REQUEST FOR PROPOSAL

SHERWOOD FIBER OPTIC NETWORK CONSTRUCTION SPECIFICATIONS

Volume 1 of 1

Proposal Requirements

AUGUST 2021

Owner
City of Sherwood
Public Works Department
15527 SW Willamette Street
Sherwood, OR. 97140
503-625-5722

Table of Contents

1. Introduction

The purpose of this document is to describe the guidelines and methods by which the physical components for the City of Sherwood fiber networks will be designed and installed. Completed construction projects will follow the guidelines and principles outlined in this document, in addition to local rules, regulations, and specifications as they apply. Contractors will adhere to industry standard quality installation principles and provide quality installation services to ensure that the most reliable and cost-effective network is built.

All fiber routes will be installed to fall within public right-of-way (ROW), existing utility easements, or other property to which the City has legal access.

Any changes to this document will be provided in writing and a revised version will be disseminated to all stakeholders upon approval.

1.1 Contract Pricing and Adjustments

Prices shall be firm through the first year of the contract, with the following exceptions:

A. City shall be given immediate benefit of any price decreases.
B. Contractor shall promptly notify the City of amount and effective date of any decreases.
C. Any decrease shall apply to any item(s) requested on or after the effective date of decrease

1.2 Price Increases

Contractor may propose price adjustments in writing not less than 60 days prior to the anniversary date of the contract. City shall have the option to either accept the price increase effective on the anniversary date or terminate the contract. All proposals for price increases shalt be accompanied by documents showing an increase in Contractor's cost for each item for which a price increase is proposed.

1.3 Length of Contract

The length of this contract will be for one (1) year with the option to extend an additional three (3) years upon agreement between the City and the Contractor, pending budget approval each year. The total contract term shall not exceed four (4) years.

1.4 Material Storage

The Contrator (or Contractor’s vendor) will need to store materials onsite as the City does not have the capacity to store material quantities for this multi-year project. The City will provide Contractor 15 days’ notice of materials needed. Contractor (or Contractor’s vendor) to deliver materials within 7 days of request. The Contractor (or Contractor’s vendor) shall have all materials delivered in quantities as requested by the City.

2. General Guidelines

These guidelines identify and define the City of Sherwood’s requirements and policies for designing and installing broadband infrastructure and substructure for the City. Use of, and compliance with these guidelines is mandatory for architects, engineers, and installation contractors including all subcontractors working on City of Sherwood’s Network Infrastructure upgrades, moves, maintenance and restoration projects.

The City Infrastructure Standards are based upon the code requirements and telecommunications industry standards contained in the following guidelines. These guidelines will not duplicate the information contained in those references, except where necessary to provide guidance, clarification or direction. Installers shall use sound judgement in order to comply with the requirements of the codes and standards in references and standards.

2.1 License

Contractor shall possess any and all contractor licenses, in form and class as required by any and all applicable laws with respect to any and all work to be performed under this contract (including but not limited to a Metro Business License or City of Sherwood Business License); in accordance with the provisions of the Contractor's License Law in the State of Oregon and rules and regulation adopted pursuant thereto.

2.2 Insurance

The Contractor shall not commence work under this contract until he has obtained all insurance required per the contract with the City. Nor shall the Contractor allow any subcontractor to commence work on his subcontract until all insurance required of the subcontractor has been obtained. The Contractor shall take out and maintain at all time during the life of the contract. The following policies of insurance: policies as required by the City of Sherwood.

2.3 Laws and Regulations

Installation contractor including all subcontractors shall follow all Federal, State, and local laws and regulations for the installation and maintenance in which the contractor has been hired to perform.

2.4 Materials

The Contractor will be responsible for providing materials necessary to complete all work described in the work order to deliver a complete and working system. Contractor shall provide cut sheets with material specifications to the City for all materials for approval prior to ordering.

2.4.A Submittals

1. Sherwood is to review all material submittals related to the project. This includes, but is not limited to, relevant material specifications sheets that include manufacturer, part numbers, size, performance and shop drawings.
2. Allow a minimum of one week (five working days) for the City to review.
3. All products seeking approval either as “approved equivalent” or otherwise, shall be submitted as a product substitution request prior to ordering. Failure to submit a product substitution request may preclude product from being utilized on the project.
4. The burden of proof is on the Contractor to provide documentation that equivalent product meets the specifications and project requirements. Include in substitution request:
    1. Product being replaced
    2. Reason for product substitution
    3. Full manufacturer specification sheet clearly indicating that all requirements in project documents have been met
5. Failure to meet these requirements will result in the product substitution request being returned without review.

6. All product substitution requests are to be reviewed and approved by the City. Not all requests will be approved, and all decisions are final, without recourse.

2.5 Subcontractors

A list of all subcontractor shall be provided to the City prior to the subcontractor being assigned to the project. All subcontractors will be properly qualified to perform work assigned and are subject to all rules and regulations defined in these specifications. The City has the right to deny or approve use of subcontractors at the City's discretion.

2.6 Permitting

Contractor shall always have a copy of approved permit and associated plans on the jobsite. The City will provide copies of approved permits to the Contractor prior to any installation work proceeding. It is the Contractor's responsibility to coordinate notice of commencement, and coordinate with the permitting authority having jurisdiction on any requirements given as a conditional approval of the permitting.

All fiber-optic network systems shall meet or exceed the latest requirements of all national, state, county, municipal, and other authorities exercising jurisdiction over the telecommunications systems and the Project.

Contractor agrees to furnish any additional labor or material required to comply with all local and other agencies having jurisdiction at no additional cost.

Contractor shall obtain certificates of inspection and approval from all authorities having jurisdiction, and forward copies of the same to the City prior to request for Project acceptance inspections, final completion inspections, substantial completion inspections, and acceptance testing/demonstrations.

All required permits and inspection certificates shall be made available at the completion of the fiber-optic system installation and commissioning.

Any portion of the fiber network which is not subject to the requirements of an electric code published by a specific authority having jurisdiction shall be governed by the National Electrical Code and other applicable sections of the National Fire Code, as published by the National Fire Protection Association (NFPA).

Installation procedures, methods and conditions shall comply with the latest requirements of the Federal Occupational Safety and Health Administration (OSHA).

2.7 Traffic Control

It is the responsibility of the Contractor to provide adequate temporary traffic control to ensure traffic safety during construction activities. Therefore, the Contractor shall submit a traffic control plan to the appropriate public works department and have the plan approved prior to starting any work in the right-of-way.

2.8 Warranties

The Contractor shall guarantee the entire work constructed by him under the contract to be free of defects in materials and workmanship for a period of one year following the date of acceptance of

the work by the City. The Contractor shall agree to make, at his own expense, any repairs or replacements made necessary by defects in materials or workmanship, which become evident within the warranty period. The Contractor shall further agree to indemnify and save harmless the City and Engineer, and their officers, agents and employees, against and from all claims and liability arising from damage and injury due to said defects. The Contractor shall make all repairs and replacements promptly upon receipt of written order from the Engineer. If the Contractor fails to make the repairs and replacements promptly, the City may do the work and the Contractor, and his surety shall be liable to the City for the cost of the work.

Manufacturers' warranties, guarantees, instruction sheets and parts lists, which are furnished with certain articles of materials incorporated in the work, shall be delivered to the Engineer before acceptance of the contracts.

2.9 Change orders

No change orders will be paid for unless preapproved by the City. Any deviations or discrepancies in the plans or field conditions that result in a change of installed billable quantities shall be submitted for approval prior to commencement of work.

2.10 Restoration

All work performed under the responsibility of the Contractor shall include full restoration of any disturbed area to like new condition. This includes, but is not limited to; asphalt, concrete, pavers, earthwork, compaction requirements, sod, plants, trees, landscaping, signage, irrigation systems, and all existing utilities.

All work and materials within the ODOT Right-of-Way shall be in accordance with the Oregon Road and Bridge Standards, latest edition.

2.11 Testing

All systems shall be tested as defined within this document to include, conduit proofing, cabling continuity and splice loss, compaction of disturbed earth, and any additional requirements set forth as a conditional approval of permitting or as directed by permitting authority and the City of Sherwood.

2.12 Craftsmanship

All work, which is defective in its construction or deficient in any of the requirements of the plans and specifications, shall be remedied or removed and replaced by the Contractor in an acceptable manner at his own expense. No compensation will be allowed for any work done beyond the lines and grades shown on the plans or established by the Engineer. Upon failure on the part of the Contractor to comply with any order of the Engineer made under the provisions of this article, the Engineer and City may cause the defective work to be remedied or removed and replaced at the expense of the Contractor.

Any unauthorized or defective work, defective material or workmanship or any unfaithful or imperfect work that may be discovered before final acceptance of work by the contractor shall be corrected immediately with no extra charge even though it may have been overlooked in previous inspections and estimates or may have been caused due to failure to inspect the work.

All cable and equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner.

Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where “approved equal” is stated or a substitution is requested, equipment shall be equivalent in every way to that of the equipment specified. All substitutions are subject to the control and approval of the owner or the owner representative.

Strictly adhere to all Telecommunications Industry Association (TIA) and BICSI recommended installation practices and manufacturer’s guidelines when installing communications components.

2.13 Safety

Payment for performing all work necessary to provide safety measures or compliance with the provisions of the safety orders and all other laws, ordinances, and regulations shall be included in Contractor’s pricing.

The Contractor shall be responsible for providing adequate safeguards, safety devices, protective equipment, confined space protections, flaggers, and any other needed actions to protect the life, health, and safety of the public and to protect property in connection with the performance of work covered by the contract. Any work within the traveled right-of-way that may interrupt normal traffic flow shall require a traffic control plan approved by ODOT, and the County or City . All sections of the ODOT Standard Specifications, Traffic Control, and the Manual of Uniform Traffic Control Devices (MUTCD) shall apply.

2.14 Protection of Public

Whenever the construction occurs within a developed residential area and/or through a school site, the Contractor shall take all necessary precautions to protect the public, especially children, from the hazards of open excavations. Trenches shall either be covered or adequately fenced at night and on weekends or whenever operations are not in actual process.

Unusual conditions may arise on the project, which will require that immediate and unusual provision be made to protect the public from danger or loss or damage to life and property, due directly or indirectly to the progression of the work. It is part of the service required of the Contractor to make such provisions and to furnish such protection.

The Contractor shall use such foresight and shall take such steps and precautions as the operations make necessary to protect the public from danger or damage, or loss of life or property, which would result from the interruption or contamination of public water supply, irrigation or other public service or from the failure of partly completed work.

Whenever, in the opinion of the City, an emergency exists against which the Contractor has not taken sufficient precaution for the safety of the public or the protection of utilities or of adjacent structures or property or if immediate action shall be considered necessary in order to protect public or private personnel or property interest, or prevent likely loss of human life or damage on account of the operations under the contract, then and in that event the City may provide suitable protection to said interest by causing such work to be done and material to be furnished, as, in the opinion of the City may seem reasonable and necessary.

The cost and expense of said labor and material together with the cost and expense of such repairs as may be deemed necessary shall be borne by the Contractor, and contractor fails to pay said cost and expense upon presentation of the bills therefore, duly certified by the Engineer, then said costs and expense will be paid by the City and shall thereafter be deducted from any amounts due, or which may become due said Contractor. Failure of the City, however, to take such precautionary

measure, shall not relieve the Contractor of his full responsibility for public safety.

2.15 Storage of Equipment and Materials in Public Streets

Construction materials shall not be stored in streets, roads, or highways for more than five days after unloading. All materials or equipment not installed or used in construction within five days after unloading, shall be stored elsewhere by the Contractor at their expense unless authorized additional storage time.

Construction equipment shall not be stored at the work site before its actual use on the work or for more than five days after it is no longer needed. Time necessary for repair or assembly of equipment may be authorized by the Engineer.

Excavated material, except that which is to be used as backfill in the adjacent trench, shall not be stored in public streets unless otherwise permitted. After placing backfill, all excess material shall be removed immediately from the site.

The foregoing provisions are in addition to and not in limitation of any other rights or remedies available to the City.

2.16 Discrepancies

If a discrepancy or inconsistency is discovered in the plans, drawings, specifications or contract for the work in relation to any such law, ordinance, regulation, order or decree, the Contractor shall forthwith report the same to the Engineer in writing.

2.17 Inspections

All craftmanship and production from outside vendors and contractors shall be inspected for compliance to specifications by an inspector. The inspector shall be working for the City or as contracted 3rd party inspector. A 3rd party inspector includes a hired vendor working on behalf of the City, or an inspector from the permitting authority having jurisdication. Any contractor hired by the City of Sherwood for installation services must agree to coordinate and schedule work with the inspector. Inspector will review production quanities and craftmanship. Any deficiencies identified by the inspector must be correct by the contractor prior to any permit close out or invoicing of work. No invoicing will be approved or processed until inspector signs off on work.

3. Fiber-Optic Cable

3.1 General Guidelines

All cable, unless specifically called out, for shall be single-mode cable, rated for the environment in which it is installed. Installations shall be OSP rated dielectric.

- **Pre-Approved Product Sets** The following product sets are pre-approved for this project. Except as noted, all others will require a substitution request to be completed and approved as per these documents. Sherwood will not consider product sets that have not been pre-approved or accepted as per the substitution request process.
- Fiber-optic cable and connection/termination products shall be manufactured by one of the following:

    1. Optical Cable Corporation
    2. Corning
    3. CommScope

4. OFS
5. Or approved alternate

3.2 Fiber Optic Cable

All cables shall be loose tube or ribbon fiber. If ribbon fiber is to be used it shall be approved by the engineer before ordering.

3.3 Bend Radius

The main risk of damage to the fiber-optic cable is by overlooking the minimum-bend radius. It is important to know that the damage occurs more easily when the cable is bent under tension, so when the installation is in process be sure to allow for at least the minimum-bend radius. The number of 90-degree turns on a pull shall not exceed four (4).

3.4 Reel Placement

Have the reel set adjacent to the hand hole and use a fiber-optic manhole pulling block assembly from Sherman & Reilly (or similar).

3.5 Cable Slack

Coil a minimum of 50 feet of cable at each hand hole location.

3.6 Cable Tags

All cables shall be tagged and labeled at each splice location, fiber termination panel and building entrance. Tags shall read cable size, count and origin.

3.7 Strength

The fibers in the cable will shatter under considerable impact, pressure or if pulling tensions exceed 600 lb., although not apparent from the outside of the cable. With fiber-optic cable the jacket of the cable and the Kevlar layer directly beneath give the cable its strength, note and repair all nicks and cuts.

3.8 Installation

During installation, use a swivel eye for pulling the fiber-optic cable and conduit system including use of a 600 lb. breakaway.

3.9 Precautions

Review the manufacturer's installation instructions prior to commencing with the installation. If any questions arise during installation, refer to the manufacturer's installation instructions or notify the project Engineer.

All fibers in the cables shall be usable fibers and shall be free of surface imperfections and occlusions, in order to meet or exceed all the optical, mechanical, and environmental requirements contained in this specification.

All cables shall be free of material or manufacturing defects and dimensional non-uniformity that would:

- Interfere with the cable installation employing accepted cable installation practices.
- Degrade the transmission performance and environmental resistance after installation.
- Inhibit proper connection to interfacing elements.

- Otherwise yield an inferior product.
- Each fiber optic outside plant cable for this project shall be all-dielectric, dry water-blocking material, duct type, with loose buffer tubes, and shall conform to these special conditions.

Fiber-optic cables shall be supplied in the configurations shown on the plans and specified in these special conditions.

The optical fibers shall be contained within buffer tubes. The buffer tubes shall be stranded around an all-dielectric central member. Aramid yarn and/or fiberglass shall be used as a primary strength member and a medium or high-density polyethylene outside jacket shall provide for overall protection.

All fiber-optic cable on this project shall be from the same manufacturer who is regularly engaged in the production of optical fiber material.

The cable shall be qualified as compliant with Chapter XVII, of Title 7, Part 1755.900 of the Code of Federal Regulations, “REA Specification for Filled Fiber Optic Cables.”

3.10 Cable Marking

The optical fiber cable outer jacket shall be marked with manufacturer's name, the month and year of manufacture, the words "Optical Cable," telecommunications handset symbol as required by Section 350G of the National Electrical Safety Code® (NESC®), fiber count, fiber type and sequential meter marks. The markings shall be repeated every two feet. The actual length of the cable shall be within -0/+1% of the length marking. The marking shall be in a contrasting color to the cable jacket. The marking shall be approximately –0/+1% of the actual length of the cable in height and must be permanent and weatherproof.

The fiber-optic cable shall consist of, but not be limited to, the following components:
- Single-mode optical fiber
- Buffer tubes
- Central member
- Filler rods (as needed per cable type)
- Stranding
- Dry-filled, water blocking tape and water blocking yarn
- Tensile strength member
- Ripcord
- Outer jacket

3.11 Single-Mode Optical Fiber

Each optical fiber shall be glass and consist of a doped silica core surrounded by concentric silica cladding. All fibers in the buffer tube shall be usable fibers and shall be sufficiently free of surface imperfections and occlusions to meet the optical, mechanical, and environmental requirements of these specifications. The coating shall be a dual layered, UV cured acrylate. The coating shall be mechanically or chemically strippable without damaging the fiber.

3.12 Buffer Tubes

The loose buffer tubes shall be single or dual layered in construction. For single layer, use polypropylene. For dual layer, the inner layer shall be made of polycarbonate and the outer layer shall be made of polyester. Buffer tubes shall provide clearance between the fibers and the inside

of the tube to allow for expansion without constraining the fiber. The fibers shall be loose or suspended within the tubes and shall not adhere to the inside of the tube. Each buffer tube shall contain 12 fibers based upon the total fiber count in the cable and the fiber assignment table as shown on the plans and these special conditions. No individual fiber tube shall contain more than 12 fibers. **The number of buffer tubes for the fiber-optic cable shall be approved by the Engineer before ordering.**

The loose buffer tubes shall be extruded from a material having a coefficient of friction sufficiently low to allow free movement of the fibers. The material shall be tough and abrasion resistant to provide mechanical and environmental protection of the fibers yet designed to permit safe intentional "scoring" and breakout, without damaging or degrading the internal fibers.

Buffer tube filling compound shall be a homogenous, hydrocarbon-based gel with anti-oxidant additives. It shall be used to prevent water intrusion and migration. The filling compound shall be non-toxic and dermatologically safe to exposed skin. It shall be chemically and mechanically compatible with all cable components, non-nutritive to fungus, non-hygroscopic and electrically non-conductive. The filling compound shall be free from dirt and foreign matter and shall be readily removable with conventional, nontoxic, solvents.

Buffer tubes shall be stranded around a central member by a method such as the reverse oscillation stranding process that will prevent stress on the fibers when the cable jacket is placed under strain.

Each buffer tube shall be distinguishable from other buffer tubes in the cable by using the same color coding as specified for fibers elsewhere in this document.

3.13 Central Member

The central member, which functions as an anti-buckling element, shall be a glass reinforced plastic rod with similar expansion and contraction characteristics as the optical fibers and buffer tubes. To provide the proper spacing between buffer tubes during stranding, a symmetrical, linear, overcoat of polyethylene may be applied to the central member to achieve the optimum diameter.

3.14 Filler rods

Fillers may be included in the cable cross-section. Filler rods shall be solid medium or high-density polyethylene. The diameter of filler rods shall be the same as the outer diameter of the buffer tubes.

3.15 Stranding

The buffer tubes shall be helically wrapped using the reverse lay stranding process around the central member in order to decouple the buffer tubes and optical fibers from the mechanical forces experienced during installation.

Completed buffer tubes shall be stranded around the central member using stranding methods, lay lengths, and positioning such that the cable shall meet mechanical, environmental, and performance specifications. A polyester binding shall be applied over the stranded buffer tubes to hold them in place. 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.

3.16 Core and Cable Water-Block Material

The cable core shall use a dry, water-blocking material to block the ingress and migration of water. The water-blocking performance shall be equivalent to flooded optical cables when tested in accordance with industry standards (ICEA, RUS). Dry, water-blocking material is used in optical cables to enhance the ease of handleability while maintaining reliable water-blocking performance.

3.17 Tensile Strength Member

Tensile strength shall be provided by high tensile strength Aramid yarns and/or fiberglass which shall be helically stranded evenly around the cable core and shall not adhere to other cable components.

3.18 Ripcord

The cable shall contain at least one ripcord under the jacket for easy sheath removal.

3.19 Outer Jacket

The all-dielectric cables (no armoring) shall be sheathed with medium or high-density polyethylene. The minimum nominal jacket thickness shall be 1.4 mm. Jacketing material shall be applied directly over the tensile strength members and shall not adhere to the Aramid strength material. The polyethylene shall contain carbon black to provide ultra-violet light protection, and it shall not promote the growth of fungus. The jacket shall be free of holes, splits and blisters. The cable jacket shall contain no metal elements and shall be of a consistent thickness.

The jacket or sheath shall be marked with the manufacturer's name, the words "Optical Cable", the number of fibers, fiber type, month and year of manufacture, and sequential measurement markings every meter. The actual length of the cable shall be within ±1 percent of the length marking. The marking shall be in a contrasting color to the cable jacket. The print height of the marking shall be approximately 2.5 mm and must be permanent and weatherproof. The cable shall contain at least one ripcord under the sheath for easy sheath removal.

3.20 Quality Assurance

The manufacturer(s) of supplied optical cable, optical cable assemblies and hardware shall be TL 9000 registered.

3.21 Fiber Characteristics

One hundred percent (100%) of the optical fibers shall meet or exceed the requirements contained in this specification.

The cable shall be tested in accordance with TIA/EIA-455-3A (FOTP-3), "Procedure to Measure Temperature Cycling Effects on Optical Fiber, Optical Cable, and Other Passive Fiber-Optic Components." The average change in attenuation at extreme operational temperatures (-40°C to +70°C) will not exceed 0.05 dB/km at 1550 nm. The magnitude of the maximum attenuation change of each individual fiber will not be greater than 0.15 dB/km at 1550 nm. This figure includes an allowance of up to 0.05 dB/km for measurement repeatability. All fibers within the finished cable shall be composed primarily of silica and shall have a matched clad index of refraction profile as well as the physical and performance characteristics that shall meet the requirements in the following table:

Table 1 – Field Characteristics

Parameters	Value
Mode	Single
Type	Corning SMF-28 or approved equal
Core diameter	8.3 µm (nominal)
Cladding diameter	125 µm ± 1.0 µm
Core to Cladding Offset	≤ 0.8 µm
Coating Diameter	245 µm ±10 µm
Cladding Non-circularity defined as: [1- (min. cladding dia ÷ max. cladding dia.)]x100	≤ 1.0%
Proof/Tensile Test	100 kpsi, min.
Attenuation:	
@ 1310 nm	≤ 0.4 dB/km
@ 1550 nm	≤ 0.3 dB/km
Attenuation Uniformity	No point discontinuity greater than 0.1 dB at either 1300 nm or 1550 nm
Attenuation at the Water Peak	≤ 2.1 dB/km @ 1383 ±3 nm
Attenuation at Extreme Operational Temperatures	≤ +0.05 dB @ 1310 nm or 1550 nm
Chromatic Dispersion:	
Zero Dispersion Wavelength (λ_o)	$1301.5 \leq \lambda_o \leq 1321.5$ nm
Zero Dispersion Slope	≤ 0.092 spy/(nm^2•km)
Maximum Dispersion:	≤ 3.5 peso/(nm•km) for 1285 - 1330 nm ≤ 18 spy/(nm•km) for 1550 nm
Cut-Off Wavelength	<1260 nm
Mode Field Diameter (Petermann II)	9.3 ± 0.5 µm at 1310 nm 10.5 ± 1.0 µm at 1550 nm

3.22 Color Coding

Optical fibers shall be distinguishable from others in the same buffer tube by means of color-coding according to the following:

1. Blue (BL)
2. Orange (OR)
3. Green (GR)
4. Brown (BR)
5. Slate (SL)
6. White (WT)
7. Red (RD)
8. Black (BK)
9. Yellow (YL)
10. Violet (VL)
11. Rose (RS)
12. Aqua (AQ)

The colors shall be targeted in accordance with the Munsell color shades and shall meet TIA/EIA-598B "Color Coding of Fiber Optic Cables" and RUS 7 CFR 1755.900.

The color formulation shall be compatible with the fiber coating and the buffer tube filling compound and be heat stable. It shall not fade or smear or be susceptible to migration, it shall not affect the transmission characteristics of the optical fibers and shall not cause fibers to stick together.

3.23 General Cable Performance Specifications

The fiber-optic cable shall withstand water penetration when tested with a one-meter static head or equivalent continuous pressure applied at one end of a one-meter length of filled cable for one hour, no water shall leak through the open cable end. Testing shall be done in accordance with

TIA/EIA-455-82 (FOTP-82), "Fluid Penetration Test for Fluid-Blocked Fiber Optic Cable."

The cable shall exhibit no flow (drip or leak) for 24 hours at 80°C. The weight of any compound that drips from the sample shall be less than 0.05 grams (0.002 ounce). A representative sample of cable shall be tested in accordance with TIA/EIA-455-81B (FOTP-81), "Compound Flow [Drip] Test for Filled Fiber Optic Cable." The test sample shall be prepared in accordance with method A.

Crush resistance of the finished fiber-optic cables shall be 220 N/cm applied uniformly over the length of the cable without showing evidence of cracking or splitting when tested in accordance with TIA/EIA-455-41 (FOTP-41), "Compressive Loading Resistance of Fiber Optic Cables." The 220 N/cm (125 lbf/in) load shall be applied at a rate of 2.5 mm (0.1 in) per minute. The load shall be maintained for a period of 1 minute. The load shall then be decreased to 110 N/cm (63 lbf/in). Alternatively, it is acceptable to remove the 220 N/cm (125 lbf/in) load entirely and apply the 110 N/cm (63 lbf/in) load within five minutes at a rate of 2.5 mm (0.1 in) per minute. The 110 N/cm (63 lbf/in) load shall be maintained for a period of 10 minutes. Attenuation measurements shall be performed before release of the 110 N/cm (63 lbf/in) load. The change in attenuation shall not exceed 0.4 dB during loading at 1550 nm for single-mode fibers and 1.0 dB during loading at 1300 nm for multimode fiber. The repeatability of the measurement system is typically 0.05 dB or less. No fibers shall exhibit a measurable change in attenuation after load removal.

The cable shall withstand 25 cycles of mechanical flexing at a rate of 30 ±1 cycles/minute with a sheave diameter not greater than 20 times the cable diameter. The cable shall be tested in accordance with Test Conditions I and III of TIA/EIA-455-104A (FOTP-104), “Fiber Optic Cable Cyclic Flexing Test.” The magnitude of the attenuation change will be within the repeatability of the measurement system for 90% of the test fibers. The remaining 10% of the fibers will not experience an attenuation change greater than 0.1 dB at 1550 nm. The repeatability of the measurement system is typically ± 0.05 dB or less. The cable jacket will exhibit no cracking or splitting when observed under 5X magnification.

Impact testing shall be conducted in accordance with TIA/EIA-455-25B (FOTP-25) "Repeated Impact Testing of Fiber Optic Cables and Cable Assemblies." The cable shall withstand 20 impact cycles. The magnitude of the attenuation change will be within the repeatability of the measurement system for 90% of the test fibers. The remaining 10% of the fibers will not experience an attenuation change greater than 0.1 dB at 1550 nm. The repeatability of the measurement system is typically ± 0.05 dB or less. The cable jacket will not exhibit evidence of cracking or splitting at the completion of the test.

Using a maximum mandrel and sheave diameter of 560 mm, the finished cable shall withstand a longitudinal tensile load of 2700 N (608 lbs.) applied for one hour (using "Test Condition II" of the test plan). The test shall be conducted in accordance with TIA/EIA-455-33 (FOTP-33), "Fiber Optic Cable Tensile Loading and Bending Test." The measured fiber tensile strain shall be $\leq$ 60% of the fiber proof strain. The cable will not experience a measurable increase in attenuation when subjected to the rated residual tensile load, 890 N (200 lbf). The repeatability of the measurement system is typically ± 0.05 dB or less.

The cable shall be capable of withstanding a bending radius of 15 times the cable diameter under tensile loading and 10 times the cable diameter under a no-load condition

4. Splicing

4.1 General Guidelines

This section describes minimum requirements for splicing and connecting of the specified optical fiber cables.

Fiber-optic cable shall be installed without splices except where specifically allowed on the plans or described in these special conditions. The single-mode fiber-optic cables used for distribution shall be spliced in pull boxes as shown on the plans or at aerial slack locations as shown on drawings. When splicing into a distribution cable, only those fibers associated with the count transferring onto the distribution cable shall be severed. All other fibers shall remain intact. The Engineer may allow additional splices between these specified locations.

At no point shall cables be severed out of the convenience of the installation contractor. Splices shall only be performed at planned locations. Any situation where this can be accomplished shall be pre-approved prior to adding any additional splices to the network.

4.2 Labeling

All splice cases, trays and fiber termination panels shall be properly labeled as to identify cable size, fiber count and routing of each fiber strand.

4.3 Splicing

Optical fibers shall be spliced using the fusion splice method and the insertion loss shall not exceed 0.20 dB of loss per splice when tested using a bi-directional average.

All closures shall include all necessary hardware items to support the cable adjacent to the closure and to terminate the lashing wire (if aerial). The fiber organizer trays shall be supplied as part of the Splice Case Closure.

Cable closures shall be installed in accordance with the manufacturer's instructions. Splicing shall be performed in accordance with RUS Splicing Standard Bulletin 1753F-401 (PC-2).

Field splicing is permitted for the following:

- Connection of cable reel sections.
- Connection of a mainline service distribution cable to a service drop cable or a breakout cable.
- Connection of service drop cable or breakout cable to an optical fiber pigtail at cabinets or the patch panels.
- Connection of the backbone cable to an optical fiber pigtail at a hub patch panel.

The Contractor shall not exceed the maximum number of field splices permitted as shown in the plans. Completed splices shall be placed in a splice tray. The splice tray shall then be placed in a water tight splice enclosure. Field splices shall be conducted only at locations as shown in the plans as an approved splice location.

All splicing equipment shall be in good working order, properly calibrated with calibration certificate showing proof of calibration within the past 12 months. Craftmanship shall meet all industry standards and safety regulations. Cable preparation, closure installation and splicing shall be

accomplished in accordance with accepted and approved industry standards.

All splices shall be protected with a thermal shrink sleeve. All fibers shall be labeled in the splice tray with permanent vinyl markers. Pigtail ends shall also be labeled to identify the destination of the fiber. Pigtail ends shall also be labeled to identify the destination of the fiber.

Upon completion of the splicing operation, all waste material shall be deposited in suitable containers, removed from the job site and disposed of in an environmentally acceptable manner.

4.4 Splice Cases

All splice cases used on this project shall be CommScope FOSC 450 Gel sealed fiber-optic splice closure or approved equal. The following sizes shall be used:

FOSC 450A – Holds up to 96 fiber splices
FOSC 450B – Holds up to 144 fiber splices
FOSC 450C – Holds up to 192 fiber splices
FOSC 450D – Holds up to 576 fiber splices

All cases shall be sized to accommodate cable sizes that are housed in the splice case. Contractor shall include splice trays, label all fiber coming in and out of splice case, and protect each fusion splice with heat shrink protectors.

4.5 Photos

Contractor shall take a photo of each splice tray and document as part of the deliverables with the test results. All photos shall be labeled with location, date, tech name, company and description of the completed splice.

4.6 Fiber-Optic Cable Termination Assemblies

Cable termination assemblies (connectors, pigtails and couplers) shall be products of the same manufacturer. The cable used for cable assemblies shall be made of fiber meeting the performance requirements of these special conditions for the F/O cable being connected, except that the operating temperature shall be modified to -20°C to +70°C.

Manufacturer's attenuation test results shall be provided for all cable assemblies.

4.7 Optical Fiber Connectors

All optical fiber termination components shall meet or exceed the applicable provisions of TIA/EIA-455-B, Standard Test Procedure for Fiber-Optic Fibers, Cables, Transducers, Sensors, Connecting and Terminating Devices, and Other Fiber-Optic Components.

All optical fiber connectors shall be of industry standard LC Angled polished APC, type for single-mode optical fiber and shall meet or exceed the applicable provisions of TIA/EIA-455-2C (FOTP-2), Impact Test Measurements for Fiber-Optic Devices, TIA/EIA-455-5B (FOTP-5), Humidity Test Procedure for Fiber-Optic Components, and TIA/EIA-455-34A (FOTP-34), Interconnection Device Insertion Loss Test. When tested in accordance with FOTP –2, the connector assembly will be subjected to ten impact cycles by being dropped from a height of 1.5 m. The maximum insertion loss measured before and after the impacts shall be $\leq$ 0.50 dB. The mean insertion loss of the before and after impacts shall be $\leq$ 0.30 dB. The insertion loss increase measured before and after the impacts shall be $\leq$ 0.30 dB. The maximum reflectance measured before and after the

impacts shall be ≤ - 40 dB. When tested in accordance with FOTP – 5, the connector assembly will be subjected to test conditions of 75 °C and 95% relative humidity for 7 days. Measurements of loss and reflectance will be made at the beginning of the test, at a minimum of six-hour intervals during the test, and at the end of the test. The maximum insertion loss measured before, during or after the test shall be ≤ 0.50 dB. The mean insertion loss of the before, during or after the test shall be ≤ 0.30 dB. The insertion loss increase measured before, during or after the test shall be ≤ 0.30 dB. The maximum reflectance measured before, during or after the test shall be ≤ - 40 dB. Optical fiber connectors shall satisfy all interface parameters of equipment components as may be defined by the transmission equipment specifications. All optical fiber connector assemblies shall be machine angle polished for low back-reflection and low insertion losses at both 1310 nm and 1550 nm wavelengths.

Single-mode pigtails shall be provided with factory pre-connectorized single-mode connectors of the "LC Angle-PC" type. Connectors shall have maximum insertion loss of 0.5 dB or better. Connectors shall have a composite barrel with a “push-pull” connection design, ceramic (zirconia) ferrule. Each connector shall be capable of 200 repeated matings with a total maximum additional increase in insertion loss after 200 matings limited to 0.30 dB.

Each connector shall have a return loss (back reflection) equal to or better than .50 dB.

All connectors shall be factory-assembled and tested. There shall be no fabrication of connectors in the field.

All unmated connectors shall have protective caps installed.

4.8 Couplers

Couplers shall be made of nickel-plated zinc or a glass reinforced polymer that is consistent with the material forming the associated lC connector body. The design mechanism for mounting the coupler to the connector panel may be flanged or threaded but shall coincide with the connector panel punch-outs. All coupler sleeves shall be ceramic of the split clamshell or clover leaf design. The temperature operating range for couplers shall be the same as that specified for the SC connectors.

4.9 Pigtails

Pigtails shall be of simplex (one fiber) construction, in 900 μm tight-buffer form, surrounded by Aramid for strength, with a connector on one end. The outer jacket shall be yellow PVC with a nominal diameter of 3 mm, marked with the manufacturer’s identification information. All pigtails shall be of adequate length for the intended connection purpose, but not less than two meters in length. Pigtails installed in conduit shall follow the installation procedures outlined for fiber-optic cables, except that the pulling tension shall not exceed 500 N (110 lbf.).

4.10 Fiber Termination Panels

Fiber terminations shall be housed in a rack mounted fiber termination panel, sized appropriately for the cable size installed. All materials including fiber panel housing, pigtails, splice cassettes, trays, connector panels and all other materials required for a complete working system shall be provided by the Contractors and shall be included in Contractor pricing.

4.11 Testing

The contractor shall perform fiber testing on 100% of all fiber strands installed. Testing shall be completed using the following standards using equipment calibrated within the past 12 months.

4.11.A Reel Testing

All fiber shall be tested on the reel prior to installation utilizing an OTDR. Testing shall be completed to verify continuity of length consistent with the length of the reel documented. OTDR reel test shall be completed in one direction at 1550nm. Raw OTDR traces as well as .pdf copies of reel test shall be provided to the city as a project deliverable. Traces shall be performed long enough to provide a clean trace and show beginning and end of fiber. Any issues in fiber continuity or defects discovered shall be brought to the attention of the City and shall not be installed until the issue is rectified.

4.11.B Post Installation Testing

All fiber strands shall be tested once they are in their final configuration. Test documentations shall be provided to the City as part of the project deliverables. Acceptance testing shall be completed utilizing two wavelengths of 1310 and 1550nm. Acceptance testing shall utilize both OTDR and Powermeter testing. OTDR test shall be delivered to the City in both raw trace format as well as .pdf copies. Powermeter test shall be documented and delivered on a Powermeter test form.

All field splicing shall have a bi-directional dB loss no greater than -.20dB. All connectors shall have a dB loss no greater than -.50dB.

In the event any fiber splice or termination test with a dB loss higher than the maximum loss, fiber splices shall be broken and re-spliced until allowable dB loss can be achieved. In the event a fiber stand has been re-spliced three different times and cannot meet these standards, an exception document shall be provided identifying the fiber, splice locations, and documentation showing the three attempts of re-splicing.

5. Underground Construction

5.1 General Guidelines

Governing Oregon Department of Transportation indexes and regulations will be used as well as all applicable codes in force.

No construction shall begin without authorization or permit from the authority having jurisdiction.

5.2 Locates

Contractor shall follow all state laws pertaining to the Locates rules and regulations.
Contractor shall call 811 at least two business days and not more than 10 business days prior to excavations. Notification can be completed by utilizing one of the following methods:

1. Call 811
2. https://digsafelyoregon.com/

Contractor shall utilize sound judgement when completing underground utility excavations and installations. No guess work as to where existing utilities are located. All practical means necessary

shall be utilized to locate existing utilities to include locates, soft digs and spot holes, and ground penetrating radar shall be considered to avoid conflicts. Contractor's pricing shall include these in their pricing as a cost of doing business.

5.3 Special Considerations

All railroad crossings shall be 6" SDR 11 conduit with (3) 2" corrugated innerducts per railroad requirements. Special considerations shall be made for any installation deemed as high profile or where a spare conduit for future use would be a significant financial benefit to the City. A spare conduit shall be considered at railroad, waterways and other areas of significant utility congestion, as well as environmentally sensitive areas and any installations with long permit lead times.

All bore pits shall be compacted to 95% density in roadways, roadway shoulders, roadway prism and driveways and 85% density in unpaved areas.

The Contractor's trench safety system shall be a protective system designed and maintained by a competent person and shall meet accepted engineering requirements or practices. This trench safety system may require the use of a support system in locations not designated in the contract as requiring a support system.

5.4 Conduit Placement

The standard quantity for the City's Backbone Network shall be a quantity of three (3) 2" conduits. The conduit shall be placed as shown on the construction documents. If no offset measurement is identified or running line offset needs to be adjusted due to field conditions, conduit shall be placed at an offset from the roadway that meets the governing ODOT regulations and indexes while still staying within the ROW. If this cannot be accomplished, raise issue to The City of Sherwood Project Engineer or liaison.

Warning Tape shall be required for all buried cable installation process except when directional boring operation are used and shall be as follows:

1. Extra Stretch terra tape
2. Minimum of six inches (6") wide
3. Orange in color with black lettering which reads "Caution Buried Fiber Optic Cable Below"
4. Placed in the Trench a minimum of twelve inches (12") above all conduit/ fiber

5.5 Depth of Placement

Unless otherwise specified by the Contractor's project engineer above the depth of buried cable or wire placed, measured from the top of the cable or wire to the surface of ground or rock must be as listed below:

1. Minimum depth in soil (Mainline) - 36 inch
2. Minimum depth at ditch crossings 36 inch
3. Minimum depth in rock 24-inch (152 mm) Rock to surface.

Note: ODOT or other authority having jurisdication may require a deeper requirement for minimum depth. In the event of conflicting requirements, the more stringent depth requirement shall be used.

In the case of a layer of soil over rock, either the minimum depth in rock, measured to the surface of the rock, or the minimum depth in soil, measured to the surface of the soil, may be used at the Contractor's Project Engineer's option.

When rock excavating is required, width and depth requirements of the trench must be:

Trench Width	Trench Depth
10" (or greater)	24"

Either the minimum depth in rock must be achieved or some other method may be employed by the Contractor to provide adequate protection to the cable or wire as agreed to by the AHJ, e.g. concrete cap.

5.6 Grade Away from Buildings/Structures

The conduit shall be placed in such a way to as to maintain a gradual grade down away from buildings and other major structures.

5.7 Conduit Type

5.7.A Directional Boring/Plowing

Conduit for directional boring shall be HDPE with a minimum rating of SDR 11 type.

5.7.B Trenching

Conduit type for open trench shall be PVC with a minimum rating of Schedule 40.

5.7.C Innerduct

Inner duct, where required, shall be of the corrugated type and orange in color. Inner duct requirements (size and amount) will be determined by the Project Engineer.

5.8 Conduit Turns and Transitions

All conduit turns shall be made with 45-degree bends or sweeps. At no time shall 90-degree bends be utilized in the outside plant arena, unless it is already existing conduit, and approved by the City.

5.9 Conduit Proofing

All conduit installed shall be proofed utilizing a mandrel and shall include the installation of a continuous, jet-line pull-string. Duct proofing shall ensure new conduit is continuous, free from dirt and debris and conduit is in good usable condition.

5.10 Duct plugs

All conduit ends shall be properly sealed with mechanical duct plugs. Duct plugs shall be Jack-moon type or equal.

5.11 Trace Wire

A #12 AWG insulated solid trace wire shall be placed along with all conduit put in place. This trace

wire shall maintain continuity from end station to end station. It is acceptable to use vaults/hand holds for joining the trace wire, while keeping these joints visible and out of the way of the fiber cable.

5.12 Marker Posts

Easily visible, marked, HDPE orange dome fiber-optic marker posts shall be placed above the conduit at all major transitions to said conduit (turns greater than 25 degrees, etc.). Fink plated marker posts are required where necessary. Marker posts will display the City of Sherwood logo and will be marked "Underground Fiber Cable." Fink test locations shall be installed and properly grounded at every splice location.

5.13 Conduit Entering Hand Holes/Man Holes

All conduits shall be stubbed up underneath the bottom of each manhole/hand hole leaving at least 8" but no more than 12" of visible conduit exposed. Conduit and inner ducts shall be capped until use. After use they shall be plugged appropriately to maintain the integrity of the conduit/inner duct from dirt and water.

5.14 Locate Information

All splice points, vaults, hand hole/manhole, and conduit turns of 45-degrees or greater shall receive a GPS coordinate that is marked and labeled back onto the as-built drawings.

5.15 Building Entrances

All building entrances should be checked and approved with The City of Sherwood Project Engineer or liaison. Preference is given in the following order (but dictated by the facility itself): use of existing entrance conduit, core drilling and bringing conduit up the outside of a facility, attaching a pull-box to the exterior of said building and entering through the wall of the building.

5.16 Box Sizing

All boxes utilized MUST meet the ODOT applicable indexes and be on the ODOT approved equipment list. Handholes shall be polymer composite Quazite brand or approved equal with a minimum tier 15, 20k load rating. The following sizes are to be used unless specifically called out for in the design:

17x30x24 (20K Load)
24x24x24 (20K Load)
24x36x24 (20K Load)
30x48x24 (20K Load)

5.17 Box Spacing

Hand holes and vault spacing on backbone shall be installed as designed. If any adjustments in location of hand holes needs to be made, new location needs to be pre-approved by the City or City representative authorized to approve any adjustments.

As an overall guideline, hand hole spacing on the backbone shall be held to a maximum distance of 1,500' between handholes to assist in pulling and access to the network. Any 90-degree turn, major intersection of place of future connectivity or splice locations will also require a hand hole or vault to be placed.

5.18 Box Placement

All hand holes and vaults shall be installed flush with the existing grade unless otherwise specifically directed. Box installation shall include a 6” base or crushed stone or gravel for drainage purposes. Any earth disturbed in the immediate area surrounding the box shall be compacted to avoid any future wash outs. All box, hand holes, vault installations shall include all restoration. Box pricing shall also include placement of all bolts to secure lid.

Have all boxes approved prior to purchasing/installation of said boxes per the material submittal requirements. All box lids shall have “CITY FIBER” embedded on them.

Aerial Construction (Optional Services)

6.1 General Guidelines

All aerial construction shall be completed per federal, state and local codes. All work shall be performed by qualified and experienced individuals in a safe manner.

All pricing for aerial construction shall include worksite safety and traffic control plans for work crews.

All installation shall comply with all pole owner requirements and conditions as listed on any pole attachment agreements.

All aerial cables, and accessory materials used in the construction of the Project shall be handled with care. Each reel of aerial cable shall be inspected for damage. Any damage shall be repaired to the satisfaction of the Owner. If reel wrap is present, the reel wrap shall remain intact on the reel until the cable is ready to be placed.

6.2 Installation Methods

All aerial construction shall be installed using the strand and lashing method. Strand, unless specifically directed, shall be 6m galvanized strand. Cable shall be double lashed to strand.

Where physical obstructions make it necessary to pull cable along the line from a stationary reel, cable stringing blocks shall be used to support the cable during all placing and tensioning operations. Ladders, cable cars and other equipment shall not be placed on or against the cable.

During installation, maximum pulling tension and minimum bending radius of the aerial fiber-optic cable shall not exceed the cable manufacturer's recommendations.

Initial stringing tension, maximum permissible span length, and sagging shall be in accordance with the cable manufacturer’s recommendations. The cable shall be installed within a reasonable time after the strand is installed and tensioned. If a delay in installing cable in excess of 24 hours is encountered, temporary dampers shall be installed on the strand.

When tensioning strand, the cable suspension clamps shall be loose enough to allow free movement of the strand.

Suspension strand shall be placed in accordance with the manufacturer's instructions and shall be tensioned in accordance with same.

The suspension strand shall be placed on the roadside of the pole line.

In tangent construction, the lip of the suspension strand clamp shall point toward the pole. At angles in the line, the suspension strand clamp lip shall point away from the load.

In level construction the suspension strand clamp shall be placed in such a manner that it shall hold the strand below the through-bolt. At points where there is an up-pull on the strand, the clamp shall be so placed that it shall support the strand above the through-bolt.

When a thimble-eye bolt is used both to mount the suspension strand clamp and to make the guy attachment, the size of the suspension strand clamp shall be governed by the size of the thimble-eye bolt required for the guy.

Tensioning the strand shall be in accordance with air temperature as per manufacturer's instructions.

The suspension strand shall be made electrically continuous throughout its entire length.

Cable shall be lashed with lashing wire to the suspension strand by means of a suitable lashing machine. The pitch of the lashing wire may be from 10" – 15" but must be constant for any section of cable of the same size and gauge. For cables of 3⁄4" or larger in diameter, the lashing wire shall be placed with a tension of 35 to 40 lbs. Cables having a diameter less than 3⁄4" shall be lashed with a lashing wire tension of 18 to 25 lbs.

6.3 Height of attachment

Cable shall be installed on poles at specific height and location as called out on construction drawings. Any deviation from this could result in Contractor having to correct attachment as the Contractor's own expense. New aerial construction shall be located in the communication space on the poles. 40" minimum separation from pole neutral is required. Midspan cable height shall meet state regulations as to minimum height to allow safe passage of vehicular traffic.

6.4 Sag

Installed aerial cables shall match sag of all existing communication of the poles to prevent midspan rubbing on contact with other cables.

6.5 Down guys

All pole attachments requiring down guys shall be identified on the drawings. Down guy installations shall be at proper "rise and run" to support new pole attachment. Down guys shall be galvanized 6m strand and shall include yellow guy guards.

6.6 Anchors

All anchors installed shall be either Manta Ray type or screw-in anchors. All material specification sheets shall be submitted for approval prior to ordering and installation.

6.7 Snow shoes

Cable slack shall be installed per project plans. All aerial cable slack shall include the use of fiber-optic aerial slack organizers commonly referred to as snow shoes. 150' of aerial cable slack shall be installed every 1500' of aerial construction. Snow shoes shall be secured to the 6m strand per manufacturer installation instructions.

The Contractor shall supply all the labor and material associated with installation of slack storage devices for aerial cable. The contractor shall use the Preformed FIBERLIGN® CLAS (Center-Lock Aerial Slack) storage system for All Dielectric Self Supporting (ADSS) cables and lashed messenger cable.

6.8 Tags

Orange high-visibility cable tags shall be installed at every pole attachment. Cable tags shall be weather rated and read "City of Sherwood Fiber Optic Cable." In addition, splice case shall be tagged per requirements as to identify cable size, routing and count.

6.9 Hardware

All pole attachment hardware shall be galvanized, and adequately sized to support proposed attachment.

All bolts employed for the mounting of hardware items on poles shall be long enough to fully engage the nut (including locknut, where applicable) but shall not extend more than 2" beyond the nut after the nut is tightened. The ends of bolts shall not be cut.

6.10 Grounding

All pole attachments, down guys and splice cases shall be properly grounded utilizing #6 solid wire and 5/8"x8' copper clad ground rods.

The support messenger of fiber-optic cable shall be grounded in compliance with the pole owners, City standards and the NEC.

Suspension strands shall be bonded to other bare cable suspension strands, and guys on the same pole and grounded by connection to ground leads. The lashing wire shall be terminated at each pole and the cable shall be supported and protected at the suspension clamp. Where the strand is to be grounded to a multi-grounded neutral on a pole which does not carry a vertical pole ground wire, a #6 AWG bare copper wire shall be left coiled and taped to permit it to be extended up the pole and connected to the multi-ground neutral by a representative of the servicing power company. This contract shall coordinate such bonding and grounding activities.