Maximum Rated Cable Loads & Minimum Bending Diameter
Application Note AN-101

Optical Fiber Cable

An optical fiber cable is a composite structure comprised of anti-buckling members, strength members, buffer tubes, polyethylene sheaths, and additional cable components. These cable elements are arranged in a precise manner to protect the optical fibers within the cable structure from mechanical, chemical, and environmental hazards.

To maintain cable integrity, the individual cable elements must not be strained beyond their recommended limits. During static conditions, bending strain is the primary strain mechanisms while both bending and tensile strains are active during dynamic conditions. Cable minimum bend diameter determination encompasses both conditions.

Cable minimum bend diameter is typically expressed as a multiplier of the cable outer diameter under static and dynamic conditions. The static condition represents an installed cable under a residual tensile load only. The dynamic condition represents a cable during installation subjected to the full tensile load rating of the cable.

Minimum Bend Diameter Loose Tube Cable Table 1

Recommended minimum bend diameter for various loose tube cable designs. Please contact OFS for cable outer diameter (OD) data. The minimum bending diameter for most OFS loose tube cables is 20 times the cable diameter for unloaded condition, and 30 times the cable diameter for loaded condition, where an unloaded condition is defined as up to 30% of the maximum tensile rating. Temporary bending of cable coils into smaller diameters may be necessary to pass cable coils into a manhole, however the cable should not be bent to a diameter less than 10 times the cable diameter under any circumstances. See Figure 1. Table 1 summarizes OFS's cable designs and their associated minimum bend diameters during placing, as well as the minimum cable coil diameter for long-term storage:

Minimum Bend Diameter Central Core Cable Table 2

Table 2 lists the recommended minimum bend diameter for various OFS central core cable designs. The minimum bending diameter for most OFS central core cables is 20 times the cable diameter for unloaded condition, and 40 times the cable diameter for loaded condition, where an unloaded condition is defined as up to 30% of the maximum tensile rating. For all OFS central core cables containing 240 fibers and above, the minimum-bending diameter is 30 times the cable diameter for unloaded and 40 times the cable diameter for loaded conditions. Temporary bending of cable coils into smaller diameters may be necessary to pass cable coils into a manhole, however the cable should not be bent to a diameter less than 20 times the cable diameter under any circumstances. See Figure 1. Table 2 summarizes OFS's central core cable designs and their associated minimum bend diameter during placing, as well as the minimum cable coil diameter for long-term storage:

Cable Maximum Rated Cable Load

Optical fiber cable is designed and manufactured to provide stable and reliable performance when subjected to the rigors of conventional aerial, direct burial and underground duct environments. During cable installation, care should be taken to not violate the maximum rated cable load (MRCL) and minimum bending diameter.

The maximum rated cable load is the greatest tensile load that may safely be applied to a cable. The maximum rated cable load also referred to as the maximum cable pulling tension or maximum allowable pulling force, is specified under short-term and long-term (residual) conditions. The short-term condition represents a cable during installation. The long-term condition represents an installed cable subjected to a permanent load for the life of the cable. The maximum rated cable load is a function of specific cable design

Table 1. Minimum Bending Diameter and Maximum Rated Cable Loads Loose Tube OSP Cables

Cable Design	Maximum Rated Cable Long term / Short term	Minimum Bending Diameter
Outside Plant (OSP) DryBlock™ & Fortex™ DT Loose Tube Single Jacket, Double Jacket, Standard Armor, Heavy Armor, Light Armor, Double Armor, Laminated Aluminum Polyethylene (LAP)	200 lb. / 600 lb. (890 N / 2700 N)	Static: 20 x Cable OD Dynamic: 30 x Cable OD
Outside Plant (OSP) Mini C2 Armored Drop Cable	100 lb. / 300 lb. (445 N / 1335 N)	Static: 20 x Cable OD Dynamic: 30 x Cable OD
Outside Plant (OSP) Midia FX Plus Loose Tube Drop Cable	100 lb. / 300 lb. (445 N / 1335 N)	Static: 20 x Cable OD Dynamic: 30 x Cable OD
OSP Self-Supporting LooseTube Figure 8, Armored Figure 8	1,500 lb. / 4,000 lb. (6670 N / 17,790 N)	Static: 20 x Cable OD Dynamic: 30 x Cable OD
OSP All Dielectric Self-Supporting (ADSS) Loose Tube PowerGuide®, PowerGuide®TR	See note below.	Static: 20 x Cable OD Dynamic: 30 x Cable OD
OPTION1™ , Armored OPTION1™ Indoor/Outdoor Loose Tube	200 lb. / 600 lb. (890 N / 2700 N)	Static: 20 x Cable OD Dynamic: 30 x Cable OD
OSP DryBlock™ High Density loose Tube Cable Single Jacket, Standard Armor & Light Armor	333 lb. / 1000 lb. (1481 N / 4450 N)	Static: 20 x Cable OD Dynamic: 30 x Cable OD
OSP AccuTube™ (12-fiber ribbons) Loose Tube Ribbon Single Jacket, Standard Armor, Light Armor,	333 lb. / 1000 lb. (1481 N / 4450 N)	Static: 30 x Cable OD Dynamic: 30 x Cable OD
OSP ADSS AccuTube™ (12-fiber ribbons) Loose Tube Ribbon PowerGuide®, PowerGuide®TR	See note below.	Static: 30 x Cable OD Dynamic: 30 x Cable OD

Contact OFS for cable OD's

NOTE: The PowerGuide® all dielectric self-supporting cable is custom engineered to meet the environmental and mechanical requirements associated with the application. The cable design and tensile performance is a function of loading conditions, fiber count, jacket type, maximum span lengths and sag requirements, see Application Note 200 for additional information.

Please contact OFS for additional cable designs not listed and for any application or installation related issues.

Table 2. Minimum Bending Diameter and Maximum Rated Cable Loads Central Core OSP Cables

Cable Type	Fiber Count	Cable Diameter	Minimum Bend Diameter	Minimum Bend Diameter	Minimum Storage Coil Diameter*	Maximum rated Cable Load
			Unloaded* 20X	**Loaded 40X**		
Lightpack® Dielectric Drop	1-18	0.30" (7.6 mm)	6" (16 cm)	12" (31 cm)	18" (46 cm)	100 lb. / 300 lb. (445 N / 1335 N)
Lightpack® Mini-LXE	2-18	0.36" (9.1 mm)	8"(20 cm)	15" (37 cm)	18" (46 cm)	133 lb. / 400 lb. (582 N / 1780 N)
Lightpack® LXE-DE (Dielectric)	4-48	0.51" (13.0 mm)	11" (26 cm)	20.5" (52 cm)	18" (46 cm)	200 lb. / 600 lb. (890 N / 2700 N)
	50-96	0.61" (15.5 mm)	13" (31 cm)	24.5" (62 cm)	18" (46 cm)	200 lb. / 600 lb. (890 N / 2700 N)
Lightpack® LXE-ME (Metallic)	4-24	0.45" (11.4 mm)	9"(23 cm)	18" (46 cm)	18" (46 cm)	200 lb. / 600 lb. (890 N / 2700 N)
	26-48	0.51" (13.0 mm)	11" (26 cm)	20.5" (52 cm)	18" (46 cm)	200 lb. / 600 lb. (890 N / 2700 N)
	50-96	0.61" (15.5 mm)	16" (31 cm)	24.5" (62 cm)	18" (46 cm)	200 lb. / 600 lb. (890 N / 2700 N)
Accu Ribbon® LXE / AccuRibbon® DC (Dielectric & Metallic)	12-48	0.51" (12.9 mm)	11" (26 cm)	20.5" (52 cm)	18" (46 cm)	200 lb. / 600 lb. (890 N / 2700 N)
	60-144	0.61" (15.5 mm)	13" (31 cm)	24.5" (62 cm)	18" (46 cm)	200 lb. / 600 lb. (890 N / 2700 N)
	156-216	0.71" (18.0 mm)	15" (37 cm)	28.5" (72 cm)	18" (46 cm)	200 lb. / 600 lb. (890 N / 2700 N)
Cable Type (Fiber counts 240 & Above)	**Fiber Count**	**Cable Diameter**	**Minimum Bend Diameter**	**Minimum Bend Diameter**	**Minimum Storage Coil Diameter** 40X**	**Maximum rated Cable Load**
			Unloaded* 30X	**Loaded 40X**		
AccuRibbon® LXE	240	0.71" (18.0 mm)	22" (54 cm)	29" (73 cm)	29" (73 cm)	200 lb. / 600 lb. (890 N / 2700 N)
AccuRibbon® DC (Dielectric & Metallic)	264-432	0.84" (21.3 mm)	25.5"(64 cm)	32" (82 cm)	32" (82 cm)	200 lb. / 600 lb. (890 N / 2700 N)
Primary Armor M-Sheath	264-576	0.78" (19.8 mm)	23.5" (60 cm)	31.5" (79 cm)	31.5" (79 cm)	200 lb. / 600 lb. (890 N / 2700 N)
DuctSaver (Metallic)	264-576	0.90" (22.9 mm)	27" (69 cm)	36" (92 cm)	36" (92 cm)	200 lb. / 600 lb. (890 N / 2700 N)
DuctSaver (Dielectric)	264-576	0.76" (19.3 mm)	23" (58 cm)	30" (78 cm)	30" (78 cm)	200 lb. / 600 lb. (890 N / 2700 N)
	744-864	0.96" (24.4 mm)	29" (74 cm)	39" (98 cm)	39" (98 cm)	200 lb. / 600 lb. (890 N / 2700 N)
Metallic DuctSaver+	744-864	1.00" (25.4 mm)	30" (77 cm)	40" (102 cm)	40" (102 cm)	200 lb. / 600 lb. (890 N / 2700 N)

***** For short-term bending during low-tension cable handling operations, and long-term cable racking or cable storage using snowshoe-type storage systems. ****** Coiling the cable for long term storage.

Figure 1 – Passing Cable Into Manholes