
Sumitomo Cable Specification

SE-*RF

Litepipe™ Ribbon / Hostile Environment Sheath Cable

Hermetically Sealed Central Tube Cable with 12 - 432 Optical Fibers

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1. General

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 Ribbon cables contain 12 to 432 optical fibers. The fibers are grouped in the form of 12 or 24 fiber ribbons. The optical fiber ribbons are housed in a single gel-filled high temperature stabilized central buffer tube. Dual layers of stranded dielectric strength elements are wound around the buffer tube and are covered by an inner jacket. Corrugated copper armor is wrapped around the cable core and hermetically welded to prevent moisture penetration. A black high temperature stabilized sheath is extruded over the copper armor. Highly visible ripcords are placed under the inner jacket and copper for easy sheath entry.

The Litepipe Ribbon / Hostile Environment sheath cable is designed for high density outside plant environments where possible exposure to high temperature steam or other corrosive substances might occur. Recommended application include direct buried or duct. Sumitomo's Litepipe / Hostile Environment cable meets all the requirements of Bellcore's TR-NWT-001322, Issue 1 and GR-20-CORE, Issue 1.

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

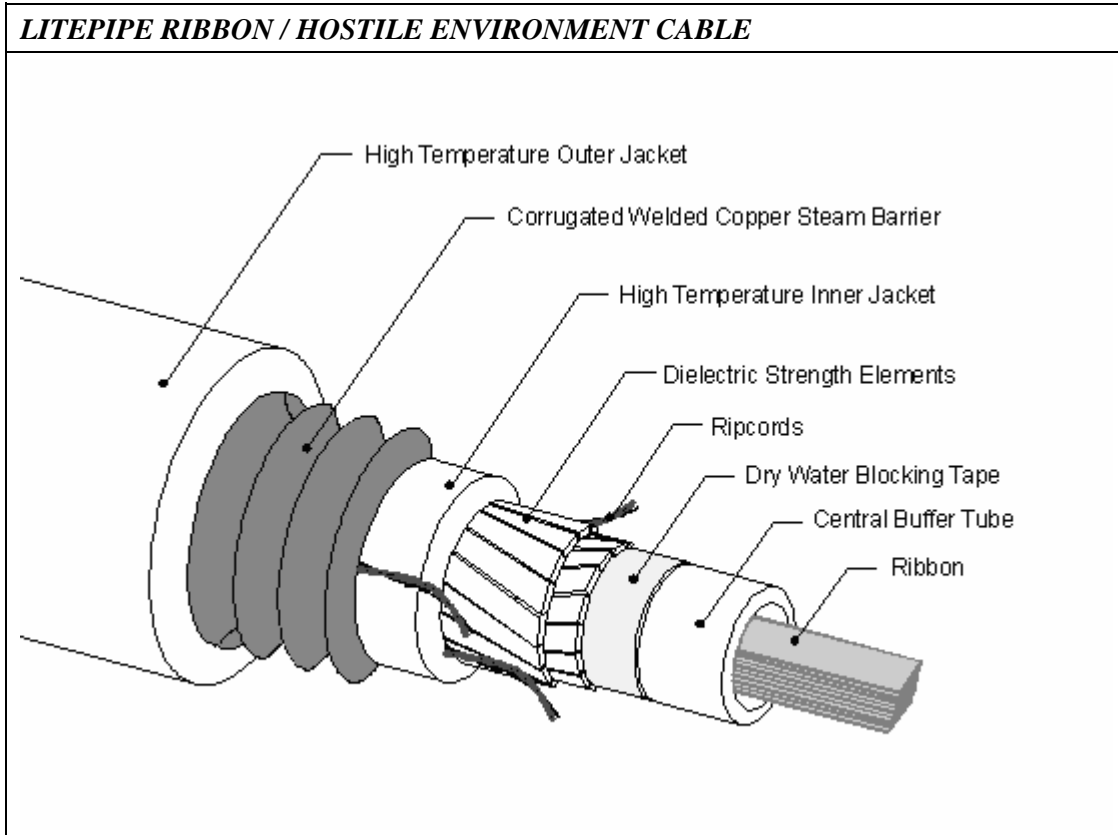
Sumitomo ensures product reliability through rigorous qualification testing of each product family to meet or exceed industry standards. Both initial and periodic qualification testing are performed to assure the cable's performance and durability in the field environment.

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 Ribbon / Hostile Environment sheath optical cables utilize ribbons in a central tube construction to provide high fiber density packed cable. The sealed copper sheath construction produces a rugged, steam & petroleum resistant cable, ideal for direct buried or duct installations in hazardous environments.



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.

APPLICABLE FIBER TYPES		
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.

FIBER COLOR CODE	
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

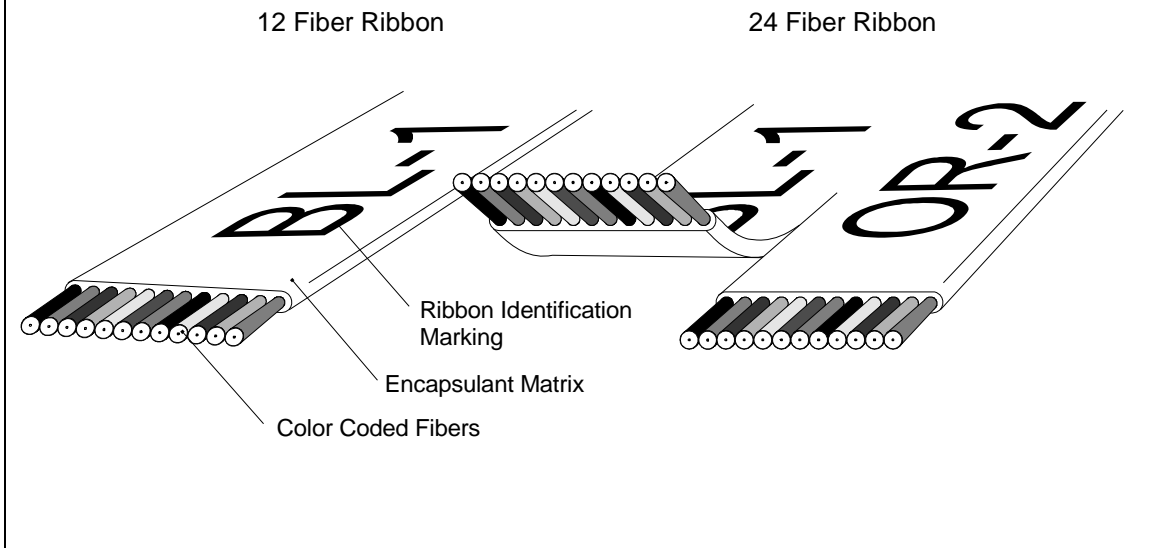
RIBBON MARKING CODES			
RIBBON #	CODE	RIBBON #	CODE
1	BL 1	19	D-RD 19
2	OR 2	20	D-BK 20
3	GR 3	21	D-YL 21
4	BR 4	22	D-VI 22
5	SL 5	23	D-RS 23
6	WH 6	24	D-AQ 24
7	RD 7	25	DD-BL 25
8	BK 8	26	DD-OR 26
9	YL 9	27	DD-GR 27
10	VI 10	28	DD-BR 28
11	RS 11	29	DD-SL 29
12	AQ 12	30	DD-WH 30
13	D-BL 13	31	DD-RD 31
14	D-OR 14	32	DD-BK 32
15	D-GR 15	33	DD-YL 33
16	D-BR 16	34	DD-VI 34
17	D-SL 17	35	DD-RS 35
18	D-WH 18	36	DD-AQ 36

2.4 Ribbon Matrices

Twelve (12) colored fibers are held together in the form of a flat ribbon by a UV cured acrylate matrix. Fibers within the ribbon are arranged in the order as shown above. Each ribbon within the cable is marked with "SUMITOMO" and a unique identification number and code as shown above. For cables with greater than 216 fibers, the 12 fiber ribbons are formed together into 24 fiber ribbons. These 24 fiber ribbons are easily split apart into two 12 fiber ribbons for ease of handling and splicing.

The optical fiber ribbons are fully compatible with Sumitomo's mass fusion splicing equipment and other commercially available splicing techniques. The matrix and coatings are easily stripped with thermal strippers. The matrix material can also be easily and cleanly pulled away from the individual 250 μ m colored fibers if single fiber access is needed from the ribbon end or at midspan using Sumitomo's ribbon midspan access kit.

SUMTOMO OPTICAL FIBER RIBBON



2.5 Central Buffer Tube

The ribbons are placed in a single, gel-filled, high temperature buffer tube. The gel prevents water migration down the tube and can be easily removed from the ribbons with isopropyl alcohol.

2.6 Cable Water Blocking

The central buffer tube is wrapped with a water absorbing tape to prevent the migration of water through the cable. The dry tape does not adhere to the tube and is easily removed during cable preparation.

2.7 Cable Sheath

The Hostile Environment sheath consists of two counter helically wound layers of dielectric strength elements. These strength rods provide the necessary tensile, compression, and bending strength for cable installation and service lifetime.

The stranded strength elements are covered by an inner jacket of high temperature stabilized material. Highly visible ripcords are placed under the inner jacket for quick sheath entry. The inner jacket is also clear for quick location of the ripcords underneath.

A dry water blocking tape is wrapped around the jacketed core. A corrugated copper armor is formed around the cable core and is welded to produce a hermetically sealed barrier against steam and chemical intrusion. On top of the copper is a black outer jacket of high temperature, humidity stabilized material. Two additional aramid ripcords are placed under the armor barrier to facilitate its removal.

2.8 Cable Dimensions

<i>LITEPIPE RIBBON / HOSTILE SHEATH CABLE</i>		
FIBER COUNT	NOMINAL DIAMETER	NOMINAL WEIGHT
12 - 96	17.1 mm (0.67 in)	381 Kg/km (256 lbs/kft)
108 - 216	19.6 mm (0.77 in)	460 Kg/km (309 lbs/kft)
240 - 432	23.7 mm (0.93 in)	630 Kg/km (423 lbs/kft)

2.9 Sheath Marking

The entire length of each cable is marked, at a minimum, with the following items:

- "SUMITOMO OPTICAL CABLE"
- Month and Year of Manufacture
- Bellcore SOC Code per SR-NWT-002014
- 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. The actual cable length will be within +1%, -0% of the marked length. All markings are printed 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

<i>MECHANICAL PERFORMANCE</i> 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 (248 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 \pm 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 \leq 3

3.2 Environmental Performance

<i>ENVIRONMENTAL PERFORMANCE</i> PROPERTY	TEST PROCEDURE	SPECIFICATION
Temperature:	Operation	EIA/TIA-455-3
	Installation	-40 to +130 °C (-40 to +266 °F)
	Storage / Shipping	-30 to +60 °C (-22 to +140 °F)
		-40 to +75 °C (-40 to +167 °F)
Cable Aging	EIA/TIA-455-3	1440 hours @ 130°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	65 °C (149 °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

4. Testing and Inspection

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.

5. Packaging and Shipping

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 wrap which is fastened to the cable by packaging straps. This wrap is reusable and provides excellent thermal and UV 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.

<i>REEL DIMENSIONS</i>						
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

		REEL CODES						[ft.]	[m]	
WOOD STEEL	L-18 417	L-25 420	L-29 420	L-37 421	L-46 NA	NA NA	NA NA	30,000	9,140	CABLE LENGTH
	L-15 416	L-21 417	L-25 420	L-37 420	L-46 422	L-46 NA	NA NA	25,000	7,620	
	L-15 416	L-18 417	L-25 420	L-29 420	L-37 421	L-46 422	L-46 NA	20,000	6,100	
	L-11 415	L-15 416	L-21 417	L-25 420	L-27 420	L-37 420	L-37 421	15,000	4,570	
	L-8 414	L-11 415	L-15 416	L-21 417	L-21 417	L-27 420	L-37 420	10,000	3,050	
	L-8 414	L-11 414	L-15 415	L-21 416	L-21 417	L-27 417	L-37 420	7,500	2,290	
	L-8 414	L-8 414	L-11 414	L-21 415	L-21 416	L-27 416	L-37 417	5,000	1,520	
	L-3 414	L-3 414	L-11 414	L-21 414	L-21 414	L-27 414	L-37 415	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			
CABLE DIAMETER										

NOTE: Actual reel size used will depend on production capacity, net weight, and reel availability. Check with your sales representative for more details.

6. Installation / Handling Practices

Sumitomo has incorporated a wide range of technical support and training services for our fiber optic cable products into our Technical Support Services (TSS) program. TSS offers training in the areas of cable installation, sheath entry, splicing, testing, and system troubleshooting. The services are available in a variety of media formats and can be customized to better accommodate individual training needs. The TSS program consists of an extensive series of recommended procedure documents, training courses with classroom and hands-on instruction, as well as demonstration video tapes. Please contact Sumitomo's Customer Service department for more information.

7. Ordering Information

To learn more about Sumitomo's cables or to place an order, call, fax, e-mail, or write us at:

*Sumitomo Electric Lightwave Corp.
78 Alexander Drive
Research Triangle Park, NC 27709
Attn: Customer Service Department*

*Phone: 800-358-7378
919-541-8100
Fax: 919-541-8265
E-mail: info@sumitomoelectric.com*

Sumitomo Electric Lightwave Corp. reserves the right to improve, enhance, or modify the cable's features and specifications. For special requirements different than those shown above, please contact our Inside Sales Department. 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.

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