

144F Loose Tube, Indoor/Outdoor Optical fibre cable

Telecommunications

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Nothing in this document diminishes the responsibility of designers and constructors for applying the requirements of any applicable law or standard.

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1. Purpose

- a) The purpose of this document is to provide designers, suppliers and the other contractors with detailed technical requirements to be complied when providing Optical Fibre Infrastructure for VicTrack Telecommunications.
- b) This performance specification is applicable for new Optical fibre Infrastructure/plant for telecommunications and defines the whole-of-life requirements including planning, design, performance and construction requirements, operations and maintenance, and disposal.
- c) Due consideration shall be given to the durability, serviceability, strength, environmental performance, and quality of the infrastructure to produce a finished product that is fit for its intended purpose.
- d) This Standard is also applicable for new works (network re-arrangements, transmission upgrades, etc.) on existing VicTrack sites.

2. Scope

- a) The requirements specified in this document apply to all new support Optical fibre infrastructure designed and constructed for VicTrack Telecommunications.
- b) This document is to be used in conjunction with normal practices in the telecommunications and transport industries.
- c) In the event that a conflict arises between the requirements of this document and relevant Australian and International Standards, the mandatory obligations of the Australian Standards shall prevail as follows:
- Commonwealth and State Acts;
 - Australian Standards, Codes and Regulations and BCA;
 - Victorian Government standards;
 - Transport and Rail Industry standards.
- d) This document is to be used by all VicTrack Telco engineering staff, in particular presales, engineering, Telco projects and operations staff and infrastructure suppliers.

3. Reference documents

a) This procedure shall be read and applied in conjunction with the following documents.

3.1. Australian and International Standards

Ref No	Standard ID	Title/Description
A	ITU-T G.652	Characteristics of a single-mode optical fibre cable.
B	IEEE-383/IEEE-1202 flame test	Suitable for Direct Burial (DIR BUR).
C	National Electrical Code® (NEC®)	OFN-LS, Sunlight Resistant (SUN RES).
D	IEC 60332-3-10:2018	Tests on electric and optical fibre cables under fire conditions.
E	IEC 60754-2:2011	Test on gases evolved during combustion of materials from cables
F	IEC 61034	Measurement of smoke density of cables burning under defined conditions
G	IEC 60793	Optical fibres: Measurement methods and test procedures – General and guidance
H	IEC 60794-1-2:2017	Generic specification - Basic optical cable test procedures - General guidance
I	ANSI/ICEA S-104-696	Standard for Indoor/Outdoor Optical fibre Cable.
J	UL 13	Standard for Power-Limited Circuit Cables.
K	UL 444	Communications Cables.
L	UL 1277	Standard for Electrical Power and Control Tray Cables with Optional Optical-Fibre Members.
M	UL 1666	Standard for Test for Flame Propagation Height of Electrical and Optical-Fibre Cables Installed Vertically in Shafts.
N	CSA C22.2 No. 230	Tray Cables.
O	CSA C22.2 No. 232	Optical fibre Cables.
P	CSA OFC (FT-4-S1)	Optical Fibre Cable
Q	AS/ACIF S008:2010	Requirements for customer cabling.
R	AS 1049	Telecommunication cables - Insulation, sheath and jacket.
S	AS 3080:2013	Information technology - Generic cabling for customer premises.
T	NEC Article 770	Optical Fibre Cables and Raceways

3.2. VicTrack Standards

Ref No	Document ID	Document Title
A	TS-SP 015	Network Protection
B	TS-SP 013	Network Construction

4. LSZH Loose Tube, Indoor/Outdoor, Gel-Free, Double Jacket, Rodent-Resistant Cable

4.1. Cable construction

- a) The Optical fibre Cable shall have the following characteristics.
- b) It shall be LSZH (Low-smoke, zero-halogen sheath) loose tube, gel-free, rodent-resistant cables which are flame -retardant, indoor/outdoor and suitable for installation in inter-building and intra-building applications.
- c) The loose tube design shall offer mechanical ruggedness and environmental durability while the all-dielectric cable construction requires no grounding or bonding.
- d) The water-swellaable yarn shall eliminate the need for gel-filling compound and shall allow more efficient and craft-friendly cable preparation. The 250 µm colour-coded fibres allow quick and easy identification during installation
- e) The flexible, flame-retardant outer jacket shall be UV-resistant and shall enable direct exposure to sunlight. Interlocking armour options shall be available for special applications requiring additional mechanical durability.
- f) LSZH cables shall eliminate risks in the event of a fire as the LSZH compound does not drip when superheated.
- g) The material shall burn to ash, eliminating the onset of secondary fires.
- h) Note: When cables containing halogens ignite, they emit highly reactive gases that can be harmful if inhaled. When halogens combine with water, acids are formed. These acids damage both living tissue and inorganic materials, such as metal and electronic equipment.

4.2. Cable Design and construction

Item	Cable design	
A	Cable Type	Loose Tube
B	Product type	Dielectric
C	Application	Aerial, Direct Buried, Duct, General Purpose Horizontal
D	Central Element	Dielectric
E	Environment	Outdoor, aerial and duct; indoor general-purpose horizontal according to NEC Article 770.
F	Fibre Count	144
G	Fibre colouring	Blue, orange, green, brown, grey, white, red, black, yellow, violet, pink, turquoise
H	Fibre Category	Single-mode (OS2)
I	Fibres per tube	12
J	Number of Tube Positions	12
K	Number of Active Tubes	12
L	Buffer tube colour coding	Blue, orange, green, brown, grey, white, red, black, yellow, violet, pink, turquoise
M	Buffer tube diameter	2.5 mm (0.1 in)
N	Tape	Water-swellable
O	Tape, Layer 2	Flame-retardant tape
P	Tape, Layer 3	Water-swellable
Q	Inner Jacket Material	Flame-retardant, non-corrosive/low-smoke, zero-halogen (FRNC/LSZH) material
R	Tape, Layer 4	Water-swellable
S	Tensile Strength Elements and/or Armouring - Layer 1	Dielectric strength members
T	Number of ripcords	4
U	Outer jacket material	Flame-retardant, non-corrosive/low-smoke, zero-halogen (FRNC/LSZH) material
V	Outer jacket colour	black
W	Flame Rating	LSZH (OFN-LS)

Table 1. Cable design and construction



Figure 1. Typical Optical fibre construction

4.3. Applications

a) A “Dry” water-blocked non-metallic stranded loose tube cable designed for long haul applications, typically used by “Utilities” such as involving road and rail construction, and suitable for tray/trunk/duct and direct burial applications by either trenching or direct ploughing.

b) It use shall be aimed specifically for protected environments such as tunnels where termite and rodent resistance are required as well as a degree of flame resistance and self-extinguishing.

4.4. Temperature

Item	Temperature Range
A	Storage -40 °C to 70 °C (-40 °F to 158 °F)
B	Installation and assembly -30 °C to 60 °C (-22 °F to 140 °F)
C	Operation -40 °C to 70 °C (-40 °F to 158 °F)

Table 2. Temperature performance

4.5. Mechanical performance

Item	Mechanical/Physical Characteristics
A	Nominal Outer Diameter 25.9 mm (1.02 in)
B	Nominal Weight 649 kg/km (436 lb/1000 ft)
C	Max. Tensile Strength, short-term 4500 N (1000 lbf)
D	Max. Tensile Strength, Long-Term 1500 N (333 lbf)
E	Max. Crush Resistance 550 N/cm (375 lbs/in)
F	Min. Bend Radius Installation 360 mm (14.2 in)
G	Min. Bend Radius Operation 259 mm (10.20 in)
H	Meets cyclic impact and chemical resistance test.

Table 3. Cable mechanical performance

4.6. Hazardous materials

Item	Chemical Characteristics
A	RoHS Free of hazardous substances according to RoHS 2011/65/EU

Table 4. Hazardous materials

5. Abbreviations, Definitions

General Abbreviations

Acronym	Definition
a/c	Air conditioner
ACMA	Australian Communications and Media Authority
AFFL	Above Finished Floor Level
AS	Australian Standard
AS/NZS	Australian and New Zealand Standard
CER	Communications Equipment Room
CET	Communications Earth Terminal (to AS/ACIF S009)
CIS	Customer Information System
EME	Electromagnetic Energy
EMI	Electro Magnetic Interference
ERDB	Equipment room distribution board
EWP	Elevated Work Platform
FFE	Fittings, Furniture and Equipment (supplied by purchaser)
FRNC	Fire Retardant Non-corrosive
GL	Ground Level
IEC	International Electrotechnical Commission
IFR	Issue For Review
IPnn	Ingress protection rating - Where nn = 2 digit number
LED	Light Emitting Diode
LSZH	Low Smoke Zero Halogen
MDB	Main Distribution Board
MDF	Main Distribution Frame
MTM	Metro Trains Melbourne
NCC	National Construction Code of Australia
NTS	Not to Scale
OCS	Operational Control Systems
OFC	Optical fibre Cable
PPE	Personal Protection Equipment
PTV	Public Transport Victoria
SNMP	Simple Network Management Protocol
SODF	Small Optical Distribution Frames
TBF	To Be Confirmed
UNO	Unless Noted Otherwise
UPS	Uninterruptible Power Supply
VOS	Verify on Site
VRIOGS	Victorian Rail Industry Operators Group Standards
VT	VicTrack
WB	Wet bulb
WHS	Work Health and Safety
XLPO	Cross linked Polyolefin

Definitions commonly used throughout this document are provided in the following table:

Term	Definition
24x7	24 hours per day, 7 days per week. When in regard to equipment availability, services may be temporarily unavailable allowing for scheduled maintenance, upgrades/renovation, or emergency repair.
Shall	Is used as the descriptive word to express a requirement that is mandatory to achieve conformance to the standard.
Should	Is used as the descriptive word to express a requirement that is recommended in order to achieve compliance to the standard. Should can also be used if a requirement is a design goal but not a mandatory requirement.
Specification	A set of high level requirements that are mandatory to be adhered to achieve Victrack's objectives.

6. Document review and approval

Delegation	Name	Position	Version	Date
Owner	Kathryn Schoolman	Manager Infrastructure Design	1.0	05/02/2020
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7. Document history

Version	Amendment description	Author	Date
Version 1.0	First Issue	John Berti	29/10/2019

8. Review period

This document will be reviewed at least every two (2) years by the Document Owner, or amended as appropriate.