



a world class African city



TITLE	SPECIFICATION FOR LONG SPAN ALL-DIELECTRIC SELF- SUPPORTING FIBER OPTICAL CABLE (ADSS)	REFERENCE	REV
		CP_TSSPEC_109	2
		DATE:	APRIL 2022
		PAGE: 1	OF 13

---

## TABLE OF CONTENTS

	Page
FOREWORD .....	2
INTRODUCTION .....	3
1 SCOPE .....	3
2 NORMATIVE REFERENCES.....	3
3 DEFINITIONS AND ABBREVIATIONS .....	3
4 REQUIREMENTS FOR ADSS .....	3
5 SERVICE CONDITIONS .....	4
6 TESTS .....	4
7 MARKING, LABELLING AND PACKAGING .....	5
8 DOCUMENTATION .....	6
9 TRAINING.....	7
10 QUALITY MANAGEMENT .....	7
11 HEALTH AND SAFETY .....	7
12 ENVIRONMENTAL MANAGEMENT .....	7
Annex B - Revision information.....	9
Annex C - Technical schedules A and B for ADSS (Continues).....	11
Long-Span All-Dielectric Self-Supporting Fiber Optic Cables (ADSS) .....	12
Annex D - Stock Items .....	13

## **FOREWORD**

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

Research and Development

City Power Johannesburg (SOC) Ltd

P O Box 38766

Booyens

2016

## **INTRODUCTION**

The long span all-dielectric self-supporting fiber optical (ADSS) cable forms an integral part of City Power's transmission network; it is used for control circuit and protection. An ADSS is non-metallic, self-supporting cable which is utilized on pole routes and HV towers with a span length  $\leq 250$  m.

## **1 SCOPE**

The purpose of this specification is to detail the technical requirements to be met when manufacturing or supplying the long span all dielectric self-supporting cable (ADSS) for application on networks with a nominal voltage from 11 kV up to and including 275 kV.

## **2 NORMATIVE REFERENCES**

The following standards and specifications 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 specification 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 standards and specification listed below.

NRS 078-1:2014 *Long-span All-Dielectric Self-Supporting fiber optic cables Part 1: Product specification*

SANS 60793-1 *Measurement methods and test procedures.* SANS 60793-2 *Optical fibers. Part 2: Product specifications – General.*

SANS 60794-4 *Optical fiber cables. Part 4: Sectional specification – Aerial optical cables along electrical power lines.*

SANS 60815 *Selection and dimensioning of high-voltage insulators intended for use in polluted conditions.*

SANS 61089. *Round wire concentric lay overhead electrical stranded conductors*

CP\_TSSPEC\_204: *Specification for heavy duty duct fiber cable.*

## **3 DEFINITIONS AND ABBREVIATIONS**

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

## **4 REQUIREMENTS FOR ADSS**

- 4.1 The cable shall contain no metallic elements; a circular cross section is preferred.
- 4.2 The maximum acceptable mass per length shall be 200kg/km of the finished cable, and its maximum allowable cable diameter shall be  $\leq 15$ mm.
- 4.3 Each fiber shall be uniquely identified in an approved manner as per TIA/EIA-598-A.
- 4.4 The cable cut-off wavelength shall be less than or equal to 1 260 nm.
- 4.5 Cables shall be resistant to both ultraviolet radiation and electric field strengths; the immunity shall be guaranteed for the service life of at least 25 years.

- 4.6 The cable shall be provided with an anti-tracking sheath and perfectly smooth without any cable markings to provide a possible inception point for corona discharge or dry-band arcing.
- 4.7 All measures taken to minimize hydrogen absorption in the fibers shall be provided.
- 4.8 The cable shall have sufficient crush resistance capability to withstand a load of 2 000 N.
- 4.9 The cable shall be flexible enough to accommodate a minimum bending radius of 350 mm without damage or change in its optical properties.
- 4.10 The cable shall be designed to withstand a degree of twisting without any damage to either the component parts of the cable or change to the optical transmission properties of the fibers.
- 4.11 The cable shall have an impact resistance capability that following an impact; there shall be no permanent change to the optical transmission performance of any fiber.
- 4.12 The cable shall be resistant to the effects of aeolian vibration such that the attenuation coefficient increase shall be less than 0, 5 dB/km at 1310 NM and 1 550 nm (nanometer).

## **5 SERVICE CONDITIONS**

The requirements in this specification apply to ADSS for use under the following general conditions:

- a) Pollution level :very heavy
- b) Maximum temperature : 50 °C;
- c) Minimum temperature : - 10 °C;
- d) Altitude : 1800 m (above sea level);
- e) Relative humidity : 100 %;
- f) Barometric pressure: 82 kPa; and

## **6 TESTS**

### **6.1 Type tests**

The availability of type test reports shall be stated in schedule B (see annex B). The customer reserves the right to request and witness type tests.

#### **6.1.1 Water penetration**

The cable shall be tested for water penetration as to SANS 60794-1-2 and comply with clause

#### **6.1.2 Tensile strength**

Test the cable in accordance with test method E1 in SANS 60794-1-2. Method E1

#### **6.1.3 Sheave test**

The test shall be performed to ensure that the performance does not degrade after installation as to IEC 60794-1-2, method E9.

#### **6.1.4 Stress strain on metallic cables.**

Stress strain test shall be performed to determine behavior under load as to IEC 61089.

#### **6.1.5 Crush resistance**

The ADSS shall be tested for crush resistance as described in test method E3 in SANS 60794-1-2, Method E3 and comply.

#### **6.1.6 Impact resistance**

Test the cable in accordance with test method E4 in SANS 60794-1-2 and comply with 4.12

#### **6.1.7 Temperature cycling**

Perform this test in accordance with test method F1 in SANS 60794-1-2.

#### **6.1.8 Short Circuit test.**

The test shall be performed to determine the performance and the characteristics of the ADSS under typical short circuit as to IEC 60794, method H1.

### **6.2 Factory acceptance tests**

Factory acceptance tests shall be carried out according to the quality plan of the supplier and in the presence of City Powers representative. Additional tests may be agreed between the supplier and and City Power as a customer.

#### **Typical tests**

- 6.2.1 Design
- 6.2.2 Visual inspection of the cable elements
- 6.2.3 Lay length of armoring
- 6.2.4 Diameter of cable
- 6.2.5 Weight of cable
- 6.2.6 DC Resistance of cable
- 6.2.7 Breaking strength test (one sample)
- 6.2.8 Optical fiber attenuation coefficient at operational wave length

#### **6.3 Site Acceptance test.**

The site acceptance tests are intended to prove conformance of the cable to the requirements specified in this document. Particular attention shall be given to packaging, marking. Verification of marking may include drawings and marking required by the purchaser. Deviations shall be subject to agreement between supplier and purchaser and shall be appropriately documented.

## **7 MARKING, LABELLING AND PACKAGING**

### **7.1 Marking and Labelling**

- 7.1.1 The following information shall be clearly and permanently marked on the internal strip of the cable at intervals of 1 m:
  - a) Name of manufacturer;

- b) Year of manufacture;
- c) Type of fiber (coded) and
- d) Number of fibers.

7.1.2 Each reel shall be labelled with at least one water-resistant tag, containing the following minimum information:

- a) Manufacturer's name;
- b) ADSS size and number of fibers;
- c) ADSS length;
- d) Gross tare and net weight;
- e) SAP number;
- f) Type of cable;
- g) The words "Not to be laid flat",
- h) An arrow (to indicate the direction in which the drum is to be rolled in order to prevent the ADSS from unwinding)

**Note:** The outer ends of the cable shall be accessible for testing purposes.

## **7.2 Packaging**

- 7.2.1 Long-span ADSS shall be supplied tightly and uniformly wound onto returnable steel cable reels.
- 7.2.2 The reel shall be of such construction that no damage to the long span ADSS will occur during transportation and handling.
- 7.2.3 The outer layer of the long-span ADSS on the reel shall be protected by a water-resistant wrapping over the exposed surface, to prevent ingress of moisture and dirt during transportation and handling.
- 7.2.4 Each end of the long-span ADSS shall be properly sealed to prevent the ingress of moisture into the optical fiber unit during transportation or storage.

## **8 DOCUMENTATION**

- 8.1 Details of the cable construction and design including colour coding information to enable positive identification of each fiber.
- 8.2 A copy of all type test certificates and routine test reports in English shall be provided.
- 8.3 Full details of all the manufacturer's tests performed to ensure quality of manufacturing shall be provided.
- 8.4 The drawings of the ADSS cable construction shall indicate the following:
  - a) All dimensions of the various components;
  - b) The cross-sectional area of the aramid strength member;
  - c) The thermal coefficient of the cable;

- d) Young's modulus of the ADSS cable; and
- e) The mass per length of the ADSS cable.

## **9 TRAINING**

- 9.1 A necessary training course shall be offered to relevant City Power staff. The training shall include, amongst other things, the handling, storage and installation of ADSS.

## **10 QUALITY MANAGEMENT**

A Quality management system shall be set up in order to assure the quality the ADSS cables during design, development, production and maintenance. 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 of the ADSS cables during installation, operation, maintenance, and decommissioning phases. Guidance on the requirements of a Health and Safety plan may be found in ISO 45001:2018 Standards. This is to ensure that the asset conforms to standard operating procedures and City Power SHERQ Policy. 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 of the ADSS cables during their entire life cycle (i.e. during design, development, production, installation, operation and maintenance, decommissioning as well as disposal phases). Guidance on the requirements for an Environmental management system may 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 SHEQ Policy

---

**Annexure A - Bibliography**

None



## Annex B - Revision information

DATE	REV. NO.	NOTES
April 2009	0	First issue
AUGUST 2018	1	Second issue
		Normative references: Added SANS 60793-1
		Normative reference: Updated SANS 60815
		Normative references: Added CP_TSSPEC_204
		Added type tests in Clause 6
April 2022	2	Third Issue
		Update Annexure C
		Correct Annexure D

**Annex C - Technical schedules A and B for ADSS  
Long-Span All-Dielectric Self-Supporting Fiber Optic Cables**

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

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

Item	Sub-clause of NRS 078	Description	Schedule A	Schedule B
1	<b>4.3</b>	Name of the manufacture	XXXX	
2		Country of Origin	XXXX	
3		<b>Service condition</b>		
		a) Altitude above sea level m	1800	
		b) Maximum temperature °C	50	
		c) Minimum temperature °C	-10	
		d) Maximum barometer pressure kPa	104	
		e) Minimum barometer pressure kPa	76	
		f) Relative humidity %	100	
4	4.1	Type of fiber	ITU-T G.652	
5	4.1	Number of fibers	XXXX	
6	4.2.2	Mass per length of cable Kg/km	≥ 200	
7	4.2.2	Cable diameter mm	≤ 15	
8	4.2.11	Maximum design span length m	400	
9	4.2.11	Ultimate tensile strength kN	≥ 35	
10	4.2.11	Maximum working load (where fiber strain does not exceed 0, 2 %)	kN XXXX	
11	4.2.11	Maximum continuous load (fiber under no strain)	kN XXXX	
12	4.2.8	Anti-tracking sheath	Requirement	
13	4.2.7	Guaranteed for service life Years	≥ 25	

**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: \_\_\_\_\_

**Annex C - Technical schedules A and B for ADSS (Continues)**

**Long-Span All-Dielectric Self-Supporting Fiber Optic Cables**

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

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

Item	Sub-clause of NRS 078	Description	Schedule A	Schedule B
14	4.2.8	Sheath tracking performance (maximum permitted leakage current under heavy pollution conditions, 100kΩ/m longitudinal resistance) As given in NRS 078 Part1	XXXX	
15	4.2.9	Details of measures against water penetration	XXXX	
16	4.2.10	Details to minimise fiber hydrogen absorption	XXXX	
18		Documentation provided (See clause 8 of specification).	Requirement	
19	6.2.1	Cable reel used	Steel	
20	6.2.1	Wound length of ADSS	State	
21		Marking, Labelling and Packaging a s to clause 7	Requirement	
22	7	All documentation provided as to Clause 8 (including type test reports)	Requirement	

**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: \_\_\_\_\_

**Long-Span All-Dielectric Self-Supporting Fiber Optic Cables (ADSS)**

**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 NRS 078	Proposed deviation

**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: \_\_\_\_\_

Annex D - Stock Items

Item	SAP No.	SAP Short Description	SAP Long Description
1	4143	ADSS Fiber optic cable	LONG SPAN ALL-DIELECTRIC SELF-SUPPORTING FIBER OPTICAL CABLE MASS: 200kg/km, and MAXIMUM CABLE DIAMETE 15mm. ITEM SPECIFICATION NO1. CP_TSSPEC_109