	Standard	Technology
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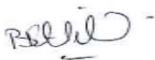
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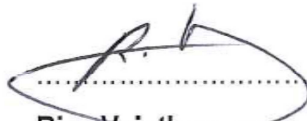
Disclosure Classification: **CONTROLLED DISCLOSURE**

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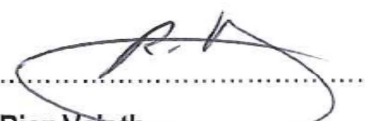
Barry Hill
Chief Engineer Civil

Approved by



Riaz Vajeth
Senior Manager Lines
Engineering Services

Authorised by



Riaz Vajeth
Senior Manager Lines
Engineering Services

Date: 31-3-2016

Date: 31-3-2016

Date: 31-3-2016

Approved by
SCOT Chairperson



Riaz Vajeth
SCOT Chairperson

Date: 31-3-2016

PCM Reference: **Perform Line Engineering**

SCOT Study Committee Number/Name: <number or name>

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EXECUTIVE SUMMARY

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1. INTRODUCTION

This is a purchase standard for spindles.

1.1 KEYWORDS

Spindle, poles, insulators

2. SUPPORTING CLAUSES

2.1 SCOPE

This standard specifies the technical requirements for the design, manufacture and testing of spindles and spindles with collar. The spindles and spindles with collar will be used on Eskom's distribution system

2.1.1 Purpose

None

2.1.2 Applicability

This document shall apply throughout Eskom Holdings Limited Divisions.

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] ASTM A 370-77, *Standard methods and definitions for mechanical testing of steel products*
- [2] SABS 1700-2-6:1996, Fasteners Part 2: Screw threads. Section 6: ISO general purpose metric screw threads – Tolerances – Limits of size for general purpose bolt and nut threads – Medium quality
- [3] SABS 1700-3-2:1996, Fasteners Part 3: Forms, dimensions and designations Section 2: Hexagon products – Widths across flats
- [4] SABS ISO 1461:2000, Hot-dip galvanised coatings on fabricated iron and steel articles – specifications and test methods
- [5] Eskom drawings D-DT-3050 Sheets 1 to 4

2.2.2 Informative

None

2.3 DEFINITIONS

None

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2.3.1 Disclosure Classification

Controlled Disclosure: Controlled Disclosure to External Parties (either enforced by law, or discretionary).

2.4 ABBREVIATIONS

None

2.5 ROLES AND RESPONSIBILITIES

None

2.6 PROCESS FOR MONITORING

None

2.7 RELATED/SUPPORTING DOCUMENTS

None

3. SPINDLES AND SPINDLES WITH COLLAR FOR DISTRIBUTION LINES STANDARD

3.1 REQUIREMENTS

3.1.1 General

Nothing in this specification shall lessen the obligations of the supplier that are detailed in any other document forming part of a contract.

3.1.1.1 Workmanship

All spindles shall have a smooth finish free from defects and generally be of high quality workmanship. All ends shall be rounded.

3.1.1.2 Drawings

3.1.1.2.1 All drawings shall clearly indicate all critical tolerances on spindles.

3.1.1.2.2 Any revision to drawings of spindles being manufactured for and supplied to Eskom shall clearly indicate the revision number and date.

3.1.1.2.3 The manufacturing drawings shall be submitted to Distribution Technology for approval at the time of tendering.

3.1.1.3 Tolerances

Dimensions of all spindles shall be subject to the tolerances specified in the referenced standard. Where no standard or tolerance is referenced, the tolerance shall be $\pm 2\%$ of the dimension but not more than

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± 0, 7 mm. All tolerances shall be subject to Eskom's approval. Spindles found to be outside of the specified tolerance will be rejected.

3.1.2 Design requirements

3.1.2.1 General

The supplier shall be fully responsible for his design and its satisfactory performance in service. Approval by Eskom shall not relieve the supplier of responsibility for the adequacy of the design, dimensions and detail.

3.1.2.2 Material

3.1.2.2.1 The material chosen to manufacture spindles from shall have the following characteristics: high strength, corrosion withstand and good ductility and high fracture toughness. The material selected for the component shall be subject to Eskom's approval procedure.

3.1.2.2.2 The yield of the chosen material in the final product shall exceed 280 MPa.

3.1.2.2.3 Ductility of the material at room temperature shall be sufficient to provide a minimum elongation, including the fracture, of 12 % on the final product.

3.1.2.2.4 The flow stress of the selected material in the final product shall be less than 1000 MPa flow stress $\frac{1}{2}$ (yield + UTS).

3.1.2.2.5 All samples of material taken from the finished product shall have Charpy V-notch energy of 8 J at – 10 °C. Charpy V-notch testing shall be done in accordance with ASTM A-370.

NOTE: The toughness of the material may be determined by other methods, but is subject to Eskom's approval.

3.1.2.3 Galvanizing

3.1.2.3.1 All ferrous material shall be hot-dip galvanized in accordance with SABS ISO 1461. No material shall be galvanized until all shop operations have been completed.

3.1.2.3.2 All male threads in ferrous material shall be threaded to a M20 x 2,5 — 6g thread before galvanizing.

It shall be possible to screw a nut, M20 x 2,5 — 6H 0,38 oversize, down the full thread length of the final product by hand.

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3.1.2.3.3 If stainless steel is used, it shall be of a grade, condition or design that will not enhance stress corrosion cracking.

3.2 TESTS

3.2.1 Qualifying design tests

3.2.1.1 General

3.2.1.1.1 Before the closing date for tendering, all tenderers shall satisfactorily perform all design tests to qualify their spindles as acceptable for use on Eskom's distribution lines. Tests shall be performed at an independent accredited test facility. Alternatively the tests may be performed at a facility agreed to by the Distribution Technology technical specialist for spindles.

3.2.1.1.2 Each design test, if successfully completed shall be performed once. If a spindle fails a design test the component shall not be re-tested until Eskom has approved the design modifications.

3.2.1.1.3 A minimum of five galvanized samples shall be submitted for qualifying design tests.

3.2.1.1.4 A copy of each test certificate showing the results of the design tests shall be submitted to Eskom.

3.2.1.2 Visual and dimensional tests

3.2.1.2.1 All spindles to be tested shall be visually inspected by an Eskom representative to verify specification conformance regarding design, dimensions, fit, thread size and alignment before testing commences.

3.2.1.2.2 Acceptance criteria

If any sample fails the visual and/or dimension test then five new samples shall be submitted for testing.

3.2.1.3 Strength and deformation tests

3.2.1.3.1 General

Samples shall be subjected to the following tests. Loads shall be applied in a manner simulating service conditions. See figures 1 and 2 in Appendix A for the assembly of spindles during bending testing and testing of threads, respectively.

3.2.1.3.2 Bending tests

Using the test set-up in Figure 1, the spindles shall withstand:

- a. A load of 1,6 kN without undergoing permanent deformation (< 1 degree) after the removal of the load.
- b. A load of 10,5 kN without failure for a rigid spindle or 4,5 kN without failure for a swivel spindle.

Swivel spindles shall be tested in the plane in which there is no swivel motion and the spindle shall not twist out of this plane.

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3.2.1.3.3 Testing of threads

A sample nut shall be assembled on the threaded spindle in accordance with Figure 2. A load, axial to the spindle and equal to 10, 5 kN shall be applied.

Rejection criteria

Samples submitted for testing shall be rejected if

- a. the thread of the nut or spindle strips or if the nut or spindle show defects after the application of a load equal to 10,5 kN; and
- b. the spindle breaks at a value less than the 10,5 kN load.

3.2.1.3.4 Charpy V-notch impact test

Samples of ferrous material taken from the finished product shall be tested for Charpy V-notch energy in accordance with the method in ASTM A-370.

3.2.1.3.5 Acceptance criteria

Samples submitted for testing shall be accepted if a minimum Charpy V-notch energy of 8 J at 10 °C is obtained.

3.2.1.4 Galvanising test

The supplier shall submit test certificates showing the results of tests and inspections required by SABS ISO 1461. For spindles manufactured in South Africa, tests shall be performed to the satisfaction of the South African Bureau of Standards.

3.2.2 Production routine tests

3.2.2.1 General

3.2.2.1.1 All spindles produced shall be visually inspected for defects, by the supplier, in accordance with an Eskom-approved technique sheet, before any tests are carried out and packaging occurs.

3.2.2.1.2 Defective components shall be permanently marked and discarded.

3.2.2.1.3 Test certificates showing results of production routine tests, shall be retained by the supplier for a minimum of five years for inspection by Eskom.

3.2.2.1.4 At its discretion Eskom reserves the right to submit randomly selected spindles delivered to site, to qualifying design, routine or sample tests. The cost of testing shall be for Eskom's account for spindles that pass the tests and for the supplier's account for spindles that fail. Failure to pass any test will result in rejection of all spindles until the problem is satisfactorily resolved.

3.2.2.2 Visual and dimensional tests

3.2.2.2.1 All spindles to be tested shall first be visually inspected to verify specification conformance regarding design, dimensions, fit, thread size and alignment.

3.2.2.2.2 Acceptance criteria

If any sample fails the visual and/or dimension test, then five new samples shall be submitted for testing.

3.2.2.3 Bending test

3.2.2.3.1 Utilizing the test set-up in Figure 1 the spindle shall withstand a load of 1,6 kN without undergoing permanent deformation after removal of the load.

3.2.3 Sample tests

3.2.3.1 Visual and dimensional tests

3.2.3.1.1 All spindles to be tested shall first be visually inspected to verify specification conformance regarding design, dimensions, fit, thread size and alignment.

3.2.3.1.2 Acceptance criteria

If any sample fails the visual and/or dimension test, then five new samples shall be submitted for testing.

3.2.3.2 Bending tests

Using the test set-up in Figure 1, the spindles shall withstand:

- a. A load of 1.6 kN without undergoing permanent deformation (< 1 degree) after the removal of the load. Comment at this loading there is no FOS when used with a 4 kN insulator viz $4/2.5 = 1.6$
- b. A load of 10.5 kN without failure for a rigid spindle or 4.5 kN without failure for a swivel. (Do we intend purchasing swivel spindles?)

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Swivel spindles shall be tested in the plane in which there is no swivel motion and the spindle shall not twist out of this plane.

3.2.3.3 Testing of threads

3.2.3.3.1 A sample nut shall be assembled on the threaded spindle in accordance with Figure 2, and a load axial with the spindle and equal to 10,5 kN shall be applied.

3.2.3.3.2 Rejection criteria

The entire batch represented by the samples tested shall be rejected if:

- a. The thread of the nut or spindle strips or if the nut or spindle show defects after application of a load equal to 10,5 kN; and
- b. The spindle breaks at a value less than the 10,5 kN load.

3.2.4 Chemical analysis

Eskom reserves the right to conduct chemical analysis on the supplied spindles. One spindle of each batch submitted for testing shall be analysed to determine the chemical composition and steel specification of the supplied spindles.

4. AUTHORISATION

This document has been seen and accepted by:

Name	Designation
B. Hill	Chief Engineer Electrical
B. McLaren	Senior Engineer Electrical
Riaz Vajeth	Senior Manager Lines Engineering Services

This specification shall apply throughout Eskom Holdings Limited, its divisions, subsidiaries and entities wherein Eskom has a controlling interest.

5. REVISIONS

This revision cancels and replaces revision no 5 of document no. **SCSSCAAH8**.

Date	Rev.	Compiler	Remarks
March 2016	1	Barry Hill	Document re-numbered and in the new format approved through the TDAC process
February 2014	0.1	B. Hill	Document reformatted. No content change. This document supersedes document DSP_34-1649
February 2014	1	B. Hill	Compiler changed from G. Stanford to B. Hill. Authoriser changed from MN Bailey to R. Vajeth
July 2010	0.1	G. Stanford	Document reformatted no content change. This document supersedes document DSP_34-1083

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March 2002	5		1.1 Add. All ends shall be rounded. 4.2.2.1 Remove first sentence and amend the second sentence to read – “ The material chosen to manufacture spindles from shall have the following characteristics: high strength, corrosion withstand and good ductility. 4.2.3.2 Replaced SABS 760 with SABS ISO 1461. 5.1.1.1 All tests shall be conducted by an accredited test facility or a DT approved test facility. 5.1.1.3 Add galvanized to describe the samples. 5.2 split into 5.2 routine tests and 5.3 sample tests since routine tests should be non-destructive. 5.2.2.1 Removed Eskom witness visual dimension check from routine test.
Sept 1998	4		Bending test criteria changes, in accordance with insulator spec and new insulator. Update of figure 1 to reflect new insulator dimensions.
Dec 1997	3		Text changes in accordance with J Calitz, TRI recommendations
??	2		Text changes and production routine tests added.
Aug 1995	1		Document issued.

6. DEVELOPMENT TEAM

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

Not applicable

7. ACKNOWLEDGEMENTS

N/A

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APPENDIX A: LIST OF DRAWINGS

(Normative)

The following drawings form part of this Appendix:

Number	Title
Figure 1	Bending test assembly
Figure 2	Tensile test on spindle

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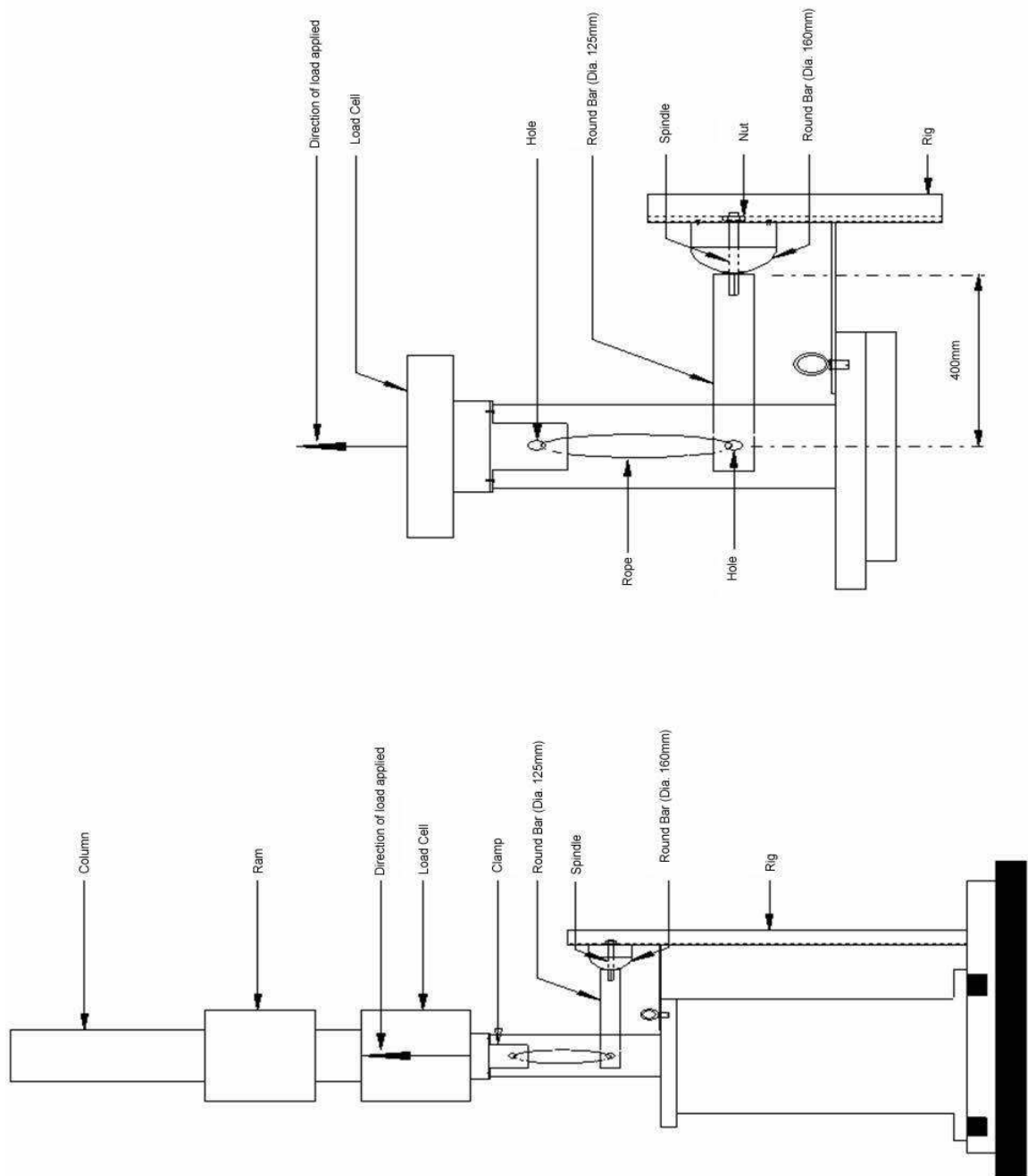


Figure 1: Bending test assembly

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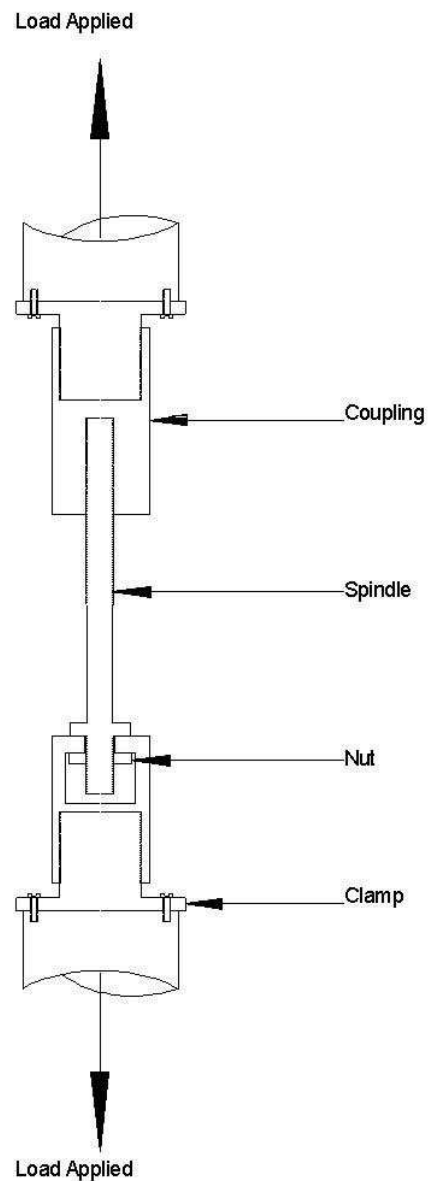


Figure 2: Tensile test on spindle

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APPENDIX B - 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: Re-number document

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: No

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

Comment: N/A

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 swop possible with a competitor's product?

Comment: N/A

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: None

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

Comment: None

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APPENDIX B

(continued)

3 Implementation timeframe

3.1 Time period for implementation of requirements.

Comment: N/A

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

Comment: N/A

4 Buyers Guide and Power Office

4.1 Does the Buyers Guide or Buyers List need updating?

Comment: No

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: N/A

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: No

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

Comment: N/A

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

Comment: N/A

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APPENDIX B

(continued)

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

Comment: N/A

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

Comment: N/A

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: N/A

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

Comment: N/A

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: No

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

Comment:

6.3 State designations of personnel that will require training.

Comment:

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

Comment:

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:

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APPENDIX B

(continued)

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

Comment:

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

Comment:

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: None

7.2 Are there stock numbers available for the new equipment?

Comment:

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

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:

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

Impact assessment completed by:

Name: V Singh_____

Designation: Power Plant Technologies Manager_____

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