Eskom	Standard	Technology

Title: **STANDARD FOR HV YARD STONES IN ESKOM SUBSTATIONS**

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Content

1. Introduction

This document prescribes the minimum requirements for substation HV yard stone to be used in Eskom substations. Every substation HV yard terrace should have a high resistive covering to increase the resistance of the current path through the body for personnel safety, reduce weed growth and help the ground to retain moisture.

2. Supporting Clauses

2.1 Scope

This specification covers the requirements for the stone surfacing of the yard.

2.1.1 Purpose

The purpose of this document is to provide a detail specification of the yard stone to be used within Eskom Substations.

2.1.2 Applicability

This document shall apply throughout Eskom Holdings Limited Divisions.

2.2 Normative/Informative References

2.2.1 Normative

[1] ISO 9001 Quality Management Systems.

[2] SANS 1083:2014, Aggregates from natural sources

[3] SANS 3002:2012, Aggregates crushing value of coarse aggregates

[4] TJ Marais, Investigation into the electrical properties of crusher stone used in substation earthing systems (Cigre IEC International Symposium – South Africa 2015)

2.2.2 Informative

[5] DST 34-1245, Distribution Standard – Part 2: Earthing Section 3: Substation Earthing

[6] TST41-877, Transmission Design Earthing Standard

2.3 Definitions

2.3.1 General

Definition	Description
Crusher run (road construction material)	Ungraded mixture of rock fragments and sand
Mod AASHTO	Modification of the laboratory test of finding the optimum moisture content (OMC) and maximum density under a standard compaction energy input as stipulated by the American Association of State Highway and Transportation Officials.
Operating Unit	In this document the term refers to either a Distribution Operating Unit or a Transmission Grid

Definition	Description
Resistivity	Intrinsic property of a material that is measured as its resistance to current per unit length for a uniform cross section. This quantity is generally specified in Ohms metre (Ωm).
Sieve Analysis	The determination of the proportions of particles within certain size ranges in a granular material by separation on sieves of different size openings.
X-ray Diffraction	A non-destructive analytical technique which can yield the unique fingerprint of Bragg reflections associated with a crystal structure

2.3.2 Disclosure classification

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

2.4 Abbreviations

Abbreviation	Description
AGG	Aggregates
HT	High Tensile
HV	High Voltage
kN	kilo Newton
m	metre
mm	millimetre
OU	Operating Unit
SANS	South African National Standard
XRD	X-ray Diffraction

2.5 Roles and Responsibilities

Designers & the Asset Owner (respective OUs) should ensure that this specification is adhered to for all Eskom Substations. This applies to both new and existing substations.

The contractor shall be responsible for the provision of all services associated with the concept and implementation of the quality assurance control.

2.6 Process for monitoring

Not applicable.

2.7 Related/Supporting Documents

Not applicable.

3. Requirements

3.1 Stone

Crushed stone shall be clean, hard, durable and sound crushed (granite) stone of aggregate size between 26,5mm and 37,5mm nominal size as stipulated in [2] and should have a wet resistivity value of at least 3000Ωm. Prior to acceptance of any crushed stone the aggregate report shall be submitted to the Substation Design Engineer for approval. The aggregate report shall include the grading result from the sieve analysis, wet resistivity values (refer to [4]) and an XRD analysis of the stone.

The above together with samples of the stone shall be submitted in good time to the design engineer for approval and no stone, other than the samples, shall be delivered to the site before the Site Supervisor's written approval has been obtained after consultation with the design engineer.

No crusher-run (road construction material or stone from mining activities (contaminated with chemicals)) will be accepted as yard stone.

3.2 Construction

3.2.1 Surface Preparation

After the completion of the earthworks and just before the application of the stone surfacing the Contractor shall clear the area of all vegetation growth and ensure that the underlying wearing course layer is levelled to match required terrace levels and slopes, than re-compact to 93% Mod AASHTO density.

3.2.2 Laying of Stone

The stone shall be spread over the compacted surface of the yard, levelled and lightly rolled to a finished thickness of at least 100 mm or as otherwise specified in the design drawings and/or document.

3.2.3 Tolerances

The average finished thickness of the stone layer shall be at least 100 mm or as otherwise specified in the design and nowhere shall the finished thickness be less than 10 mm less than the specified finished thickness.

3.2.4 Contractor's Equipment

The Contractor shall ensure the provision of suitable construction equipment for the spreading of the stone in compliance with the requirements of the specification.

3.3 Measurement and Payment

The rates as scheduled in the Bill of Quantities shall cover the cost of all activities, labour, materials and testing required for the provision of the relative item in accordance with the design/drawings and specifications.

4. Authorisation

This document has been seen and accepted by:

Name and surname	Designation
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5. Revisions

Date	Rev	Compiler	Remarks
Feb 2017	1	Z.I Mkhize	New document required

6. Development team

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

- Zinhle Mkhize
- Dawie Senekal
- Thato Seatlholo

7. Acknowledgements

Krishna Naidoo, Mohammad Nabbie and Theunus Marais for inputs