

Attachment C – 864 Fiber Construction Pricing Guidelines (Line-Item Quotes)

MCNC is requesting separate detailed line-item quotes for the services noted below, for each listed segment:

Segment 1-Charlotte to Hamlet	426,379 ft (80.75 miles)
● Route 1 – SC1 Charlotte to Polkton →	254,182 ft (48.14 miles)
● Route 2 – SC2 Polkton to Hamlet →	172,197 ft (32.61 miles)
Segment 2-Hamlet to Wilmington	819,392 ft (155.19 miles)
● Route 3 - SC3 Hamlet to Pembroke →	192,259 ft (36.41 miles)
● Route 4 - SC4 - Pembroke to Whiteville →	207,714 ft (39.34 miles)
● Route 5 - SC5 Whiteville to Bolivia →	264,114 ft (50.02 miles)
● Route 6 - SC5 cont'd Bolivia to Wilmington →	155,305 ft (29.41 miles)
Segment 3-Hamlet to Raleigh	610,561 ft (115.64 segment miles)
● Route 7 - RH2 Hamlet to Sanford →	318,308 ft (60.29 miles)
● Route 8 - RH1 Sanford to Raleigh →	292,253 ft (55.35 miles)
Total: 1,856,332 ft (351.58 miles)	

1) Proofing and Placement - Per foot pricing for proofing and placement of approximately 1,856,332 ft (351.58 miles) of .50" O.D. 864F Prysmian non-armored ribbon cable (24 Fibers per ribbon) into existing empty .75" I.D. conduit (price includes the provision of redline documentation, fiber cable footages (tick marks) at handholes (HHs), and splice closures.

*Splicing and testing noted on item #6

Placing 100ft maintenance loops at each HH and placing appropriate slack/tails at splice locations. Contractor must provide GPS Coordinates (Decimal Lat/Long) and photos of each HH location along with annotating this on the Construction drawing "redlines" to be turned over at completion to support final "As-builts." (GPS details and photos must be submitted electronically with invoicing)

2) Handholes - Per unit pricing for the placement of approximately **386** (30"x48"x36") handholes. Some will be new locations (no previous vault) along the MCNC route and some will be placed to "up-size" from a smaller existing HH. The Contractor must provide GPS

Coordinates (Decimal Lat/Long) and photos of each location. These must be submitted electronically with invoicing.)

*HH placement must adhere to professional installation standards including proper tamping, pea gravel base/floor, proper dressing of conduits, cable tags, ground rod, seed & straw, and restoration of surrounding final grade.

When pulling through existing HHs (even those not exchanged or new), place new pea gravel base prior to new fiber placement. As per design drawings, the slack of existing MCNC fiber cables is to be carefully removed from vaults, laid aside, the new 864F is to be tagged, coiled and placed at the bottom of the vaults then the existing MCNC fiber cable coils are to be dressed and placed back into the HHs on top of the new 864.

Segments & Routes	HH Upgrade/replace existing	New HH for new splice locations
S1- Route 1-Charlotte to Polkton	65	13
S1- Route 2-Polkton to Hamlet	28	10
S2- Route 3-Hamlet to Pembroke	23	10
S2- Route 4-Pembroke to Whiteville	23	11
S2- Route 5-Whiteville to Bolivia	32	13
S2- Route 6-Bolivia to Wilmington	23	8
S3- Route 7- Hamlet to Sanford	46	16
S3- Route 8-Sanford to Raleigh	49	16
Totals	289	97

3) Marker Posts - Per unit pricing for the installation of locatable marker posts at approximately 97 splice points. To include proper tie-ins of accompanying locate wire connections

4) Dig up and Repair - pricing for each location encountered (i.e., any location where duct couplers have failed or existing conduit needs repair or access requiring excavation, contractor

must provide GPS Coordinates/Decimal Lat/Long and photographic support for each location, to be submitted electronically, with invoicing.)

5) Aerial Placement - Contractors must provide an all-inclusive pricing for placing approx. 3,976 feet of 864F cable placement via overlash to existing MCNC Aerial plant. We have identified the following section of existing aerial plant. Contractor to price this as separate line items for per foot aerial overlash of existing MCNC 144F and strand with corresponding risers and maintenance loops.

3,976 ft Aerial section within Route 7 – RH2 Hamlet to Sanford

Note: Installation contractor is responsible for safeguarding the integrity of the 864F cable during installation through detailed final acceptance testing. Pre-testing of reels is advised.

6) Splicing – Contractors must provide composite costs associated with all facets of cable prep, closure installation, high volume ribbon splicing and testing per ribbon splice AND a separate line item for highly detailed fiber characterization test data packages per route span (a package for each of the 8 named route spans) - See Splicing and Test package requirements

Total Number of Splice/Set-up locations: 97

Segment 1-Charlotte to Hamlet	(23 splice locations)
● Route 1 – SC1 Charlotte to Polkton	468 ribbon burns, 13 locations
● Route 2 – SC2 Polkton to Hamlet	360 ribbon burns, 10 locations
Segment 2-Hamlet to Wilmington	(42 splice locations)
● Route 3 - SC3 Hamlet to Pembroke	360 ribbon burns, 10 locations
● Route 4 - SC4 - Pembroke to Whiteville	396 ribbon burns, 11 locations
● Route 5 - SC5 Whiteville to Bolivia	468 ribbon burns, 13 locations
● Route 6 - SC5 Bolivia to Wilmington	288 ribbon burns, 8 locations
Segment 3-Hamlet to Raleigh	(32 splice locations)

<ul style="list-style-type: none"> Route 7 - RH2 Hamlet to Sanford 	576 ribbon burns, 16 locations
<ul style="list-style-type: none"> Route 8 - RH1 Sanford to Raleigh 	576 ribbon burns, 16 locations

7) Logistics include receiving the 864F cable so contractors must plan for taking ownership for transportation and security of the large fiber reels and handholes within 30 days of contract award.

Please note that MCNC will purchase and provide all required materials, including all fiber, locate posts, splice enclosures, and associated hardware.

8) Progress Reports: Daily progress reports and Detailed Weekly production reports/cable footage placed with corresponding supporting photos are required. Reports are to reference & use the same Segment # & Route # nomenclature as provided.

(example: Segment 3-Route 7 – RH2 Hamlet to Sanford)

(Contractor must provide GPS Coordinates (Decimal Lat/Long) and photos of each HH location. These must be submitted electronically with invoicing)

9) Final Documentation for Completion. As noted on Item #1, Your pricing is to include required data at project completion to support final As-builts as part of a final “Turnover Package” which includes:

- Organized and detailed documentation of construction/installation drawings/aka Redlines (GPS details and photos must be submitted electronically with invoicing)
- Construction documentation must include fiber cable footage details (tick marks) in and out of handholes (HHs), and splice closures) and
- Full fiber testing and acceptance packages as described.

Please note that MCNC will purchase and provide all required splice enclosures, and associated hardware.

864 Splicing and Detailed Test Packages (per route segment)

****Please provide pricing to meet the following detailed Fiber splice, test and acceptance & documentation package requirements (High quality Splicing is of paramount importance):***

Composite splicing price per unit is to include ribbon splicing, set ups, closure preparation for the **97** splice locations and bi-directional OTDR and Power meter testing & documentation. Please price this as an all inclusive unit per each 24 ribbon splice. Provide separate pricing line item for the highly detailed fiber characterization testing packages per route segment (*see testing requirements below).

*Price accordingly for Eight 864F acceptance/bi-directional fiber characterization packages to include Chromatic Dispersion, Polarization Mode Dispersion, Zero Dispersion Wavelength, etc (one pkg required for each named Route span)

Splicing and Test Package Requirements / Fiber Cable Testing and Acceptance Procedures.

(a) Subsequent to the splicing

(b) Testing will be documented and provided electronically (emailed files) .sor and .pdf format on trace analysis sheets reflecting

unidirectional losses by fiber and installed span loss by fiber.

(c) During initial OTDR testing, a general indicator of the quality of each splice will be an objective.

Fiber and Connector Standards

Fiber Testing: All fiber testing should be conducted Uni-Directional and Bi-directional at 1550 nm and 1625 nm.

Connector Standards:

The build will use LC connectors with a UPC polish unless otherwise specified in any applicable work order. The loss value of any pigtail connector and any associated Fiber jumper or pigtail with matching mode field diameters will not exceed 0.5 dB at 1550 nm and 1625 nm.

The loss value of a connector and its associated jumper with mismatched mode field diameters should not exceed 0.8 dB.

Fiber Continuity:

It is the contractor's responsibility to maintain proper continuity and documentation of all Fibers installed at all fiber splice points, fiber patch panels, fiber pigtails, and fiber terminations. Ensure that there are no fiber crosses on the Fibers between the fiber span end points. Any fibers that cross in the Route will be remedied by contractor at contractor's expense.

Launch Reels

All Launch reels used in testing are required to be 1 K minimum or better

Fiber Labeling:

Contractor shall label said Fibers at fiber terminations, fiber jumpers, and fiber pigtails clearly with a printed label. The label must include the local fiber identifier (CID), Rack#, Panel#, Port# and the next ILA site

Customer Equipment Rack Fiber Label Example:

- RR101.PNL1
- Ports 1-2

- CID: TFS/1732
- Facing Campbell

unless otherwise stated in the Scope of work to ensure compliance with a customer site or contractual obligation.

Field Splice Standards:

All splices will be fusion splices.

The objective for each new splice is a loss value of less than or equal to 0.1 dB. Any splice with a loss greater than 0.1 dB will need to be re-spliced.

When validating a new splice using an OTDR, an average loss value of 0.25 dB or less is acceptable when measured bi-directionally with an OTDR at 1550 nm with 1-minute averaging.

If after 3 restoration splicing attempts, contractor is not able to produce a loss value of 0.25 dB or less bi-directionally with an OTDR at 1550 nm with 1-minute averaging, then 0.5 dB or less bi-directionally at 1550 nm with 1-minute averaging will be acceptable.

Fibers not meeting the 0.25 dB or less specification will be identified as Out Of Specification (OOS).

Documentation of the three attempts (re-burns) to bring the OOS Fiber within specification must be provided.

Span Loss:

It is the contractor's responsibility to ensure proper continuity of all Fibers at the Fiber level, not just the pigtail level. Any Fibers that cross in the Route will be remedied by contractor.

The attenuation as measured by a light source and power meter will not exceed the following:

- Maximum Allowable Attenuation per Fiber Span = $(A * L) + (0.1 * N) + (0.5 * C)$
- A = 0.3 dB per Km (at 1550 nm)
- L = Optical length of cable measured in Kms (from OTDR trace)
- N = Number of splices in the span

- C = Number of mated connector pairs in the span. The connector loss will not exceed 0.5 dB per mated pair.

Total end to end loss (in dB) measured on the fiber must not exceed $0.25 \text{ dB/Km} \times L$

Reflectance:

The maximum reflectance per event on the Fibers at 1550 nm, as measured by an OTDR, will not exceed -50dB.

The total reflected power (ORL) for all events on each fiber span at 1550 nm will not exceed 27dB.

Chromatic Dispersion (CD)

For homogeneous fiber type Fibers, the chromatic dispersion at a given wavelength shall not exceed the fiber manufacturer's specification at the given wavelength.

For mixed fiber type Fibers, the chromatic dispersion at a given wavelength shall not exceed the sum of the chromatic dispersion of each fiber type in the fiber span at the given wavelength of the Fibers.

The per wavelength chromatic dispersion value shall be taken from the fiber manufacturer's published specification.

Polarization Mode Dispersion:

The Polarization Mode Dispersion will not exceed 0.1 ps/sqrt(km) .

Zero Dispersion Wavelength:

The Zero Dispersion Wavelength will not fall between 1527 nm and 1567 nm.

Naming Of Traces:

OTDR traces taken for bi-directional testing, and the OTDR traces of the pigtail splice must be recorded electronically and emailed to the Customer.

Please name the traces in the following format: <A-end> - <Z-end> <wavelength and/or test>, <Fiber#>

Examples:

- Springfield-Lebanon Bi-directional OTDR-1550 nm, Fiber 96
- Springfield-Lebanon Uni-directional OTDR Short-1550 nm, Fiber 96
- Springfield-Lebanon CD, Fiber 96
- Springfield-Lebanon PMD, Fiber 96

Note: All Header Information on OTDR Trace Must Be Completed.

Unless otherwise stated in the Scope of work to ensure compliance with a customer site or contractual obligation

Test Packages:

Contractor will provide a package containing the following test data and documentation for each Dark Fiber. All data provided will be provided in digital format.

FC Summary Spreadsheet: Contractor to handoff the following data in a provided Excel template:

1. describing the fiber type being tested
2. stating if it meets MCNC's fiber specification, and if not, the deficient measurement
3. fiber test date
4. fiber identifier as labeled by MCNC
5. fiber end points
6. fiber type
7. fiber connector type (LC, SC)
8. demarcation rack, panel, and/or pigtail location
9. bi-directional power meter and light source data taken at 1625nm and 1550nm.

10. losses in each direction (dB)
11. average bi-directional loss (dB)
12. loss as a function of distance (dB/km)
13. zero dispersion wavelength
14. chromatic dispersion (CD) at 1530nm, 1550nm, and 1564nm (ps/nm)
15. polarization mode dispersion (PMD) at 1550nm (ps) Bi-directional OTDR traces
 - at 1550nm set at 1 minute averaging
 - at 1625nm set at 1 minute averaging

OTDR traces of the Fibers must be recorded electronically as SOR files and pdf.

Chromatic Dispersion data of each fiber of each fiber span of the Fibers:

Test set data points in the Customer-provided Excel template as a graph in .pdf format to get a visual representation of the data points

Polarization Mode Dispersion data of each fiber of each fiber span of the Fibers:

Test set data points in Excel template (sample pending) as a graph in .pdf format to get a visual representation of the data points

Attenuation Profile data of each fiber of each fiber span of the Fibers:

test set data points in Excel template (sample pending) as a graph in .pdf format to get a visual representation of the data points

In addition to the native format, all documentation will be provided in a PDF digital format. This test data will need to be uploaded to the appropriate drop folder.

Test Setup: Use the following guidelines when performing tests to provide the test data requested above.

OTDR Dead-Zone:

Dead-Zone of THE OTDR test set should be determined and a launch cable of a length greater than the dead-zone should be utilized.

A 1km minimum or greater is required.

Dead-Zone information as well as launch cable details should be included in the test package.

OTDR Test Point: OTDR shots, and Characterization should be performed from the Outside Plant FDP port

Fiber Characteristics:

Characterization should be performed on the Dark Fiber Routes with homogeneous fiber characteristics.

If span is known to have Routes of differing characteristics they should be noted and individually characterized whenever possible.

Links to final drawing files and route KMZ files

<https://www.mcnc.org/knowledge-center/864-fiber-construction-project/864-fiber-construction-project-rfps>

Projected Completion Date

MCNC requires total completion of this project NLT **September 30, 2026**. Start date is pending permit approvals and the logistics period but not to exceed 30 days after award.

Prior to responding, please note any time frame considerations that may impact your availability.

Please return your bid or an email indicating that you will not be bidding by **May 27, 2025**. If you have questions or concerns about this project, please respond to the Question and Answers email address provided below and in this RFP. Questions and responses will be provided to all contractors. 864-fiber-construction-rfp@mcnc.org

Please let us know if you have problems accessing the files by responding to this email.

Thank you in advance for your time and efforts.

