

	Standard	Technology
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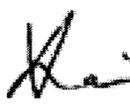
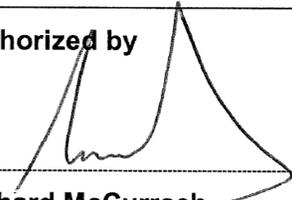
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Executive Summary

Fibre optic communications increasingly play an important role in Eskom's Private Telecommunications Network. In light of new and emerging advances in fibre optic connectivity, an investigation was launched to evaluate and assess the performance of different leading connectors in an effort to standardize on a more efficient, reliable and superior connector suitable for utility applications or Eskom Telecommunications in particular. It has been highlighted that the connector is the most common site of failure and therefore critical to a fibre optic network. Furthermore, Eskom regions (have been using different sets of connectors including ST, FC among others and it is imperative that Eskom assumes a common standard for compatibility and seamless interoperability with OLTE and other fibre optic communications equipment. Assuming a common standard will be beneficial from a spares management perspective as well as allowing Eskom field personnel to build wealth of experience on a standard connector type.

The procedure for the evaluation of different connectors involved the derivation of a weighting matrix from several performance metrics such as insertion loss, packing density, mating durability (# mating cycles), tensile load and return/reflection loss. From a cost-benefit analysis perspective the cost, compatibility, serviceability and OEM availability of the leading connectors were also factored into the derivation.

This recommendation defines Eskom Telecommunications' standard for Fibre Optic Connector type for use with Fibre Optic communications equipment such as Optical Distribution Frames, Optical Line Terminating Equipment, Fibre Optic adapters etc.

1. Introduction

This document is necessary to ensure that a common standard fibre optic connector is used by all Eskom regions resulting in compatibility and seamless interoperability with fibre optic communications equipment currently in use.

2. Supporting clauses

2.1 Scope

This recommendation defines Eskom Telecommunications' standard for Fibre Optic Connector type for use with Fibre Optic communications equipment such as Optical Distribution Frames, Optical Line Terminating Equipment, Fibre Optic adapters etc.

This recommendation overrides any other recommendation or specification. In cases of conflicting requirements, contract documents only, override this recommendation. Nevertheless, nothing in this recommendation shall lessen the obligations of the supplier detailed in any other document forming part of the contract.

2.1.1 Purpose

This report recommends SC APC connectors for the issuing of all enquiries with aim to set up enabling contract for Fibre Optic communications equipment from patch panel to patch panel. This recommendation also motivates ET's migration to a standard SC APC connector type across the Private Telecommunications Network.

2.1.2 Applicability

This specification is applicable to Eskom Transmission and Distribution and Eskom Telecommunications, its divisions and partially/wholly owned subsidiaries.

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] "Optical Connector Types and Specifications" < http://www.fiber-optics.info/articles/fiber_optic_connectors>
- [2] EIA-440-A Fiber Optic Connector Terminology
- [3] EIA/TIA-4750000-B Generic Specification for Fiber Optic Connectors

2.2.2 Informative

- [4] ETST 0522 Fibre Optic Connector
- [5] 240-81321219 - Substation Automation – Network Architecture Standard for Distribution Substations
- [6] 240-61268959 - Substation Automation – Network Architecture Standard for Distribution Substations

2.3 Definitions

2.3.1 General

Definition	Description
Eskom Telecommunications	Eskom Telecommunications: A division of Eskom Enterprises (Pty) Ltd Registration No 1999/002761/07 a juristic person incorporated in terms of the company laws of the Republic of South Africa, with its registered office at Megawatt Park, Maxwell Drive, Sandton, herein referred to as Eskom.

2.3.2 Disclosure classification

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

2.4 Abbreviations

Abbreviation	Description
APC	Angled Polished Connector
ASL	Altitude above Sea Level
dB	Decibel
EIA	Electronic Industries Alliance
ET	Eskom Telecommunications
FC	Ferrule Connector
g	gram
IEC	International Electro technical Commission
ITU	International Telecommunications Union
KZN	KwaZulu Natal
LC	Lucent Connector
N	Newton
N/A	Not Applicable
Nm	Newton metre
ODF	Optical Distribution Frame
OLTE	Optical Line Terminating Equipment
RX	Receive
SC	Subscriber/Standard Connector
ST	Straight Tip
SM	Single Mode
TIA	Telecommunications Industry Association
TX	Transmit

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2.5 Roles and responsibilities

It is the responsibility of Eskom Telecommunications and Distribution and Transmission lines division to ensure that staff are trained and found competent to implement this document.

2.6 Process for monitoring

Random inspections shall be carried out by the relevant authority to ensure that the prescribed safety procedures are complied with at all times.

2.7 Related/supporting documents

This document is based on the Eskom Telecommunications document ETST 0522 Fibre Optic Connector.

3. Fibre Optic Connectors Recommendation

The ST is a bayonet-nut connector and uses an internal spring which pushes against the bayonet to maintain contact pressure. This mechanism makes the ST vulnerable to direct tension, i.e. pulling the connector directly away from the bulkhead.

Eskom Tx and Dx had previously selected the ST connector as the standard for termination of their teleprotection fibres at all substations. However, ET's applications will, in many instances, involve high power long haul repeater-less transmissions. For flat polished connectors such as ST, reflections at the fibre-air interface can be captured by the fibre core. This phenomenon becomes more pronounced in long haul transmissions and affects the stability and reliable transmission of data.

In contrast, Angle Polishing (APC) significantly reduces back-reflection levels hence reducing feedback problems and improving the stability and reliability of fibre-optic links. ST connectors are not available in APC format (least not widely available) therefore this connector type is not the most suitable for ET applications.

Hence there is a specific preference to SC APC connectors and SC APC optical interface for OLTE. Therefore, Tx and Dx shall standardise on the SC APC and hence further maintains the same mating quality at the terminal optical interface.

The exception would be for fibre runs starting and terminating within the same site for Substation Automation. For these instances Dx and Tx prefers LC connectors as per 240-61268959 and 240-81321219. Also, where the equipment manufacturer will not adhere to the change, Eskom will accommodate by changing the patch lead for FC, LC and ST.

4. Authorization

This document has been seen and accepted by:

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5. Revisions

Date	Rev	Compiler	Remarks
March 2016	1	V Naidu	New Document based on ETST 0522

6. Development team

This document was revised and compiled through the efforts and contributions of the following individuals representing their respective departments:

- Seetsele Seetswane Eskom Telecommunications (Senior Advisor)
- Alan Driver Eskom Telecommunications (National Planning Manager)

7. Acknowledgements

- Antonio Pereira