### General Comments:

1. Install per manufactures requirements.
2. Coordinate/verify site sign requirements/installation with Owner.
3. Review/coordinate installations with Owner and Engineers office.
SUBMITTAL COVER SHEET

PROJECT NAME & NUMBER: Northwest Elementary School & District Warehouse Project - 7164

ARCHITECT: Beers & Hoffman

ENGINEER: Moore Engineering

PRIME CONTRACTOR: Pagoda Electric

SUBCONTRACTOR/SUPPLIER: __________________________

MANUFACTURER: __________________________

ITEM SUBMITTED: Telecommunications

SPEC. SECTION NO: 271400

SUBMITTAL NO: 4R

PARAGRAPH NO: __________________________

DRAWING REFERENCE: __________________________

SUBMITTED BY: R. Scott Cromwell

PAGODA ELECTRICAL, INC.
REVIEW STAMP

Date: 3/6/17  Job No: 7164  By: RSC

Reviewed as to type and/or design
except as noted

Subject to Approval of Owner or
Architect  X

Rejected/Resubmit ______
Optical fiber used in Hubbell’s OptiChannel HFCD Series cable delivers high bandwidth optical network performance and reliability. Featuring high performance laser optimized OM3 and OM4 fiber, with ease of termination, all HFCD series fiber cables are supported by the Hubbell Mission Critical® 25-year warranty. Premium quality OM3, OM4 and OS2 fibers provide maximum durability and tight bend transmission performance. Tight bend rated fibers enhance cable performance, adding headroom to certification test results. Hubbell also remains committed to supporting legacy OM1 and OM2 fibers.

**FEATURES**

- Laser optimized, high bandwidth, low bend radius for optimum transmission performance
- Premium bend-insensitive fiber for enhanced durability and maximum testing headroom
- Fibers supported: OM1, OM2, OM3, OM4, OS2
- Low dispersion, extended distance OM3 and OM4 performance at 10G/40G/100G data rates
- E-Z strip buffer with new dash style color stripes for contractor-friendly termination
- High performance fiber minimizes cable contribution to overall link loss budgets

**SPECIFICATIONS**

- OM1 and OM2 core: legacy graded index
- OM3 and OM4 core: graded, laser optimized
- OS2 core: step index
- Tensile proof stress: ≥ 100 kpsi
- Fiber coating: acrylate
- Buffer layer: flame retardant PVC
- Temperature test range: -60º C to +85º C
- Dimensional specifications: see chart
- Performance specifications: see chart

**STANDARDS**

- TIA-492AAAA-A: OM1 Optical Fiber Standard
- TIA-492AAAB-A: OM2 Optical Fiber Standard
- TIA-492AAC-B: OM3 Optical Fiber Standard
- TIA-492AAD-D: OM4 Optical Fiber Standard
- TIA-492CAAA: OS2 Optical Fiber Standard
- IEC 60793-2-10: Multimode Fiber Specifications
- IEC 60793-2-50: Singlemode Fiber Specifications
- ITU-T-G651.1: Multimode Fiber Specifications
- ITU-T-G652D: Singlemode Fiber Specifications
- TIA-568-C.3: Optical Fiber Cabling Standard

**APPLICATIONS**

- Indoor building LAN, backbone, and horizontal fiber cabling
- Data Center and Storage Area Network cabling
- Bandwidth-intensive, high speed data and video transmission
- Extended distance, non-conductive data links
- Indoor/Outdoor duct and campus cabling
- Commercial, medical, government and education facilities

Visit www.hubbell-premise.com for more information.
OPTICAL FIBER CABLE ORDERING INFORMATION

Optical fiber described in this specification is supplied in the following Hubbell HFCD Series tight buffered cables:

- HFCD1 Series: Indoor Distribution
- HFCD1M Series: Indoor Distribution, Multi-Unit
- HFCD15 Series: Indoor Distribution, Armored
- HFCD14 Series: Indoor/Outdoor
- HFCD19 Series: Indoor/Outdoor Armored

OPTICAL FIBER PERFORMANCE SPECIFICATIONS

<table>
<thead>
<tr>
<th>Fiber Type</th>
<th>Max Attenuation (dB/km)</th>
<th>Laser-Based EMB (MHz·Km)</th>
<th>1 Gb/s Link Distance (meters)</th>
<th>10 Gb/s Link Distance (meters)</th>
<th>40/100 Gb/s Link Distance (meters)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>850 nm</td>
<td>1300 nm</td>
<td>850 nm</td>
<td>1300 nm</td>
<td>850 nm</td>
</tr>
<tr>
<td>OM1</td>
<td>≤ 2.9</td>
<td>≤ 0.6</td>
<td>220</td>
<td>n/a</td>
<td>300</td>
</tr>
<tr>
<td>OM2</td>
<td>≤ 2.3</td>
<td>≤ 0.6</td>
<td>950</td>
<td>n/a</td>
<td>750</td>
</tr>
<tr>
<td>OM3</td>
<td>≤ 2.3</td>
<td>≤ 0.6</td>
<td>2000</td>
<td>n/a</td>
<td>1,000</td>
</tr>
<tr>
<td>OM4</td>
<td>≤ 2.3</td>
<td>≤ 0.6</td>
<td>4700</td>
<td>n/a</td>
<td>1,100</td>
</tr>
<tr>
<td>OS2</td>
<td>≤ 0.35</td>
<td>≤ 0.20</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>

Note: All link distance limits are based on 1.0 dB max connector loss and 3.0 dB/km max cable loss.

OM2, OM3, OM4, and OS2 are bend-insensitive versions, optimized for tight macro-bending performance. See Hubbell cable literature for standard IEEE 802.3 application distances.

OPTICAL FIBER DIMENSIONAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Fiber Type</th>
<th>Core Diameter (microns)</th>
<th>Cladding Diameter (microns)</th>
<th>Core-Clad Concentricity (microns)</th>
<th>Cladding Non-Circularity</th>
<th>Core Non-Circularity</th>
<th>Coating Diameter (microns)</th>
<th>Coating-Cladding Concentricity (microns)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OM1</td>
<td>62.5 ± 2.5 µm</td>
<td>125 ± 2.0 µm</td>
<td>≤ 1.5 µm</td>
<td>≤ 1.0%</td>
<td>≤ 5.0%</td>
<td>242 ± 5 µm</td>
<td>&lt; 12 µm</td>
</tr>
<tr>
<td>OM2</td>
<td>50.0 ± 2.5 µm</td>
<td>125 ± 1.0 µm</td>
<td>≤ 1.5 µm</td>
<td>≤ 1.0%</td>
<td>≤ 5.0%</td>
<td>242 ± 5 µm</td>
<td>&lt; 12 µm</td>
</tr>
<tr>
<td>OM3</td>
<td>50.0 ± 2.5 µm</td>
<td>125 ± 1.0 µm</td>
<td>≤ 1.5 µm</td>
<td>≤ 1.0%</td>
<td>≤ 5.0%</td>
<td>242 ± 5 µm</td>
<td>&lt; 12 µm</td>
</tr>
<tr>
<td>OM4</td>
<td>50.0 ± 2.5 µm</td>
<td>125 ± 1.0 µm</td>
<td>≤ 1.5 µm</td>
<td>≤ 1.0%</td>
<td>≤ 5.0%</td>
<td>242 ± 5 µm</td>
<td>&lt; 12 µm</td>
</tr>
<tr>
<td>OS2</td>
<td>8.2 µm**</td>
<td>125 ± 0.7 µm</td>
<td>≤ 0.5 µm</td>
<td>≤ 0.7%</td>
<td>n/a</td>
<td>242 ± 5 µm</td>
<td>&lt; 12 µm</td>
</tr>
</tbody>
</table>

**OS2 Mode field diameter at 1310 nm: 9.2 ± 0.4 µm; OS2 Mode field diameter at 1550 nm: 10.4 ± 0.4 µm.

INSTALLATION TIPS

- Verify the IEEE 802.3 application is supported for channel distance and attenuation limits (see chart above).
- During installation or operation, comply with maximum loading, minimum bend radius, and temperature limits.
- Always pull cables by the internal strength member, or fiber damage may result.
- Use proper tools for stripping and dressing out cable to avoid fiber damage.
- Adhere to best installation practices, avoiding kinks, crushing, and abrasion. Always use proper cable supports.
- Use recognized field termination methods. Fiber terminations shall be strain relieved from any cable weight.
Hubbell's OptiChannel HFCD14 Series Indoor/Outdoor Tight Buffer Fiber Cables offer a universal solution for campus networks, eliminating transition points in the building entrance. Plenum and riser ratings allow full deployment into the building backbone and horizontal spaces. Featuring ease of termination similar to distribution cable, HFCD14 series cables are supported by the Hubbell Mission Critical® 25-year warranty. Premium bend-insensitive fibers are used in Hubbell OM3, OM4 and OS2 fiber cables for maximum durability. Bend insensitive fibers enhance installed cable performance, adding headroom to certification test results.

**Cut, Spooled and Shipped to Order**
- Universal Construction for Indoor/Outdoor Installations
- 10 GbE Application Assurance for all Standards-Supported Lengths
- RoHS Compliant, Flame-Retardant Cable, Manufactured Locally

**Features**
- E-Z strip buffer with new dash style color stripes for contractor-friendly termination
- Multi-purpose outdoor duct to building riser and horizontal infrastructure, all with a single cable
- Premium bend-insensitive fiber for enhanced durability and maximum testing headroom
- Fibers supported: OM1, OM3, OM4, OS2
- Sold in feet, available in Riser (OFNR), and Plenum (OFNP) for all supported fibers
- Most cables stocked with low MOQs—call for stock availability, with fast delivery

**Specifications**
- Fiber count: 2, 6, 12, 24, 48 and 72 strand
- Subunits: 12 fibers/unit (48–72 strand only)
- Fiber coating: 900 micron PVC tight buffer
- Temperature range:
  - Storage: -40º F to +185º F (-40º C to +85º C)
  - Installation: 32º F to +132º F (0º C to +56º C)
  - Operation: -4º F to +185º F (-20º C to +85º C)
- Multimode attenuation: 3.5/1.5dB/km at 850/1300nm
- Singlemode attenuation: 0.5/0.4dB/km at 1310/1550nm
- Optical: see fiber specifications on page 4

**Standards**
- Telcordia GR-409 and GR-20
- ANSI/ICEA S-87-640
- TIA-492 Series optical fiber specifications
- TIA-568-C.3 Optical fiber cabling standards
- Riser cables: UL 1666/CSA FT-4
- Plenum cables: NFPA-262/UL910/CSA FT-6

**Cable Jacket and Buffer Color Codes**
- Black outer jacket: all fiber types (OM1, OM3, OM4, and OS2)
- Buffer color codes and pairing sequence:
  - 1-Blue, 2-Orange, 3-Green, 4-Brown, 5-Slate, 6-White
  - 7-Red, 8-Black, 9-Yellow, 10-Violet, 11-Rose, 12-Aqua
  - 13-Blue/Black, 14-Orange/Black, 15-Green/Black, 16-Brown/Black
  - 17-Slate/Black, 18-White/Black, 19-Red/Black, 20-Black/White
  - 21-Yellow/Black, 22-Violet/Black, 23-Rose/Black, 24-Aqua/Black
- 48 strand subunit colors: Blue, Orange, Green, Brown
- 72 strand subunit colors: Blue, Orange, Green, Brown, Slate, White
- Repeat buffer colors 1 through 12 for 48 and 72 strand cable subunits

**Applications**
- Inter-building duct, backbone and horizontal fiber cabling
- Campus to data center and storage area network
- High bandwidth cross-campus data and video transmission
- Extended distance, non-conductive indoor/outdoor data links
- Commercial, medical, government, and education facilities
- Not recommended for direct burial or weather exposure

www.hubbell-premise.com
INDOOR OUTDOOR TIGHT BUFFER FIBER CABLE

Configuration | Catalog Number
-- | --
xxx = Fiber count (002, 006, 012, 024, 048 or 072 strand) | HFC14xxxrnBK
r = ‘R’ for Riser, ‘P’ for Plenum
n = ‘6’ for 62.5 μm OM1 Multimode
‘3’ for 50 μm OM3 Multimode
‘4’ for 50 μm OM4 Multimode
‘S’ for 9 μm OS2 Singlemode
BK = Black jacket

Example: HFC14012PSBK

Description: CBL, Fiber, SM, 12F, I/O, P, TB, BK

Jacket print: OFNP RoHS Plenum 12 Fiber Indoor/Outdoor Cable xxxFT

(Date) E# (UL) C(UL) Plus Corning SMF28e+ Optical Fiber 9/125

DELIVERY
HFCD14 Series fiber cables are priced and delivered in feet. Spool size and weight varies by cable and length ordered. Specify cable put-up lengths on purchase order. MOQ for non-stocked cables is 1,640 feet. Contact Hubbell Premise Wiring for availability.

Length ordered may be subject to a +/-10% production tolerance. Cut charges may apply to multi-reel orders. Refer to next page for reel capacities, dimensions and estimated shipping weights.

Note: See Hubbell HFC19 Series for armored indoor/outdoor tight buffered cables.

CABLE DESIGN INFORMATION

HFCD14 Series: Indoor/Outdoor Tight Buffer Riser OFNR FT-4, and Plenum OFNP FT-6

<table>
<thead>
<tr>
<th>Fiber Count</th>
<th>Cable Diameter in (mm)</th>
<th>Cable Weight lb/kft</th>
<th>Minimum Bend Radius (Installation) in (cm)</th>
<th>Minimum Bend Radius (In-Service) in (cm)</th>
<th>Maximum Installation Pulling Load lb</th>
<th>Maximum Operating Tensile Load lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0.17 (4.4)</td>
<td>12</td>
<td>2.6 (6.6)</td>
<td>1.73 (4.4)</td>
<td>150</td>
<td>45</td>
</tr>
<tr>
<td>6</td>
<td>0.21 (5.3)</td>
<td>20</td>
<td>3.1 (8.0)</td>
<td>2.1 (5.3)</td>
<td>150</td>
<td>45</td>
</tr>
<tr>
<td>12</td>
<td>0.25 (6.3)</td>
<td>35</td>
<td>3.7 (9.5)</td>
<td>2.5 (6.3)</td>
<td>150</td>
<td>45</td>
</tr>
<tr>
<td>24</td>
<td>0.32 (8.1)</td>
<td>43</td>
<td>4.8 (12.2)</td>
<td>3.2 (8.1)</td>
<td>300</td>
<td>90</td>
</tr>
<tr>
<td>48</td>
<td>0.61 (15.4)</td>
<td>146</td>
<td>9.1 (23.1)</td>
<td>6.1 (15.4)</td>
<td>475</td>
<td>145</td>
</tr>
<tr>
<td>72</td>
<td>0.79 (20)</td>
<td>238</td>
<td>11.8 (30)</td>
<td>7.9 (20)</td>
<td>600</td>
<td>180</td>
</tr>
</tbody>
</table>

Note: Pulling and tensile loads shall be applied only to the internal strength member.

CABLE APPLICATION GUIDELINES: DISTANCE AND CHANNEL ATTENUATION LIMITS

<table>
<thead>
<tr>
<th>IEEE 802.3 Fiber Ethernet Application</th>
<th>Transmitter Wavelength</th>
<th>Maximum Supportable Distance (m)</th>
<th>Maximum Channel Attenuation (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>62.5/125 OM1</td>
<td>50/125 OM2</td>
<td>50/125 OM3</td>
</tr>
<tr>
<td>10/100BASE-SX</td>
<td>850</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>1000BASE-SX</td>
<td>850</td>
<td>220</td>
<td>550</td>
</tr>
<tr>
<td>1000BASE-LX</td>
<td>1300</td>
<td>550</td>
<td>550</td>
</tr>
<tr>
<td>10GBASE-S</td>
<td>850</td>
<td>26</td>
<td>82</td>
</tr>
<tr>
<td>10GBASE-L</td>
<td>1310</td>
<td>NST</td>
<td>NST</td>
</tr>
<tr>
<td>10GBASE-E</td>
<td>1550</td>
<td>NST</td>
<td>NST</td>
</tr>
<tr>
<td>10GBASE-LX</td>
<td>1300</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>10GBASE-LR4</td>
<td>1310</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>40GBASE-SR4</td>
<td>850</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>40GBASE-SR10</td>
<td>850</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>100GBASE-LR4</td>
<td>1310</td>
<td>NST</td>
<td>NST</td>
</tr>
<tr>
<td>100GBASE-4LR4</td>
<td>1310</td>
<td>NST</td>
<td>NST</td>
</tr>
</tbody>
</table>

Note: S = Short wavelength, L = Long wavelength, E = Extended wavelength
SR4 = Short Range, 4-Channels (4 x 10G pairs), SR10 = Short Range, 10-Channels (10 x 10G pairs)
LX4 = Multiplex (4) Multimode Wavelengths, LR4 = Multiplex (4) Singlemode Wavelengths
NST = Non-standard, N/A = Not applicable

INSTALLATION REQUIREMENTS

- Verify the IEEE 802.3 application is supported for channel distance and attenuation limits (see chart above).
- During installation or operation, comply with maximum loading, minimum bend radius, and temperature limits.
- Always pull cables by the internal strength member, or fiber damage may result.
- Use proper tools for stripping and dressing out cable to avoid fiber damage.
- Adhere to best installation practices, avoiding kinks, crushing, and abrasion. Always use proper cable supports.
- Use recognized field termination methods. Fiber terminations shall be strain relieved from any cable weight.

www.hubbell-premise.com
HUBBELL FIBER CABLE DELIVERY POLICY

- HFCD Series fiber cables are priced and delivered in feet
- Cable orders, when permissible, are shipped on a single reel unless otherwise specified
- Multi reel put-up lengths required by the customer must be specified at the time of ordering
- Cable lengths that exceed single reel capacity must have the split approved by the customer
- MOQ for non-stocked cable is 1,640 feet
- Cables made to order are subject to a +/-10% production tolerance
- Customer order must match total length shipped
- Cable lengths that exceed single reel capacity must have the split approved by the customer
- MOQ for non-stocked cable is 1,640 feet
- Cables made to order are subject to a +/-10% production tolerance
- Customer order must match total length shipped
- Cable lengths that exceed single reel capacity must have the split approved by the customer
- Refer to reel dimensions on selection and capacity charts
- Cut charges may apply to multi-reel orders

WEIGHTS, DIMENSIONS AND CAPACITIES

- Cable weight = [length ordered] \times [weight per foot]
- Estimated shipping weight = [cable weight] + [reel weight] + [skid weight]
- Reel capacities on this specification allow for a 2-inch cable-to-flange clearance as illustrated
- Refer to specific dimensions on the reel selection chart
- Shipping dimensions = [flange] x [flange] x [width]
- Estimated shipping width = [traverse length] + [2 inches]

STANDARD REEL SELECTIONS

- Cable weight = [length ordered] \times [weight per foot]
- Estimated shipping weight = [cable weight] + [reel weight] + [skid weight]
- Reel capacities on this specification allow for a 2-inch cable-to-flange clearance as illustrated
- Refer to specific dimensions on the reel selection chart
- Shipping dimensions = [flange] x [flange] x [width]
- Estimated shipping width = [traverse length] + [2 inches]

HUBBELL HFCD SERIES FIBER CABLE: MAX REEL CAPACITY CHART, PLENUM OR RISER

<table>
<thead>
<tr>
<th>Cable Family</th>
<th>Fiber Count</th>
<th>Overall Jacket Diameter in (mm)</th>
<th>Reel A 24(^{th}) Flange ft</th>
<th>Reel B 30(^{th}) Flange ft</th>
<th>Reel C 45(^{th}) Flange ft</th>
<th>Reel D 48(^{th}) Flange ft</th>
<th>Cable Weight per Foot lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>HFCD1 Series: Indoor Distribution</td>
<td>2 strand</td>
<td>0.174 (4.4)</td>
<td>5400</td>
<td>17500</td>
<td>n/a</td>
<td>n/a</td>
<td>0.012</td>
</tr>
<tr>
<td></td>
<td>6 Strand</td>
<td>0.210 (5.3)</td>
<td>4000</td>
<td>12000</td>
<td>n/a</td>
<td>n/a</td>
<td>0.020</td>
</tr>
<tr>
<td></td>
<td>12 Strand</td>
<td>0.250 (6.3)</td>
<td>9000</td>
<td>9000</td>
<td>n/a</td>
<td>n/a</td>
<td>0.035</td>
</tr>
<tr>
<td></td>
<td>24 Strand</td>
<td>0.320 (8.1)</td>
<td>1600</td>
<td>5000</td>
<td>n/a</td>
<td>n/a</td>
<td>0.043</td>
</tr>
<tr>
<td>HFCD1M Series: Indoor Multi-Unit, Plenum</td>
<td>48 strand</td>
<td>0.610 (15.4)</td>
<td>n/a</td>
<td>1400</td>
<td>4800</td>
<td>n/a</td>
<td>0.146</td>
</tr>
<tr>
<td></td>
<td>72 strand</td>
<td>0.790 (20)</td>
<td>n/a</td>
<td>1000</td>
<td>2800</td>
<td>n/a</td>
<td>0.233</td>
</tr>
<tr>
<td>HFCD14 Series: Indoor/Outdoor Multi-Unit</td>
<td>48 strand</td>
<td>0.610 (15.4)</td>
<td>n/a</td>
<td>1400</td>
<td>4800</td>
<td>n/a</td>
<td>0.146</td>
</tr>
<tr>
<td></td>
<td>72 strand</td>
<td>0.790 (20)</td>
<td>n/a</td>
<td>1000</td>
<td>2800</td>
<td>n/a</td>
<td>0.233</td>
</tr>
<tr>
<td>HFCD15 Series: Armored Indoor</td>
<td>6 Strand</td>
<td>0.625 (15.9)</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>0.165</td>
</tr>
<tr>
<td></td>
<td>12 Strand</td>
<td>0.625 (15.9)</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>0.170</td>
</tr>
<tr>
<td></td>
<td>24 Strand</td>
<td>0.684 (17.4)</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>0.188</td>
</tr>
<tr>
<td></td>
<td>48 Strand</td>
<td>0.930 (23.5)</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>0.365</td>
</tr>
</tbody>
</table>

Note: Reel capacities are approximate based on safe clearance below flange diameter. Reel size is determined by cable diameter and quantity ordered.
Optical Fiber Specifications for Hubbell HFCD Series Cables

**FEATURES**
- High purity glass fiber, made with advanced vapor deposition and precision draw process
- Enhanced bandwidth and distance performance
- Low bend-induced attenuation for enhanced cable operating performance
- Low dispersion, laser optimized OM3 and OM4
- Low water peak singlemode, enhanced for 1310 to 1550 nm operating wavelength range

**SPECIFICATIONS**
- OM1 and OM2: graded index core
- OM3 and OM4: graded index core; laser optimized
- OS2: step index core
- Tensile proof stress: ≥ 100 kpsi, tested in-process
- Fiber coating: clear acrylate
- Buffer layer: flame retardant color coded PVC
- Temperature test range: -60º C to +85º C

**STANDARDS**
- TIA-492AAAA-A: OM1 Optical Fiber Standard
- TIA-492AAAB-A: OM2 Optical Fiber Standard
- TIA-492AAC-B: OM3 Optical Fiber Standard
- TIA-492AADD: OM4 Optical Fiber Standard
- ITU-T-G652d: Singlemode Fiber Specifications

**OPTICAL FIBER DIMENSIONAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Fiber Type</th>
<th>Core Diameter (microns)</th>
<th>Cladding Diameter (microns)</th>
<th>Core-Clad Concentricity (microns)</th>
<th>Cladding Non-Circularity</th>
<th>Core Non-Circularity</th>
<th>Coating Diameter (microns)</th>
<th>Coating-Cladding Concentricity (microns)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OM1</td>
<td>62.5 ± 2.5 μm</td>
<td>125 ± 2.0 μm</td>
<td>≤ 1.5 μm</td>
<td>≤ 1.0%</td>
<td>≤ 5.0%</td>
<td>242 ± 5 μm</td>
<td>&lt; 12 μm</td>
</tr>
<tr>
<td>OM2</td>
<td>50.0 ± 2.5 μm</td>
<td>125 ± 1.0 μm</td>
<td>≤ 1.5 μm</td>
<td>≤ 1.0%</td>
<td>≤ 5.0%</td>
<td>242 ± 5 μm</td>
<td>&lt; 12 μm</td>
</tr>
<tr>
<td>OM3</td>
<td>50.0 ± 2.5 μm</td>
<td>125 ± 1.0 μm</td>
<td>≤ 1.5 μm</td>
<td>≤ 1.0%</td>
<td>≤ 5.0%</td>
<td>242 ± 5 μm</td>
<td>&lt; 12 μm</td>
</tr>
<tr>
<td>OM4</td>
<td>50.0 ± 2.5 μm</td>
<td>125 ± 1.0 μm</td>
<td>≤ 1.5 μm</td>
<td>≤ 1.0%</td>
<td>≤ 5.0%</td>
<td>242 ± 5 μm</td>
<td>&lt; 12 μm</td>
</tr>
<tr>
<td>OS2</td>
<td>8.2 μm**</td>
<td>125 ± 0.7 μm</td>
<td>≤ 0.5 μm</td>
<td>≤ 0.7%</td>
<td>n/a</td>
<td>242 ± 5 μm</td>
<td>&lt; 12 μm</td>
</tr>
</tbody>
</table>

**OPTICAL FIBER PERFORMANCE SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Fiber Type</th>
<th>Max Attenuation (dB/km)</th>
<th>Laser-Based EMB (MHz/Km)</th>
<th>1 Gb/s Link Distance (meters)</th>
<th>10 Gb/s Link Distance (meters)</th>
<th>40/100 Gb/s Link Distance (meters)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>850 nm</td>
<td>1300 nm</td>
<td>850 nm</td>
<td>1300 nm</td>
<td>850 nm</td>
</tr>
<tr>
<td>OM1</td>
<td>≤ 2.9</td>
<td>≤ 0.6</td>
<td>220</td>
<td>n/a</td>
<td>300</td>
</tr>
<tr>
<td>OM2</td>
<td>≤ 2.3</td>
<td>≤ 0.6</td>
<td>950</td>
<td>n/a</td>
<td>750</td>
</tr>
<tr>
<td>OM3</td>
<td>≤ 2.3</td>
<td>≤ 0.6</td>
<td>2000</td>
<td>n/a</td>
<td>1,000</td>
</tr>
<tr>
<td>OM4</td>
<td>≤ 2.3</td>
<td>≤ 0.6</td>
<td>4700</td>
<td>n/a</td>
<td>1,100</td>
</tr>
<tr>
<td>OS2</td>
<td>≤ 0.35</td>
<td>≤ 0.20</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>

**Note:** All link distance limits are based on 1.0 dB max connector loss and 3.0 dB/km max cable loss.

OM2, OM3, OM4, and OS2 are bend-insensitive versions, optimized for tight macro-bending performance.
Indoor Armored Distribution

HFCD15

Hubbell OPTICHANNEL HFCD15 Series Armored Indoor Tight Buffer Cables are a cost effective solution that eliminates protected pathways and inner duct, featuring aluminum interlock armor for resistance to crushing, abrasion and rodents.

Features
- E-Z strip buffer with new dash style color stripes for contractor-friendly termination
- Compact cable diameter reduces congestion in shared or restricted pathways
- Premium bend-insensitive fiber for enhanced durability and maximum testing headroom
- Fiber supported: OM1, OM3, OM4 and OS2
- Sold in feet, available in Riser (OFNR) and Plenum (OFNP) for all supported fibers

Specifications
- Fiber count: 6, 12, 24 and 48 strand
- 48-strand cable subunits: 12 fibers per unit
- Fiber coating: 900 micron PVC tight buffer
- Armor: aluminum interlocking spiral wrap
- Temperature range:
  - Storage: -40° F to +176° F (-40° C to +80° C)
  - Installation: 32° F to +132° F (0° C to +56° C)
  - Operation: -4° F to +158° F (-20° C to +70° C)
- Multimode attenuation: 3.5/1.5dB/km at 850/1300nm
- Singlemode attenuation: 0.5/0.4dB/km at 1310/1550nm
- Optical: see fiber data sheet

Standards
- Telcordia GR-409 and GR-20
- ANSI/ICEA S-83-596
- TIA-492 Series optical fiber specifications
- TIA-568.3 optical fiber cabling standards
- Riser cables: UL 1666/CSA FT-4
- Plenum cables: NFPA-262/UL910/CSA FT-6

Ordering Information

<table>
<thead>
<tr>
<th>Strand</th>
<th>Micron</th>
<th>Riser Catalog No.</th>
<th>Plenum Catalog No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>62.5 OM1</td>
<td>HFCD15006R6</td>
<td>HFCD15006P6</td>
</tr>
<tr>
<td>50 OM3</td>
<td></td>
<td>HFCD15006R3</td>
<td>HFCD15006P3</td>
</tr>
<tr>
<td>50 OM4</td>
<td></td>
<td>HFCD15006R4</td>
<td>HFCD15006P4</td>
</tr>
<tr>
<td>OS2</td>
<td></td>
<td>HFCD15006RS</td>
<td>HFCD15006PS</td>
</tr>
<tr>
<td>12</td>
<td>62.5 OM1</td>
<td>HFCD15012R6</td>
<td>HFCD15012P6</td>
</tr>
<tr>
<td>50 OM3</td>
<td></td>
<td>HFCD15012R3</td>
<td>HFCD15012P3</td>
</tr>
<tr>
<td>50 OM4</td>
<td></td>
<td>HFCD15012R4</td>
<td>HFCD15012P4</td>
</tr>
<tr>
<td>OS2</td>
<td></td>
<td>HFCD15012RS</td>
<td>HFCD15012PS</td>
</tr>
<tr>
<td>24</td>
<td>62.5 OM1</td>
<td>HFCD15024R6</td>
<td>HFCD15024P6</td>
</tr>
<tr>
<td>50 OM3</td>
<td></td>
<td>HFCD15024R3</td>
<td>HFCD15024P3</td>
</tr>
<tr>
<td>50 OM4</td>
<td></td>
<td>HFCD15024R4</td>
<td>HFCD15024P4</td>
</tr>
<tr>
<td>OS2</td>
<td></td>
<td>HFCD15024RS</td>
<td>HFCD15024PS</td>
</tr>
<tr>
<td>48</td>
<td>62.5 OM1</td>
<td>HFCD15048R6</td>
<td>HFCD15048P6</td>
</tr>
<tr>
<td>50 OM3</td>
<td></td>
<td>HFCD15048R3</td>
<td>HFCD15048P3</td>
</tr>
<tr>
<td>50 OM4</td>
<td></td>
<td>HFCD15048R4</td>
<td>HFCD15048P4</td>
</tr>
<tr>
<td>OS2</td>
<td></td>
<td>HFCD15048RS</td>
<td>HFCD15048PS</td>
</tr>
</tbody>
</table>

Reel Capacity Chart, Plenum or Riser

<table>
<thead>
<tr>
<th>Fiber Count</th>
<th>Diameter in (mm)</th>
<th>48” Flange ft</th>
<th>Weight lb/ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 strand</td>
<td>0.625 (15.9)</td>
<td>5400</td>
<td>0.165</td>
</tr>
<tr>
<td>12 strand</td>
<td>0.625 (15.9)</td>
<td>5400</td>
<td>0.170</td>
</tr>
<tr>
<td>24 strand</td>
<td>0.684 (17.4)</td>
<td>4500</td>
<td>0.188</td>
</tr>
<tr>
<td>48 strand</td>
<td>0.930 (23.5)</td>
<td>2200</td>
<td>0.365</td>
</tr>
</tbody>
</table>

Cable Jacket and Buffer Color Codes
- OM1 Multimode: Orange jacket
- OM3 and OM4 Multimode: Aqua jacket
- OS2 Singlemode: Yellow jacket
- Buffer color codes and pairing sequence:
  - 1-Blue, 2-Orange, 3-Green, 4-Brown, 5-Slate, 6-White
  - 7-Red, 8-Black, 9-Yellow, 10-Violet, 11-Rose, 12-Aqua
  - 13-Blue/Black, 14-Orange/Black, 15-Green/Black, 16-Brown/Black
  - 17-Slate/Black, 18-White/Black, 19-Red/Black, 20-Black/White
  - 21-Yellow/Black, 22-Violet/Black, 23-Rose/Black, 24-Aqua/Black
- 48-strand subunit colors: Blue, Orange, Green, Brown
- Repeat buffer colors 1 through 12 for subunits in 48-strand cable