FIBER OPTICS

I. ENGINEERING

I.1. DEFINITIONS

I.1.1. Fiber Optic Cable:

A cable that contains individual glass fibers, designed for the transmission of digital information, using light pulses.

All Dielectric Self Support (ADSS) Cable:

A cable designed and constructed with non-metallic components, that is designed for aerial applications and does not require a separate cable messenger.

I.1.2. Loose Tube Cable:

A cable designed and constructed with non-metallic components, that is designed for underground applications. These are “dry” cables using water swell able powders to protect against water penetration.

I.1.3. OTDR:

Optical Time Domain Reflectometer. A device used for characterizing a fiber, wherein an optical pulse is transmitted through the fiber and the resulting backscatter and reflections are measured as a function of time.

I.1.4. Single-mode Fiber:

An optical fiber with a small core diameter, in which only a single mode of light is capable of propagation.

I.1.5. Multi-mode Fiber:

An optical fiber whose core diameter is large compared with the optical wavelength and which, consequently, a large number of light modes are capable of propagation.

I.1.6. Splicing:

A permanent junction between optical fiber splices. May be thermally fused or mechanically applied.

I.1.7. Minimum Bend Radius:

The minimum radius a fiber may be bent before optical losses are induced.

I.2. JEA GUIDELINES FOR INSTALLING/PULLING UNDERGROUND FIBER OPTIC CABLE

I.2.1. Bend Radius:

The main risk of damage to the fiber optic cable is by overlooking the minimum bending 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 a 13 inch bending radius. The number of 90 degree turns on a pull shall not exceed four (4).

I.2.2. Reel Placement:

Have the reel set adjacent to the manhole and use a fiber optic manhole pulling block assembly from Sherman & Reilly.

I.2.3. Cable Slack:

Please coil 150 feet of cable at the Transition, Termination points, and every 1500 feet.

I.2.4. Splices:

All splice locations will be designated by the JEA communications department.

I.2.5. Strength:

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

I.2.6. Installation:

When installing use a swivel eye for pulling the fiber optic cable and conduit system.

I.2.7. Precautions:

Please review the manufacturer's installation instructions prior to commencing with the installation. If any questions arise during installation please refer to the manufacturer's installation instructions, or notify the project engineer.

I.2.8. Testing:

Perform OTDR test on each fiber in the installed cable, to verify the parameters of each fiber meet the system design criteria.

I.3. SAFETY

I.3.1. The fiber cables used by JEA, being constructed entirely of non-conducting, all-dielectric materials are designed for installation around high voltage lines. In this application the fiber cable is classified as a fiber supply cable, and can only be installed, maintained and handled by electric utility employees trained and equipped to work on and around electric supply lines.

I.3.2. Although the fiber cable is made entirely of non-conducting materials, under certain conditions it is still capable of having induced or static charges on its surface. Each of the fiber cables in use is designed for installation in and around electric fields of up-to 12 KV per meter without material damage. These fields can however induce a static surface charge that can be dangerous if touched bare handed. To insure the safety of field operations personnel, it is recommended that all fiber cable installed near and around JEA electric facilities, be treated as an energized conductor and that it be grounded prior to handling. It should be made clear that fiber cable is more susceptible to crushing than regular conductors, so proper grounding techniques should be observed. See cable manufacturer's literature.

I.4. INSTALLATION LOCATIONS

I.4.1. Distribution

The fiber optic cables may be attached to distribution poles at various elevations, as determined by the Distribution Engineering Group (DEG), with the assistance of the Information Grid Group. This attachment location may be in the supply space of the pole, as determined by NESC rules. Installation and maintenance of cable facilities in this location must be performed by qualified electric utility personnel or approved electric utility contractor.

I.4.2. JEA Conduits and Building Entrances

The installation of fiber cable in JEA's downtown underground conduit system and building entrances, is determined by the DEG. As a general guideline, if 3 or more spare power conduits are available between any two manholes in the downtown

underground conduit system, one of the spare conduits may be reserved for JEA fiber communications. The DEG is responsible for determining what constitutes a spare conduit. The installation and maintenance of fiber cable in the JEA's underground conduit system must be performed by qualified electric utility personnel or approved electric utility contractors. However, as of the date of this standard, JEA does not lease empty conduits in the downtown network area.

I.4.3. Fire Protection

I.4.3.1. The intent is to install the cable so that fiber is protected from underground electrical conductor arc and burn. There needs to be enough cable at the splice points to allow the splice to be easily removed from the manhole and pulled into a fiber optic splice van.

I.4.3.2. Fiber cable is wrapped with fire retardant tape (TAPEL004) as it passes through each manhole. At the splice points, the fiber cable is wrapped with fire retardant tape. 75 feet of extra cable is coiled for each end. The coils are stored in a fire resistant cloth bag (FIBFB001). The fiber cable, coils, & splices are kept in the bottom of the manhole so as to be out of the way of the electrical conductors and equipment.

I.4.3.3. Inner Duct should be cut off 0-6 inches beyond the end (stick out) of the conduit. Pull string ends should be tied together if the sub-duct is not being used. Unused sub-ducts should be plugged (use plate PLUGDUCT1).

I.4.4. Location Fiber Optic Cables

I.4.4.1. Florida Statute 556.101-111 requires all excavators to call for locates 48 hours before they dig! The Sunshine State One-Call of Florida phone # is 1-800-432-4770.

I.4.4.2. The One-Call office will contact the JEA locating contractor requiring locates of our facilities.

I.4.4.3. Aiding the locators, please install fiber optic cables in the same trench with primary cables. In areas where we have no primary cable, please install a #12 gauge wire (COIBW005). Pull #12 gauge wire in with the Fiber cable for the Directional Bored conduit systems.

I.4.4.4. Terminate the ends of the #12 gauge wire in the BOXPS002 handhole box. This box can be used by the locating contractor.

I.4.4.5. Use marking tape I.TAPMA001 for electric systems and I.TAPMA005 for water systems.

I.4.5. Design and Placement of fiber optic Cables and Splices

The USC Information Grid Projects will design all fiber optic cable routes and splice points. This information will be supplied to the Project Engineer.

I.5. Documentation

A detailed discussion about fiber optic cable documentation is located in the overhead fiber optic standards section vii.10.3. Underground fiber documentation should include all of those elements in the engineering design package. These include a cover sheet & key map, composite schematic, route map construction sheets, construction detail sheets, fiber splice plans, circuit diagrams, and manufacturer provided documentation: the following paragraphs will discuss some unique or variation needed specifically for underground fiber.

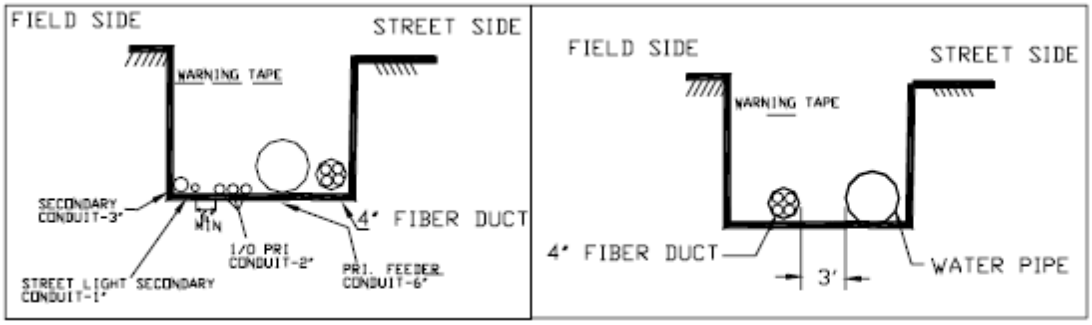
I.5.1. Underground Fiber Documentation

For each fiber optic system the following information should be included in the documentation package. The Fiber Route Map for underground should typically be prepare at a scale of 1 inch to 50 feet or less when applicable. Maps should show the locations of other existing underground infrastructure. An elevation couture should show the depth of fiber optic infrastructure (Typically conduit). When a fiber optic cable is routed with electric infrastructure (for example, within the Downtown Ductbank) the route maps should show its duct assignment. Construction detail sheets should clearly describe location and clearance information within the electric Manhole.

I.5.2. Redline Mark-ups and “As-built: See Overhead Fiber Optic Standards section VII.10.3. for details.

UC*3F (INCLUDES 3-INNERDUCTS)

INSTALLATION OF FIBER OPTIC CONDUIT IN TRENCH



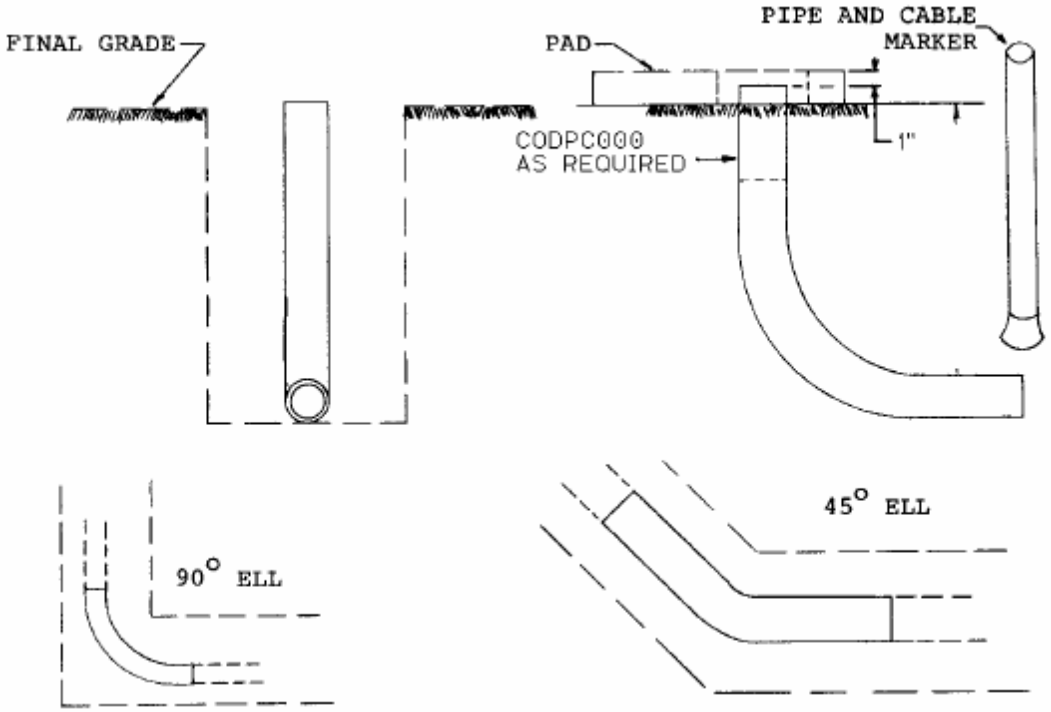
TRENCH DETAIL

POLYVINYL CHLORIDE (PVC) - SCHEDULE 40			
PLATE	**ITEM I.D.**	**DESCRIPTION**	**QTY**
UC*3F	CODPC003	4" GRAY PVC DUCT	1FT
	FIBPE012	1-1/4" PE INNER DUCT 3 COLORS PARELLELED (GRAY, GREEN, BROWN)	1FT

NOTES:

1. PVC cement must be itemized. Issue one (1) quart can, item I.ADCMI002, for each 500 linear feet of PVC conduit, or for each 25 conduit joints. Glue is not used on the 1" PE conduit.
2. Install warning tape as specified on UCT plate. Use marking tape I.TAPMA001 for electric systems and I.TAPMA005 for water systems.
3. Minimum separation of 2" between Fiber Optic conduit and conduits carrying conductors of the same voltage. Minimum separation of 6" between conduits carrying conductors of different voltage.
4. Use lubricant to pull PE conduit into the PVC conduit.

UCL9*3F (INCLUDES 3-INNERDUCTS)
UCL4*3F (INCLUDES 3-INNERDUCTS)
INSTALLATION OF FIBER OPTIC CONDUIT ELL



SCH 40 ELL CONDUIT

PLATE	ITEM	DESCRIPTION	QTY	RADIUS
UCL9*4F	CODEP006	4"– 90° SCH-40 ELBOW	1	36"
	FIBPE012	1-1/4" PE INNER DUCT 3 COLORS PARELLELED (GRAY, GREEN, BROWN)	1FT	N/A
UCL4*4F	CODEP005	4"– 45° SCH-40 ELBOW	1 36"	
	FIBPE012	1-1/4" PE INNER DUCT 3 COLORS PARELLELED(GRAY, GREEN, BROWN)	1FT	N/A

UFC* __
INSTALLATION OF FIBER CABLE IN CONDUIT

PLATE & OPTION	ITEM	QTY	DESCRIPTION
UFC*48	CAIUF048	1	48 COUNT UG FIBER OPTIC CABLE , LOOSE TUBE
UFC*72	CAIUF072	1	72 COUNT UG FIBER OPTIC CABLE , LOOSE TUBE
UFC*144	CAIUF144	1	144 COUNT UG FIBER OPTIC CABLE , LOOSE TUBE

NOTES:

1. All fiber cables are installed by blowing or pushing into conduit (Do Not Pull).
2. Use lubricant when installing fiber cable (see ADCMI004).

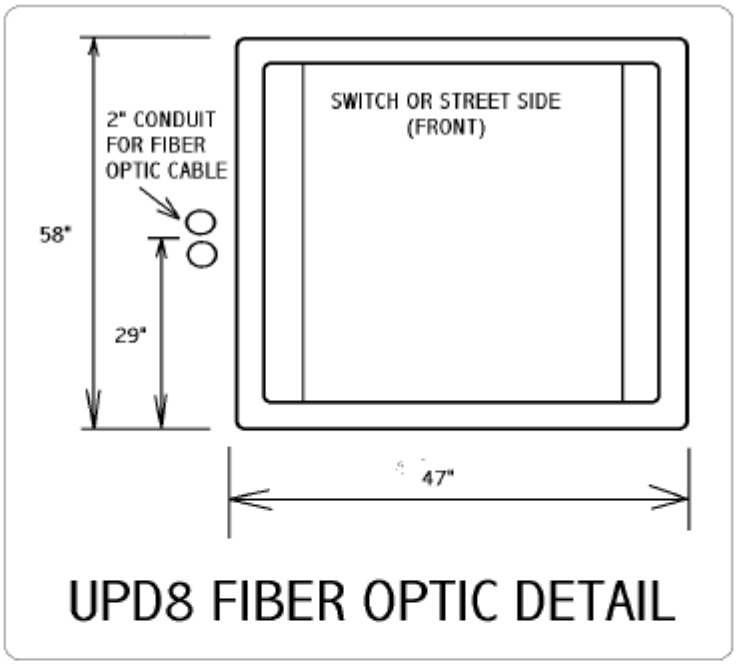
TRUCK STOCK ITEMS:

CABLE LUBRICANT 5-GAL (I.ADCMI004)

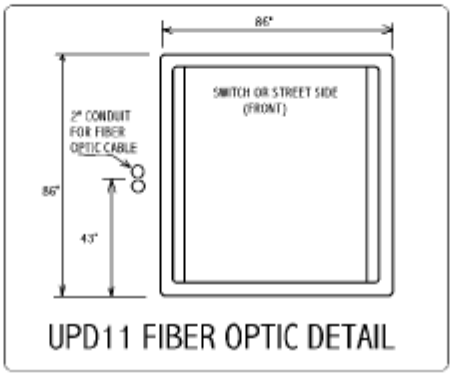
FIBER OPTIC CABLE FOR DISTRIBUTION AUTOMATION

The drawings attached below depict where the conduits should be installed. The conduits should be installed at the center of the pit wall 2-inches above the grade. In the trench, the conduit should be installed between primary cable conduits. This will help for locates and protection.

NOTE: USE FOR "DA PROJECTS"



UPD8 FIBER OPTIC DETAIL

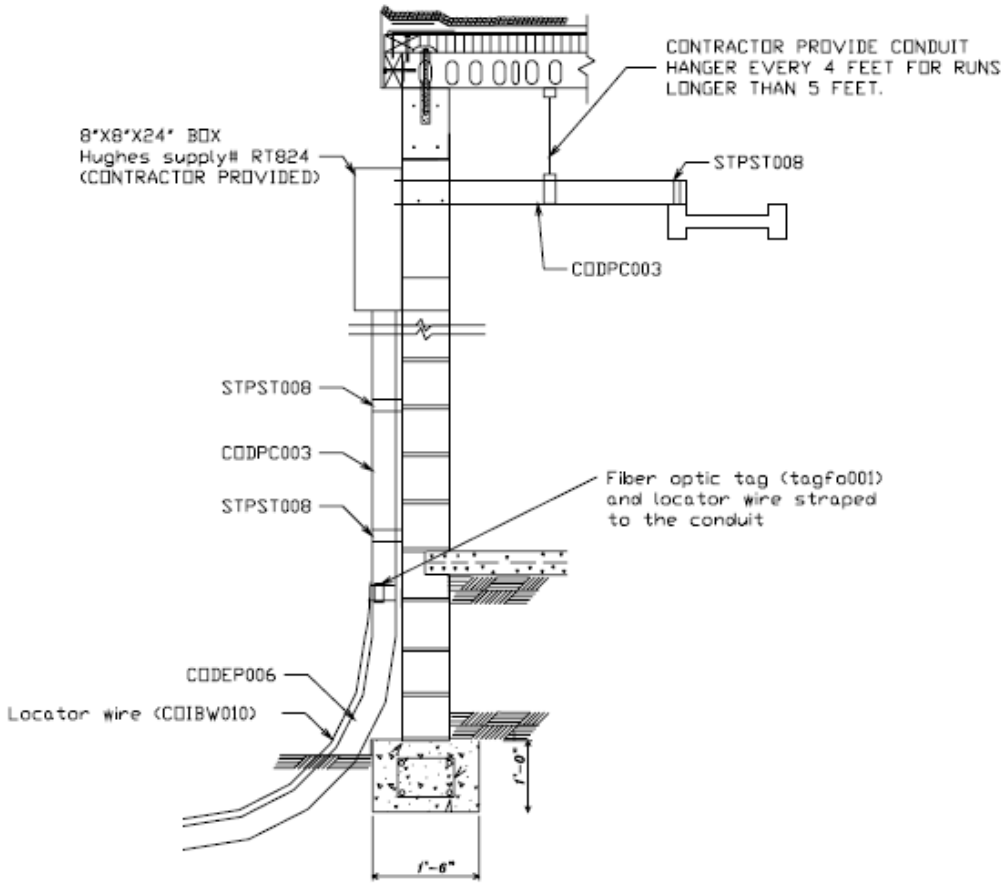


UPD11 FIBER OPTIC DETAIL

Conduit used to communicate between DA switches.

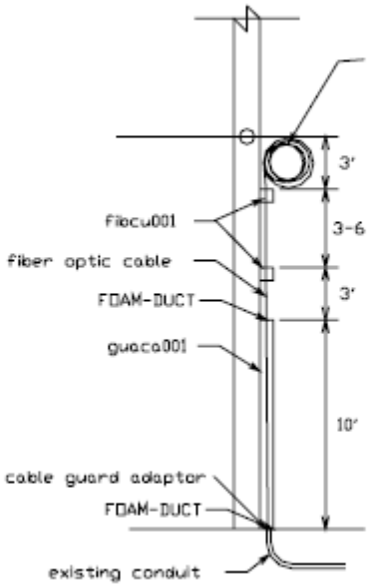
FO-ENTU1

FIBER OPTIC CABLE ENTRANCE INTO A BUILDING/CONTROL HOUSE



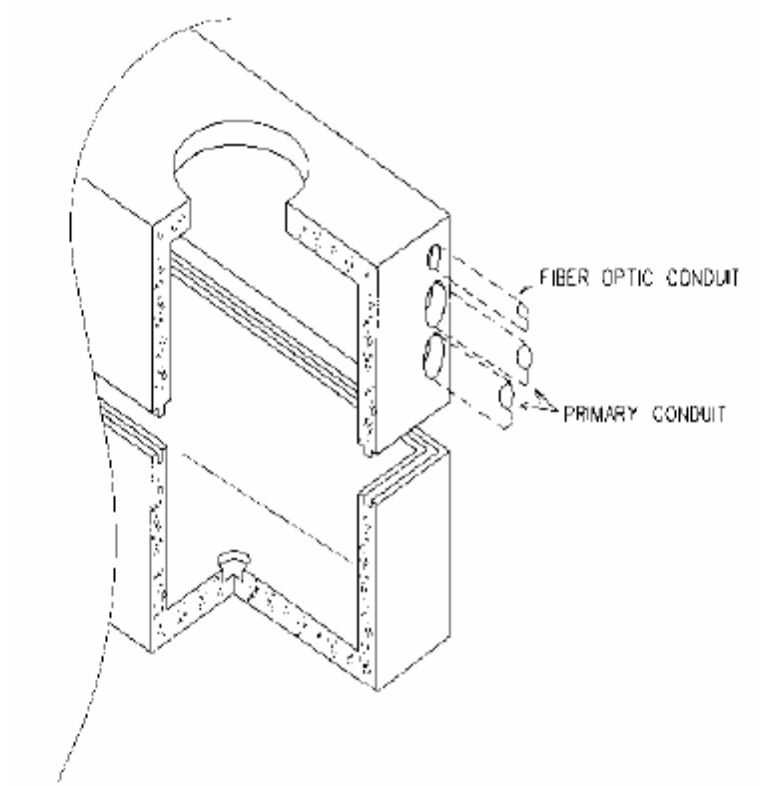
ITEM	QTY	DESCRIPTION
CODEP006	1	ELBOW, PVC 4IN. 90 DEG.36IN RAD SCH 40
CODPC003	20	CONDUIT, PVC 4" SCH40 W/COUP
STPST008	2	STRAP, CONDUIT 2-HOLE 4IN
TIETH001	4	TAG HOLDER TIE 3" DIA.
TOGFO001	1	FIBER OPTIC TAG 1-1/8" x 2-1/2" 8'X8'X24' BOX (CONTRACTOR SUPPLIED) CONDUIT HANGER (CONTRACTOR SUPPLIED)

FO-RIS1C
FO-RIS1W
FIBER OPTIC RISER POLE



APPLICATION	ITEM	QTY	DESCRIPTION
FOR CONCRETE POLES FO-RIS1C	ADPCG002	1	4"-3" CABLE GUARD ADAPTER
	ANCST002	2	ANCHOR, STUD BOLT
	ANCST003	8	SCREW, 1/4 X 1 3/4" , HEX HEAD
	FIBCU001	2	CUSHION, FIBER OPTIC CABLE DOWNLEAD
	GUACA001	1	GUARD, 2INx10FT
	NUTPG300	8	NUT, HEX ¼ PLATED
	NUTPG500	2	NUT, HEX ½ PLATED
	TIETH001	2	TAG, HOLDER TIE
	WASSF001	2	WASHER, SQ. FLAT
FOR WOOD POLES: FO-RIS1W	ADPCG002	1	4"-3" CABLE GUARD ADAPTER
	FIBCU001	2	CUSHION, FIBER OPTIC CABLE DOWNLEAD
	GUACA001	1	GUARD, 2INx10FT
	SCWLA002	2	SCREW, LAG ½" x 4"
	SCWLA005	8	SCREW, LAG FOR CABLE GUARD ¼" x 2"
	TIETH001	1	TAG HOLDER TIE 3" DIA
	WASSF001	2	WASHER, SQ. FLAT 2 SQ. x 1/8" x ½" BOLT

DOWNTOWN FIBER OPTIC CABLE MANHOLE INSTALLATION



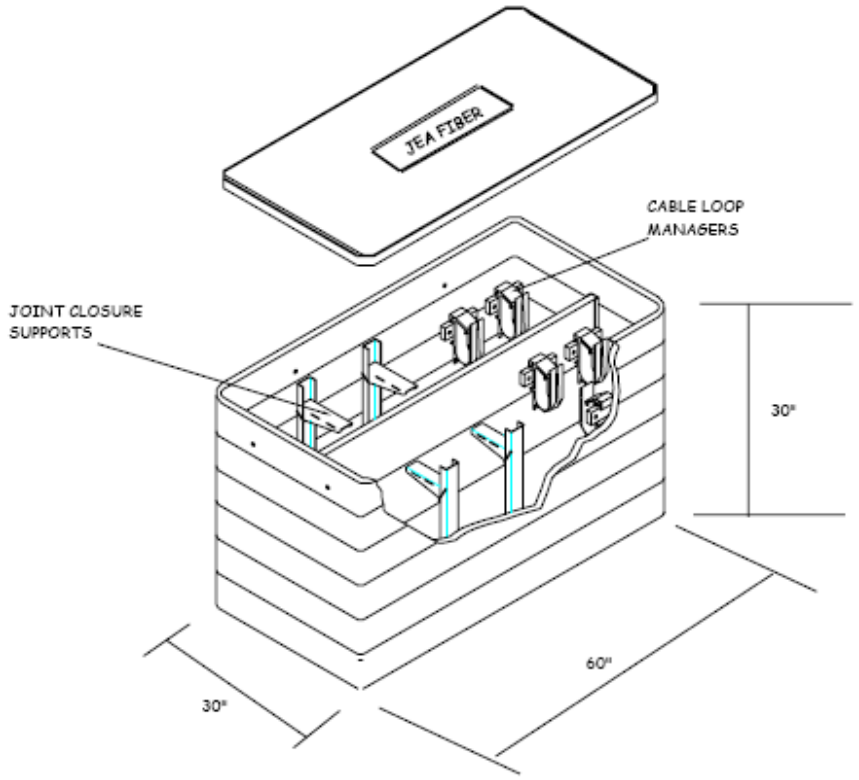
NOTES:

1. Install the Fiber conduit above the primary conduit with a 2-inch separation.
2. Rack the Fiber cable above the primary cable.
3. When installing PE Duct allow for shrink back.
4. Fiber cable is wrapped with fire retardant tape (TAPEL004) as it passes through each manhole.
5. The fiber cable is wrapped with fire retardant tape. Coil 75 feet of extra cable on each end. The coils are stored in a fire resistant cloth bag (FIBFB001). The fiber cable, coils, & splices are kept in the bottom of the manhole so as to be out of the way of the electrical conductors and equipment.

For areas outside of the downtown, route the fiber optic conduits around the outside of electric manholes.

SET-FMH

REINFORCED PLASTIC MANHOLE
20,000 LB. RATING



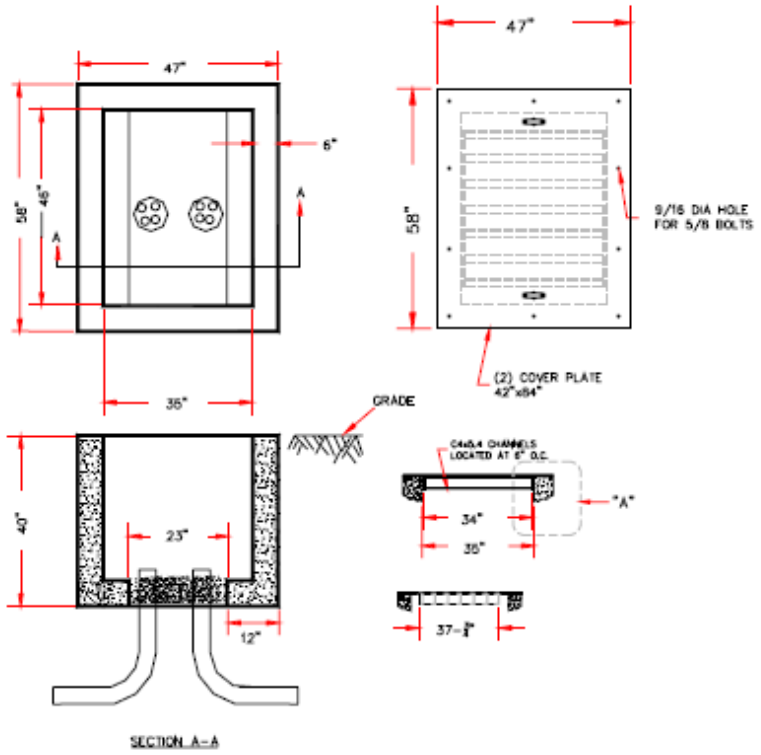
ITEM	QTY	DESCRIPTION
MANHO008	1	MANHOLE, REINFORCED PLASTIC, 30"W x 60"L x 30"H
	1 CU. YD.	BASE COURSE *

***NOTE:**

1. A compacted base course footing shall be included in this plate. Footing shall be level, minimum of one (1) foot deep, and extend a minimum of six (6) inches beyond the outside edges of the manhole base. (+/- 4.0' x 6.0' x 1.0'deep)

UPD8F

FIBER OPTIC PRE-CAST PIT



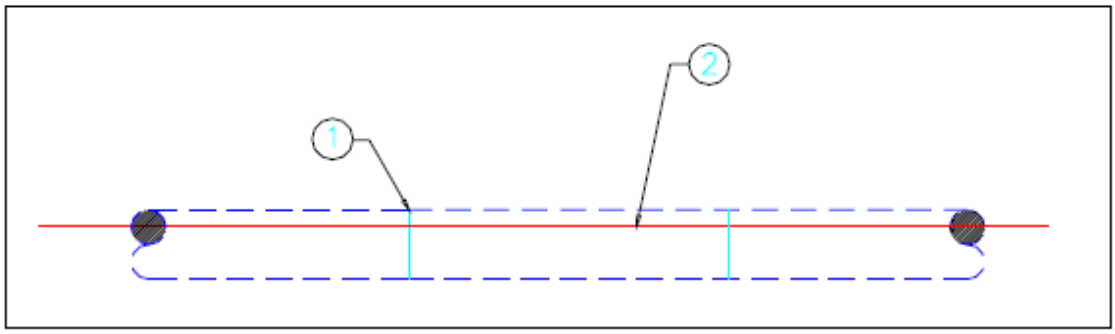
ITEM ID	QTY	DESCRIPTION
CODEP006	1	4"– 90° SCH-40 ELBOW 36" RADIUS
COVPT003	1	HINGE COVER
FIBPE001	3FT	1" BLACK PE INNER DUCT
FIBPE002	3FT	1" ORANGE PE INNER DUCT
FIBPE003	3FT	1" WHITE PE INNER DUCT
FIBPE004	3FT	1" BLUE PE INNER DUCT
PITME003	1	PIT, CONCRETE, DMD-77

NOTES:

1. Plate additional conduit ells as required on an individual basis. (See UCL9*4F & UCL4*4F)
2. Conduit ends to extend 2" above gravel/base course.
3. Conduit locations to be detailed by engineer.

FLW

LOCATE WIRE (FLW)



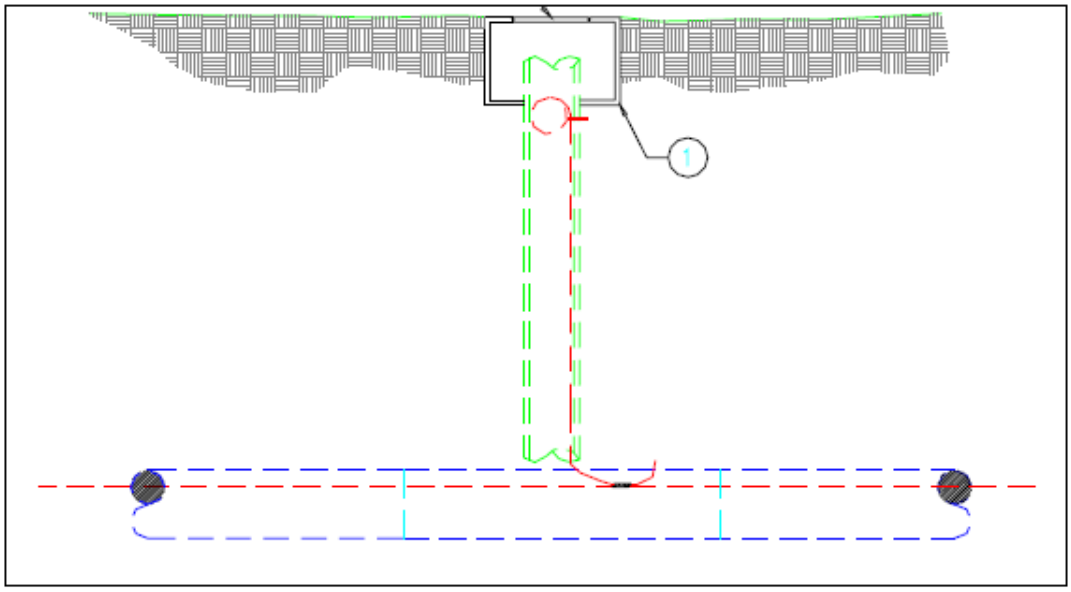
ITEM ID	QTY	DESCRIPTION
CNNTY112	2	14-1/2 NYLON CABLE TIES
CAIDF003	20	WIRE, WHITE OR ORANGE FIBER OPTIC LOCATE TRACER

NOTES:

1. This plate gives 20 feet of wire for each quantity plated.
2. Terminate the ends of the #12 gauge wire in the BOXPS002 handhole box. This box can be used by the locating contractor.

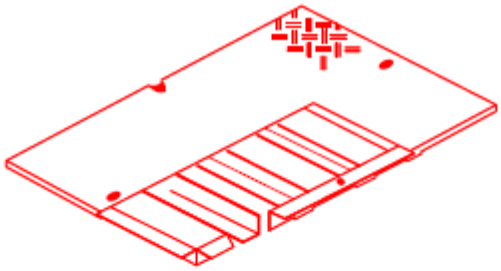
FLWLS

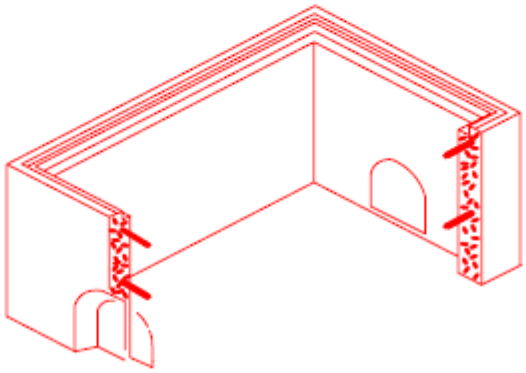
LOCATE WIRE LOCATING STATION



ITEM ID	QTY	DESCRIPTION
BOXPS001	1	BOX, POLYMER CONCRETE, 13” X 24” X 18” DP

PULL-BOX*_
CONCRETE SPLICE BOX





PULL-BOX OPTIONS:

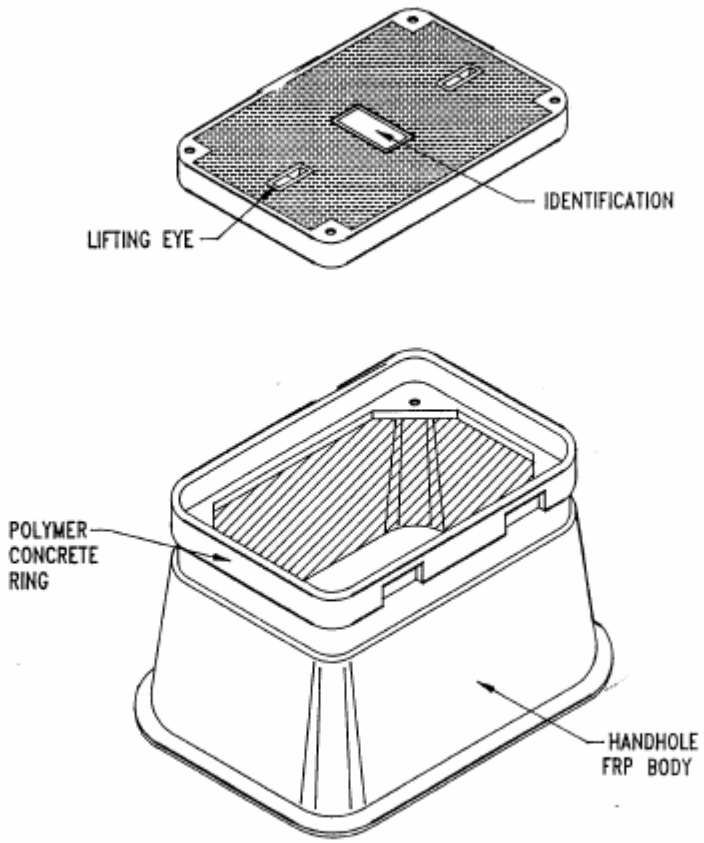
1. INSTALLATION CONDITIONS:
2. U – NEW UNDEVELOPED AREA
3. D – EXISTING DEVELOPED AREA

EXAMPLE: PULL-BOX*D
INSIDE DIMENSIONS – 16”W X 24”L X 24”DEEP

ITEM ID	QTY	DESCRIPTION
BOXSP002	1	PULL BOX, CONCRETE ,TRAFFIC BEARING, STEEL COVER

SERV_BOX-_*_

POLYMER CONCRETE SERVICE BOX



SERV-BOX OPTIONS:
INSTALLATION CONDITIONS
U – NEW UNDEVELOPED AREA
D – EXISITNG DEVELOPED AREA

EXAMPLE: SERV-BOX-P*D

PLATE	QTY	DESCRIPTION
SERV-BOX-P*_	1	BOX, POLYMER CONCRETE, 13” X 24” X 18” DP (BOXPS001)

UCCF
CURB MARKER

APPLICATION:

Contractors are required to mark manholes and hand-hole boxes. A 2-1/2" adhesive curb marker shall be installed on the curb directly in front of each manhole or in the street side of a sidewalk where no curb is available. In the event neither curb nor sidewalk is available, the contractor shall install the marker in the asphalt paving directly in front of each manhole.

PLATE	ITEM	QTY	DESCRIPTION
UCCF	MARCB003	1	MARKER, CURB 2-1/2" CIRCLES BLACK ON RED LABLED "JEA FIBER".

NOTE:

1. The markers are installed with adhesive (JEA item ADCAD002). One tube of adhesive is required for 5 markers. This item will be stored as truck stock.