

Title: **ZINC-COATED STRANDED STEEL WIRE CONDUCTORS AND STAYS FOR DISTRIBUTION LINES** Unique Identifier: **240-75883116**
Alternative Reference Number: **34-1213**

Area of Applicability: **Engineering**

Documentation Type: **Standard**

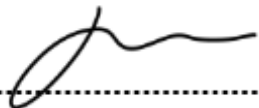
Revision: **2**

Total Pages: **15**

Next Review Date: **September 2029**

Disclosure Classification: **Controlled Disclosure**

Compiled by

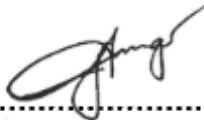


Lucy Sangweni

Chief Engineer- HV Lines Engineering

Date: 18/09/2024

Approved by



Mfundu Songo

Senior Manager: Technology & Engineering

Date: 18 September 2024

Authorized by

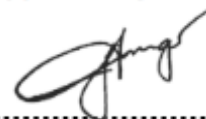


Al' Louise Van Deventer

General Manager: Technology & Engineering

Date: 19 September 2024

Supported by SCOT/SC



Mfundu Songo

SCOT/SC Chairperson

Date: 19 September 2024

Content

	Page
1. Introduction	3
2. Supporting clauses	3
2.1 Scope	3
2.1.1 Purpose	3
2.1.2 Applicability	3
2.2 Normative/informative references	3
2.2.1 Normative	3
2.2.2 Informative	3
2.3 Definitions	4
2.3.1 General	4
2.3.2 Disclosure classification	4
2.4 Abbreviations	4
2.5 Roles and responsibilities	4
2.6 Process for monitoring	4
2.7 Related/supporting documents	4
3. Requirements	4
3.1 General	4
3.2 Product	5
3.2.1 Fabrication	5
3.2.2 Joints	5
3.2.3 Greasing	6
3.3 Packaging requirements	6
3.4 Standard drum sizes	6
4. Tests	7
5. Marking and labelling	7
5.1 Stranded Steel Wire Conductor Marking	7
5.2 Drum Marking	8
5.3 Drum Label	8
6. Authorization	9
7. Revisions	9
8. Development team	9
9. Acknowledgements	9
Annex A – Impact assessment	10
Annex B – Stranded Steel Wire Conductor Marking	13
Annex C – The Eskom signature – printing guide and format	14
Annex D – Typical hybrid drum showing Eskom branded flange	15

Tables

Table 1: Steel wire general information	5
Table 2: Standard drum sizes for stranded steel wire conductor	7

1. Introduction

This document details the technical requirements of overhead powerline zinc coated steel wires for Eskom Distribution.

2. Supporting clauses

2.1 Scope

This specification covers the technical requirements for zinc-coated steel wire conductors , guys and stay wires for use on Eskom Distribution overhead powerlines.. Details of particular requirements are given in schedule A of the enquiry document. Unless otherwise stated, the requirements shall be in accordance with SANS 182-5. Deviations and additions to the Normative specifications referenced in this document are specified.

2.1.1 Purpose

This document outlines technical, manufacturing and testing requirements relating to zinc coated steel wire for conductors and stays.

2.1.2 Applicability

This document shall apply throughout Eskom Distribution Division.

2.2 Normative/informative references

2.2.1 Normative

Parties using this specification shall apply the most recent edition of the documents listed below:

- [1] SANS 182-5:2001, Conductors for overhead electrical transmission lines, Part 5: Zinc-coated steel wires for conductors and stays.
- [2] IEC 60888: 1987, Zinc-coated steel wires for stranded conductors.
- [3] SANS 61089: 1991, Round wire concentric lay overhead electrical stranded conductors.
- [4] IEC 61394: 1997, Characteristics of greases for aluminium, aluminium alloy and steel bare conductors.
- [5] SANS 935:2007, *Hot-dip (galvanised) zinc coatings on steel wire*.
- [6] SANS 61089:1991. *Round wire concentric lay overhead electrical stranded conductors*.
- [7] SANS 10005: 2006. *The preservative treatment of timber*.
- [8] SANS 1288: 2007. Preservative-treated timber.
- [9] ISPM 15: Guidelines for regulating wood packaging material in international trade.
- [10] 240-47172520 TRMSCAAC5.2: The Standard for the construction of overhead power lines.
- [11] 32-644: Eskom documentation management standard.
- [12] 240-75670386: Operating Manual of the Steering Committee for Technologies (SCOT).

2.2.2 Informative

None

2.3 Definitions

2.3.1 General

Definition	Description
Bare conductor	A conductor without any insulating covering
Conductor	An electrical conductor arranged to be electrically connected to a source of electrical energy.
Direction of lay	Industry Association Resource Centre
Lay ratio	The ratio of the axial length of a complete turn of the helix formed by an individual wire of a stranded conductor to the external diameter of the helix. (SANS 182-5: Definitions)

2.3.2 Disclosure classification

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

2.4 Abbreviations

Abbreviation	Description
CCA	Copper Chrome Arsenic
GSW	Galvanized steel wire.
KA	Kilo amperes
OHSACT	The Occupational Health and Safety Act, 1993 (Act 85 of 1993)
QITP	Quality Inspection Test Plans
UTS	Ultimate tensile strength.

2.5 Roles and responsibilities

It is the responsibility of the engineers, commercial representatives, end user and manufacturers to completely abide by the criteria set out in this standard together with the requirements mentioned in the referenced documentation.

2.6 Process for monitoring

This document will be reviewed once every five years.

2.7 Related/supporting documents

See Point 2.2 above.

3. Requirements

3.1 General

Nothing in this specification shall lessen the obligations of the supplier detailed in any other document forming part of any order.

3.2 Product

The wire nominal diameter, size and construction, material grade and ultimate tensile strength shall be as specified in schedule Table 1 below.

Table 1: Steel wire general information

Item Description	SAP No.	Buyers Guide No.	No of Strands	Diameter of Strand (mm)	Nominal overall Diameter (mm)	Mass kg/km	St wire Tolerance (mm/strand)	Max Tension (kN)
3x3,35 (1100MPa)	SAP No. 0163344	D DT 3124	3	3,35	7,22	206	± 0,08	29,1
7x4,00 (1100MPa)	SAP No. 0401337	D DT 3124	7	4,00	12,00	686	± 0,09	96,8
3x3,35 (1100MPa)	SAP No. 0163345	D DT 3124	3	3,35	7,22	206	± 0,08	29,1
7x4,00 (1100MPa)	SAP No. 0163343	D DT 3124	7	4,00	12,00	686	± 0,09	96,8
3x4,00 (1100MPa)	SAP No. 0185944	D DT 7036	3	4,00	8.8	294	± 0,09	41.157
19/2,65 (1100MPa)	SAP No. 401339	D DT 7036	19	2,65	13,25	817	± 0,07	115,3
7/3,35 (1100MPa)	SAP No. 401341	D DT 7036	7	3,35	10.3	481	± 0,08	67,9
7/3.51 (1290 MPa)	SAP No. 595551	D-DT 7036	7	3.51	10.53	532	± 0,09	87.4
19/2.7 (1310 MPa)	SAP No. 595552	D-DT 7036	19	2.7	13.48	852	± 0,07	142.5
Minimum bending factor = 30D								

3.2.1 Fabrication

Fabrication shall be in accordance with SANS 182-5.

3.2.2 Joints

- a) There shall be no joint in the individual wires of a stranded conductor consisting of less than seven wires.
- b) Joints shall be permitted in individual wires of a conductor having seven or more wires provided that:
 - 1) no two such joints are less than 15 m apart.
 - 2) the joints are made by resistance butt welding or by other acceptable means.
 - 3) the joints are protected from corrosion by recoating with zinc, and
 - 4) the diameter of a strand is not increased materially by the presence of a joint.

3.2.3 Greasing

Steel wire used for coastal and other polluted environments shall be greased using Eskom accepted conductor grease using case 4 method as per SANS 61089. All voids between the strands shall be filled with grease except the exterior part of the outermost layer of strands forming the outer surface. (See Grease Bulletin 03TB-07 for list of Accepted greases). An alternative grease offer shall be considered subject to documented proof of positive test results as per IEC 61394 requirements.

3.3 Packaging requirements

- a) The length of the wire on each drum for each item shall be in accordance with the length specified in the item description and as stated in table 2.
- b) All steel wire of length exceeding 100 metres shall be supplied on returnable hybrid (steel and wood) drums.
- c) For multi-layered constructions the steel wire shall be wound onto the drums to form complete layers. Each layer shall fill the width of the drum before the next layer is wound on. Drums not wound in this manner shall be rejected. Conductor drums where steel wire gets damaged when taken off the drum due to an incorrectly wound conductor shall be replaced by the manufacturer.
- d) An acceptable method of holding the conductor end shall be used, to ensure that no relative movement of steel wire occurs between the uppermost uncompleted layer and the completed layer directly below it. Details of the proposed holding method shall accompany the tender offer, and shall be subject to Eskom's approval.
- e) Heavy weatherproof paper, cardboard or other suitable material shall be placed between the steel wire and barrel and flange surfaces of steel drums. This material shall remain attached to the drum during unreeling.
- f) Imported steel wire shall have weatherproof material inserted between the two outermost layers of steel wire and wrapped over the outermost layer. The supplier of imported steel wire shall arrange the arrival dates and times of shipments with Eskom Distribution Quality Assurance so that the steel wire can be land-tested before it is released.
- g) Timber for wooden cable drums shall be treated with CCA (Copper Chrome Arsenic in accordance with SANS 10005: 2006 Table 3 (Hazard Class = H3).

3.4 Standard drum sizes

For hybrid drums, ANNEXURE D (D-DT 7356) and Table 2 provide guidelines on the typical design and dimensions to which the hybrid drums must conform. Drum sizes for zinc coated steel wire conductors not mentioned in Table 2, must be designed to satisfy the bending factor criteria and Annex D design. These designs must be submitted to Eskom for approval before production starts. The main criteria for the drum design is that it must be hybrid and the spindle size must have an inside diameter of 92 mm. Where drum lengths that are requested for supply either differ or are non-standard for zinc-coated steel wire conductors that are shown in Table 2, the supplier must indicate if, and if requested to, show via submitted drum designs that, the new total length and drum size are acceptable for drumming and supply according to bending factor and spindle size criteria.

Table 2: Standard drum sizes for stranded steel wire conductor

1	2	3	4	5	6	7	8	9
Steel wire Stranding and Grade	SAP No.	Diameter (mm)	Length (m)	Drum size				
				Flange diameter (mm)	Barrel diameter (mm)	Width (mm)	Flange thickness (mm)	Spindle hole diameter (mm)
3x3,35 (1100MPa)	0163344	7.22	100m Roll	-	-	-	-	-
7x4,00 (1100MPa)	0401337	12.00	100m Roll	-	-	-	-	-
3x3,35 (1100MPa)	0163345	7.22	1500	740	450	470	50	92
7x4,00 (1100MPa)	0163343	12.00	1500	890	450	645	50	92
3x4,00 (1100MPa)	0185944	8.8	1500	740	450	470	50	92
19x2,65 (1100MPa)	401339	13.25	1500	890	450	645	50	92
7x3,35 (1100MPa)	401341	10.3	1500	890	450	645	50	92
7/3.51 (1290MPa)	595551	10.3	1500	890	450	645	50	92
19/2.7 (1310MPa)	595552	13.48	1500	890	450	645	50	92
Minimum bending factor = 30D								

4. Tests

All Electrical and Mechanical tests shall be conducted according to SANS 182-5 Clause 8 and all sub-clauses inclusive. The tests as part of manufacturing routine shall be conducted in-house.

The manufacturer / supplier shall also have independent type tests performed at SANAS accredited test facilities.

5. Marking and labelling

5.1 Stranded Steel Wire Conductor Marking

Only marked steel wire conductors shall be used on Eskom projects. Marked steel wire conductors shall be procured only from Eskom approved suppliers.

Each wire shall be marked with two uniform longitudinal indentations, situated 180° opposed, along its entire length. A deviation angle of 5 to 15 degrees below 180° shall be allowed to ensure proper contact between indent ring and wire. The dimension of the indent mark shall be 0.3 mm wide and the groove depth from 0.15 mm down to 0.11 mm. The marking rollers shall undergo periodic dimension checking to ensure that the marking groove dimensions are within the specified limits (ANNEXURE B). The indentations shall be performed after the wire drawing process, but before stranding. The indentations shall be clearly visible and shall not affect the original wire characteristics, distort the wire roundness or leave any sharp protrusions. The marking is protected by patent laws and shall therefore be unique to and accepted by Eskom, prior to the first production run.

5.2 Drum Marking

- a) Drums and rolls of steel wire shall be marked as per SANS 182-5 Clause 6.2.1
- b) The drums and rolls shall be marked in black stencilled lettering and numerals of 50 mm height on the drum side or label plate attached to a steel wire roll, e.g., “19/2.65 – 1 500m – 225kg”.
- c) All drum markings pertaining to a previous order shall be painted over or otherwise satisfactorily obliterated.
- d) All steel wire drums destined for Eskom projects shall be branded with Eskom signature (logo and logotype) on one of its flat sides (the flange).

The Eskom signature shall be printed in Eskom Blue or Black only on the white-coloured background.

For metal drums and wooden drums, a portion of the flange surface shall be painted in white to provide rectangular background on which the signature shall be printed in Eskom Blue or Black only. The width (or height) of the white rectangular background shall be three times the diameter of the “circle” part of the Eskom signature. The printed Eskom signature shall appear central onto the white rectangular background leaving a space equal to one signature “circle” on both front and back ends.

The Eskom logo printing shall be made using silkscreen technique or other equivalent techniques which shall be demonstrated to and approved by Eskom - IARC.

The dimensions of complete Eskom signatures shall be a minimum length and width (height) of 82 mm and 21 mm respectively.

All other printing on the flange shall be positioned so as to ensure a minimum clearance of one logo “circle” diameter away from the Eskom signature.

The copy of the Eskom signature and standard printing guidelines are shown in Annex C.

- e) **Red Round Mark:** The Opposite end of a conductor drum (not bearing the Eskom logo) shall be marked (stamped) with a red circle of 200mm diameter to augment the logo for forensic purposes.

5.3 Drum Label

The drum label shall consist of the following minimum information for all steel wires supplied to Eskom.:

- Matched sets to be marked.
- Measured length.
- Nett mass.
- Gross mass.
- Order number.
- Conductor type.
- Greased or non-greased.
- Eskom Logo and signature.
- Red dot.
- Drum rolling direction.

6. Authorization

This document has been seen and accepted by:

Name and surname	Designation
Al' Louise Van Deventer	General Manager: Technology and Engineering
Mfundu Songo	Senior Manager: Technology and Engineering
Lucy Sangweni	High Voltage Overhead Lines Study Committee Chairperson
Matthews Baloyi	Overhead Powerlines Conductor Care Group Convener
Pravind Orrie	Asset Creation Senior Manager-Limlanga Cluster
Brenda Cebekhulu	Asset Creation Senior Manager-Central East Cluster
Thandiwe Nkambule	Asset Creation Senior Manager- Gauteng Cluster
Paul Matiwani	Asset Creation Senior Manager-Cape Coastal Cluster

This specification shall apply throughout Eskom Distribution division, subsidiaries and entities wherein Eskom Distribution has a controlling interest.

7. Revisions

Date	Rev	Compiler	Remarks
Sept 2024	2	Lucy Sangweni	Updated Introduction, purpose, and applicability information. Added hybrid conductor drum information and deleted wooded drum drawing. Steel wire conductor marking for Eskom conductor identification information, added. Revised Tables 1 and 2 to reflect the additional steel wires 7/3.51 and 19/2.7. Updated SAP numbers for steel wires 7/4.00, 7/3.35 and 19/2.65.
March 2017	1	K Rozmiarek	Document reformatted on to new template, with new document number. No content change. This document supersedes document DSP_34-1213. Abbreviation IARC removed.
Jan 2012	1	M Rapapa	3 year review
Jan 2008	0	M Rapapa	Revised to conform to the standard IARC Technical Specification Document and Normative references updated.

8. Development team

- Lucy Sangweni

9. Acknowledgements

High Voltage Overhead Powerlines Study Committee for their contribution in reviewing this document.

Annex A – Impact assessment

(Normative)

Impact assessment form to be completed for all documents.

1) Guidelines

- All comments must be completed.
- Motivate why items are N/A (not applicable)
- Indicate actions to be taken, persons or organisations responsible for actions and deadline for action.
- Change control committees to discuss the impact assessment, and if necessary give feedback to the compiler of any omissions or errors.

2) Critical points

2.1 Importance of this document. E.g. is implementation required due to safety deficiencies, statutory requirements, technology changes, document revisions, improved service quality, improved service performance, optimised costs.

Comment: Revision and standardisation for the specification for Distribution lines to conform to IARC specifications format.

2.2 If the document to be released impacts on statutory or legal compliance - this need to be very clearly stated and so highlighted.

Comment: Compliance to referenced specification(s) in Clause 2 (Normative References)

2.3 Impact on stock holding and depletion of existing stock prior to switch over.

Comment: Not applicable (N/A) as the material type does not change

2.4 When will new stock be available?

Comment: N/A

2.5 Has the interchangeability of the product or item been verified - i.e. when it fails is a straight swap possible with a competitor's product?

Comment: N/A as item is not a specialised product from one source

2.6 Identify and provide details of other critical (items required for the successful implementation of this document) points to be considered in the implementation of this document.

Comment: Steel wire drums ordered for Eskom projects must always bear the Eskom marking as stated.

2.7 Provide details of any comments made by the Regions regarding the implementation of this document.

Comment: Document to be published as it is "No further comments but Keywords

3) Implementation timeframe

3.1 Time period for implementation of requirements.

Comment: Packaging and labelling requirements to be complied with on orders made according to this specification with immediate effect.

3.2 Deadline for changeover to new item and personnel to be informed of DX wide change-over.

Comment: Changes to be effected immediately on orders made in accordance with this specification.

4) Buyers Guide and Power Office

4.1 Does the Buyers Guide or Buyers List need updating?

Comment: Yes

4.2 What Buyer's Guides or items have been created?

Comment: N/A

4.3 List all assembly drawing changes that have been revised in conjunction with this document.

Comment: Referred to HV Lines Study Committee

4.4 If the implementation of this document requires assessment by CAP, provide details under 5

4.5 Which Power Office packages have been created, modified or removed?

Comment: N/A

5) CAP / LAP Pre-Qualification Process related impacts

5.1 Is an ad-hoc re-evaluation of all currently accepted suppliers required as a result of implementation of this document?

Comment: N/A

5.2 If NO, provide motivation for issuing this specification before Acceptance Cycle Expiry date.

Comment: Sisonke orders will be made based on this specification

5.3 Are ALL suppliers (currently accepted per LAP), aware of the nature of changes contained in this document?

Comment: Yes

5.4 Is implementation of the provisions of this document required during the current supplier qualification period?

Comment: Yes

5.5 If Yes to 5.4, what date has been set for all currently accepted suppliers to comply fully?

Comment: On publication of this specification.

5.6 If Yes to 5.4, have all currently accepted suppliers been sent a prior formal notification informing them of Eskom's expectations, including the implementation date deadline?

Comment: Yes

5.7 Can the changes made, potentially impact upon the purchase price of the material/equipment?

Comment: No

5.8 Material group(s) affected by specification: (Refer to Pre-Qualification invitation schedule for list of material groups)

Comment: N/A

6) Training or communication

6.1 Is training required?

Comment: (N/A)

6.2 State the level of training required to implement this document. (E.g. awareness training, practical / on job, module, etc.)

Comment: N/A

6.3 State designations of personnel that will require training.

Comment: N/A

6.4 Is the training material available? Identify person responsible for the development of training material.

Comment: N/A

6.5 If applicable, provide details of training that will take place. (E.G. sponsor, costs, trainer, schedule of training, course material availability, training in erection / use of new equipment, maintenance training, etc).

Comment: N/A

6.6 Was Technical Training Section consulted w.r.t module development process?

Comment: N/A

6.7 State communications channels to be used to inform target audience.

Comment: N/A

7) Special tools, equipment, software

7.1 What special tools, equipment, software, etc will need to be purchased by the Region to effectively implement?

Comment: N/A

7.2 Are there stock numbers available for the new equipment?

Comment: N/A

7.3 What will be the costs of these special tools, equipment, software?

Comment: N/A

8) Finances

8.1 What total costs would the Regions be required to incur in implementing this document? Identify all cost activities associated with implementation, e.g. labour, training, tooling, stock, obsolescence

Comment: N/A

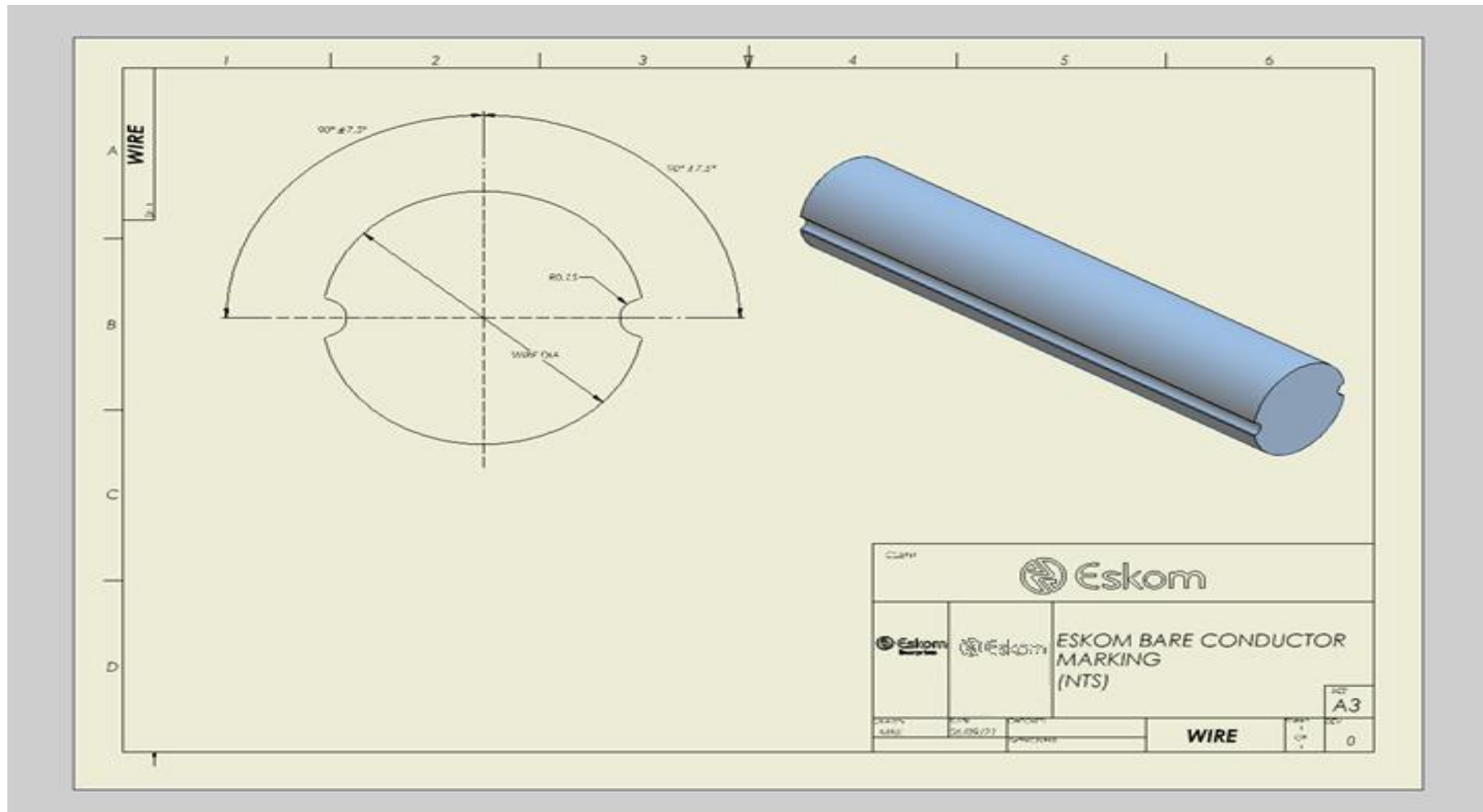
.....
.....
.....

Impact assessment completed by:

Name: _____

Designation: _____

Annex B – Stranded Steel Wire Conductor Marking



ESKOM COPYRIGHT PROTECTED

When downloaded from the WEB, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorized version on the WEB.

Annex C – The Eskom signature – printing guide and format

(informative) The Eskom Signature (logo and logotype) printing guide

The Eskom Signature (logo and logotype) must be used together as a unit. The logo (“circle”) and the logotype (the word “Eskom”) must always appear together as one unit.

a) Colour specifications:

The corporate signature may only appear in the **Eskom corporate blue** or in **black** or in **white**.

Pantone 287C

100%C + 70%M + 0%Y + 10%K

To match colours, swatches must always be used. Previously printed material must never be used for colour matching.

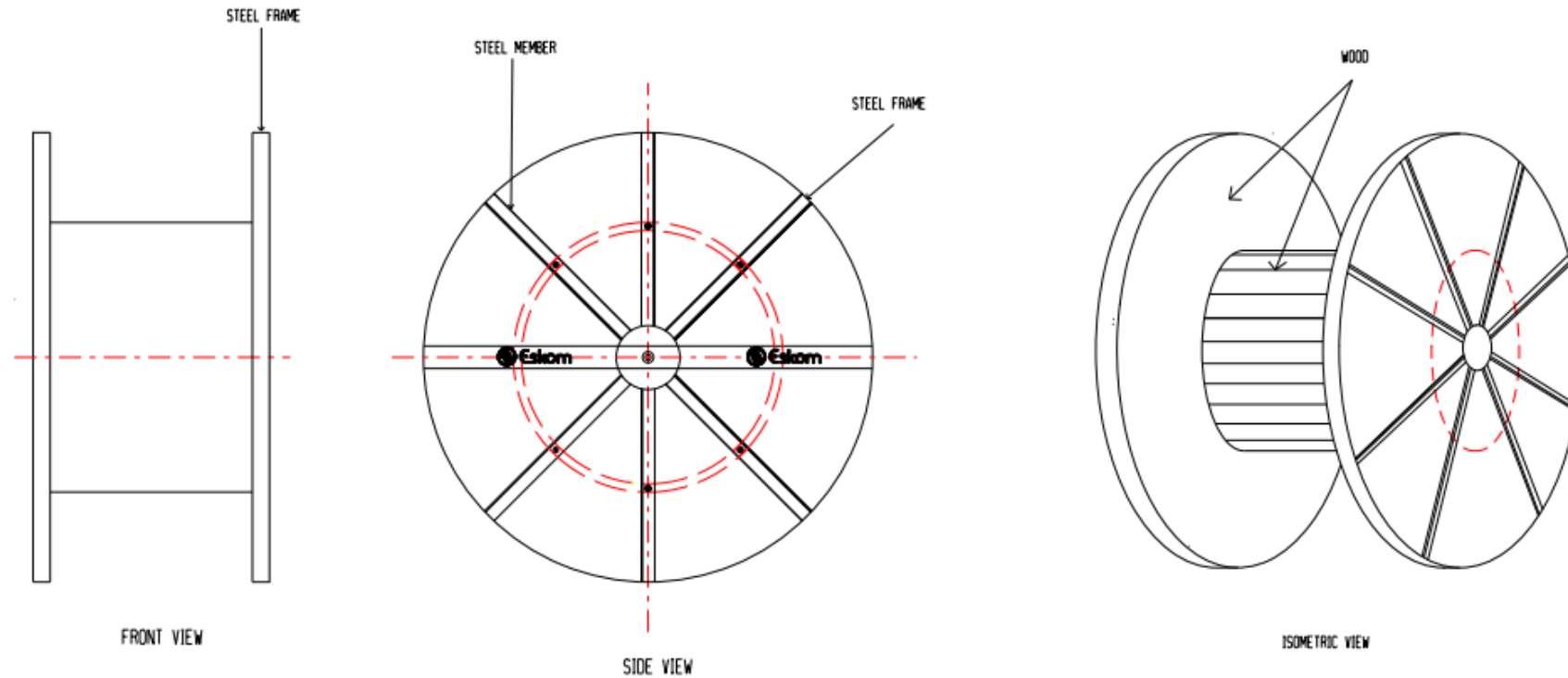
b) Corporate signature isolation area:

There should always be a minimum clear area around the signature. This minimum is equal to the full diameter of the logo (“circle”).

c) Relationship between the logo and the logotype:

The relationship between the logo and the logotype must always be followed exactly as indicated in the graphic. The measurement between the logo (“circle”) and the logotype (word “Eskom”) is twice the line-width of the “circle”.

Annex D – Typical hybrid drum showing Eskom branded flange



ESKOM COPYRIGHT PROTECTED

When downloaded from the WEB, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorized version on the WEB.