1.0 Introduction and Scope

The University of Wisconsin Superior (UW-S) is a sub-recipient of a NTIA BTOP grant award given to the University of Wisconsin – Extension. UW-S is coordinating a Superior Community Area Network (CAN) project which connects the following anchor institutions in a community fiber network: Superior Middle School, Superior Senior High School, Wisconsin Indianhead Technical College, the City and County Government Center and UW-S. Approximately 3.9 miles of fiber optic cable will be installed in the city of Superior as a result of this grant award.

This Request for Quote (RFQ) will identify a vendor to design and build the Superior CAN. This project has been funded by UW-Extension's Building Community Capacity through Broadband grant issued by the NTIA/BTOP program. The Superior CAN will connect the Superior Middle School on 37th St & Hammond, the Government Center on Belknap & Hammond, UW-S on Belknap & Catlin, the Wisconsin Indianhead Technical College on 21st St & Catlin, Superior Senior High School on 28th St & Catlin and finally loop west on 28th St back to Hammond. The entire route will be engineered for placement of fiber optic cables having 72 strands of fiber. Specific details can be found in the section titled "Network."

Route changes should not be proposed unless they are of a critical nature. Any proposed route changes should be offered in addition to the original route and include a detailed explanation as to why the change would be necessary. Any route changes will result in additional Environmental Assessment work to be done, and NTIA would have to approve the change. This could result in a delay of the project.

1.1 Network

The exact physical layout of fiber, hand holes, splicing, etc. will be designed in cooperation with the vendor and the UW-S. However, the routes provided in the maps cannot change. For the purposes of this RFQ, the following assumptions should be used:

- All entrances on buildings deemed historic will be underground.
- Hand holes will be every 1500'
- Hand holes will be installed at every building.
- Soft surface exposure and resurfacing is all taken into account with installation.
- Permits are paid for by UW-S but labor for such permitting is accounted for in the installation.
- Design testing and as-built documentation is all to be accounted for in the installation.

Network Description

The project consists of approximately 3.9 miles of fiber installed in an urban area:

- Heading south on Hammond from Belknap to 37th St.
- Heading east on 28th St from Hammond to Catlin.
- Heading north on Catlin from 28th St to Belknap.
- Heading west on Belknap from Catlin to Hammond.

1.2 Projects Delivery Requirements

Installation of the fiber must be completed by the deadline December 1, 2011.

Fiber construction specifications can be found in Appendix A. Testing and acceptance specifications can be found in Appendix B. Results should be delivered no more than 30 days after installation completion.

Provide as-built drawings, developed according to specifications as laid out in Section 3.14 of this document, within 60 days of the acceptance date.

1.3 Completion On-Time

If contract time expires before completing the project, UW-S reserves the right to assess liquidated damages in the amount of $2,000 for each full calendar day (excluding Saturday, Sunday, and legal holidays) the contract work remains incomplete. The Project Manager reserves the right to determine whether the contractor must adhere to the deadline for a specific path. Any changes to deadlines will be provided in writing.

THE CONTRACTOR UNDERSTANDS AND ACKNOWLEDGES THAT UW-S IS RELYING ON THE CONTRACTOR'S ABILITY TO MEET THE SCHEDULE REQUIREMENTS OF THIS AGREEMENT AND, FURTHER, THAT THE FAILURE OF THE CONTRACTOR TO COMPLY WITH THE SCHEDULE REQUIREMENTS WOULD RESULT IN IRREPARABLE HARM TO UW-S. ACCORDINGLY, THE CONTRACTOR AGREES TO PAY TO UW-S, AS LIQUIDATED DAMAGES, THE SUM OF TWO THOUSAND AND 00/100 DOLLARS ($2,000.00) PER DAY FOR EACH AND EVERY DAY, EXCLUDING SATURDAYS, SUNDAYS, AND LEGAL HOLIDAYS, THAT THE CONTRACTOR FAILS TO HAVE ALL OF THE WORK COMPLETED IN ACCORDANCE WITH THE TERMS OF THIS AGREEMENT FOR ANY REASON OTHER THAN EXCUSABLE DELAYS AS SET FORTH HEREIN; PROVIDED HOWEVER, THAT UW-S HAS NOT CAUSED SUCH FAILURE OF THE CONTRACTOR TO COMPLETE BY HAVING BREACHED OR DEFAULTING IN UW-S'S OBLIGATIONS HEREIN. UW-S AND THE CONTRACTOR AGREE THAT SAID SUM IS HEREBY FIXED AND AGREED TO AS LIQUIDATED DAMAGES, AND NOT AS A PENALTY, BECAUSE OF THE DIFFICULTY IN ASCERTAINING THE LOSS AND DAMAGE WHICH WOULD BE SUFFERED BY UW-S BY REASON OF THE CONTRACTOR'S FAILURE TO MEET THE SCHEDULE REQUIREMENTS. UW-S SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES ARISING UNDER THIS AGREEMENT.

EXCUSABLE DELAYS

Acts of God or of the public enemy, acts of the government in its sovereign capacity, fires, floods, explosions, earthquakes, wars, epidemics, quarantine restrictions, or other causes beyond the control of a party hereto, which cause failure to perform hereunder, and which in every case is beyond the reasonable control and without the fault or negligence of such party or its subcontractors and vendors hereunder, shall constitute an excusable delay for such party, if notice thereof is given to the other party within three (3) days after such event shall have occurred. In event of delay resulting from any of the above causes, schedule requirements shall be extended by an equivalent number of days. Notwithstanding the foregoing, UW-S shall have the right to terminate this Agreement should any delays exceed fifteen (15) days.

2.0 RFQ Timeline

2.1 The RFQ is being offered to the vendors who have been awarded contracts and been pre-qualified as the result of the University of Wisconsin-Extension, Request for Bid, EX 10-7114.

2.2 Quotes must be received by 2:00 p.m. CST on August 1, 2011.

2.3 All vendor questions must be received by July 25, 2011. Responses will be emailed back to all vendors. RFQ will be issued to vendors through email July 8, 2011.

2.3 RFQ Submissions

RFQ responses will be accepted via email or hard copy and should include the following:

- Signed copy of the RFQ signature page.
- Updated Designation of Confidential and Proprietary Information
- Completed pricing sheets in the format requested. Pricing instructions immediately follow the RFQ signature page.

RFQ responses should be sent to:

UW-Superior Purchasing
Belknap & Catlin, PO Box 2000
Superior, WI 54880

rwaksdah@uwsuper.edu

All communication must be done in writing.

3.0 Federal Broadband Contract Requirements

Since the initial contract award date, NTIA has introduced several new or revised requirements for contractors that are included as part of the Federal Broadband Grant process. These additional terms and conditions were included in the contract extension letter recently sent out by the University of Wisconsin – Extension. A brief overview is also included here. Please note: these requirements are non-negotiable. Contractors are required to accept them if they elect to provide a response to this RFQ.

We have attached the Designation of Confidential and Proprietary Information to assist contractors with identifying data they consider trade secrets. Please see Appendix C.

3.1 Buy American Requirements

Per the terms of the University of Wisconsin – Extension grant agreement with NTIA, all manufactured goods brought to the construction site for incorporation into the final work product shall be at minimum substantially American made as specified in section 1605 of the American Recovery and Reinvestment Act of 2009.

3.2 NTIA Signage

Contractor must display Broadband USA and ARRA logos at job sites throughout the construction phase. Sign placement on trucks or other construction equipment is acceptable. UW-S will provide required specifications and electronic artwork to be used for the signs.

3.3 Project Management

The Contractor will provide a primary project manager dedicated to the project to serve as a primary point of contact and also to provide necessary reporting.

The Contractor Project Manager will provide a weekly status update call with a written report including percent project completion, budget update, and necessary Davis-Bacon labor reporting. Specific reporting metrics will be provided at time of award. Reporting requirements are subject to change during the project duration. UW-S's Primary Point of Contact will be Mark Anderson who will work with the Contractor's Project Manager.

3.4 Reporting and Registration

The Contractor must provide reports to UW-S within 5 days after each quarter (April 5th, July 5th, October 5th, January 5th). The reports shall include the following information:

- Contractor's Dun and Bradstreet Data Universal Numbering System (DUNS) number.
- Contractor organization name and Zip+4 of organization's headquarters.
- Description of products/services provided (255 character limit)
- Amount invoiced to UW-S

Contractor must also maintain registration in the Central Contractor Registration (CCR) database (www.ccr.gov) at all times during which Contractor is providing materials and/or services paid for by federal grant funds. A DUNS number is one of the requirements for registration in the CCR.

3.5 Davis-Bacon Wage Act

Section 1606 of the Recovery Act requires that all laborers and mechanics at the jobsite employed by contractors and subcontractors on projects funded directly by or assisted in whole or in part by and through the Federal Government pursuant to the Recovery Act shall be paid wages at rates not less than those prevailing on projects of a character similar in the locality as determined by the U.S. Secretary of Labor. This project is being funded by Recovery Act money and is subject to Davis-Bacon and Related Act wage laws.

All contract awardees, their sub-recipients and subcontractors must prepare weekly certified payroll documentation using Form WH-347 (available at: www.dol.gov/whd/forms/wh347.pdf), properly completed for laborers and mechanics performing activities covered by the Davis- Bacon Act requirements of the Recovery Act. Sub-recipients, contractors, and subcontractors must submit this information to the UW-S Project Manager on a weekly basis within seven days of the regular payment date of the sub-recipient's, contractor's, or subcontractor's payroll period. Contractors are responsible for all submissions from subcontractors.

The original bid document, as well as the contract extension letter included additional information, and contractual requirements. Please see http://www.dol.gov/WHD/contracts/dbra.htm for any other Davis Bacon Wage Act questions.

The WI19 Wage Determination will be used for this project. The current wage rates can be found by going to http://www.wdol.gov/dba.aspx#0 and looking up the WI19 wage determination. The wage rates in effect at time of award will be the rates used for the duration of this project.

In addition to paying Davis-Bacon prevailing wage and fringe benefits, successful respondents must also:

- Post a Davis-Bacon poster at each job site. Poster can be found at: http://www.dol.gov/whd/regs/compliance/posters/fedprojc.pdf.
- Post a Fair Labor Standards Act (FLSA) poster at each job site. Poster can be found at: http://www.dol.gov/whd/regs/compliance/posters/flsa.pdf.
- Permit UW-S or its agents to inspect all work, materials, payrolls, personnel records, invoices of materials, and other relevant data and records on an as-needed basis for the life of the project plus three (3) years.
- Permit UW-S or its agents and the Office of the Inspector General to interview any officer or employees of the contractor or subcontractor regarding any and all transactions of this project.

3.6 Whistleblower Protection Act

UW-S requires all successful bidders to display a Whistleblower Protection Act poster at each job site. The poster can be downloaded from the following web site: http://www.oig.doc.gov/recovery/whistleblower.html.

3.7 Copeland Anti-Kickback Act

The contract extension letter your organization recently received included language regarding this act.

3.8 Contract Work Hours and Safety Standards Act

The contract extension letter your organization recently received included language regarding this act.

3.9 Environmental Law Compliance

The contract extension letter your organization recently received included language regarding these laws.

3.10 Byrd Anti-Lobbying Amendment (31 U.S.C. 1352)

The contract extension letter your organization recently received included language regarding these laws.

3.11 Debarment and Suspension

The contract extension letter your organization recently received included language regarding these laws.

3.12 Certification Regarding Lobbying – Lower Tier Covered Transactions

The contract extension letter your organization recently received included language regarding these laws. Any necessary forms should be filled out and sent to the RFQ contact listed above.

3.13 Disclosure of Lobbying Activities

The contract extension letter your organization recently received included language regarding these laws. Any necessary forms should be filled out and sent to the RFQ contact listed above.

3.14 As-Built Drawings

The Contractor will provide as-built drawings in electronic formats within 60 days of fiber construction acceptance. Our preference is AutoCAD (version 13 or later) with scaling of 1" = 200 feet for completed splicing work. If available, base maps will be provided. Other electronic formats may be accepted at our discretion. Any hard copy should be limited to 11" x 17".

As-built drawings will include at minimum:

- Running line route diagram relative to permanent landmarks that include but are not limited to railroad mileposts and boundary crossings.
- GPS readings for the fiber route including laterals
    - Urban every 50'
    - Readings at any event location – ex. Direction change, bore under highway etc.
    - All GPS coordinates to be provided with notation at minimum in Excel format.
- Manhole and hand hole identification with GPS coordinates.
- Locate markers/vaults with GPS coordinates
- End locations.
- Splice locations.
- Street, road, and highway names.
- Bridge, railroad and major highway crossings.
- Manhole-to-manhole and hand hole to hand hole distances in feet.
- Conduit installations (quantity 1 or 2 duct, type, etc.).
- Cable marker locations and stationing.
- Slack loop locations and length.

In addition, drawings will include:

- Fiber cable information (manufacturer, type of cable, type of fiber, fiber count, and reel numbers).
- Notation of all deviations from specifications (e.g. depth).
- A summary of distances between the locations listed above and offset of cable in relation to fixed objects such as curb, sidewalk, building structures, etc.
- The type of cable construction between location (buried, aerial, conduit) and any typical or details needed for the specified type of construction.
- Any geographical information deemed necessary to further clarify the route.
- Coordinate system used.
- Other requirements as specified in bid items.

RFQ Signature Page:

In signing this Request for Quote, we have read and agree to all terms, conditions and specifications.

We certify that we have not, either directly or indirectly, entered into any contract or participated in any collusion or otherwise taken any action in restraint of free competition; that no attempt has been made to induce any other person or firm to submit or not to submit a quote for this project.

Name and Title of Signing Officer:

Company Name and Address:

Signature:

Date:

Fiber Network Equipment Specifications

PRICING INSTRUCTIONS

Please provide pricing for items in the attached worksheet. Any quantities provided are for estimating purposes only. The assumptions used when determining estimate quantities are included. We encourage questions about the listed quantities during the official question period. Actual quantities will be determined as the project is engineered. Please provide unit pricing for all rows, including those with no quantities provided.

PRICING INSTRUCTIIONS for the Grant Overlaps

There is an overlap of two different grants in this bid. This contract will require the installation of separate conduit and hand holes for the Eventis Telecom Inc. grant to run parallel with the Superior Community Area Network installation. The attached map shows the route for this dual install in blue as "JointBuild". The route goes from Hammond St & 34th St. north to 28th St., east to Catlin Ave and north to Superior Senior High School.

The overlapping route will install two (2) 1.25" conduits to be pulled in the same bore/plow effort. Each network will have separate hand holes, to be installed roughly side by side through the overlapping route. The material for the hand holes and conduit in the overlapping route will be provided by the Eventis Telecom Inc. grant.

Overlap Items in the Pricing Sheet include:

- Item 22.L, conduit labor for boring 2-duct in the overlapping route
- Item 55.L, hand hole labor for an additional 5 hand holes in the overlapping route

Separate pricing for labor and material is requested for conduit and hand hole Bid Items: 20.M/20.L through 27.M/27.L and 55.M/55.L. .M & .L are abbreviations for material and labor respectively.

BID ITEM #1 - FUSION SPLICE, SINGLE MODE, 181-288 COUNT
BID ITEM #2 - FUSION SPLICE, SINGLE MODE, 145-180 COUNT
BID ITEM #3 - FUSION SPLICE, SINGLE MODE, 97-144 COUNT
BID ITEM #4 - FUSION SPLICE, SINGLE MODE, 49-96 COUNT
BID ITEM #5 - FUSION SPLICE, SINGLE MODE, 13-48 COUNT
BID ITEM #6 - FUSION SPLICE, SINGLE MODE, 1-12 COUNT

A. Description. This work shall consist of completing Single Mode Fusion Splice, as hereinafter provided. The work shall be performed within the geographical limits of State of Wisconsin.

B. Materials. Materials shall be as hereinafter provided.

C. Construction Methods. The Contractor shall complete Single Mode Fusion Splice as designed. All work shall be as hereinafter provided. The Contractor shall meet with the UW-S Project Manager to discuss specific requirements and issues of the Single Mode Fusion Splice. Use only fusion splicing for all splices. Ensure that each splice does not exceed the attenuation limits set forth in Appendix B. Do not make mechanical splices. Protect each splice in a protective sleeve and secure in the splice tray. Protect bare fibers with a heat shrink coating before placement in a sleeve or housing. Install the heat-shrink coating in to protect the fiber from scoring, dirt, accumulation, moisture intrusion, and micro

bending. Splice according to Siecor recommended procedure SRP-004-013 for mid-span access of fiber optic cable with cable slack present or appropriate manufacturer instructions. Contain all mid-span splices within enclosures. Do not deviate from the splice details as the final design shows without the UW-S Project Managers approval.

D. Method of Measurement. Complete Single Mode Fusion Splice will be measured as a unit installed, along with all incidentals required.

E. Basis of Payment. Complete Single Mode Fusion Splice, measured as provided above, **will be paid for at the contract price each**, which shall be payment in full for completing the splice and for all labor, tools, transportation, equipment, cables, connections, and incidentals needed to complete the work.

BID ITEM #7 - ENCLOSURE, FURNISH AND INSTALL 288- COUNT OUTDOOR FIBER OPTIC SPLICE
BID ITEM #8 - ENCLOSURE, FURNISH AND INSTALL 144- COUNT OUTDOOR FIBER OPTIC SPLICE
BID ITEM #9 - ENCLOSURE, FURNISH AND INSTALL 96- COUNT OUTDOOR FIBER OPTIC SPLICE
BID ITEM #10 - ENCLOSURE, FURNISH AND INSTALL 72- COUNT OUTDOOR FIBER OPTIC SPLICE
BID ITEM #11 - ENCLOSURE, FURNISH AND INSTALL 48- COUNT OUTDOOR FIBER OPTIC SPLICE
BID ITEM #12 - ENCLOSURE, FURNISH AND INSTALL 24- COUNT OUTDOOR FIBER OPTIC SPLICE

A. Description. The Contractor shall install Fiber Optic Splice Enclosures as described in these specifications. The work shall be performed within the geographical limits of the State of Wisconsin. Preparation work for mid-span and end to end splicing will be included in these items. Fiber Splice Enclosures shall have a single splice capacity to meet needs dictated by requirements of the installation location and meet or exceed the functionality of the AFL telecommunications type products LG-150, LG-250, and LG-350 Sealed Fiber Optic Splice Enclosures.

B. Materials. The Fiber Optic Splice Enclosures shall be designed for use under the most severe conditions such as moisture, vibration, impact, cable stress and flex temperature extremes as demonstrated by successfully passing the factory test procedures and minimum specifications listed below:

(1) Physical Requirements: The enclosure must handle up to four cables in a butt configuration. A butt adapter may be used to increase capacity to six cables.

The enclosure shall prevent the intrusion of water without the use of encapsulates.

The enclosure shall be capable of accommodating splice organizer trays that accept mechanical, fusion, or multi-fiber array splices. The splice enclosure shall have provisions for storing fiber splices in an orderly manner, mountings for splice organizer assemblies, and space for excess or unspliced fiber. Splice organizers shall be re-enterable.

The splice case shall be UL rated.
Enclosure re-entry and subsequent reassemble shall not require specialized tools or equipment. Further, these operations shall not require the use of additional parts.

The splice enclosure shall have provisions for controlling the fiber bend radius to a minimum of 38 mm.

(2) Factory Testing:

Compression Test: The enclosure shall not deform more than 10% in its largest cross sectional dimension when subjected to a uniformly distributed load of 1335 N at a temperature of -18ºC and 38ºC. The test shall be performed after stabilizing at the required temperature for a minimum of two hours. It shall consist of placing an assembled

enclosure between two flat paralleled surfaces, with the longest enclosure dimension parallel to the surfaces. The weight shall be placed on the upper surface for
a minimum of 15 minutes. The measurement shall then be taken with weight in place.

Impact Test: The assembled enclosure shall be capable of withstanding an impact of 28 N-M at temperatures of -18 ºC and 38 ºC. The test shall be performed after stabilizing the enclosure at the required temperature for a minimum of 2 hours. The test fixture shall consist of 9 kg. cylindrical steel impacting head with a 5 cm spherical radius at the point where it contacts the enclosure. It shall be dropped from a height of 30 cm. The enclosure shall not exhibit any cracks or fractures to the housing that would preclude it from passing the water immersion test. There shall be no permanent deformation to the original diameter or characteristic vertical dimension by more than 5%.

Cable Gripping and Sealing Testing: The cable gripping and sealing hardware shall not cause an increase in fiber attenuation in excess of 0.05 dB/fiber @ 1550 nm when attached to the cables and the enclosure assembly. The test shall consist of measurements from six fibers, one from each buffer tube or channel, or randomly selected in the case of a single fiber bundle. The measurements shall be taken from the test fibers, before and after assembly to determine the effects of the cable gripping
and sealing hardware on the optical transmission of the fibers.

Vibration Test: The splice organizers shall securely hold the fiber splices and store the excess fiber. The fiber splice organizers and splice retaining hardware shall be tested per EIA Standard FOP-II, Test Condition I. The individual fibers shall not show an increase in attenuation in excess of 0.1 dB/fiber.

Water Immersion Test: The enclosure shall be capable of preventing a 3-meter (10 foot) Water-head from intruding into the splice compartment for a period of 7 days. Testing of splice enclosure is to be accomplished by the placing of the enclosure into a pressure vessel and filling the vessel with tap water to cover the enclosure. Apply continuous pressure to the vessel to maintain a hydrostatic head equivalent to 3 meters on the enclosure and cable. This process shall be continued for 30 days. Remove the enclosure and open to check for the presence of water. Any intrusion of water in the
compartment containing the splices constitutes a failure.

Certification: It is the responsibility of the Contractor to insure that all of the above tests have been performed by either the manufacturer or an independent testing laboratory. Manufacturer certification is necessary for the model of enclosure supplied. It is not necessary to subject each supplied enclosure to the actual tests described herein.

C. Construction Methods. The enclosure shall be installed according to the manufacturer's recommended guidelines. All work shall be done as hereinafter provided.

For the mainline splice, the cables shall be end-to-end fusion spliced. End-to-End splicing shall be performed as per manufacturer instructions for the supplied splice Enclosure units.

Mid-span splicing (drop splice) shall be performed for each device location at locations shown on the plans. Splicing shall be performed as per Siecor Recommended Procedure SRP-004- 013, "Mid-span access of Fiber Optic Cable (Cable slack present)", or appropriate manufacturer instructions. All mid-span splices shall be contained within the enclosures.

D. Method of Measurement. Furnish and Install proper sized Fiber Optic Splice Enclosure, shall be measured as a unit, completely installed.

E. Basis of payment. Furnish and Install proper sized Fiber Optic Splice Enclosure, measured as provided above, **will be paid for at the contract unit price each**, which price shall be payment in full for installing the enclosures, not to

exclude any costs associated with preparation for end to end or mid-span splicing, including all labor, tools, equipment, and incidentals necessary to complete the work.

BID ITEM #13 - FIBER OPTIC TERMINATION PANEL, 144 COUNT, SC, FURNISH AND INSTALL
BID ITEM #14 - FIBER OPTIC TERMINATION PANEL, 96 COUNT, SC, FURNISH AND INSTALL
BID ITEM #15 - FIBER OPTIC TERMINATION PANEL, 72 COUNT, SC, FURNISH AND INSTALL
BID ITEM #16 - FIBER OPTIC TERMINATION PANEL, 48 COUNT, SC, FURNISH AND INSTALL
BID ITEM #17 - FIBER OPTIC TERMINATION PANEL, 36 COUNT, SC, FURNISH AND INSTALL
BID ITEM #18 - FIBER OPTIC TERMINATION PANEL, 24 COUNT, SC, FURNISH AND INSTALL
BID ITEM #19 - FIBER OPTIC TERMINATION PANEL, 12 COUNT, SC, FURNISH AND INSTALL

A. Description. Work under this item shall consist of furnishing and installing a fiber optic cable termination panel (FTP) in a rack/cabinet or if applicable a wall mount as shown on the Plans.

B. Materials. Fiber Optic Terminations shall be performed at a termination panel. The panel shall meet or exceed the following specifications:

Number of terminations:	144, 96, 72, 36, 48, 24 and 12
Connector Type	SC Feed-through
Access:	Front and rear, fold-down or swing out
Cabinet	Metal Construction

The panel shall include space and a fiber organizer tray for storing fiber slack for both used and unused fibers within the panel. The terminations shall be performed with SC connectors. Patch panels shall be enclosed assemblies affording protection to the cable subassemblies and to the terminated ends. The enclosures shall incorporate a hinged or retractable front cover designed to protect the connector couplings and fiber optic jumpers. The enclosure shall provide for strain relief of incoming cables and shall incorporate radius control mechanisms to limit bending of the fiber to the manufacturer's recommended minimums or 1.2", whichever is larger.

All Patch Panels shall provide protection to both the "facilities" and "user" side of the coupling. The patch panel enclosure shall be configured to require front access only when patching. The incoming cables shall not be accessible from the patching area of the panel.

C. Construction Methods. The Contractor shall affix the FTP to the rack/cabinet or wall as coordinated with UW-S Project Manager on the Plans. All cables shall be properly dressed and affixed.

Armored Cable shall be shall be bonded as per NEC requirements. Service Loop length shall be the maximum permissible by code, up to 50 feet.

All fiber connectors shall be magnified by at least 250 times at proposer's cost for end face inspection using a fiber microscope or video scope. All fiber connections shall be visually inspected for end face quality. Scratched, pitted or reasonably dirty end face connectors will not be accepted.

Fiber strands installed into fiber termination panels shall orient SC bulkheads so the tab faces up. Appliques shall be installed so numbers and labeling are right side up. Fiber bulkhead strands should be cleaned prior to insertion in the back of a fiber termination panel. Cleaning should be done using a dry cleaning system such as a cletop, white ribbon, type S cleaner (see product #14110611 at: http://www.cletop.com/html/products.html)

D. Method of Measurement. Furnish and install 144, 96, 72, 36, 48, 24, and 12 Count Fiber Optic Termination Panel shall be measured as a unit, with all connectors and pigtails necessary to make the final connections from the fiber entering the rack/cabinet.

E. Basis Of Payment. Furnish and install 144, 96, 72, 36, 48, 24, and 12 Count Fiber Optic Termination Panel, measured as provided above, **will be paid for at the contract unit price each**, which price shall be payment in full for furnishing the terminations, termination panel, connectors, and pigtails; and for all labor, tools, equipment, and incidentals necessary to complete the work.

BID ITEM #20 - HIGH DENSITY POLYETHYLENE (HDPE) CONDUIT, 2-DUCT, 1.25-INCH, DIRECT PLOW
BID ITEM #21 - HIGH DENSITY POLYETHYLENE (HDPE) CONDUIT, 1-DUCT, 1.25-INCH, DIRECT PLOW

A. Description. Work under this item shall consist of furnishing and installing outdoor/underground rated high-density polyethylene (HDPE) conduit as shown on the plans and as hereinafter provided. The work shall be performed within the geographical limits of the State of Wisconsin.

B. Materials. Material for this item shall be as documented under the item High-Density Polyethylene (HDPE) Conduit, 1 and 2-Duct, 1.25-Inch, Direct Plow. The material shall be high density polyethylene smooth solid wall conduit with a nominal inside diameter of 1.25 inches. The 2-duct package shall be individually distinct in color: blue, orange. The size-to-diameter ration shall be SDR-11.

All materials used in the installation of conduits, such as bends, adapters, couplings and fittings shall meet or exceed all of the recommendations of the duct manufacturer for suitable installation.

HDPE conduit shall be burn resistant and shall meet or exceed the testing requirements according to Bellcore GR-356-CORE: conditional requirement CR5-14.

The Contractor shall furnish and install all appropriate couplers for the conduit system. Couplers shall be anodized aluminum, reverse threaded, and sized as appropriate.

Fiber Optic Warning Tape shall meet the following requirements:

- Material: 4-mil Polyethylene
- Dimensions: 3.5” x 2”, Orange, w/Black Text
- Conform to APWA uniform color codes
- Dart Impact Strength: 70 grams/Mil
- Conform to APWA uniform color codes

C. Labor. Construction methods shall comply with federal, state, and local codes.

Direct Plow installations shall be completed at locations as shown on the plans. At these locations the Contractor shall be responsible for determining all existing utility locations, both laterally and depth. The Contractor shall use this information to plan and execute the plowing to insure against damage to any existing utilities and/or facilities within the work area. Warning tape shall be placed 12” above conduit along the path.

At locations such as railroad and river crossings, the Contractor shall follow and be bound by the requirements of the railroads and/or the Department of Natural Resources (DNR).

No repairs will be permitted to any conduit or fitting. All broken, chipped, cracked or impaired lengths of fittings or conduit shall be removed and replaced with approved new material.

This conduit design is for underground installation as shown on the construction plans, and shall not be installed above ground or on structures. A minimum depth of 42" is required and any change less than 42" must be approved by UW-S.

The minimum-bending radius of the cable shall not be exceeded at any time during conduit installation. Cable shall not be pulled over edges or corners, over or around obstructions, or through unnecessary curves or bends.

The Contractor shall be responsible for requesting and obtaining all required permits, easements, and associated approvals for all direct plowing. Any costs associated obtaining said permits, easements, and associated approvals shall be considered incidental to this item.

All disturbed areas shall have four (4) inches of topsoil placed, and the area shall be fertilized, seeded, mulched and restored to original or better than original condition and conform to all permits associated with each location.

If for some reason the Contractor cannot guarantee that the HDPE ducts have integrity and will support blowing fiber thru, **a woven pull tape (mule tape) must be installed in all ducts on the run**. The woven pull tape shall be at each raceway point in an acceptable manner. The woven pull tape shall have documentation as duct cutting resistant, tensile strength of greater than 1100 lbs., nominal width of ½-inch, and maximum allowable elongation under pulling tension of 10%.

D. Method of Measurement. High-Density Polyethylene (HDPE) Conduit with warning tape, 1 and 2-Duct, 1.25-Inch, Direct Plow, complete in place and accepted, will be measured by length in linear feet of conduit in place..

E. Basis of Payment. High-Density Polyethylene (HDPE) Conduit with warning tape, 1 and 2- Duct, 1.25-Inch, Direct Plow, measured as provided above **will be paid for at the contract unit price per linear foot** which price shall be payment in full for furnishing and installing all materials, fittings, couplers, bends; for all utility coordination; to obtain permits, easements, and approvals; and for all labor, tools, equipment, transportation, and incidentals necessary to complete this item of work. **Provide separate bids for Materials and Labor as requested in the Pricing Sheet.**

BID ITEM #22 - HIGH DENSITY POLYETHYLENE (HDPE) CONDUIT, 2-DUCT, 1.25-INCH, DIRECTIONAL BORE
BID ITEM #23 - HIGH DENSITY POLYETHYLENE (HDPE) CONDUIT, 1-DUCT, 1.25-INCH, DIRECTIONAL BORE

A. Description. Work under this item shall consist of furnishing and installing outdoor/underground rated high-density polyethylene (HDPE) conduit as shown on the plans and as hereinafter provided. The work shall be performed within the geographical limits of the State of Wisconsin.

B. Materials. Material for this item shall be as documented under the item Polyethylene (HDPE) Conduit, 1 and 2-Duct, 1.25-Inch, Directional Bore, as specified. The material shall be high density polyethylene smooth solid wall conduit with a nominal inside diameter of , 1.25 inches. The 2-duct package shall be individually distinct in color: blue, orange. The size-to-diameter ration shall be SDR-11.

As noted in the PRICING INSTRUCTIONS for the Grant Overlaps on page 9, Eventis Telecom Inc. will be supplying their own materials in the overlapping route.

C. Labor. Construction methods shall comply with federal, state, and local codes. Directional Bore installations shall be completed at locations as shown on the plans. At these locations the Contractor shall be responsible for determining all

existing utility locations, both laterally and depth. The Contractor shall use this information to plan and execute the boring to insure against damage to any existing utilities and/or facilities within the work area.

At locations such as railroad and river crossings, the Contractor shall follow and be bound by the requirements of the railroads and/or the Department of Natural Resources (DNR).

No repairs will be permitted to any conduit or fitting. All broken, chipped, cracked or impaired lengths of fittings or conduit shall be removed and replaced with approved new material.

This conduit design is for underground installation as shown on the construction plans, and shall not be installed above ground or on structures. A minimum depth of 42" is required and any change less than 42" must be approved by the UW-S Project Manager.

The minimum-bending radius of the cable shall not be exceeded at any time during conduit installation. Cable shall not be pulled over edges or corners, over or around obstructions, or through unnecessary curves or bends.

The Contractor shall be responsible for requesting and obtaining all required permits, easements, and associated approvals for all directional bore crossings. Any costs associated obtaining said permits, easements, and associated approvals shall be considered incidental to this item.

All disturbed areas shall have four (4) inches of topsoil placed, and the area shall be fertilized, seeded, mulched and restored to original or better than original condition and conform to all permits associated with each location.

D. Method of Measurement. Polyethylene (HDPE) Conduit, 1 and 2-Duct, 1.25-Inch, Directional Bore, complete in place and accepted, will be measured by length in linear feet of conduit in place.

E. Basis of Payment. High-Density Polyethylene (HDPE) Conduit, 1 and 2-Duct, 1.25-Inch, Directional Bore, measured as provided above **will be paid for at the contract unit price per linear foot** which price shall be payment in full for furnishing and installing all materials, fittings, couplers, bends; for all utility coordination; to obtain permits, easements, and approvals; and for all labor, tools, equipment, transportation, and incidentals necessary to complete this item of work. **Provide separate bids for Materials and Labor as shown in the Pricing Sheet.**

BID ITEM #24 - HIGH DENSITY POLYETHYLENE (HDPE) CONDUIT, 2-DUCT, 1.25-INCH, TRENCHING
BID ITEM #25 - HIGH DENSITY POLYETHYLENE (HDPE) CONDUIT, 1-DUCT, 1.25-INCH, TRENCHING

A. Description. Work under this item shall consist of furnishing and installing outdoor/underground rated high-density polyethylene (HDPE) conduit as shown on the plans and as hereinafter provided. The work shall be performed within the geographical limits of the State of Wisconsin.

B. Materials. Material for this item shall be as documented under the item High-Density Polyethylene (HDPE) Conduit, 1 and 2-Duct, 1.25-Inch, Trenching. The material shall be high density polyethylene smooth solid wall conduit with a nominal inside diameter of 1.25 inches. The 2-duct package shall be individually distinct in color: blue, orange. The size-to-diameter ration shall be SDR-11.

All materials used in the installation of conduits, such as bends, adapters, couplings and fittings shall meet or exceed all of the recommendations of the duct manufacturer for suitable installation.

HDPE conduit shall be burn resistant and shall meet or exceed the testing requirements according to Bellcore GR-356-CORE: conditional requirement CR5-14.

The Contractor shall furnish and install all appropriate couplers for the conduit system. Couplers shall be anodized aluminum, reverse threaded, and sized as appropriate.

C. Labor. Construction methods shall comply with federal, state, and local codes.

Trenching installations shall be completed at locations as shown on the plans. At these locations the Contractor shall be responsible for determining all existing utility locations, both laterally and depth. The Contractor shall use this information to plan and execute the trenching to insure against damage to any existing utilities and/or facilities within the work area.

At locations such as railroad and river crossings, the Contractor shall follow and be bound by the requirements of the railroads and/or the Department of Natural Resources (DNR).

No repairs will be permitted to any conduit or fitting. All broken, chipped, cracked or impaired lengths of fittings or conduit shall be removed and replaced with approved new material.

This conduit design is for underground installation as shown on the construction plans, and shall not be installed above ground or on structures. A minimum depth of 42” is required and any change less than 42” must be approved by UW-S Project Manager.

The minimum-bending radius of the cable shall not be exceeded at any time during conduit installation. Cable shall not be pulled over edges or corners, over or around obstructions, or through unnecessary curves or bends.

The Contractor shall be responsible for requesting and obtaining all required permits, easements, and associated approvals for all trenching. Any costs associated obtaining said permits, easements, and associated approvals shall be considered incidental to this item.

All disturbed areas shall have four (4) inches of topsoil placed, and the area shall be fertilized, seeded, mulched and restored to original or better than original condition and conform to all permits associated with each location.

If for some reason the Contractor cannot guarantee that the HDPE ducts have integrity and will support blowing fiber thru, **a woven pull tape (mule tape) must be installed in all ducts on the run**. The woven pull tape shall be at each raceway point in an acceptable manner. The woven pull tape shall have documentation as duct cutting resistant, tensile strength of greater than 1100 lbs., nominal width of ½-inch, and maximum allowable elongation under pulling tension of 10%.

D. Method of Measurement. High-Density Polyethylene (HDPE) Conduit, 1 and 2-Duct, 1.25- Inch, Trenching, complete in place and accepted, will be measured by length in linear feet of conduit in place..

E. Basis of Payment. High-Density Polyethylene (HDPE) Conduit, 1 and 2-Duct, 1.25-Inch,

Trenching, measured as provided above **will be paid for at the contract unit price per linear foot** which price shall be payment in full for furnishing and installing all materials, fittings, couplers, bends; for all utility coordination; to obtain permits, easements, and approvals; and for all labor, tools, equipment, transportation, and incidentals necessary to complete this item of work. **Provide separate bids for Materials and Labor as shown in the Pricing Sheet.**

BID ITEM #26 - STEEL CONDUIT, 4-INCH, DIRECTIONAL BORE
BID ITEM #27 - STEEL CONDUIT, 5-INCH, DIRECTIONAL BORE

A. Description. Work under this item shall consist of furnishing and installing outdoor/underground rated Steel conduit as shown on the plans. The work shall be performed within the geographical limits of the State of Wisconsin.

B. Materials. Material for this item shall be as documented under the item Steel Conduit 3 and 4-Inch, Directional Bore, as specified. The material shall Steel solid wall conduit with a nominal inside diameter of 3 and 4 inches with one duct.

C. Labor. Construction methods shall comply with federal, state, and local codes.

Directional Bore installations shall be completed at locations as shown on the plans. At these locations the Contractor shall be responsible for determining all existing utility locations, both laterally and depth. The Contractor shall use this information to plan and execute the boring to insure against damage to any existing utilities and/or facilities within the work area.

At locations such as railroad and river crossings, the Contractor shall follow and be bound by the requirements of the railroads and/or the Department of Natural Resources (DNR).

No repairs will be permitted to any conduit or fitting. All broken, chipped, cracked or impaired lengths of fittings or conduit shall be removed and replaced with approved new material.

This conduit design is for underground installation as shown on the construction plans, and shall not be installed above ground or on structures. A minimum depth of 42” is required and any change less than 42” must be approved by UW-S Project Manager.

The minimum-bending radius of the cable shall not be exceeded at any time during conduit installation. Cable shall not be pulled over edges or corners, over or around obstructions, or through unnecessary curves or bends.

The Contractor shall be responsible for requesting and obtaining all required permits, easements, and associated approvals for all directional bore crossings. Any costs associated obtaining said permits, easements, and associated approvals shall be considered incidental to this item.

All disturbed areas shall have four (4) inches of topsoil placed, and the area shall be fertilized, seeded, mulched and restored to original or better than original condition and conform to all permits associated with each location.

D. Method of Measurement. Steel Conduit, measured as provided above, will be measured by linear foot of conduit in place.

E. Basis of Payment. Steel Conduit, measured as provided above, **will be paid for at the contract unit price per linear foot**, after acceptance. The price shall be payment in full for conduit; and for all labor, tools, equipment, and incidentals necessary to complete the work. **Provide separate bids for Materials and Labor as shown in the Pricing Sheet.**

BID ITEM #28 – IDENTIFY/REMOVE UNUSED CABLE and CLEAN EXISITING CONDUIT

A. Description. Work with UWS-Staff to identify and remove unused cable in the UW-S conduit system. Clean the conduit to ensure that all obstructions are cleared and that conduit continuity and alignment is good. The work shall be performed within the geographical limits of the State of Wisconsin.

B. Materials. (None)

C. Construction Methods. **Identify and remove** unused phone and data cable in the UW-S conduit system. The attached map shows the UW-S conduit system in red as "InConduit". The portion requiring identification and removal of unused cable is on 18th St and between S36 -> S28 -> S44 -> Old Main. Verify unused cable results with UW-S Staff and remove unused cable.

Clean the existing conduit to ensure that all obstructions are cleared and that conduit continuity and alignment is good. Verify that there is space in the conduit system for inner duct that is 1 ¼ inches in diameter. Problem areas shall have their location identified and the distance to the problem recorded to make them easier to find and repair. Once a fiberglass fish that is 1¼ inches in diameter makes its way through the conduit without any difficulties then the conduit may be considered clean and no further repairs should be necessary.

D. Method of Measurement. Clean Existing Conduit, measured as provided above, will be measured by linear foot of conduit in place.

E. Basis of Payment. Clean Existing Conduit, measured as provided above, **will be paid for at the contract unit price per linear foot**, after acceptance. The price shall be payment in full for proofing the conduit; and for all labor, tools, equipment, and incidentals necessary to complete the work.

BID ITEM #29 - DIRECT BURIED CABLE, NO CONDUIT, DIRECT PLOW, WITH WARNING TAPE

A. Description. Work under this item shall consist of installing outdoor/underground rated Fiber Optic Cable. The work shall be performed within the geographical limits of the State of Wisconsin.

B. Materials. Fiber Optic Warning Tape shall meet the following requirements:

- Material: 4-mil Polyethylene
- Dimensions: 3.5" x 2", Orange, w/Black Text
- Conform to APWA uniform color codes
- Dart Impact Strength: 70 grams/Mil

C. Construction Methods. All work shall comply with federal, state, and local codes.

Direct Plowing shall be completed at locations as shown on the plans. At these locations the Contractor shall be responsible for determining all existing utility locations, both laterally and depth. The Contractor shall use this information to plan and execute the plowing to insure against damage to any existing utilities and/or facilities within the work area.

At locations such as railroad and river crossings, the Contractor shall follow and be bound by the requirements of the railroads and/or the Department of Natural Resources (DNR).

No repairs will be permitted to any Fiber Optic Cable. Any damaged Fiber Optic Cable shall be removed and replaced with approved new material.

A minimum depth of 42" is required and any change less than 42" must be approved by UW-S.

The minimum-bending radius of the cable shall not be exceeded at any time during conduit installation. Cable shall not be pulled over edges or corners, over or around obstructions, or through unnecessary curves or bends.

Warning tape shall be placed 12" above fiber along the complete path.

The Contractor shall be responsible for requesting and obtaining all required permits, easements, and associated approvals for all direct plowing. Any costs associated obtaining said permits, easements, and associated approvals shall be considered incidental to this item.

All disturbed areas shall have four (4) inches of topsoil placed, and the area shall be fertilized, seeded, mulched and restored to original or better than original condition and conform to all permits associated with each location.

D. Method of Measurement. Direct Plow, Direct Buried Cable with No Conduit, measured as provided above, will be measured by linear foot of cable in place.

E. Basis of Payment. Direct Plow, Direct Buried Cable with No Conduit, measured as provided above, **will be paid for at the contract unit price per linear foot**, after acceptance. The price shall be payment in full for installing the cable; and for all labor, tools, equipment, and incidentals necessary to complete the work.

BID ITEM #30 - DIELECTRIC 144-COUNT FIBER OPTIC CABLE, FURNISH ONLY
BID ITEM #31 - DIELECTRIC 96-COUNT FIBER OPTIC CABLE, FURNISH ONLY
BID ITEM #32 - DIELECTRIC 72-COUNT FIBER OPTIC CABLE, FURNISH ONLY
BID ITEM #33 - DIELECTRIC 48-COUNT FIBER OPTIC CABLE, FURNISH ONLY
BID ITEM #34 - DIELECTRIC 36-COUNT FIBER OPTIC CABLE, FURNISH ONLY
BID ITEM #35 - DIELECTRIC 24-COUNT FIBER OPTIC CABLE, FURNISH ONLY
BID ITEM #36 - DIELECTRIC 12-COUNT FIBER OPTIC CABLE, FURNISH ONLY

A. Description. Work under this item shall consist of furnishing and testing 144, 96, 72, 48, 36, 24, and 12 Count Dielectric Fiber Optic Communications Cable as shown on the Plans. The work shall be performed within the geographical limits of the State of Wisconsin.

B. Materials. The Dielectric Fiber Optic Cable shall meet the following requirements:

- Meets or exceeds the Fiber Optic Communications Cable performance characteristics and test methods are defined in the Department of Agriculture Rural Utilities Service (RUS) 7 CFR 1755.900 (PE-90)
- Meets or exceeds the requirements of ANSI/ICEA Standard for Fiber Optic Outside Plant Communications Cable, ANSI/ICEA S-87-640-2006
- Color coding shall meet TIA/EIA-598B, "Color Coding of Fiber Optic Cables."
- Meet or exceed applicable National Electrical Safety Code specifications

Fiber Construction - Optical fibers shall be placed inside a loose buffer tube. Each buffer tube shall contain 12 fibers dependent on the fiber size. The fibers shall not adhere to the inside of the buffer tube.

In buffer tubes containing multiple fibers, the colors shall be stable across the specified storage and operating temperature range and not subject to fading or smearing onto each other or into the gel filling material. Colors shall not cause fibers to stick together.

Buffer tubes shall be kink resistant within the specified minimum bend radius.

Fillers may be included in the cable core to lend symmetry to the cable cross-section where needed.

The central anti-buckling member shall consist of a glass reinforced plastic rod. The purpose of the central member is to prevent buckling of the cable.

Each buffer tube shall be filled with a non-hygroscopic, non-nutritive to fungus, electrically non-conductive, homogenous gel. The gel shall be free from dirt and foreign matter. The gel shall be readily removable with conventional nontoxic solvents. Buffer tubes shall be stranded around a central member using the reverse oscillation, or "S-Z", stranding process.

The cable core shall contain a water-blocking material. The water blocking material shall be non-nutritive to fungus, electrically non-conductive and homogenous. It shall also be free from dirt and foreign matter and shall be readily removable with conventional (nontoxic) solvents.

Binders shall be applied with sufficient tension to secure the buffer tubes to the central member without crushing the buffer tubes. The binders shall be non-hygroscopic, nonwicking and dielectric with low shrinkage. The cable shall contain at least one ripcord under the sheath for easy sheath removal. Tensile strength shall be provided by a combination of high tensile strength dielectric yarns. The high tensile strength dielectric yarns shall be helically stranded evenly around the cable core.

The jacket or sheath shall be free of holes, splits, and blisters. The cable jacket shall contain no metal elements and shall be of a consistent thickness. Cable jackets shall be marked with:

Manufacturer's Name, Optical Cable-Year and UW-S.

Where the Description conforms to the following depending on cable type:

Single-Mode Cable: XXF SMF28E, XX denotes the fiber count

The cable length shall also be marked every meter. The actual length of the cable shall be within –0/+1% of the length markings. Cable marking shall be in contrasting color to the cable jacket. The height of the marking shall be approximately 2.5 mm.

The maximum pulling tension shall be 2700 N (608 lbf) during installation (short term) and 890 N (200 lbf) long term installed

The shipping, storage, and operating temperature range of the cable shall be -40o C to +70o C. The installation temperature range of the cable shall be -30o C to +70o C. C. Construction Methods. All cable shall be installed as per Siecor Recommended Procedure 005-011 “Fiber Optic Cable Placing B Duct”. These general procedures will be followed regardless of the manufacturer of the cable. Testing shall be compliant with Appendix B

D. Method of Measurement. 144 Count, 96 Count, 72 Count, 48 Count, 36 Count, 24 Count, and 12 Count Dielectric Fiber Optic Cables shall be measured by the linear foot of cable in place.

E. Basis of Payment. 144 Count, 96 Count, 72 Count, 48 Count, 36 Count, 24 Count and 12 Count Dielectric Fiber Optic Cables, measured as provided above, **will be paid for at the contract unit price per linear foot**, after cable acceptance. The price shall be payment in full for furnishing and testing the cabling; and for all labor, tools, equipment, and incidentals necessary to complete the work.

BID ITEM #37 - PLENUM RATED 144-COUNT FIBER OPTIC CABLE, FURNISH ONLY
BID ITEM #38 - PLENUM RATED 96-COUNT FIBER OPTIC CABLE, FURNISH ONLY
BID ITEM #39 - PLENUM RATED 72-COUNT FIBER OPTIC CABLE, FURNISH ONLY
BID ITEM #40 - PLENUM RATED 48-COUNT FIBER OPTIC CABLE, FURNISH ONLY
BID ITEM #41 - PLENUM RATED 36-COUNT FIBER OPTIC CABLE, FURNISH ONLY
BID ITEM #42 - PLENUM RATED 24-COUNT FIBER OPTIC CABLE, FURNISH ONLY
BID ITEM #43 - PLENUM RATED 12-COUNT FIBER OPTIC CABLE, FURNISH ONLY

A. Description. Work under this item shall consist of furnishing and testing 144, 96, 72, 48, 36, 24, and 12 Count Plenum Rated Fiber Optic Communications Cable as shown on the Plans. The work shall be performed within the geographical limits of the State of Wisconsin.

B. Materials. The Plenum Rated Fiber Optic Cable shall meet the following requirements:

- TIA 568, fiber optic standards on topology, terminations, etc.
- SIO 11801, telecommunications cabling systems
- ICEA 696, optical fiber indoor/outdoor cable standard
- ICEA 640, water blocking specification
- Meets or exceeds the requirements of ANSI/ICEA Standard for Fiber Optic Outside Plant Communications Cable, ANSI/ICEA S-87-640-2006
- Color coding shall meet TIA/EIA-598B, “Color Coding of Fiber Optic Cables.”
- Meet or exceed the National Electrical Safety Code specifications

Fiber Construction - Optical fibers shall be placed inside a loose buffer tube. Each buffer tube shall contain 12 fibers dependent on the fiber size. The fibers shall not adhere to the inside of the buffer tube.

In buffer tubes containing multiple fibers, the colors shall be stable across the specified storage and operating temperature range and not subject to fading or smearing onto each other or into the gel filling material. Colors shall not cause fibers to stick together.

Buffer tubes shall be kink resistant within the specified minimum bend radius.

Fillers may be included in the cable core to lend symmetry to the cable cross-section where needed.

The central anti-buckling member shall consist of a glass reinforced plastic rod. The purpose of the central member is to prevent buckling of the cable.

Each buffer tube shall be filled with a non-hygroscopic, non-nutritive to fungus, electrically non-conductive, homogenous gel. The gel shall be free from dirt and foreign matter. The gel shall be readily removable with conventional nontoxic solvents. Buffer tubes shall be stranded around a central member using the reverse oscillation, or "S-Z", stranding process.

The cable core shall contain a water-blocking material. The water blocking material shall be non-nutritive to fungus, electrically non-conductive and homogenous. It shall also be free from dirt and foreign matter and shall be readily removable with conventional (nontoxic) solvents.

Binders shall be applied with sufficient tension to secure the buffer tubes to the central member without crushing the buffer tubes. The binders shall be non-hygroscopic, non-wicking and dielectric with low shrinkage. The cable shall contain at least one ripcord under the sheath for easy sheath removal. Tensile strength shall be provided by a combination of high tensile strength dielectric yarns. The high tensile strength dielectric yarns shall be helically stranded evenly around the cable core.

The jacket or sheath shall be free of holes, splits, and blisters. The cable jacket shall contain no metal elements and shall be of a consistent thickness. Cable jackets shall be marked with:

Manufacturer's Name, Optical Cable-Year and UW-S.

Where the Description conforms to the following depending on cable type: Single-Mode Cable: XXF SMF28E, XX denotes the fiber count

The cable length shall also be marked every meter. The actual length of the cable shall be within –0/+1% of the length markings. Cable marking shall be in contrasting color to the cable jacket. The height of the marking shall be approximately 2.5 mm.

The maximum pulling tension shall be 2700 N (608 lbf) during installation (short term) and 890 N (200 lbf) long term installed

The shipping, storage, and operating temperature range of the cable shall be -40o C to +70o C. The installation temperature range of the cable shall be -30o C to +70o C.

C. Construction Methods. All cable shall be installed as per Siecor Recommended Procedure 005-011 “Fiber Optic Cable Placing B Duct”. These general procedures will be followed regardless of the manufacturer of the cable.

Testing shall be compliant with Appendix B

D. Method of Measurement. 144 Count, 96 Count, 72 Count, 48 Count, 36 Count, 24 Count and 12 Count Plenum Rated Fiber Optic Cables shall be measured by the linear foot of cable in place.

E. Basis of Payment. 144 Count, 96 Count, 72 Count, 48 Count, 36 Count, 24 Count, and 12 Count Plenum Rated Fiber Optic Cables, measured as provided above, **will be paid for at the contract unit price per linear foot**, after cable acceptance. The price shall be payment in full for furnishing and testing the cabling; and for all labor, tools, equipment, and incidentals necessary to complete the work.

BID ITEM #44 - ARMORED SINGLE MODE 144-COUNT FIBER OPTIC CABLE, FURNISH ONLY
BID ITEM #45 - ARMORED SINGLE MODE 96-COUNT FIBER OPTIC CABLE, FURNISH ONLY
BID ITEM #46 - ARMORED SINGLE MODE 72-COUNT FIBER OPTIC CABLE, FURNISH ONLY
BID ITEM #47 - ARMORED SINGLE MODE 48-COUNT FIBER OPTIC CABLE, FURNISH ONLY
BID ITEM #48 - ARMORED SINGLE MODE 36-COUNT FIBER OPTIC CABLE, FURNISH ONLY
BID ITEM #49 - ARMORED SINGLE MODE 24-COUNT FIBER OPTIC CABLE, FURNISH ONLY
BID ITEM #50 - ARMORED SINGLE MODE 12-COUNT FIBER OPTIC CABLE, FURNISH ONLY

A. Description. Work under this item shall consist of furnishing and testing, as specified, 144, 96, 72, 48, 36, 24, 12 Count Armored Single Mode Fiber Optic Communications Cable as shown on the Plans. The work shall be performed within the geographical limits of the State of Wisconsin.

B. Materials. The Armored Single Mode Fiber Optic Cable shall meet the following

- Meets or exceeds the Armored Single Mode Fiber Optic Communications Cable performance characteristics and test methods are defined in the Department of Agriculture Rural Utilities Service (RUS) 7 CFR 1755.900 (PE-90)
- Meets or exceeds the requirements of ANSI/ICEA Standard for Fiber Optic Outside Plant Communications Cable, ANSI/ICEA S-87-640-2006
- Color coding shall meet TIA/EIA-598B, "Color Coding of Fiber Optic Cables."
- Meet or exceed applicable National Electrical Safety Code specifications

Armored cables shall have an inner jacket with an inner sheath of MDPE. The minimum nominal jacket thickness of the inner sheath shall be 1.0 mm for cables with 3.0mm OD buffer tubes and for reduced diameter (RD) cables. The minimum nominal jacket thickness of the inner sheath shall be 0.8 mm for cables with 2.5mm OD buffer tubes. The

inner jacket shall be applied directly over the tensile strength members (as required) and water swellable tape. A water swellable tape shall be applied longitudinally around the outside of the inner jacket. The armor shall be a corrugated steel tape, plastic-coated on both sides for corrosion resistance, and shall be applied around the outside of the water blocking tape with an overlapping seam with the corrugations in register. The outer jacket shall be applied over the corrugated steel tape armor. The outer jacket shall be MDPE with a minimum nominal jacket thickness of 1.4 mm for cables with 3.0mm OD buffer tubes and for reduced diameter (RD) cables. The minimum nominal jacket thickness shall be 1.3 mm for cables with 2.5mm OD buffer tubes. The polyethylene shall contain carbon black to provide ultraviolet light protection and shall not promote the growth of fungus.

Fiber Construction - Optical fibers shall be placed inside a loose buffer tube. Each buffer tube shall contain 12 fibers dependent on the fiber size. The fibers shall not adhere to the inside of the buffer tube.

In buffer tubes containing multiple fibers, the colors shall be stable across the specified storage and operating temperature range and not subject to fading or smearing onto each other or into the gel filling material. Colors shall not cause fibers to stick together.

Buffer tubes shall be kink resistant within the specified minimum bend radius.

Fillers may be included in the cable core to lend symmetry to the cable cross-section where needed.

The central anti-buckling member shall consist of a glass reinforced plastic rod. The purpose of the central member is to prevent buckling of the cable.

Each buffer tube shall be filled with a non-hygroscopic, non-nutritive to fungus, electrically non-conductive, homogenous gel. The gel shall be free from dirt and foreign matter. The gel shall be readily removable with conventional nontoxic solvents. Buffer tubes shall be stranded around a central member using the reverse oscillation, or "S-Z", stranding process.

The cable core shall contain a water-blocking material. The water blocking material shall be non-nutritive to fungus, electrically non-conductive and homogenous. It shall also be free from dirt and foreign matter and shall be readily removable with conventional (nontoxic) solvents.

Binders shall be applied with sufficient tension to secure the buffer tubes to the central member without crushing the buffer tubes. The binders shall be non-hygroscopic, non-wicking and dielectric with low shrinkage. The cable shall contain at least one ripcord under the sheath for easy sheath removal. Tensile strength shall be provided by a combination of high tensile strength dielectric yarns. The high tensile strength dielectric yarns shall be helically stranded evenly around the cable core.

The jacket or sheath shall be free of holes, splits, and blisters. The cable jacket shall contain no metal elements and shall be of a consistent thickness. Cable jackets shall be marked with:

Manufacturer's Name, Optical Cable-Year and UW-S.

Where the Description conforms to the following depending on cable type:

Single-Mode Cable: XXF SMF28E, XX denotes the fiber count

The cable length shall also be marked every meter. The actual length of the cable shall be within –0/+1% of the length markings. Cable marking shall be in contrasting color to the cable jacket. The height of the marking shall be approximately 2.5 mm.

The maximum pulling tension shall be 2700 N (608 lbf) during installation (short term) and 890 N (200 lbf) long term installed

The shipping, storage, and operating temperature range of the cable shall be -40o C to +70o C. The installation temperature range of the cable shall be -30o C to +70o C.

C. Construction Methods. All cable shall be installed as per Siecor Recommended Procedure 005-011 “Fiber Optic Cable Placing B Duct”. These general procedures will be followed regardless of the manufacturer of the cable. Testing shall be compliant with Appendix B

D. Method of Measurement. 144 Count, 96 Count, 72 Count, 48 Count, 36 Count, 24 Count and 12 Count Armored Single Mode Fiber Optic Cable shall be measured by the linear foot of cable in place.

E. Basis of Payment. 144 Count, 96 Count, 72 Count, 48 Count, 36 Count, 24 Count and 12 Count Armored Single Mode Fiber Optic Cable, measured as provided above, **will be paid for at the contract unit price per linear foot**, after cable acceptance. The price shall be payment in full for furnishing and testing the cabling; and for all labor, tools, equipment, and incidentals necessary to complete the work.

BID ITEM #51 - CABLE IN CONDUIT, INSTALLATION ONLY

A. Description. Conduit will be newly installed and/or proofed and ready for installation. The work shall be performed within the geographical limits of the State of Wisconsin.

B. Materials. (None)

C. Construction Methods. Install all cables into the conduit using a flat woven pull tape. Optionally, install the cable via forced air and a track pushing mechanism. Do not use a single pull tape for more than a single cable pull. Install the pull tape and fiber optic cables according to the testing procedures completed for this project and the pull tape and cable manufacturers' recommendations.

Install all cable according to Siecor recommended procedure SRP 005-011 for fiber optic cable placing – duct. Follow these procedures regardless of the manufacturer of the cable. If the cable manufacturer recommends an operation in conflict with these procedures, submit a request for installation procedure change to the department for approval. Do not exceed a maximum pulling tension of 608 pounds-force during installation and 200 pounds-force after installation.

Pull boxes shall have a slack loop with a minimum length of 50 feet. Splice enclosures shall have a slack loop with a minimum length of 100 feet.

D. Method of Measurement. Install Fiber Optic Cable in Existing Conduit, measured as provided above, will be measured by linear foot of conduit in place.

E. Basis of Payment. Install Fiber Optic Cable in Existing Conduit, measured as provided above, **will be paid for at the contract unit price per linear foot**, after acceptance. The price shall be payment in full for proofing the conduit; and for all labor, tools, equipment, and incidentals necessary to complete the work.

BID ITEM #52 - TRACER WIRE, 10 AWG

A. Description. This work shall consist of furnishing and installing 10 AWG Tracer Wire, as hereinafter provided. This Wire should be placed with the fiber optic cable when it is bored, plowed or trenched when shielded cables are not used. The work shall be performed within the geographical limits of the State of Wisconsin.

B. Materials. 10 AWG Tracer Wire shall meet the following requirements:

- Conductor: 10 AWG Bare Copper
- Stranding: solid
- Insulating Material: PE
- Insulating Thickness: 0.047" Nom.
- Insulating Conductor Diameter: 0.196" Nom.
- Temperature rating: -20 degrees C to 60 C
- Operating voltage: 600 V RMS Max.
- DC Resistance @ 20 Degrees C: 1 Ohms/1M' Nom.

C. Construction Methods. (None)

D. Method of Measurement. All 10 AWG Tracer Wire shall be measured by the linear foot of Wire placed.

E. Basis of Payment. All 10 AWG Tracer Wire, measured as provided above, **will be paid for at the contract unit price per linear foot**, after acceptance. The price shall be payment in full for furnishing, installing, and testing the Wire; and for all labor, tools, equipment, and incidentals necessary to complete the work.

BID ITEM #53 - FIBER OPTIC BURIED MARKER/SIGN WARNING

A. Description. This work shall consist of furnishing and installing Fiber Optic Buried Marker/Sign, Warning, as hereinafter provided. This Marker/sign should be placed with the fiber optic cable when it is bored, plowed or trenched as shown on the Plans. The normal installation will be in near potential dig-ins, road crossings, or where indicated by UW-S's Plans. The work shall be performed within the geographical limits of the State of Wisconsin.

B. Materials. Fiber Optic Buried Marker/Sign, Warning shall meet the following requirements:

- Material: UV Treated, .125" Polyethylene
- Marker Height: 78-84"
- Cap Color: Orange, w/Black Text
- Cap Dimensions: 3.50 – 3.80" Diameter
- Post Color: White, 3.50" Diameter
- Conform to APWA uniform color codes

C. Construction Methods. (None)

D. Method of Measurement. All Fiber Optic Buried Marker/Signs, Warning, shall be measured as a unit furnished and installed, with all incidentals required.

E. Basis of Payment. All Fiber Optic Buried Marker/Signs, measured as provided above, **will be paid for at the contract unit price each**, after acceptance. The price shall be payment in full for furnishing and installing the Fiber Optic Buried Marker/Signs; and for all labor, tools, equipment, and incidentals necessary to complete the work.

BID ITEM #54 - FIBER OPTIC BURIED TEST STATION

A. Description. This work shall consist of furnishing and installing Fiber Optic Buried Test Station, as hereinafter provided. This Test Station should be placed with the fiber optic cable as shown on the Plans. This Test Station will be utilized for bonding & grounding the tracer wire. This Test Station will be used for locating the fiber optic cable. This Test Station can be purchased from either ACP International or Pro-Mark Utility supply. UW-S will accept an equivalent supplier. The normal installation will be near splice points or where indicated by UW-S's Plans. The work shall be performed within the geographical limits of the State of Wisconsin.

B. Materials. Fiber Optic Buried Test Station shall meet the following requirements:

- Material: UV Treated, .125" Polyethylene
- Marker Height: 78-84"
- Cap Color: Orange, w/Black Text
- Cap Dimensions: 3.95 – 4.375" Diameter
- Post Color: White, 3.00-3.50" Diameter
- Minimum of Three Terminals
- Conform to APWA uniform color codes

C. Construction Methods. (None)

D. Method of Measurement. All Fiber Optic Buried Test Stations shall be measured as a unit furnished and installed, with all incidentals required.

E. Basis of Payment. All Fiber Optic Buried Test Stations, measured as provided above, **will be paid for at the contract unit price each**, after acceptance. The price shall be payment in full for furnishing and installing the Fiber Optic Buried Test Stations; and for all labor, tools, equipment, and incidentals necessary to complete the work.

BID ITEM #55 - COMMUNICATION VAULT (HANDHOLE)

A. Description. Work under this item shall consist of installing a communications vault (hand hole) and vault lid as hereinafter provided. The work shall be performed within the geographical limits of the State of Wisconsin.

B. Materials. The communication vault and vault lid should be constructed of the polymer concrete material, "Quazite" or equivalent and be gray in color.

The communication vault shall be 30x48-inches and shall have an effective height of 36 inches. The vault shall be one piece. Stackable vaults are **not acceptable**.

The communication vault lid shall have a minimum design load of 15,000 pounds and shall have a permanently recessed logo that reads "UW-S" or a name will be specified by UW-S in the design for different geographic areas as identified by the UW-S Project Manager. The communications vault lid shall have two (2) ½-inches x 4-inch pull slots.

Manufacturer approved gasketing to resist water from entering the communications vault shall be installed between the lid and the top of the vault.

12" of gravel base extending 12" around the bottom of the vault.

Void areas between openings and conduit shall be filled with self-curing caulking that will provide a permanent, flexible rubber which is unaffected by sunlight, water, oils, mild acids and alkali. The caulking shall be mildew resistant and non-flammable. The material shall provide a permanent bond between the conduit entering the vault and the polymer concrete. The caulking shall be gray in color.

C. Labor. The Construction Methods of Communications Vault shall be in accordance with the following requirements:

A manufacturer approved knockout punch driver may be used to provide openings in the vaults for conduit. Alternatively, the required openings may be machined at the time of vault fabrication.

Voids between entering conduits and the punch driven openings shall not exceed ½-inch. The void areas shall be caulked from the interior and exterior of the communications vault. The conduit shall be allowed to fully cure as per the manufacturer's specifications prior to backfilling.

Add and compact a 12" deep gravel base extending 12" around the base of the vault.

D. Method of Measurement. Communications Vault will be measured as a unit complete in place.

E. Basis of Payment. Communications Vault, measured as provided above, **will be paid for at the contract unit price each**, which price shall be payment for furnishing and installing all materials, including the vaults, lids, gasketing, bolts, washers, stainless steel mounting hardware, caulking, and coarse aggregate; for all excavation, backfilling, topsoil, sodding, fertilizer, and disposal of surplus material; and for all labor, tools, equipment and incidentals necessary to complete the work. **Provide separate bids for Materials and Labor as shown in the Pricing Sheet.**

BID ITEM #56 - LOCATE VAULT

A. Description. Work under this item shall consist of installing a locating vault and vault lid as hereinafter provided. This item will be used in areas of the UW-S project where above ground markers are not permitted or as requested by the UW-S Project Manager. The work shall be performed within the geographical limits of the State of Wisconsin.

B. Materials. The locate vault and vault lid should be constructed of the polymer concrete material, "Quazite" or equivalent and be gray in color. The locate vault shall be 8x8-inches and shall have an effective height of 12 inches. The vault shall be one piece. 12" of gravel base extending 12" around the bottom of the vault.

Manufacturer approved gasketing to resist water from entering the locate vault shall be installed between the lid and the top of the vault.

C. Construction Methods. The locate vault shall be located directly adjacent to the communications vault containing locate wires accessible from ground level. Locating wires shall be extended into this vault for locaters to gain easy access of using these utilities for the purpose of locating UW-S fibers. Add and compact a 12" deep gravel base extending 12" around the base of the vault.

D. Method of Measurement. Locate Vault will be measured as a unit complete in place.

E. Basis of Payment. Locate Vault, measured as provided above, **will be paid for at the contract unit price each**, which price shall be payment for furnishing and installing all materials, including the vaults, lids, gasketing, bolts, washers; for all excavation, backfilling, topsoil, sodding, fertilizer, and disposal of surplus material; and for all labor, tools, equipment and incidentals necessary to complete the work.

BID ITEM #57 - FIBER OPTIC NETWORK TECHNICIAN (HR)

A. Description. This item is to set an hourly rate agreed to by UW-S and the contractor that will be used for change orders or additions to the project as assigned by the UW-S Project Manager. The work shall be performed within the geographical limits of the State of Wisconsin.

B. Materials. (None)

C. Construction Methods. (None)

D. Method of Measurement. The Fiber Optic Network Technician shall be **measured per hour** of work completed. Each 15-minute increment (or portion thereof) will be measured at quarter hour increments.

E. Basis of Payment. The technician, measured as provided above, **will be paid for at the contract unit price per hour.**

BID ITEM #58 - PERMIT FEES

A. Description. Permit Fees assessed to the project will be paid for by the Contractor and then reimbursed by UW-S under this item. The contractor shall submit a copy of a paid receipt

for the assessed permit fees and will be reimbursed for amount of the permit fee only. Any labor or incidentals in acquiring such permits for the UW-S project will not be accounted for under this item but under boring, trenching and plowing of any fiber in the UW-S project design. The work shall be performed within the geographical limits of the State of Wisconsin.

B. Materials. (None)

C. Construction Methods. (None)

D. Method of Measurement. Reimbursement will be paid for Permit Fees only after copy of each paid receipt of the permit fee is submitted for reimbursement.

E. Basis of Payment. Permit Fees **will be paid for at the price of each paid receipt.**

BID ITEM #59 - BUILDING ENTRANCE – WITHIN 50 FEET

A. Description. Work under this item shall consist of penetrating and extending the fiber to the building demarcation point within 50 feet inside the building entrance. The work shall be performed within the geographical limits of the State of Wisconsin

B. Materials. Building entrance sleeving, necessary support materials (e.g. support anchors, hangers, fire stopping, ladders, etc.), grounding wire must be provided.

C. Construction Methods. All metallic fiber optic cable components at splice points and building entrance must be bonded and grounded in compliance with ANSI/NFPA 70 requirements (AWG #6 copper wire minimum). Vendors must adhere to manufacturer's specification for bend radius and pull strength maximums when installing fiber. Fiber optic cable entrances into the building must be via metal conduit or sleeves. Outside plant fiber optic cable must be terminated within 50 feet of entering a building or extended using EMT conduit. All outside plant fiber optic cables must be sealed and properly tested at building entrance. Vendors may choose to use fiber cable rated for both inside and outside use. Cable used inside the building must adhere to all building and local codes including requirements established. Vendor must determine the best entry point and route fiber optic cable to designated location in compliance with local and state building codes including requirements established by the UW-S Project Manager or the building owner.

D. Method of Measurement. Building Entrance Within 50 Feet, measured as provided above, will be measured as a unit complete installed.

E. Basis of Payment. Building Entrance Within 50 Feet, measured as provided above, **will be paid for at the contract unit price each**, which price shall be payment for furnishing and installing all materials, including building entrance sleeves, necessary support materials (e.g. support anchors, hangers, fire stopping, ladders, etc.) and proper ground; and for all labor, tools, equipment and incidentals necessary to complete the work.

BID ITEM #60 - BUILDING ENTRANCE – WITHIN 100 FEET, EMT CONDUIT PATHWAY

A. Description. Work under this item shall consist of penetrating and extending the fiber to the building demarcation point within 100 feet inside the building entrance. Furnish and install EMT

Conduit to create a pathway from building entrance to the termination location. The work shall be performed within the geographical limits of the State of Wisconsin

B. Materials. Building entrance sleeving, EMT conduit with all EMT necessary hardware to create the pathway, necessary support materials (e.g. support anchors, hangers, fire stopping, ladders, etc.), grounding wire must be provided.

C. Construction Methods. All metallic fiber optic cable components at splice points and building entrance must be bonded and grounded in compliance with ANSI/NFPA 70 requirements (AWG #6 copper wire minimum). Vendors must adhere to manufacturer's specification for bend radius and pull strength maximums when installing fiber. Fiber optic cable entrances into the building must be via metal conduit or sleeves and then installed in EMT conduit to the termination location. Outside plant fiber optic cable must be terminated within 50 feet of entering a building or extended using EMT conduit. All outside plant fiber optic cables must be sealed and properly tested at building entrance. Vendors may choose to use fiber cable rated for both inside and outside use. Cable and other materials used inside the building must adhere to all building and local codes including requirements established. Vendor must determine the best entry point and route fiber optic cable to designated location in compliance with local and state building codes including requirements established by the UW-S Project Manager or the building owner.

D. Method of Measurement. Building Entrance Within 100 Feet, EMT Conduit Pathway, measured as provided above, will be measured as a unit complete installed.

E. Basis of Payment. Building Entrance Within 100 Feet, EMT Conduit Pathway, measured as provided above, **will be paid for at the contract unit price each**, which price shall be payment for furnishing and installing all materials, including building entrance sleeves, EMT conduit, necessary support materials (e.g. support anchors, hangers, fire stopping, ladders, etc.) and proper ground; and for all labor, tools, equipment and incidentals necessary to complete the work.

BID ITEM #61 - BUILDING ENTRANCE – WITHIN 100 FEET, PLENUM INNER DUCT PATHWAY

A. Description. Work under this item shall consist of penetrating and extending the fiber to the building demarcation point within 100 feet inside the building entrance. Furnish and install plenum rated inner duct to create a pathway for plenum fiber from building entrance to the termination location as directed by UW-S Project Manager.

B. Materials. Building entrance sleeving, Plenum rated INNER DUCT with all necessary hardware to create the pathway, necessary support materials (e.g. support anchors, hangers, fire stopping, ladders, etc.), grounding wire must be provided.

C. Construction Methods. All metallic fiber optic cable components at splice points and building entrance must be bonded and grounded in compliance with ANSI/NFPA 70 requirements (AWG #6 copper wire minimum). Vendors must adhere to manufacturer's specification for bend radius and pull strength maximums when installing fiber. Fiber optic cable entrances into the building must be via metal conduit or sleeves and then installed in Plenum INNER DUCT to the termination location. Outside plant fiber optic cable must be terminated within 50 feet of entering a building and extended using Plenum Inner Duct. All outside plant fiber optic cables must be sealed and properly tested at building entrance. Vendors may choose to use fiber cable rated for both inside and outside use. Cable and other materials used

inside the building must adhere to all building and local codes including requirements established. Vendor must determine the best entry point and route fiber optic cable to designated location in compliance with local and state building codes including requirements established by the UW-S Project Manager or the building owner.

D. Method of Measurement. Building Entrance Within 100 Feet, PLENUM INNER DUCT PATHWAY, measured as provided above, will be measured as a unit complete installed.

E. Basis of Payment. Building Entrance Within 100 Feet, Plenum Inner Duct Pathway, measured as provided above, **will be paid for at the contract unit price each**, which price shall be payment for furnishing and installing all materials, Inner duct, including building entrance sleeves, necessary support materials (e.g. support anchors, hangers, fire stopping, ladders, etc.) and proper ground; and for all labor, tools, equipment and incidentals necessary to complete the work.

BID ITEM #62 - EXTEND EMT CONDUIT PATHWAY BEYOND 100 FEET, PER FOOT

A. Description. Work under this item shall consist of extending the EMT Conduit Pathway beyond 100 feet to the demarcation point, this price per foot is to be added to the Building Entrance Within 100 Feet, EMT Conduit Pathway listed above. The work shall be performed within the geographical limits of the State of Wisconsin

B. Materials. EMT conduit with all EMT necessary hardware to create the pathway

C. Construction Methods. All materials and construction will be similar in design to **Building Entrance Within 100 Feet, EMT Conduit Pathwa**y as it is an extension of that service. Cable and other materials used inside the building must adhere to all building and local codes including requirements established. Vendor must determine the best entry point and route fiber optic cable to designated location in compliance with local and state building codes including requirements established by the UW-S Project Manager or the building owner.

D. Method of Measurement. Extend EMT Conduit Pathway Beyond 100 Feet, per Foot, measured by the linear foot of conduit in place beyond the first 100 feet installed.

E. Basis of Payment. Extend EMT Conduit Pathway Beyond 100 Feet, per Foot, measured as provided above, **will be paid for at the contract unit price per linear foot in place after acceptance** for furnishing and installing all materials, including conduit, necessary support materials (e.g. support anchors, hangers, fire stopping, ladders, etc.) and proper ground; and for all labor, tools, equipment and incidentals necessary to complete the work.

BID ITEM #63 - EXTEND PLENUM INNER DUCT PATHWAY BEYOND 100 FEET, PER FOOT

A. Description. Work under this item shall consist of extending the PLENUM INNER DUCT Pathway for plenum fiber beyond 100 feet to the demarcation point, this price per foot is to be added to the Building Entrance Within 100 Feet, PLENUM INNER DUCT listed above. The work shall be performed within the geographical limits of the State of Wisconsin

B. Materials. Inner duct with all necessary hardware to create the pathway

C. Construction Methods. All materials and construction will be similar in design to **Building Entrance Within 100 Feet, Plenum Inner Duct Pathway** as it is an extension of that service. Cable and other materials used inside the building must adhere to all building and local codes including requirements established. Vendor must determine the best entry point and route fiber optic cable to designated location in compliance with local and state building codes including requirements established by the UW-S Project Manager or the building owner.

D. Method of Measurement. Extend Plenum Inner Duct Pathway Beyond 100 Feet, per Foot, measured by the linear foot of conduit in place beyond the first 100 feet installed.

E. Basis of Payment. Extend Inner Duct Pathway Beyond 100 Feet, per Foot, measured as provided above, **will be paid for at the contract unit price per linear foot in place after acceptance** for furnishing and installing all materials, including conduit, necessary support materials (e.g. support anchors, hangers, fire stopping, ladders, etc.) and proper ground; and for all labor, tools, equipment and incidentals necessary to complete the work.

BID ITEM #64 - EXPOSE EXISTING UTILITY, PAVED SURFACES (PER SQ FOOT)

A. Description. Work under this item shall consist of exposing existing utilities under paved surfaces, providing for both lateral and depth dimensions for use with specified Conduit, Directional Bore, and restoring the pavement. In addition to providing the required dimensions, the utility shall remain exposed during the directional bore process, allowing for visual assistance that all required utility clearances are met. The work shall be performed within the geographical limits of the State of Wisconsin.

B. Materials. Materials required for this item shall include all base course and pavement (asphalt and/or concrete) as required to restore the site of the utility exposure to its original condition. The materials shall conform to the material removed or to any specifications set by the public or private pathway owner (WI DOT, county, city, etc).

C. Construction Methods. The Contractor shall remove pavements, alleys, or driveways, including all surfaces or other pavements superimposed thereon and base course or soil to a minimum depth of 18-inches below the bottom of the utility being exposed.

When removing pavement, the Contractor shall either remove the pavement to an existing joint, or saw and chip to a true line with a face perpendicular to the face of the existing pavement. Drainage shall be maintained. Lateral and depth measurements in feet and inches shall be performed and provided prior to the directional bore taking place.

The utility shall remain exposed and available for visual inspection until the completion of the directional bore. If the utility shall remain exposed overnight, or for prolonged periods of time, the Contractor shall be responsible for traffic protection in the form of traffic rated steel plating.

Upon completion of the utility exposure, the roadway shall be restored in the following manner. Crushed aggregate base course shall be installed from the bottom of the excavation to the bottom of the pavement. Concrete pavement and asphalted surface shall be placed to the dimensions as found in the existing roadway.

D. Method of Measurement.
Expose Existing Utility, Paved Surfaces shall be measured by the square foot per each utility exposure. Should multiple utilities be located within the same exposure area, this occurrence shall be measured as one unit.

E. Basis of Payment. Expose Existing Utility, measured as provided for above, **will be paid for at the contract price per square foot**, which price shall be payment for all pavement saw cutting; for pavement removal; for all excavation; for location of the utilities; for documentation of utility lateral and depth information; for all items required to maintain the site during the directional bore process, including all traffic protection and traffic rated steel plating; for all concrete, asphaltic surfaces, base course and soil required to restore the site to its original condition; and for all labor, tools, equipment, transportation, and incidentals necessary to complete this item of work.

Appendix A – Fiber Construction Specifications

Optical fibers shall be placed inside a loose buffer tube. Each buffer tube shall contain 12 fibers dependent on the fiber size. The fibers shall not adhere to the inside of the buffer tube.

In buffer tubes containing multiple fibers, the colors shall be stable across the specified storage and operating temperature range and not subject to fading or smearing onto each other or into the gel filling material. Colors shall not cause fibers to stick together.

Buffer tubes shall be kink resistant within the specified minimum bend radius.

Fillers may be included in the cable core to lend symmetry to the cable cross---section where needed.

The central anti---buckling member shall consist of a glass reinforced plastic rod. The purpose of the central member is to prevent buckling of the cable.

Each buffer tube shall be filled with a non---hygroscopic, non---nutritive to fungus, electrically non---conductive, homogenous gel. The gel shall be free from dirt and foreign matter. The gel shall be readily removable with conventional nontoxic solvents. Buffer tubes shall be stranded around a central member using the reverse oscillation, or "S---Z", stranding process.

The cable core shall contain a water---blocking material. The water blocking material shall be non---nutritive to fungus, electrically non---conductive and homogenous. It shall also be free from dirt and foreign matter and shall be readily removable with conventional (nontoxic) solvents.

Binders shall be applied with sufficient tension to secure the buffer tubes to the central member without crushing the buffer tubes. The binders shall be non---hygroscopic, non---wicking and dielectric with low shrinkage. The cable shall contain at least ripcord under the sheath for easy sheath removal. Tensile strength shall be provided by a combination of high tensile strength dielectric yarns. The high tensile strength dielectric yarns shall be helically stranded evenly around the cable core.

The jacket or sheath shall be free of holes, splits, and blisters. The cable jacket shall contain no metal elements and shall be of a consistent thickness. Cable jackets shall be marked with:

- Manufacturer's Name
- Optical Cable---Year
- UW-S (as required by Section 350G of the National Electrical Safety Code) and a description of cable type:
- Single---Mode Cable: XXF SMF28E (XX denotes the fiber count)

The cable length shall also be marked every meter. The actual length of the cable shall be within ---0/+1% of the length markings. Cable marking shall be in contrasting color to the cable jacket. The height of the marking shall be approximately 2.5mm.

The maximum pulling tension shall be 2700 N (608 lbf) during installation (short term) and 890 N (200 lbf) long term installed.

The shipping, storage, and operating temperature range of the cable shall be -40 degrees C to +70 degrees C. The installation temperature range of the cable shall be -30 degrees C to +70 degrees C.

Appendix B --- Testing Specifications

The Contractor shall provide the date, time and location of any tests required by this specification at least 24 hours before performing the test.

Upon completion of the cable installation, splicing, and termination, the Contractor shall test all fibers for continuity, events above 0.1dB, and total attenuation of the cable. The test procedure is as follows:

A Certified Fiber Optics Technician utilizing an Optical Time Domain Reflectometer (OTDR) and Optical Source/Power Meter must conduct the installation test. The Technician is directed to conduct the test using the Standard Operating Procedure as defined by the manufacturer of the test equipment.

The method of connectivity between the OTDR and the cable shall be a factory patch cord of a length equal to the "dead zone" of the OTDR. Optionally, the Technician can use a factory "fiber box" of 100 meters minimum with no splices within the box. The tests shall be conducted at 1310 and 1550 nm for all cable.

At the completion of the test, the Contractor shall provide two copies of documentation of the tests results to the UW-S Project Manager. The test documentation shall be bound and include the following:

- Cable & Fiber Identification
- Cable ID
- Cable Location – begin and end point
- Fiber ID, including tube and fiber color
- Operator Name
- Date & Time
- Setup Parameters
- Wavelength
- Pulse width (OTDR)
- Refractory index (OTDR)
- Range (OTDR)
- Scale (OTDR)
- Test Results

These results shall also be provided in standard readable electronic format (e.g. Excel or Adobe PDF). If this is not possible, the bidder must provide UW-S the appropriate software to enable UW-S to read the results electronically.

i) OTDR Test

- Total Fiber Trace
- Splice Loss/Gain
- Events greater than 0.10dB
- Measured Length (Cable Marking)
- Total Length (OTDR) ii) Optical Source/Power Meter
- Total Attenuation
- Attenuation (dB/km)

These results shall be provided in tabular form.

The following shall be the criteria for the acceptance of the cable:

The test results shall demonstrate that the dB/km loss does not exceed +3% of the factory test or 1% of the cable's published production loss. The error rate for the test equipment will be considered.

No event shall exceed 0.10dB. If any event is detected above 0.10dB, the Contractor must replace or repair that event point.

The total loss of the cable, less events, shall not exceed the manufacturer's production specifications as follows: .5 dB/km at both 1310 and 1550 nm. If the total loss exceeds these specifications, the Contractor shall replace or repair that cable run at the Contractor's expense, both labor and materials. Elevated attenuation due to exceeding the pulling tension during installation will require the replacement of the cable run at the Contractor's expense, both labor and materials.

Eventis Telecom Inc. will test the conduit integrity and continuity by pressurizing to 110 PSI in the overlapping route. Please refer to Pricing Instructions for the Grant Overlaps on page 9.

APPENDIX C: DESIGNATION OF CONFIDENTIAL AND PROPRIETARY INFORMATION

The attached material submitted in response to Bid/Proposal # _____ includes proprietary and confidential information which qualifies as a trade secret, as provided in s. 19.36(5), Wis. Stats., or is otherwise material that can be kept confidential under the Wisconsin Open Records Law. As such, we ask that certain pages, as indicated below, of this bid/proposal response be treated as confidential material and not be released without our written approval.

Prices always become public information when bids/proposals are opened, and therefore cannot be kept confidential.

Other information cannot be kept confidential unless it is a trade secret. Trade secret is defined in s. 134.90(1)(c), Wis. states as follows: "Trade secret" means information, including a formula, pattern, compilation, program, device, method, technique or process to which all of the following apply:

1. The information derives independent economic value, actual or potential, from not being generally known to, and not being readily ascertainable by proper means by, other persons who can obtain economic value from its disclosure or use.

2. The information is the subject of efforts to maintain its secrecy that are reasonable under the circumstances.

We request that the following pages not be released

Section Page # Topic

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_____

IN THE EVENT THE DESIGNATION OF CONFIDENTIALITY OF THIS INFORMATION IS CHALLENGED, THE UNDERSIGNED HEREBY AGREES TO PROVIDE LEGAL COUNSEL OR OTHER NECESSARY ASSISTANCE TO DEFEND THE DESIGNATION OF CONFIDENTIALITY AND AGREES TO HOLD THE STATE HARMLESS FOR ANY COSTS OR DAMAGES ARISING OUT OF THE STATE'S AGREEING TO WITHHOLD THE MATERIALS. Failure to include this form in the bid/proposal response may mean that all information provided as part of the bid/proposal response will be open to examination and copying. The state considers other markings of confidential in the bid/proposal document to be insufficient. The undersigned agrees to hold the state harmless for any damages arising out of the release of any materials unless they are specifically identified above.

Company Name _____

Authorized Representative _____ Signature

Authorized Representative _____ Print

Date _____

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