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AccuRiser™ Indoor/Outdoor, Universal Cable Application Overview

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Deploying fiber optic cable from the outdoors into a building interior can be time consuming and requires extensive interconnecting hardware when ordinary approaches are used. National Electric Code (NEC) Article 770.48 requires that unlisted, outside plant (OSP) fiber optic cables be terminated within 50 feet of a building entrance.[1] Entrance is defined as the point at which a cable emerges from an external wall, a concrete floor slab or a rigid metal conduit (Type RMC) into the building.[2] This limitation requires that a building entrance terminal be installed and the OSP cable spliced to a suitable NEC flame-rated cable. The cable is then deployed to locations inside the building as needed. Cable solutions that can eliminate the need for the entrance terminal and associated splicing can help to significantly reduce installed costs and enable faster installation.

Single Universal Cable

Using a cable that can transition from OSP to indoor riser applications eliminates the need for termination within the 50 foot limit. These cables should meet stringent OSP and indoor premise cable requirements along with the NEC Article 770 Flame Propagation test. OFS AccuRiser cable meets all or relevant portions of the requirements outlined in Telcordia GR-409/ICEA-S-83-696/ICEA-S-104-696/ICEA-S-115-730 and TIA-568, along with UL 1666 Riser-rated flame testing.

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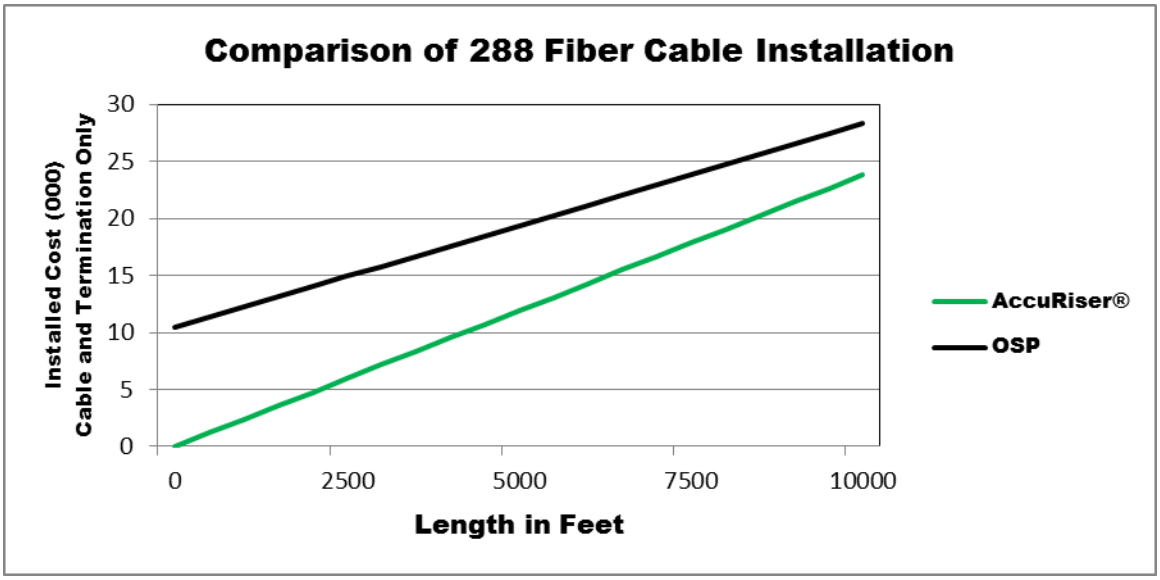
[1] **NEC Article 770.48: Unlisted Cables and Raceways Entering Buildings.**
(A) Conductive and Nonconductive Cables. Unlisted conductive and nonconductive outside plant optical fiber cables shall be permitted to be installed in locations as described in 770.154(C), where the length of the cable within the building, measured from its point of entrance, does not exceed 15 meters (50 feet) and the cable enters the building from the outside and is terminated in an enclosure.
(B) Nonconductive Cables. Unlisted nonconductive outside plant optical fiber cables shall be permitted to enter the building from the outside and run in raceway systems installed in compliance with any of the following articles in Chapter 3: Article 342, Intermediate Metal Conduit: Type IMC; Article 344, Rigid Metal Conduit: Type RMC; Article 352, Rigid Polyvinyl Chloride Conduit: Type PVC; and Article 358, Electrical Metallic Tubing: Type EMT.

[2] **Point of Entrance:** The point within a building at which the cable emerges from an external wall, from a concrete floor slab, or from a rigid metal conduit (Type RMC) or an intermediate metal conduit (Type IMC) connected by a grounding conductor to an electrode in accordance with 770.100(B).

AccuRiser Indoor/Outdoor Cable allows engineers and technicians to bypass the building entrance terminal and route the cable directly to where it is needed. The gel-free construction of the AccuRiser Cable also has the benefit of helping to reduce cable preparation time for splicing. Technicians can enter and prepare an AccuRiser Cable for splicing by up to 90 minutes faster than comparable gel-filled OSP cables.

Note: These guidelines are based on typical known practices. Always check local and city building code requirements when installing flame-rated cables.

Economics of Single Universal Cable Design



The comparison chart above is based on the fact that AccuRiser Cable eliminates the need for traditional splice hardware and accessories. The installed product cost advantages of using an AccuRiser single cable solution can range from approximately $5,000 to $10,000 in this example. Only when using lengths greater than 15 kft can the standard OSP cable's installed product cost begin to compare to that of the AccuRiser cable solution.

These costs are computed using a $15 per single fiber splice rate and nominal costs of terminals and placement of $1,780 based on typical OFS product costs. The labor expense for pulling the cable was not included in the calculation as this cost was involved in both approaches. Even greater savings opportunities are possible when using higher-fiber count AccuRiser cables. For example, when using 864-fiber-count AccuRiser Cable, the installed product cost savings opportunities can range from $20,000 on short runs to $10,000 on runs of 10 kft, when compared to an OSP cable-based approach.

Data Center Interconnect (DCI) Applications

Ideally suited for DCI applications, the AccuRiser Cable supports campus interconnections between data center buildings while also eliminating costly splicing between OSP and indoor cables. Designed for links of up to 10,000 feet, the AccuRiser Cable is a more cost-effective solution than using traditional OSP cable and facility entry terminals. The high-fiber count capacity of AccuRiser Cable allows a single solution to be used for data centers by eliminating the need for multiple runs of smaller-fiber count cables.

Flame Ratings

AccuRiser Cable is rated for both indoor and OSP use with an NEC flame rating for riser applications (OFNR) and an IEC 60332-3C low smoke zero halogen (LSZH) rating.[3] The dual rating makes this cable universally suitable for applications in North America and EMEA as well as throughout much of the world.

Cable placement based on the dual rating of AccuRiser Cable provides greater options when transitioning into buildings. OFNR ratings can exist in places where OFCR and general purpose cables are required, but not in plenum spaces. While an IEC 60332-3C (LSZH) rating offers an

[3] IEC 60332-3/BS 4066-3 (Flame Test on Bunched Wires/Cables) IEC60332-3C describes a method of type approval testing to define the ability of bunched cables to resist fire propagation. In this test, a cable specimen, consisting of a number of 3.5 meter length cables, is fixed to a vertical ladder tray where a flame from a gas burner is applied for a specified time under controlled air flow. Four categories (A, B, C & D) are defined and distinguished by test duration and the volume of non-metallic material of the sample under testing. The cable specimen is deemed to have met the requirements of the standard if, after burning has ceased, the extent of charred or affected portion does not reach a height exceeding 2.5 meters above the bottom edge of the burner.

advantage in the North American region, it is required in EMEA and provides a single solution for customers demanding an option without regional borders.

Note: Please reference local and city building codes for the specific requirements for the region of installation.

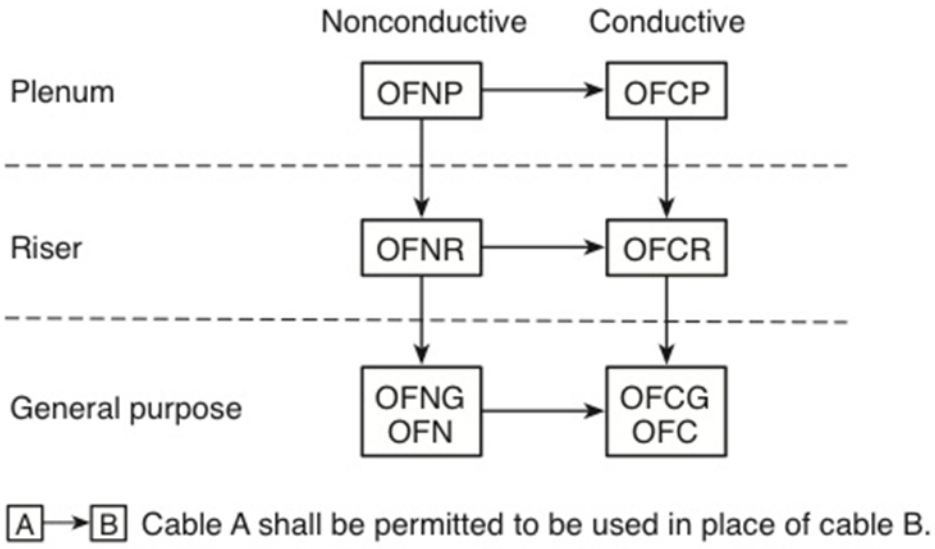


Figure 770.154(E) Cable Substitution Hierarchy.

Features Comparison

Customer Need	AccuRiser™ Universal Cables	OSP Rated Cables	Indoor Riser Rated Cables	Indoor LSZH Rated Cables
Fiber Counts 288 to 864	✓	✓	✓	✓
OSP ICEA-S-83-696 Rated	✓	✓	X	X
Premises GR-409 Rated	✓	X	✓	✓
Indoor Riser Rated OFNR (North America)	✓	X	✓	X
Indoor Placement EMEA (LSZH Rated)	✓	X	X	✓
Connect Direct to Equipment (not Limited to 50ft restriction)	✓	X	✓	✓
Completely Dry Construction	✓	X	✓	✓

Several requirements were incorporated into designing a dual-rated universal cable including those outlined in Telcordia GR-20 and GR-409 Standards, and NEC flame ratings. (Note that flame ratings are specific to the installation region and local/city requirements must be reviewed for compliance). Craft friendliness was another key consideration. The elimination of gel in the cable's core tube allows the technician to prepare and splice the fibers faster and with less

concern for contamination. Even after gel is removed from the fiber ribbons, some remaining gel residue tends to contaminate equipment such as splicers, which require vigilant cleaning to help avoid quality issues. The fully gel-free construction of AccuRiser Cable removes this headache from the installation process.

Customer Need	OFS AccuRiser™ Universal Cables	Corning FREEDM® UltraRibbon™	Prysmian FusionLink™
Smaller OD for easier installation (864)	24.5 mm	25.4 mm	26.5 mm
Completely Dry Construction	✓	✓	x
Indoor Riser Rated OFNR (North America)	✓	✓	✓
Indoor Placement EMEA (LSZH Rated)	✓	✓	x
Jacket Color Options (Black, Black with Stripe, or Yellow)	✓	x	x
Fiber Counts 288 to 864	✓	x	x

Note: Product comparisons are based on currently available data sheets from respective websites as of August 2016.

In terms of cable, smaller is better as long as performance and reliability requirements are maintained or exceeded. AccuRiser Cable meets all relevant industry standards and requirements while also maintaining an industry-leading, small outer diameter. Reduced cable diameters can often enable the use of potentially smaller duct, and result in lower duct fill ratio, lower overall weight and easier handling.

While the AccuRiser Indoor/Outdoor Cable is available with a standard black outer jacket (or black with a stripe), it is also available on request in solid jacket colors such as yellow to match the color coding used for indoor flame-rated cables. The AccuRiser Cable is available in fiber counts from 288 up to 864, which is a wider range than offered by many other leading cablers based on currently available information from respective websites. These factors all combine to offer more craft-friendly installation for the cable technician and substantially more cabling options for the network design engineer.

Routing AccuRiser Cable between buildings often involves working with manholes or vaults to access ducts while entering the building. With AccuRiser Cable, the cable can be coiled and any slack cable stored within a 48-inch diameter manhole. Coils are most effectively built within the manhole to prevent the unnecessary handling of heavy coils through the manhole opening. Recommendations for installation methods can be found in OFS Installation Practice IP-084.

Minimum Recommended Bend Diameters for AccuRiser Cable				
Fiber Count	Cable Diameter	Static Condition	Dynamic Condition	Storage Coil
	in. (mm)	30 × OD	40 × OD	40 × OD
288	0.67 (17)	21 (534)	27 (686)	27 (686)
576	0.77 (19.6)	24 (610)	31 (787)	31 (787)
864	0.96 (24.4)	29 (737)	39 (991)	39 (991)

Summary:

NEC Section 770 requires that OSP cables must be terminated within 50 feet of entry into a building. With a dual flame rating and adherence to key requirements[i], AccuRiser Indoor/Outdoor Cable allows cables to be terminated only as needed, helping to eliminate the costly splicing of OSP cables at the building entrance. This capability also frees up limited space and helps to save on time, a factor that is essential to efficient installation. The AccuRiser Cable enables more cost-effective and faster installation of interconnections for data centers and other buildings that require high-fiber-count, flame rated cables.

[4] AccuRiser Indoor/Outdoor Cable meets all or portions of GR-409/ICEA-S-83-696/ICEA-S-104-696/ICEA-S-115-730 and TIA-568 requirements

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