b>Item</b>	<b>SAP No.</b>	<b>SAP Short Description</b>	<b>SAP Long Description</b>
1.	7088	EARTH ROD 1,5 M	EARTH ROD, COPPER CLAD STEEL, M16, SUITABLE FOR USE WITH EXOTHERMIC WELDING SYSTEM, 1,5 M LENGTH. ITEM SPECIFICATION NO. CP_TSSPEC_056.
2.	496	EARTH ROD 3,0 M	EARTH ROD, M16, SUITABLE FOR USE WITH EXOTHERMIC WELDING SYSTEM, 3,0 M LENGTH. ITEM SPECIFICATION NO. CP_TSSPEC_056.
3.	497	EARTH ROD COUPLER	COUPLER, BRONZE, M16, FOR USE WITH EARTH ROD. ITEM SPECIFICATION NO. CP_TSSPEC_056.