

24F Loose Tube, Indoor/Outdoor Optical fibre cable

Telecommunications

Document information

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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 civil contractors with detailed technical requirements to be complied with in performing works for VicTrack Telecommunications when providing Optical Fibre Infrastructure.
- b) This performance specification is applicable for new Optical fibre Infrastructure/plant for telecommunications.
- 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 Optical fibre infrastructure designed and constructed for VicTrack Telecommunications.
- b) This document is 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 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 as required.

3.1. Australian and International Standards where applicable

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	ANSI/ICEA S-104-696	Standard for Indoor/Outdoor Optical fibre Cable.
	UL 13	Standard for Power-Limited Circuit Cables.
	UL 444	Communications Cables.
	UL 1277	Standard for Electrical Power and Control Tray Cables with Optional Optical-Fibre Members.
	UL 1666	Standard for Test for Flame Propagation Height of Electrical and Optical-Fibre Cables Installed Vertically in Shafts.
H	CSA C22.2 No. 230	Tray Cables.
	CSA C22.2 No. 232	Optical fibre Cables.
I	CSA OFC (FT-4-S1)	
J	AS/ACIF S008:2010	Requirements for Customer Cabling.
K	IEC 60793: 2017	Optical fibres - Part 1-1: Measurement methods and test procedures - General and guidance.
L	IEC 60794-1-22: 2018	Optical Fibre Cables – Part 1-22 Generic Specification – Basic Optical Cable Test Procedures – Environmental Test Methods.
M	AS 1049: 2003	Telecommunication cables - Insulation, sheath and jacket.
N	AS 3080: 2013	Information technology - Generic cabling for customer premises.
O	Mil-L-23699	Lubricating oil, aircraft turbine oil.
P	Mil -H-5606	Hydraulic fluid.
Q	NFPA 130	Standard for Fixed guideway transit and passenger rail systems.
R	NFPA 502	Standard for road tunnels, bridges, and other limited access ways.

3.2. VicTrack Standards

Ref No	Document ID	Document Title
A	TS-SP 015	Network protection
B	TS-SP 013	Network construction

4. XLPO, LSZH, Double Jacket, Indoor/Outdoor, Loose Tube cable

4.1. Requirements

- a) The cable shall be a 24 fibre, loose tube, FRP central member, constructed optical cable.
- b) The cable shall be retardant, low smoke zero halogen (LSZH), thermoset (XLPO) jacket.
- c) The cable design shall include a dry-core water blocking system.
- d) The cable shall be SZ-stranded core for easy mid-span access to fibres.
- e) The cable shall be resistant to lubricant oil (Mil-L23699), hydraulic fluid (Mil-H-5606), petrol and deionized water.
- f) The cable shall be NEC OFNG-LS listed.
- g) The cable shall meet requirements of NFPA 130 and NFPA 502.
- h) The cable shall be designed for use in harsh environments and for indoor and outdoor industrial applications.
- i) The loose tube design shall offer mechanical ruggedness and environmental durability while the all-dielectric cable construction shall require no grounding or bonding.

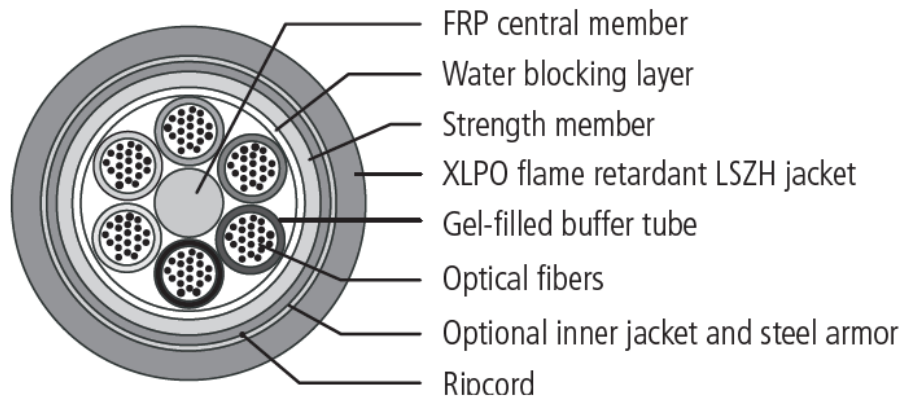


Figure 1. Typical Optical Fibre Construction

4.2. General

Item	General Specifications	
A	Environment	Indoor / Outdoor, tunnel.
B	Application	Aerial, Duct, General Purpose Horizontal
C	Cable Type	Loose Tube.
D	Product type	Dielectric.
E	Flame rating	LSZH (OFNG-LS)
F	Fibre Category	Single-mode (OS2)

Table 1. General specifications

Item	Temperature Range	
A	Storage	-50 °C to 75 °C
B	Installation and assembly	-20 °C to 60 °C
C	Operation	-40 °C to 70 °C

Table 2. Temperature performance

4.3. Cable Design and construction

Item	Cable design	
A	Central Element	Fibre Reinforced Plastic
B	Fibre Count	24
C	Fibre colouring	Blue, orange, green, brown, grey, white, red, black, yellow, violet, pink, turquoise
D	Fibres per tube	12
E	Number of Tube Positions	5
F	Number of Active Tubes	2
G	Buffer tube colour coding	Blue, orange, green, brown, grey.
H	Buffer tube diameter	2.5 mm (0.1 in)
I	Water resistance	Water blocking layer
J	Outer Jacket Material	XLPO flame retardant LSZH jacket.
K	Inner jacket	Strength member
L	Number of ripcords	1
M	Outer jacket colour	black

Table 3. Cable design and construction

4.4. Mechanical performance

Item	Mechanical/Physical Characteristics	
A	Nominal Outer Diameter	11.9 mm (0.47 in)
B	Nominal Weight	137 kg/km (92 lb/1000 ft)
C	Max. Tensile Strength, short-term	2670 N (600 lbf)
D	Max. Tensile Strength, Long-Term	800 N (180 lbf)
E	Max. Crush Resistance	550 N/cm (375 lbs/in)
F	Min. Bend Radius Short Term	340 mm (9.4 in)
G	Min. Bend Radius Long Term	120 mm (4.7 in)

Table 4. Cable mechanical performance

4.5. Composition

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

Table 5. Cable composition

5. Abbreviations, Definitions

Abbreviations

Acronym	Definition
a/c	Air conditioner
ACMA	Australian Communications and Media Authority
AFFL	Above Finished Floor Level
AHD	Australian Height Datum
AS	Australian Standard
AS/NZS	Australian and New Zealand Standard
BMS	Building management System
BTS	Base Station Transceiver
CCTV	Closed Circuit Television
CER	Communications Equipment Room
CET	Communications Earth Terminal (to AS/ACIF S009)
CFW	Continuous Fillet Weld
CHE	Centres
CHS	Circular Hollow Section
CIS	Customer Information System
Coverage Antenna	Telecommunications antenna that transmits/receives radio signals to provide cover to the surrounding areas
DB	1.Dry bulb (in the context of temperatures
DB	2. Distribution board (in the context of electrical wiring
DTRS	Digital Train Radio System
ELCB	Earth Leakage Circuit Breaker
EME	Electromagnetic Energy
EMI	Electro Magnetic Interference
EPR	Earth Potential Rise
ERDB	Equipment room distribution board
EWP	Elevated Work Platform
FFE	Fittings, Furniture and Equipment (supplied by purchaser)
FSBW	Full Strength Butt Weld
GL	Ground Level
GPO	Electrical general purpose outlet (10A unless otherwise specified)
Guyed Mast	Steel framed truss reliant on the mast footing for vertical and horizontal ground support and on steel cables connecting the mast to footings for overturning stability
HVAC	High Voltage Alternating Current
IDF	Intermediate Distribution Frame
IEC	International Electrotechnical Commission
IFR	Issue For Review
IPnn	Ingress protection rating - Where nn = 2 digit number
Lattice Tower	Steel framed cantilever truss reliant on the support footing for overturning stability
LED	Light Emitting Diode
Link Antenna	Antenna that supports wireless backhaul to another telecommunications site
LSZH	Low Smoke Zero Halogen
MDB	Main Distribution Board
MDF	Main Distribution Frame
Monopole	Monolithic cantilever structure constructed in either steel, reinforced or prestressed concrete or timber reliant on the support footing or direct ground embedment for overturning stability
MS tower	Specialty software tool by Bentley Systems Inc. for engineering and assessment of lattice structures
MTM	Metro Trains Melbourne
NCC	National Construction Code of Australia

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Acronym	Definition
NTS	Not to Scale
OCS	Operational Control Systems
ODU	Radio Outdoor unit associated with microwave radio antennas
PPE	Personal Protection Equipment
PSS	Primary Support Structure
PTV	Public Transport Victoria
RAS	Remote Access System
RCD	Residual Current Device
RF	Radio Frequency
RL	Reduced Level
SNMP	Simple Network Management Protocol
SODF	Small Optical Distribution Frames
SSS	Secondary Support Structure
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

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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 Shoolman	Manager Internal Plant Design	1.0	05/02/2020
Reviewers	Ezio Lattanzio	Chief Engineer	1.0	05/02/2020
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Approver	Bruce Moore	Executive General Manager, Telecommunications	1.0	

7. Document history

Version	Amendment description	Author	Date
Version 1.0	Only major versions required (1.0, 2.0 etc.)	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.