



Purpose:

The purpose of this document is to provide a guide to the installer of Belden OptiTuff(TM) Mini Fiber Cable. This guide should be used in conjunction with normal fiber installation procedures and practices, as it is meant to advise the user on the additional considerations to take due to the unique construction of the OptiTuff(TM) Mini Fiber Cable. This guide does not cover all aspects and installation should only be performed by crews with prior training and experience.

General Precautions:

OptiTuff(TM) Mini Fiber Cables have been engineered with advanced thermoplastics to be rugged in nature compared to standard indoor cables. Due to the nature of these materials, these cables can withstand greater mechanical forces, but care should be taken not to exceed the pulling tensions or bend radii during installation. The ruggedized jacket creates an inherently kink resistant product, but can still be kinked if sufficient measures are not in place to plan the wire path.

The loose tube design of the cable provides the optical fibers greater isolation from mechanical and thermal induced stresses. This also allows the very low pulling tensions required during installation to be transferred through the jacket without straining the fiber. OptiTuff(TM) Mini Fiber Cables can be both pulled and pushed during an installation due to the stiffness of the jacket material. Exceeding the maximum rated pulling tensile will be apparent after installation, as the jacket will stretch while the fibers will not, creating an empty region at the pulling end.

Mechanical Characteristics:

Full OptiTuff(TM) Technical Datasheets are available online at <https://belden.com/optituff>, but below is a general mechanical characteristic table that can be used as a quick reference guide.

Extended Performance Specifications		
Max. Install Load	FOTP-33	100 N (25 lbf)
Min. Bend Radius Long Term:	FOTP-33	15 mm
Min. Bend Radius Short Term:	FOTP-33	15 mm
Crush Resistance:	FOTP-41	220 N/cm
Crush Resistance (Recoverable Signal < +0.5 dB):	FOTP-41	2500 N/cm
Impact Resistance:	FOTP-25	2.9 N•m
Torsion Resistance:	FOTP-85	0.3 m



Reel Handling:

All Belden Fiber cables ship with a test inspection report that will include the measured fiber attenuation values. This report should be inspected upon receipt by the customer and can be verified using an OTDR to ensure that no damage was incurred during transit. Cables should be stored in a suitable dry environment prior to install, protected from the elements and according to the temperature limits on the technical datasheet. The ends of the cable should be capped if exposed to humidity. The outer end of the reel should be taped or secured to keep the cable from flailing when moved.

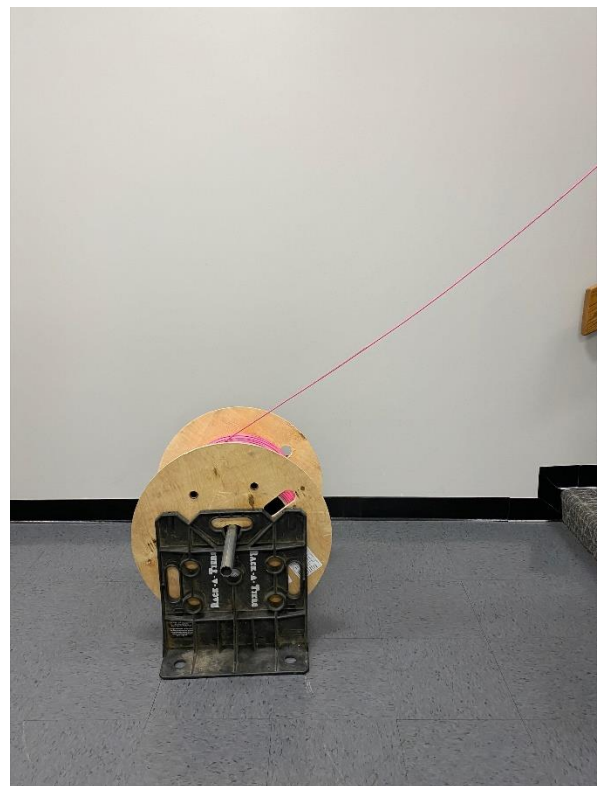
OptiTuff(TM) Mini Fiber Cable cables are generally shipped on wooden reels, up to 2km in length. A full reel is comparatively light in weight and can be moved with greater ease than many competitive products. Smaller reels may be lifted by hand, but all reels can be moved with support equipment, if necessary. Care should still be taken by the user to avoid injury to themselves or damage to the cable. Generally, the fiber should be placed or rolled on the flanges of the reel, as setting on the flat-side of the flange may allow the cable to unwind and pile up to the floor. Damaged reel flanges pose a risk as a potential snag point for cable to catch on or to unspool from the side, and any such reels should be inspected prior to continuing with an installation.

Installation Preparation:

Prior to installation, all fiber optic cables should be taken out of storage and conditioned for 24 hours in an environment according to the installation temperature ranges specified on the technical datasheet. This helps ensure that installation goes smoothly by avoiding material stress and cracking due to extreme temperatures.

Reels should be placed on cable rollers or a horizontal shaft payoff and pay-off the top of the reel. Never place the reel on the side-flange using a turntable or vertical shaft, as this will allow the cable to unwind to the bottom of the payoff. Never pay-off a fiber optic cable over the side-flanges of the reel, as this will induce a helix into the cable and cause torsional stress to the cable and fibers, a failure point.

Belden recommends the use of breakaway or fused swivels and pulling eyes that are designed to fail at the rated installation load. If these materials are not available, a tension gauge can be successfully used if monitored during the entire installation pull. Such swivels should be secured in-line, and fastened to the cable using either a cable sock or pulling rope tied with a clove hitch and secured with tape.





Tensile Performance:

As long as the rated installation load is not exceeded, the installer should experience no deformation or stretch in the cable. If the user is in doubt of whether an installation was successful, either due to suspect materials or equipment, an OTDR should be used to verify the integrity of the link. Any damaged cables should be replaced. For lower fiber count cables (2-6F) an aramid yarn is included in the cable construction to mitigate strain forces from transferring into the fibers. Pulling forces can be reduced if the installer manually rotates the reel by hand, rather than pulling the fiber to rotate the reel, as this can transfer excess force to the cable.

OptiTuff(TM) Mini Fiber Cable's rugged design and UL OFNP (Plenum) listings offer the user ease of design, having the ability to avoid grounding or conduit requirements. For vertical installations, the preferred method is to drop the cable in place, while using service loops to mitigate fiber creep induced strain in the ends of the install. A service/locking loop can simply be made by coiling the cable twice with a radius of 20x cable O.D. and securing it.

Crush Performance:

OptiTuff(TM) Mini Fiber Cable cables have been proven rugged in design and are resilient to crushing or compressive loads. Care should still be taken during installation to avoid excessive risk to the cable. These cables have been shown to take more punishment than comparative metal armors by attenuation recovery after the mechanical stress is removed. Should a section be suspect to defect or damage, an OTDR can be used to verify the fiber performance and, if necessary, a suitable cable sleeve or wrap can be used to reinforce the area for the life of the system before being secured in place.

Impact Performance:

OptiTuff(TM) Mini Fiber Cable's unique jacket construction gives it superior impact performance to other indoor fiber cables. Impact is the most likely cause of permanent damage to the optical fibers within a cable, and any such events should be checked with an OTDR to verify that no such damage occurred. OptiTuff(TM) Mini Fiber Cable fiber cables are rated the same as most indoor/outdoor fiber cables, 2.9 N*m, which is about equivalent to a 1 pound weight being dropped from 2 feet. If any damage is observed to the cable, it should be replaced.

Kink Performance:

Kinking a fiber optic cable will place a great amount of stress at a specific point in the fiber at the point of the kink. Fiber is a very flexible material, but is still glass, and any point stresses may cause the glass to fracture. The materials used in OptiTuff(TM) Mini Fiber Cable cables provide it with kink resistance, but it is still possible to place it under such a load that it eventually fails. In such a case of events, the jacket should be inspected for cracks and the fiber tested with an OTDR to verify performance. If required, an over-sleeve or wrap can be used



at the point of kinking to reinforce the cable for the life of the system, before being secured. OptiTuff(TM) Mini Fiber Cable cables use bend-insensitive ITU-T G.657.A1 and TIA 492AAAF, A1-OM4 fibers, which helps mitigate loss due to excessive bending.

Staple Installation:

OptiTuff(TM) Mini Fiber Cable fiber cables can be secured using traditional cable ties or hook-and-loop fasteners, but also have the capability to withstand staple-gun installations. When fastened directly to walls using staples, they should be fixed at regular intervals of 12 inches (300mm) Horizontally or 16 inches (400mm) Vertically. In such installations the staple equipment should be tested beforehand to provide enough force to fasten the staple in-place, without crushing the jacket of the fiber cable.

