Chapter 13: Fiber Optic Conduit & Cable Installation

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1. General

A. Fiber optic cables shall be installed in accordance with *NECA 301-2004, Installing and Testing Fiber Optic Cables,* and the following City of Delaware standards.

1. NECA 301-2004, Standard for Installing and Testing Fiber Optic Cables (ANSI) - This standard describes practices for installing and testing fiber optic networks used for high-speed data connections. It is developed jointly with the Fiber Optic Association (FOA), the leading certifier of fiber optic installers. It is an update to standard NEIS 301-1997.
2. National Electrical Installation Standards (NEIS) are the standards for electrical construction. NEIS are published by the National Electrical Contractors Association (NECA), developed in cooperation with other industry expert groups, and approved by the American National Standards Institute (ANSI).

B. Drawings

1. The contractor shall provide record drawings in the format specified by the City of Delaware upon completion and acceptance of the project.

2. Fiber Specifications

A. A minimum of 144 strand fiber optic cables are to be installed.
B. All splicing must be color coded between different cables where possible. i.e. red tube fibers must be spliced into red tube fibers, etc.
C. All contractors that are to install fiber lines must be approved prior to the start of construction by the City.

3. Aerial Installation

A. For an aerial installation, a slack loop is required every seven spans and at logical locations where a splice off the main fiber line is anticipated. The splice location will be determined by the Public Works Department and the Department of Information Technologies.
B. The contractor shall install riser "U-Guards" at all locations were the conduit is ascending or descending from any aerial construction.

4. Subsurface Installation

A. For subsurface installation, three 1 ¼ inch (minimum) SDR 11 HDPE conduits shall be installed for each run of fiber line.

- 1st conduit for primary backbone
- 2nd for distribution fiber
- 3rd to be used as a maintenance conduit (fiber upgrade/cut over replacement).

1. When constrained, with the COD approval, two 4"conduits may be used in lieu of three 1 ¼ inch.
2. Sweep of the conduits under the bottom edge of the pull-boxes should be done by a 22.5 or 30 degree sweep that is slightly higher than the substrate base in the bottom of the pull-box. The majority of the space in the box needs to be free for fiber cable slack and splice case.

B. The conduits are to be blue, orange, and green, unless otherwise specified.

C. The minimum vertical and horizontal separation shall be 1.5 feet between the fiber conduits and public water and private utility lines; and 1.5 feet vertical and 5 feet horizontal between all sanitary and storm sewers.
D. The bury depth is to be 36-inches below finish grade
E. For new construction, all conduit crossing under roadways shall be concrete encased to the top of subgrade and extend from right-of-way line to right-of-way line, unless bored.
F. When crossing existing roadways, the fiber conduit may be directional bored under the roadway with an appropriately sized steel casing pipe extending from right-of-way line to right-of-way line.
G. If trenching, plastic caution tape is to be placed over the conduit at a depth of 18-inches. Newly installed pull-boxes must be marked with 4" x 4" x full depth (bottom of box) wye poles painted orange at the top. The wye poles shall remain in place until fiber is installed with tracer wire.

5. Pull Boxes

A. All pull boxes must meet or exceed all test provisions of ANSI/SCTE 77 2013.
B. All pull boxes shall be polymer concrete and rated for 20K lbs. minimum load, bolt down covers with stainless steel penta-head hardware and stamped with a label designating "FIBER OPTICS". Quazite PG style or equivalent.
C. Distribution and branch line pull-boxes shall be 30" x 48" x 36"D or larger as required to meet the minimum bend radius of the fiber optic cable. Quazite # PG3048BA36, 2 piece bolt down cover with stainless steel penta-head hardware and labeled FIBER OPTICS, Quazite # PG3048HS0021P or equivalent.
D. Pull-boxes shall have a spacing of no more than 1000-feet between boxes. An additional pull-box shall be placed at logical locations where a splice off the main fiber line is anticipated.
E. Boxes are to be located so water drains away from the box.
F. Select projects may utilize 30" x 48" x 24"D pull boxes if no future splicing is anticipated, as approved by the City.
G. Shop drawings of the pull-box and lid that differ from the ones specified above are to be approved by the City prior to installation.

6. Tracer Wire

A. Tracer wire or a trace fiber shall be used throughout the system and is to be placed inside the solid orange conduit.
B. Underground locating test stations shall be installed no more than every 2000 feet.
C. Rhino TriView test stations shall be installed adjacent to pull-boxes and connected via 1.25" HDPE duct through the bottom opening of the pull-box; the connected tracer wire shall pass through the duct into the test station. Specifications for the Rhino TriView test Station is available at http://rhinomarkers.com/DP_Doco/SPEC/ISOLEVER_SPEC.pdf
D. Test station tracer wire bonded to the main tracer wire system shall be grounded in the pull-box.