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Sumitomo Cable Specification

**SE-\*LB**

**Litepipe<sup>®</sup> Fiber Bundle / Armorlux<sup>®</sup> Sheath Cable**

*Armored Central Tube Cable with 2 -72 Optical Fibers*

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# 1. GENERAL

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This specification covers the design requirements and performance standards for the supply of optical fiber cables as described below. The features described in this document are intended to provide information on the performance of Sumitomo Electric Lightwave's optical cable and aid in handling and installation. Please refer to the separate fiber specification for details regarding the optical fiber.

## 1.1 Cable Description

Sumitomo's Litepipe Fiber Bundle cables contain 2 to 72 optical fibers. The fibers are grouped into bundles held together and identified by colorful thread binders. The fiber bundles are housed in a single gel-filled central buffer tube. Corrugated steel armor is placed around the buffer tube with a ripcord underneath for easy removal. Two steel wires are longitudinally laid down each side of the armor for tensile strength. Highly visible ripcords are placed along each wire. A smooth black medium density polyethylene (MDPE) sheath is extruded over the armor and wires.

The Litepipe Fiber Bundle / Armorlux sheath cable is ideal for low count fiber applications where additional sheath protection is needed such as in direct buried builds. Recommended applications also include lashed aerial. Sumitomo's Litepipe cables are Bellcore approved and RUS (formally REA) listed.

## 1.2 Quality

Sumitomo ensures a high level of quality through ISO / TL 9000 registered Quality Management Systems and our commitment to continuous improvement. Guaranteed, high quality products have been manufactured at Sumitomo's facility in Research Triangle Park, North Carolina since 1984.

## 1.3 Reliability

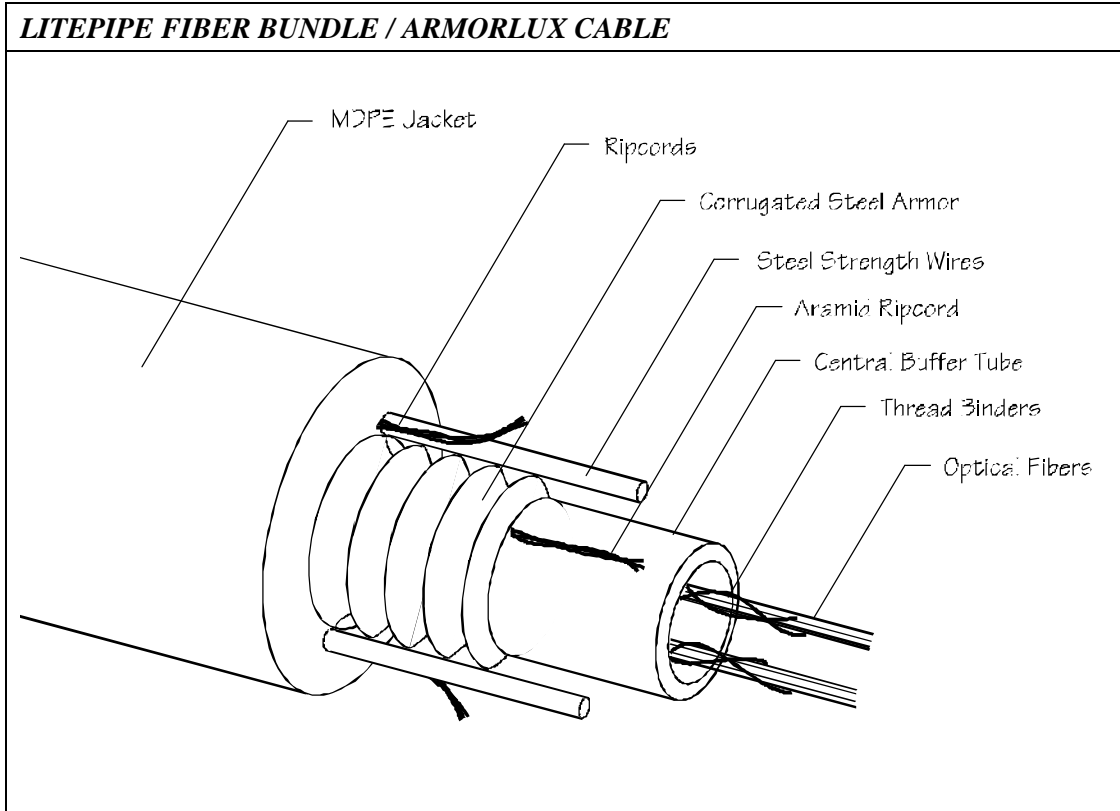
Sumitomo ensures product reliability through rigorous qualification testing of each product family to meet or exceed industry standards. Both initial and periodic qualification testing are performed to assure the cable's performance and durability in the field environment.

Sumitomo supports industry standards organizations such as Bell Communications Research (Bellcore), Telecommunications Industry Association (TIA), International Telecommunications Union (ITU), International Electrotechnical Commission (IEC), American Society for Testing and Materials (ASTM), Rural Utilities Service (RUS), The Institute of Electrical and Electronics Engineers (IEEE), and Insulated Cable Engineers Association (ICEA).

## 2. CABLE DESIGN

### 2.1 General

Sumitomo's Litepipe Fiber Bundle / Armorlux sheath optical cables utilize a central tube construction, which provides for a small diameter cable. The steel armored sheath construction produces a rugged, rodent resistant cable; ideal for direct buried or lashed aerial installations.



### 2.2 Fiber Types

The following fiber types are available in this cable design. Please refer to the appropriate fiber specification document for details on fiber design and performance.

<b>APPLICABLE FIBER TYPES</b>		
FIBER TYPE	TIA CLASS	SUMITOMO SPEC. #
PureBand – Low Water Peak Attenuation	Type IVa	SE-5**

### 2.3 Optical Fiber Color Code

The UV acrylate coated fibers are color coded with highly distinguishable, vibrant colors according to the following table. All colors meet Munsell standards as specified in TIA-359 and TIA-598.

<b>FIBER COLOR CODE</b>	
FIBER #	COLOR
1	Blue
2	Orange
3	Green
4	Brown
5	Slate
6	White
7	Red
8	Black
9	Yellow
10	Violet
11	Rose
12	Aqua

<b>THREAD BINDER COLORS</b>	
BINDER #	COLOR
1	Blue
2	Orange
3	Green
4	Brown
5	Slate
6	White

### 2.4 Thread Binders

The colored fibers are grouped together in bundles of either 6 or 12 fibers according to the total fiber count of the cable. For cable counts not evenly divisible by 6 or 12, the remaining odd number of fibers will be placed in a last bundle. The bundles are held together by colorful threads. Two opposite wound threads are used on each bundle to make bundle identification and separation easy.

<b>FIBER BUNDLES</b>		
TOTAL FIBERS IN CABLE	# FIBERS / BUNDLE	# BUNDLES
2 - 6	NA	No Bundles Used
8 - 36	6	2 - 6
38 - 72	12	4 - 8

### 2.5 Central Buffer Tube

The fiber bundles are placed in a single, gel filled, buffer tube. The gel prevents water migration down the tube and can be easily removed from the ribbons with isopropyl alcohol. The buffer tube is made of a semi-translucent thermo-plastic material.

## 2.6 Cable Water Blocking

The interstices between the buffer tube and steel armor are filled with a water blocking gel to prevent the migration of water through the cable. The gel is easily removed with commercially available gel solvents such as D-Gel®.

## 2.7 Cable Sheath

The Armorlux cable sheath consists of a co-polymer coated steel tape, which is corrugated and wrapped around the central buffer tube. This steel armor provides additional cable compression strength and rodent protection. An aramid ripcord is placed under the armor to facilitate its removal.

Two steel wires are longitudinally laid 180° opposed along the outside of the armor. They provide the cable with the necessary tensile strength for installation and service loads. Highly visible ripcords are placed along each steel wire for quick and easy sheath entry.

The armor and steel wires are covered with a smooth outer black MDPE jacket.

## 2.8 Cable Dimensions

<i><b>LITEPIPE FIBER BUNDLE / ARMORLUX SHEATH CABLE</b></i>		
<b>FIBER COUNT</b>	<b>NOMINAL DIAMETER</b>	<b>NOMINAL WEIGHT</b>
2 - 24	11.1 mm (0.44 in)	130 Kg/km (87 lbs/kft)
26 - 48	13.0 mm (0.51 in)	188 Kg/km (126 lbs/kft)
50 - 72	15.0 mm (0.59 in)	235 Kg/km (158 lbs/kft)

## 2.9 Sheath Marking

The entire length of each cable is marked with the following items:

- "SUMITOMO OPTICAL CABLE"
- Month and Year of Manufacture
- Number of Optical Fibers
- Sequential Length Markings in feet (optional meters)
- Telephone Handset Symbol per Section 350G, NESC

All length markings are placed at two foot intervals (one meter intervals if metric length markings are specified). The actual cable length will be within +1%, -0% of the marked length. All markings are in indented in permanent white characters. If remarking is required, yellow markings are used to correct the error in the original markings.

### 3. CABLE PERFORMANCE

The finished cables can be subjected to the following mechanical and environmental conditions without a permanent increase in attenuation or damage to the cable.

#### 3.1 Mechanical Performance

<b><i>MECHANICAL PERFORMANCE</i></b>		
PROPERTY	TEST PROCEDURE	SPECIFICATION
Low and High Temperature Cable Bend	EIA/TIA-455-37	20 x cable O.D. @ -30°C and 60°C
Impact Resistance	EIA/TIA-455-25	25 impact cycles
Compressive Strength	EIA/TIA-455-41	440 N/cm (170 lbs/in.)
Maximum Tensile Load:	EIA/TIA-455-33	2700 N (600 lbs)
During Installation		890 N (200 lbs)
During Service		
Cable Twist	EIA/TIA-455-85	2 meter length ± 180°
Cable Cyclic Flexing	EIA/TIA-455-104	20 x cable O.D. 25 cycles
Minimum Bend Radius:	EIA/TIA-455-37	20 x cable O.D.
During Installation		10 x cable O.D.
During Service		
Gopher Resistance	Bellcore GR-20	Index Rating ≤ 3

#### 3.2 Environmental Performance

<b><i>ENVIRONMENTAL PERFORMANCE</i></b>		
PROPERTY	TEST PROCEDURE	SPECIFICATION
Temperature:	EIA/TIA-455-3	-40 to +70 °C (-40 to +158 °F)
Operation		-30 to +60 °C (-22 to +140 °F)
Installation		-40 to +75 °C (-40 to +167 °F)
Storage / Shipping		
Cable Aging	EIA/TIA-455-3	168 hours @ 85°C
Cable Freezing	EIA/TIA-455-98	Frozen in Ice
Water Penetration	EIA/TIA-455-82	1 meter for 24 hours
Compound Drip Temperature	EIA/TIA-455-81	80 °C (176 °F)
Wasp Spray Exposure	Bellcore GR-20	No Deterioration
Color Coding Permanence	Bellcore GR-20	Colors are Stable after Aging
Lightning Damage Susceptibility	EIA/TIA-455-181	Exceeds Category 1
Current Carrying Capacity	Bellcore GR-20	60 Amp, 60 Hz

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## 4. TESTING AND INSPECTION

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The optical properties of all fibers are measured prior to cable manufacturing and remain traceable throughout the manufacturing process and the lifetime of the cable.

After cabling, we use statistical process control techniques along with periodic verification to insure 100% compliance to attenuation requirements in each length of cable with bi-directional OTDR at all operating wavelengths. Cable dimensional measurements are also made at final inspection and recorded.

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## 5. PACKAGING AND SHIPPING

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Cable is supplied in lengths specified at the time of purchase. Each length will be shipped on a separate non-returnable wooden reel or if specified, a returnable steel reel. The minimum barrel diameter of the reel will not be less than 30 times the cable diameter.

The cable on each reel will be completely covered with a thermal / mechanical composite board wrap which is fastened to the cable by packaging straps. This wrap is reusable and provides excellent protection to cables sitting in reel yards.

The cable ends will be sealed with plastic protection caps to prevent water penetration and the escape of water blocking gel. The ends will be easily accessible for testing. Optional pulling grips may be factory installed if specified at the time of purchase.

<b>REEL DIMENSIONS</b>				
REEL TYPE	REEL CODE	FLANGE DIAMETER	REEL WIDTH	REEL WEIGHT
Wood	L-3	850 mm (34 in.)	580 mm (23 in.)	32 Kg (70 lbs)
	L-8	1050 mm (41 in.)	760 mm (30 in.)	61 Kg (134 lbs)
	L-11	1250 mm (49 in.)	760 mm (30 in.)	91 Kg (200 lbs)
	L-15	1350 mm (53 in.)	910 mm (36 in.)	106 Kg (233 lbs)
	L-18	1500 mm (59 in.)	910 mm (36 in.)	133 Kg (293 lbs)
	L-21	1600 mm (63 in.)	1050 mm (42 in.)	214 Kg (471 lbs)
	L-25	1800 mm (71 in.)	1050 mm (42 in.)	246 Kg (541 lbs)
	L-27	1850 mm (73 in.)	1120 mm (44 in.)	294 Kg (647 lbs)
	L-29	1950 mm (77 in.)	1120 mm (44 in.)	307 Kg (676 lbs)
	L-37	2210 mm (87 in.)	1240 mm (49 in.)	421 Kg (927 lbs)
	L-46	2440 mm (96 in.)	1240 mm (49 in.)	504 Kg (1108 lbs)
Steel	414	1270 mm (50 in.)	810 mm (32 in.)	109 Kg (240 lbs)
	415	1420 mm (56 in.)	810 mm (32 in.)	130 Kg (285 lbs)
	416	1680 mm (66 in.)	810 mm (32 in.)	155 Kg (340 lbs)
	417	1980 mm (78 in.)	840 mm (33 in.)	241 Kg (530 lbs)
	420	2130 mm (84 in.)	1220 mm (48 in.)	350 Kg (770 lbs)
	421	2290 mm (90 in.)	1220 mm (48 in.)	405 Kg (890 lbs)
	422	2440 mm (96 in.)	1220 mm (48 in.)	539 Kg (1185 lbs)

Each reel is marked with the manufacturer's name and address, cable type, fiber count, attenuation specs, and cable length. A final inspection test report with attenuation performance data for each fiber is attached to the reel flange along with shipping labels.

**REEL USAGE**

WOOD STEEL	REEL CODES							[ft.]	[m]	CABLE LENGTH
	<b>L-18</b> 417	<b>L-25</b> 420	<b>L-29</b> 420	<b>L-37</b> 421	<b>L-46</b> NA	<b>NA</b> NA	<b>NA</b> NA	30,000	9,140	
<b>L-15</b> 416	<b>L-21</b> 417	<b>L-25</b> 420	<b>L-37</b> 420	<b>L-46</b> 422	<b>L-46</b> NA	<b>NA</b> NA	25,000	7,620		
<b>L-15</b> 416	<b>L-18</b> 417	<b>L-25</b> 420	<b>L-29</b> 420	<b>L-37</b> 421	<b>L-46</b> 422	<b>L-46</b> NA	20,000	6,100		
<b>L-11</b> 415	<b>L-15</b> 416	<b>L-21</b> 417	<b>L-25</b> 420	<b>L-27</b> 420	<b>L-37</b> 420	<b>L-37</b> 421	15,000	4,570		
<b>L-8</b> 414	<b>L-11</b> 415	<b>L-15</b> 416	<b>L-21</b> 417	<b>L-21</b> 417	<b>L-27</b> 420	<b>L-37</b> 420	10,000	3,050		
<b>L-8</b> 414	<b>L-11</b> 414	<b>L-15</b> 415	<b>L-21</b> 416	<b>L-21</b> 417	<b>L-27</b> 417	<b>L-37</b> 420	7,500	2,290		
<b>L-8</b> 414	<b>L-8</b> 414	<b>L-11</b> 414	<b>L-21</b> 415	<b>L-21</b> 416	<b>L-27</b> 416	<b>L-37</b> 417	5,000	1,520		
<b>L-3</b> 414	<b>L-3</b> 414	<b>L-11</b> 414	<b>L-21</b> 414	<b>L-21</b> 414	<b>L-27</b> 414	<b>L-37</b> 415	2,500	760		
[in.]	0.4	0.5	0.6	0.7	0.8	0.9	1.0			
[mm]	10.2	12.7	15.2	17.8	20.3	22.9	25.4			
<b>CABLE DIAMETER</b>										

NOTE: Actual reel size used will depend on production capacity, net weight, and reel availability.

Sumitomo Electric Lightwave Corp. reserves the right to improve, enhance, or modify the cable's features and specifications.  
 Each Sumitomo Electric Lightwave Corp. optic cable and/or its manufacture may be covered by one or more of the following US Patents:  
 4,715,677 4,729,629 4,763,983 4,770,489 4,828,349 4,953,945 5,043,037 5,082,347 5,165,003 D331,567 5,247,599 5,410,901 5,471,555 5,642,452.  
 Cable and/or its manufacture may be covered by one or more of the following US Patents: 4,715,677 4,729,629 4,763,983 4,770,489 4,828,349  
 4,953,945 5,043,037 5,082,347 5,165,003 D331,567 5,247,599 5,410,901 5,471,555 5,642,452.