

User Guide

# National Implementation Engineering Guidelines

Audience: Field Ops, OSPE

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# 1. Purpose

The purpose of this document is to provide users with a single reference point to find all relative information for designing and maintaining outside plant for Lumen National Implementation. This may contain links to other reference materials as needed.

## 2. General Information

### 2.1 General Design Information

All Lumen National projects will follow the same basic design requirements. This manual will provide some of the basic details that should be included on every project. Each area may have individual requirements in addition to those found here.

**Note:** This manual is not meant to cover every situation that may arise in the field. Discretion should be used when designing Lumen projects using best practices and industry standards. Requirements set forth by all governing authorities (having jurisdiction over the work that is taking place) should be met and included in the design as appropriate.

### 2.2 Cross Network Utilization

It is important that the OSPE review potential use of other networks for best case scenario options. For instance, the National Lumen network may be closer to the building vs the former Level3(fLVLT) Network and thus may be the best choice to serve the customer in the most cost-efficient manner. When using other networks, conduit, space, power or lit service it is imperative that the affiliate order is created showing the lease or use of the other network properly. To facilitate this, we have created a Cross-Network Utilization process that must be followed any time we use a different network than where the order originated from. For instance, if the order originates in the fLVLT order entry stack but we will use Lumen National or Local facilities to serve the order, this requires an affiliate order for the fLVLT entity to lease facilities from Lumen National.

The Cross-Network Utilization process document can be found here:

- [Cross Network Utilization Flow chart 032218](#)
- [Cross Network Utilization Request Form](#)
- [NA Cross Build Capital Request](#)

### 2.3 Site Surveys (Preliminary review of work to be done)

A Site Survey or preliminary review of work to be done should be completed for every construction project. The site survey should be performed by the Lumen Outside Plant Engineer (OSPE) and/or the engineering vendor for any projects that involve a customer related build. Other projects such as maintenance, augments, or relocation requests may be reviewed by other appropriate individuals as required. During the site survey, a high-level review of the work that needs to be done should be identified. At a minimum, this should include the route, method of accessing the building and location of the equipment. Other site survey information such as rack space, power, and other requirements for ISP should also be reviewed. Any special considerations such as RR crossings, easement requirements, or special permit requirements should be identified. Additional research may be required to determine some of the permitting and easement requirements.

Upon completion of the survey, a high-level summary is assembled by the Lumen OSPE for the engineering vendor.

## 2.4 New Route Design

There are many items to consider when designing the route of a new Lumen fiber optic cable. When able, the engineer should explore the most cost effective, time efficient and secure route. Market planning and other potential opportunities and/or expansion in the area should be considered in order to place the fiber in the most beneficial location for future use. Consideration should also be taken around areas that have potential for road improvements due to developments in the area.

When designing a new route, the general practice is to build back to an existing access point in order to prevent additional loss in the route due to added splice locations. There may, however, be times where a new access point must be placed, and slack pulled from the nearest vault in order to create a new splice. Cost consideration and due diligence is necessary to ensure the design is consistent with network capabilities.

## 2.5 Aerial vs Underground

Underground design is the preferred method of placement for Lumen fiber optic cable. At times, there are locations where an aerial lead is required due to regional issues. Items to consider when determining the best method of placement include customer requirements, potential safety concerns, future growth in the area, recurring pole rental fees, maintenance costs, environmental concerns and make ready issues. The Lumen OSPE is required to use due diligence and consider all options before making the decision to build an aerial lead.

## 2.6 Maintenance

At times a Lumen OSPE will be called upon to provide a solution to a maintenance issue. A cable that is unlocatable and needs tracer wire placed, a manhole lid that needs to be adjusted to grade, or a section of exposed duct due to washouts in the area are a few examples of maintenance issues. When a maintenance issue is identified by Operations, it is the OSPE's call to determine how to correct the issue. For situations that are small in scope, the LE vendor can be engaged via Fireworks/Bidmaster. Larger projects may need engineering drawings. For any situation that needs to replace an item of plant, there are capitalization guidelines that need to be adhered to. For more information on the capitalization guidelines please reach out to your Director.

## 2.7 Repair

When there is an issue with our plant that causes an outage to our customers, our first order of business should be to review the situation, determine the cause, and decide on a course of action. Care should be taken to determine if a permanent solution can be efficiently put into place to get the customer back into service or if a temporary solution is required. If the damage was caused by a 3rd Party, a Damage Claim needs to be processed. For more information on handling Damage Claims, please refer to the following link:

[http://library.corp.intranet/site\\_search/damage%20claims](http://library.corp.intranet/site_search/damage%20claims)

The following are the main steps to receiving and acting upon a repair notification.

1. Notification received

- a. This may be from a technician or other that noticed a problem in the field or the NOC may notify us of a network impact.
2. Assessment of the situation
  - a. Service Impact
  - b. Troubleshooting and isolation of the incident
    - 1) Should this be a planned or emergency repair?
  - c. Determination of resources needed
  - d. Cause of incident
3. Mobilization of Contractors as required
4. Repair & Restoration
5. Documentation

## 2.8 Planned Repair

A planned repair is a situation where we can schedule a repair rather than a requirement of an immediate repair due to network outage or hazardous situation. Steps for planned repairs would follow conventional design standards with the addition of damage documentation as required.

## 2.9 Emergency Repair

An emergency repair is any situation where there is either a loss of service (LOS) or a hazardous situation that needs to be rectified immediately. If unsure of whether the situation constitutes an emergency, please reach out to your immediate supervisor.

## 2.10 Records Corrections or Maintenance/Repair

If there are records corrections that needs to be done or maintenance work that affects our existing cable running line, for instance a washout that causes us to have to move the cable, the OSPE is required to open a My Support Desk Ticket to have the records updated. **This is only required if there is not a Netbuild project associated with the work.**

[https://level3.service-now.com//my\\_support\\_desk/](https://level3.service-now.com//my_support_desk/) - Request a Service>Network Services>Under GIS click **More Items**>Submit Newly Constructed/Missing/Incorrect OSP Data

**At a minimum, the following information needs to be added to the ticket:**

- Description of records update that needs to be done
  - Example: Washout repair from station 10+23 to Station 25+24
- Location: From and To (Address if available, existing as built, intersection, etc)
- City:
- State

## 2.11 Basic Project Format

All design and engineering packages for placing new plant shall be completed using the Lumen provided AutoCAD blocks and standards using AutoCAD 2014 or newer and need to be in a WGS 84 projected format. All external engineering/drafting design (including final as-builts as applicable) shall be delivered to Lumen in both a .dwg file and .pdf format.

Where existing Lumen plant is in place, projects may be drawn utilizing Lumen as built. Final as-built drawings must be drawn on existing as-builts. In locations where there is no existing Lumen as-built drawings, Lumen will provide a baseline drawing for the engineering contractor to use. All drawings must be drawn to Lumen standards regardless of base file.

## 2.12 Face Sheet

Every Lumen project must have a face sheet to identify the necessary details of the project at a glance. Each face sheet should have the following information:

### 2.12.1 Vicinity Map

The vicinity map of the face sheet should be a clear map that outlines the limits of the project. The map should have street names and arrows marking the beginning and end of the project. It should also include shadow boxes that show which project pages encompass which sections of the project.

### 2.12.2 Customer Contact Information

The customer contact information, if applicable, should be provided on the face sheet. This should include a name and a phone number whom the construction team can contact when ready to begin the project.

### 2.12.3 Building Management Information

The building management contact information, if applicable, should be provided on the face sheet. This should include a name and a phone number whom the construction team should contact before beginning work on the property.

## 2.13 Call Before You Dig Logo

Each face sheet must have a "Call Before You Dig" logo that should be located in the bottom right hand corner of the sheet. Approved versions and rules regarding the use of the 811 logos can be found at [www.call811.com](http://www.call811.com). The following is the logo used in most states:



### 2.13.1 Construction Units

Every Lumen project must include a list of the applicable construction units for that project. A list of the construction units and their descriptions can be obtained by contacting your Lumen representative. The contract design firm must be familiar with these units and when to use them. The unit list for each project must be reviewed by the Lumen OSPE during review of the design, before sending to construction.

## 2.13.2 Dimensions

Stationing is required on most Lumen projects. In the event it is not used, dimensioning should be on the project to provide a running line and/or location for the placement of facilities. If using stationing instead of full scale drawings, stationing marks along trench running line are at a minimum required at every bend in the conduit on either end of the manhole (access point), at every riser, transitions between public and private ROW, and every 100'. Aerial plant will require stationing at every pole where strand is attached to support the project (including overhead guys). These requirements are at a minimum. Common sense should dictate other locations where stationing is required.

ROW and/or Easement dimensions should also be provided on every Lumen project where facilities are to be placed in the ROW or Easement. This is especially important if the same project prints used for placing are also utilized to gain the appropriate permit. Showing these dimensions on the project gives the construction contractor a clear idea of where they need to be and helps eliminate accidental placement on private property.

### Standard Scale

It is recommended the maximum standard scale on 11x17 paper to be used for underground on each project is 1" = 50', aerial is 1" = 100'.

## 2.14 Method of Construction

When designing a Lumen project, a method of construction should be noted on the project. If more than one method of construction is to be required, the location of the change should be noted on the print.

There are several approved methods of construction including underground trenching, directional boring, plowing, and aerial placement. When determining the method of construction, the most cost-effective solution should be used although consideration should be given to the amount of disruption, potential damage, and impact to the ROW or customer property.

## 2.15 Running Line

The location of underground fiber in the ROW or easement is very important. Be sure to design the running line as far back in the ROW as possible to avoid possible forced relocations in the future. This also allows for less damage from other utilities that are placed in the ROW. Keep running line changes to a minimum. If the cable meanders back and forth in the ROW, it has a much higher chance of being damaged during placement of other utilities in the ROW.

Clearly mark the running line of the cable on the project drawings using offset measurements as appropriate. Sever running line changes that are needed once construction has begun should be discussed before placement to ensure the fiber will still be in the ROW or easement and that the changes are necessary.

There are standard clearances from other utilities that should be maintained when placing underground fiber optic cable. Please check the local and state requirements for your area to determine proper clearances.

## 2.16 Railroad Access

For gaining access for Laterals, Right of Entry and Over pulls within the Railroad Right of Way please reach out to the Network Infrastructure Team.

## 2.17 Forced Relocation

Relocations Project Managers and Business Analysts work with OSP Engineers in the field to protect our Network from both physical and potentially legal issues. Therefore, all inquiries & notifications need to be centrally tracked. All notices or inquiries concerning potential relocation projects or conflicts with our physical network should be routed to our National team's inbox immediately for screening and official company response: [NationalRelo@CenturyLink.com](mailto:NationalRelo@CenturyLink.com) (Inbox email addresses subject to change later in 2018) Relocation Business Analysts receive and screen initial notifications and review our records for potential conflict and log these notices to our Corporate Database. Here is the link to the Relocation Guidelines: [OSP Relocation Process Guidelines](#)

## 2.18 Building Access

The objective of the BEA Drawings is to provide the landlord with visual depictions and scope of what Lumen intends to install in their building. The drawings and scope are used by the BEA Team to communicate to the landlord the scope of our proposed presence. They will serve as the basis from which to negotiate building access rights with the landlord and become an Exhibit to the Building Access Agreement when required. To help identify valuable information and remain consistent market to market, a Building Access Request form has been created to assist you. The Building Access Request form is initially populated by the sales associate with building contact information and attached to the CAT.

The scope of work should outline when these are required and if they must be certified, if scope doesn't state certified drawings are required then work can be self-performed if preferred.

The elements to be included in the drawings are:

- The locations where Lumen intends to enter the private property.
- The building entrance link(s) – depiction of existing and proposed new entrance infrastructure and method of installation: trenching, boring, size of conduit, etc. Note: Underground building penetrations will be made with steel sleeves, or as mandated by building engineer, and shall never compromise the architectural structure of the building.
- Equipment and Facilities to be placed in the MPOE.
- Risers to be utilized – existing and/or new installation.
- Equipment room where Lumen equipment is to be installed with space dimensions of the Equipment Room and Equipment footprint.
- Power needs and source to be identified and depicted.
- Pathways utilized inside the building connecting MPOE to equipment spaces and facilities demarks – existing and/or new pathways to be installed.
- Any additional facilities to be installed on the subject property that complete the full scope of the build (OSP and ISP elements). This will be requested on either pre-construction or full construction NetBuild kick off basis but must be an approved project with funding provided. As part of either the Outside Engineering or Field Engineering task (one or the other may be received based on project type) this activity should be completed as defined by the scope of work.
- The level of detail contained in the drawings is dependent upon the individual landlord's requirements necessary in order to obtain approval to close a BAA. The minimum requirement is an excel General Depiction drawings incorporating elements described above.
- When required by landlord, Detailed Engineering drawings most typically produced by construction.

## 2.19 Common Dmarc

This section is meant to reference the design criterion for Common Dmarcs deployed throughout the network. In some scenarios, a Collector Node will be deployed as an aggregation point for several Common Dmarcs. A collector node may also be used as a fiber distribution point to aggregate traffic. The specifications for the Collector Node will have minor variations as stipulated below or by the individual scope of work.

- **Common Dmarc** – a Point-of-Presence located within a building that is intended to serve all potential customers within the building via electronic solution or dark fiber extension. A Distribution POP will typically be served via a single lateral and should be centrally located in a dedicated or common area of the building. Common Dmarc layout models will vary depending on prospective customer base, space availability and availability of suitable power within the building.
- **Collector Node** – a Point-of-Presence in a building that will be used to serve customers in a cluster of buildings via transport equipment or dark fiber extension. A Collector Node will typically be served via diverse laterals and contain at least 3 racks and will typically require provisions for access to emergency generator power or an umbilical for a roll-up generator.

## 2.20 ISP Construction Guidelines

### Selection of Distribution POP space

This section shall govern all new building adds (including single tenant buildings - understanding that single tenant buildings can be subdivided into multi-tenant buildings in the future) and for existing sites that require an augment to be brought up to these standards.

When deploying into a building, the preferred location for the Lumen Distribution POP is to be on the same level as the MPOE. Either a dedicated or common area space is acceptable. If the building is located within a flood plain, then consideration should be given to the floor level such that the Lumen Distribution POP is located above anticipated flood levels.

Space selection for the Distribution POP will be at the discretion of the GFS Field Planner with input from the OSPE and Metro Planner and will typically be identified during the initial site survey. Consideration for prospective customer base, space availability within the building and availability of suitable power will be primary contributing factors in DistroPOP space determination. Refer to the [Typical Distro POP Models.doc](#) for standard models:

There may be circumstances where specific site requirements exceed the Typical Distro POP Models.doc specifications and those will be identified on a case-by-case basis. Ideally, the space should be secured by a lockable door or caged area. If a common area is to be used, then locking cabinets may be deployed in lieu of a caged area.

Heat loading from the rectifier and telecom equipment needs to be taken into consideration, and the chosen space should have adequate ventilation. House cooling is the preferred method for cooling of the space. Supplemental cooling is not planned as a part of these Distribution POP's; however, consideration should be given to determine if the planned space will be at risk for exceeding the alarming thresholds for equipment (50°F to 100°F). In instances where there is concern for potential temperature thresholds being exceeded, Network Planning will evaluate the appropriate supplemental requirements.

A floor load capacity rated at a minimum of 100+ lbs. per square foot is required.

### Riser System

Typically, only a fiber optic riser system will be constructed in multi-tenant buildings. All installations should follow Lumen standards, local building codes and building requirements. Copper or coaxial facilities will only be used as part of a specific approved business case.

Riser cabling should be designed to the specifics of the building and the prospective customer base. The distribution riser cable should be appropriately sized depending upon the number of prospective tenants to be served with the guideline of 6 fibers per prospective tenant, and a minimum fiber cable count of 48. If no tenant information is available, the riser is to be designed with 4 fibers per floor. If the Distribution POP is to be located on an upper floor, the riser should be appropriately sized as listed above for distribution to tenants, plus 24 fibers to serve the POP. Consideration of the planned riser conduit sizing should also be considered when sizing the distribution riser cable (i.e. if the conduit size will only allow a single fiber cable - oversizing the distribution riser cable would be appropriate).

The riser system should be designed to integrate seamlessly with the existing building riser system and not interfere by obstructing any pathways. Any FDP's or splice cases need to be out of the way of existing or future riser cables/conduits.

A small coil shall be placed on every third floor to be available to serve customers one floor above, below, or on the same floor. The density of the coil should be a minimum of 50 feet and not to exceed 100 feet to provide appropriate slack for the adjacent floors.

In buildings that utilize a rigid conduit, Lumen will deploy conduit that is properly sized to pull the appropriately sized fiber through without friction. All junction boxes shall be NEMA1 rated.

When using a Corning FlexNap solution it is recommended that a 4 fiber/floor solution is implemented to serve a typical multi-story building. However, the tenant density and potential bandwidth demands should be evaluated to determine if a 6, 8, or 12 fiber/floor solution is required. In such cases, the FlexNap taps shall be placed at three-floor spacing (in a four fiber per floor solution, each tap would be a 12-fiber tap).

In instances where the Distribution POP is located on a floor above the basement or MPOE level, construction of a parallel integrated distribution riser should be designed and constructed at the time of the Distribution POP.

## 3. Underground Construction

### 3.1 Handhole/Manhole/Vault (Access Point) Locations

It is strongly recommended that an Access Point be placed along a metro cable route at least every 1000' to allow for easier cable placement and access. For Intercity applications the minimum access point placement is 5280'. It is recommended that no more than 270 degrees worth of bend radius be allowed before placing an access point, however, the design should never exceed the manufacturer's recommended pulling tension. There should also be an Access Point located on both sides of any major crossings such as RR, Interstate, Waterway, and in locations where future access to the cable is anticipated.

Consideration should be given to items such as future needs, major water crossings, highways, RR's, multi-tenant buildings, ingress/egress, future road projects, and riser locations, just to name a few.

In building applications, Access Points should be placed in a location that allows for easy access while taking into consideration potential impacts to building tenants and aesthetics. For slack storage in Access Points, please see the "Slack Storage" information contained in these standards.

It is recommended when placing a new Access Point that is a splice location, an 8' 5/8" ground rod with #6 copper wire attached and coiled in the vault should be shown on the design.

Where appropriate, access point installation should include the placement of the racking and follow the manufacturer's recommended placement guidelines and load requirements.

All Access Points must be appropriately sealed (i.e. Grouted etc.)

## 3.2 Conduits

Lumen does not direct bury fiber. All underground fiber must be placed in a duct in accordance with the Lumen Construction standards or the governing permitting authority requirements, whichever is greater. Lumen utilizes primarily Orange, Green, Blue or Black conduit. The minimum depth for Metro fiber is 36"; however, the local permitting authority requirements prevail. For building applications, the fiber must be placed in the appropriate rated duct per the NEC or the local building code, whichever is more stringent, for the environment.

When designing conduit, the appropriate number of conduits must be designed to be sufficient for growth in the area and the cable being placed. Ideally you should be considering conduit placement for at a minimum, the next 20 years. Details such as forecasted growth, market opportunity as well as cost, length and difficulty of placement should be measured.

- For backbone a minimum of 2-1.5" conduit pathways or sufficiently sized conduit for the growth in the area, shall be included in the design.
- For intercity design consideration should be given to future growth and existing cross-sections of conduit; however, a minimum of 3 – 1.5" conduit pathways or equivalent should be included in the design.
- For customer laterals, a minimum of 2-1.5" or equivalent conduit pathway should be included in the design if not using existing customer owned duct.
- All Lumen conduits shall terminate directly into manholes, handholes, vaults, buildings or stubbed up a pole into a u-guard, per the Lumen Construction Standards.

## 3.3 Method of Placement

It is the responsibility of the Lumen OSPE to determine the best and most cost-efficient method of placement for a project. The most common methods for placing underground fiber are directional bore, trenching and plowing. Micro-trenching is also used albeit rarely. The feasibility of the placement along with consideration of field conditions must be reviewed in the determination.

## 3.4 Crossings

Whenever possible major crossings such as interstate, waterway or RR should be avoided due to the cost of placement, permitting fees, and difficulty of placement. Future maintenance, congestion of the ROW and future relocation requirements are also a concern. In the instance where it is not possible to avoid these crossings, the Lumen OSPE should research the permitting authority requirements on depth, distance, and fees associated with such crossings in order to determine the most safe and economical design possible. The OSPE may also reach out to the regional Implementation Services 3rd Party Fiber and Right of Way Contract Acquisitions regional manager for assistance with the due diligence.

## 3.5 Slack Storage

When designing a new underground fiber route, sufficient slack must be placed in strategic locations to best optimize the use of the cable for future needs. The minimum requirement for metro cable is 100' slack located every 1000' and in access points that could be utilized to serve future businesses.

For Intercity, the minimum requirement is 100' slack loop at every access point.

When designing slack, the amount needed may depend on the location of the loop. For instance, if the splicing truck cannot park directly adjacent to the access point where the slack is stored, additional slack may be needed so the loop can be pulled into the splicing vehicle.

There should also be sufficient slack storage at the dmarc location of a building to allow for splicing. A minimum of 65' is recommended.

## 3.6 Locate Wire

All Lumen underground cable must be locatable. This can be done in a couple of diverse ways. If the cable is dielectric, a locate wire must be placed. If the cable is armored, a locate wire is not required as long as the integrity of the cable is maintained.

In areas where a di-electric cable will be placed in a newly placed duct or in situations where duct only is being placed, the design should include placement of a continuous #10 AWG locate wire in the trench or bore hole to be terminated to a ground lug in the access point or at an above ground marker post or in a pedestal if allowed by the permitting authority.

If placing di-electric cable into an existing duct, the locate wire should be pulled into the conduit with the cable. The locate wire must be terminated to a ground lug as per above paragraph.

## 3.7 Locate Management System

A location management system is a system that provides continuous signal using a remotely controlled transmitter housed in a Central Office or other centralized location. Tone on individual routes can be turned off and on remotely via phone

Permanent tone should be provided on all intercity backbone and where appropriate on intracity backbone routes. Grounding units with surge protection to be used at all OSP splicing locations. Laterals will be designed to be located via portable tone generation as a rule. Side leg bonding should only be done in special situations as warranted by unique circumstances where portable tone generation isn't an option and backbone tone will not be impeded.

Rack mounted units are preferred for generation of permanent tone. Tone generators should be spaced among sites for maximum efficiency in a leap frog configuration. Tone generators to be specified with the proper channel capacity for sufficient coverage of more than two cables in sites with more than two backbone terminations

# 4. Bridge and Fixes Structure Attachments

## 4.1 General

This practice describes methods for the placement of Lumen conduit and fiber optic cable onto bridges and fixed structures. In this context, a fixed structure is defined as a tunnel, wall or other permanent surface to which Lumen will attach conduits, cables, devices or support structures.

## 4.2 Design Guidelines

The following factors must be considered before designing bridge or structure attachments:

- Acceptable engineering techniques
- Accessibility for construction
- Aesthetics
- Alternative routes
- Economics
- Environmental considerations
- Ownership
- Permitting agencies and requirements
- Security
- Structure building materials
- Type of structure
- Worker safety

All bridge and structure attachments will be considered and designed individually. There is no single standard type of bridge or structure attachment. Each situation is unique, and each attachment must be engineered with a particular bridge or structure in mind. However, bracket types and associated hardware should be limited to Lumen standard designs when possible. Non-standard bracket designs and associated hardware must be submitted to the appropriate Lumen representative for written approval prior to incorporation into an engineering design.

The design engineer is required to obtain copies of all available bridge drawings from the permitting agency / structure owner. The design of bridge attachments shall minimize bends and to the greatest possible extent shall maintain a horizontally and vertically straight conduit alignment. If there are expansion joints in the bridge design, a conduit coupler that allows for expansion or an attachment that allows for conduit movement should be utilized.

Due care and consideration will be given to future bridge construction, relocation, maintenance and the impact on the conduit system.

Bridge attachments will be placed as high on the structure as practical, but always above the bottom of the bridge.

If future bridge reconstruction and/or maintenance is anticipated, consideration should be given to the possibility of using split GSP, slotted GSP or split GSP collars and to storing extra cable in adjacent handholes.

Lumen approved conduit materials for attachment to bridges and fixed structures are:

- Galvanized Rigid Conduit (GRC)
- Split or Slotted Galvanized Steel Pipe (SPGSP)
- Bullet Resistant Fiberglass (with Lumen approval)
- High Density Polyethylene (HDPE)

Generally, head walls may be core bored if required. However, the core bore must not cut any rebar. The core bore must be sleeved with Schedule 40 GSP/GRC and concrete grouted. Link Seal inserts may be used in lieu of GSP/GRC and grout, if approved by the owner of the structure.

Conduit will not be attached to draw, swing or other type of movable bridges or structures. Conduit will not be attached to wooden bridges or structures unless no alternative placement method is available. Approval for attachment to wooden bridges or structures must be obtained in writing from the appropriate Lumen representative and the structure owner.

Handholes will be placed at both ends of bridges at which locations a transition from the conduit used to cross the bridge to HDPE will be made.

All casings will be equipped with a minimum of three corrugated innerducts. When designing conduit, the appropriate number of conduits must be designed to be sufficient for growth in the area and the cable being placed. Ideally you should be considering conduit placement for a minimum the next 20 years. Details such as forecasted growth, market opportunity as well as cost, length and difficulty of placement should be measured.

All attachment brackets will be hot-dipped galvanized. Attachment brackets will be placed to adequately support the conduit structure. A general guideline would be attachment at optimum intervals of ten feet (10'). Bracket spacing to fifteen feet (15') may be allowed in special cases.

Design must also include vibration-dampening materials for easing vibration stress caused by rail or road traffic. Neoprene insulators or equivalent will have a minimum of one-quarter inch (1/4") thickness. When embedding bracket studs in concrete, an epoxy cartridge will be used. Welding to a metal bridge or structure is not allowed unless otherwise approved in writing by the appropriate Lumen representative and the permitting agency / structure owner.

All nuts (top cone lock-nuts, side-lock nuts or equivalent), bolts and lock washers will be of stainless steel or hot-dipped galvanized design. A length equal to one diameter of the bolt will be exposed after nut is in place.

The design engineer is required to obtain copies of all available bridge drawings from the permitting agency / structure owner. The design of bridge attachments shall minimize bends and to the greatest possible extent shall maintain a horizontally and vertically straight conduit alignment. If there are expansion joints in the bridge design, a conduit coupler that allows for expansion or an attachment that allows for conduit movement should be utilized.

Due care and consideration will be given to future bridge construction, relocation, maintenance and the impact on the conduit system.

Bridge attachments will be placed as high on the structure as practical, but always above the bottom of the bridge.

If future bridge reconstruction and/or maintenance is anticipated, consideration should be given to the possibility of using split GSP, slotted GSP or split GSP collars and to storing extra cable in adjacent handholes.

## 4.3 Drawing Requirements

Drawing requirements for bridge crossings will be dictated by the permitting authority but at a minimum will require three views: plan, profile and cross section.

Bridge drawing will be incorporated into the construction drawings. Bridge and construction drawings will be properly cross-referenced.

Drawings will reflect each section of structural changes, with a cross section for each structural change.

Drawings will also include the following:

- Method of attachment and attachment bracket details, location and spacing with all appropriate measurements and manufacturing notations that may be required
- All appropriate handhole and pull box locations and conduit, sweeps and riser details
- The location of all expansion joints, which should be placed at the same location as the bridge expansion joint and have a capacity to expand and contract greater than, or equal to, that of the bridge's joint
- Tie-down measurements for conduit placement

- Any special construction requirements and/or restrictions
- Attachment bracket details for each bridge and will be of sufficient detail for fabrication.
- All nut and bolt specifications
- Complete materials list
- All core borings
- References to milepost locations, railroad bridge numbers and construction drawing sheet numbers
- Directional arrows and north arrow
- Pertinent permitting information and contact numbers
- All appropriate road, railroad, stream, river and/or creek names and direction of flow
- Special construction materials, conduit size, conduit type and innerduct specifications
- The height of the bridge above the road or water will be shown to the bottom and top of the bridge structure
- If the bridge is over water, the depths of the water will be indicated
- Single or multiple duct placement and note the ducts occupied by Lumen

Bridge drawing will be incorporated into the construction drawings. Bridge and construction drawings will be properly cross-referenced.

## 5. Aerial Design

Lumen's preferred method of cable placement is underground. At times it may be a requirement to place aerial cable instead of underground due to extenuating circumstances. Condition of poles, recurring fees, number of attachments, clearance and safety concerns must all be taken into account when considering aerial placement.

### 5.1 Pole Attachments

At times, it may be more cost efficient to attach to existing poles owned by other utilities than it is to place cable underground or build a new pole lead. Consideration of recurring pole rental fees, number of utilities already on the pole line, anchor and down guy requirements, clearance issues, and potential make ready requirements should be taken into account when attaching to a pole not owned by Lumen. The OSPE may also reach out to the National Implementation Services 3rd Party Fiber and ROW Contract Acquisition Team regional manager for assistance with the due diligence needed to determine use of the identified poles.

If you require a new master pole attachment agreement, engage the [Implementation Services 3rd Party Fiber and ROW Contract Acquisitions team](#) via Netbuild and your OSP Project Manager. The OSPE is to research the public right of way boundaries and the existing pole placement to validate the new pole provider is not on private property. Pole Attachment Agreements generally do not provide the underlying land rights for our attachments and will require Lumen to secure an easement. The OSPE must confirm and provide the name of the pole provider and any private property information associated with ROW occupancy. Implementation Services 3rd Party Fiber and ROW Contract Acquisition will be responsible for securing any new Pole Attachment or Easement Agreements.

If the OSPE requires an overlash of existing cables on existing leased poles, OSPE is to advise the Lumen Project Manager via NetBuild to engage the Implementation Services 3rd Party Fiber and ROW Contract Acquisition regional manager to review the existing Agreement for process and defined use.

Implementation Services 3rd Party Fiber and ROW Contract Acquisition may also be engaged for existing Agreements, to assist with long lead times with pole providers and specific design requirements.

The pole provider's engineering guidelines may change upon attachment submittal to the pole owner. This will serve as the OSPE's notice of engineering requirements. These engineering changes will need to be adhered to and design changes made.

If the OSPE is proposing attachments on Lumen owned poles, the Joint Use team is to be engaged for review and attachments inventoried.

## 5.2 Tagging

When placing cable in an aerial environment, it is a requirement to tag the cable. Cable will have a 4" to 6" slack loop and fiber warning tag at every pole and at every building entry. Many pole owners require specific colored tags for each utility that attaches to their poles. Be sure to check with the pole owner for their specific requirements and note the drawings accordingly.

When placing a Lumen pole, the pole must be tagged with the unique ID that matches the fiber inventory system.

## 5.3 Stand Size, Grounding, Down Guys

- Strand - Minimum 6.6M 1/4 EHS. (or greater as required by Lumen, pole owner, or permitting agency)
- At a minimum, Strand will be grounded at 1/4 mile intervals with #6 copper wire bonded to power company MGN/MGNV (if permissible) or to a 10-foot long copper clad 3/4" ground rod.
- New anchors shall be 3/4" (minimum) when required and shall be noted on the engineering drawings.
- Slack spans may be utilized when necessary but should be kept at a minimum and only when the sag will not exceed the minimum clearance requirements
- All corner poles will be guyed where the change in direction exceeds 4'.

## 5.4 Clearance

Aerial plant clearance requirements are based on the National Electric Safety Code (N.E.S.C.) and shall meet all requirements of the governing authority.

The cable is classified as a fiber optic supply cable as described in the N.E.S.C...

## 5.5 Anchors

Down guys and anchors are to be utilized at the end or beginning of an aerial lead and at every location where there is a directional change greater than 4' or as required to maintain the structural integrity of the pole lead. There are several types of anchors to choose from. The scenario, type of soil, and weight of cable determine the most applicable material to use. Two of the most commonly used anchors are listed below.

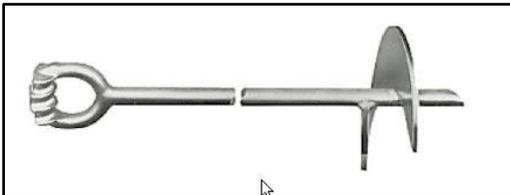
One anchor is the multi-blade, one-piece top plated expanding anchor that expands upon impact into undisturbed earth to form a cone shaped square, which distributes the anchor's holding power over a wide area, building up compression against an inverted pyramid of earth. The expanding anchor retains its shape under extremely heavy loads because the base plate supports the blades in the middle and distributes the load uniformly over the blades. Reinforcing ribs provide additional strength.

Figure 1 - Expanding Anchor



The other type to use is the screw anchor. This anchor screws into the ground and the down guy is fastened to the eye of the anchor for supporting the pole line sag.

Figure 2 – Screw Anchor



## 5.6 Make Ready

A make ready is when existing attachments on a pole need to move to make room for another utility to attach to the pole and maintain proper clearance.

When designing aerial cable, make ready work should be identified early in the process and the requests submitted as soon as possible due to the lead time the work generally takes to get completed. The existing pole attachment agreement dictates how make ready requests are handled.

Many times, there are specific timeframes allowed for make ready work which are outlined in the pole agreement. It is imperative that the Outside Plant Engineer be familiar with the existing pole agreements that are in place for their markets and respond accordingly to all make ready requirements requested for Lumen adjustments.

## 5.7 ADSS

ADSS or self-supporting cable should only be used in situations where the specific requirements warrant it. An example would be a short section into a building where there is no way to place strand. When placing ADSS cable, adherence to the ADSS standards from the cable manufacturer is required.

## 5.8 Wind Loading

In many areas wind loading calculations are required to request a pole attachment, or to add to an existing one. There are several wind loading calculation software applications that may be used for this. It is a requirement that the Lumen OSPE and the OSP Engineering vendor be familiar with the wind loading specifications and requirements for their area. When designing

aerial projects, it is a requirement that the engineering vendor provide the OCALC documentation with the design package. This information must be stored with the rest of the drawing package for future reference if needed.

## 5.9 Aerial Conduits

Aerial conduits are used in situations where additional protection is required for the fiber cable or where we may need to pull an additional cable over a difficult aerial crossing. It can also be beneficial where scheduling difficulties in new cable placement require the crossing to be done at a different time than the overall construction.

Some examples of areas where an aerial conduit might be helpful include areas of heavy vegetation, highway, RR, or water crossings and areas where we have severe pest issues. The recommended size for an aerial duct is a minimum of 1 ½" HDPE type conduit. You must verify that the governing authority of both the crossing and pole owner will allow use of the conduit. Aerial duct type, span loading and anchors must be called out in the design.

## 5.10 Slack storage

When designing an aerial fiber route, sufficient slack must be placed in strategic locations to best optimize the use of the cable for future needs. The minimum requirement is 150' slack located every 1500' and locations that could be utilized to serve future businesses. Slack storage must be stored in snow shoes.

When designing slack, the amount needed may depend on the location of the loop. For instance, if the splicing truck cannot park directly adjacent to the pole where the slack is stored, additional slack may be needed so the loop can be pulled into the splicing vehicle.

# 6. Fiber

## 6.1 Fiber Cable

Standard Cable Type is (SMF28) single mode, single armor, single jacket, loose tube is the standard for most underground and aerial applications. Standardize on the sizes. In some instances, it is acceptable to use an all dielectric design if the cable will be in a highly conductive environment such as leasing a duct from a power company or if the cable is utilized as a building entry cable. It is also acceptable to use an indoor-outdoor cable for building entries or a riser rated or plenum cable for interior building applications.

### 6.1.1 Matching Fiber Types

When splicing OSP cable, every effort should be made to match like for like fiber types to avoid core size mismatch at the splice point. Spliced fiber spans with mismatched cores have been found to restrict wavelength capacity on DWDM systems deployed within the network resulting in costly remediation. For this reason, all planned projects (non-outage related) shall match like for like fiber cable types, where possible, to the existing fiber it will be spliced to. Example: True Wave to True Wave, All wave to All wave and Ultra to Ultra.

Where matching like for like fiber type is not possible, such as product availability or inherent route design, fiber cable type selection shall match as closely as possible to the existing fiber's Chromatic Dispersion (CD) characteristics and core size to reduce the effects of core size mismatch. There are a number of dissimilar fiber types with matching core sizes that will differ by CD coefficient. First consideration should be made to match core size and secondly to match

as closely as possible the CD coefficient. Newer Corning Ultra and Ultra Low Loss fiber have a unique Mode Field Diameter that make the core size appear extremely large when viewed unidirectionally. For this reason, in the unlikely event dissimilar fiber type must be spliced into existing Ultra or Ultra Low Loss fiber, then ONLY SMF28 or Allwave should be considered. When dissimilar fiber types are spliced, it is critical fiber testing is completed and results are reviewed and accepted by the FQA team (Fiber Quality Assurance team) prior to commissioning. Follow the [L5 Methods and Procedures Fiber Testing and Acceptance Process](#).

Exception shall be made for emergency restoration where immediate repair is needed, and available fiber type is limited. In these circumstances it is permissible to temporarily splice dissimilar fiber types with the understanding the permanent solution will replace the cable with one of matching or closely matching specifications.

\*Going forward MetroCor fiber will be exempt from following the matching fiber type policy due to industry availability. LEAF is an approved alternative when splicing to existing MetroCor.

## 6.2 Fiber Sizing

### 6.2.1 Building Laterals

When designing a building entry project, the cable should be sized with sufficient spare fibers to allow for growth along the given route to the building. While the minimum cable size for a lateral to a building is a 24-count fiber, consideration should be given to the requirements of the building, both long and short term. For instance, larger buildings or campus environments may require a higher count fiber based on their future needs. Long laterals with potential for future customers along the route, should be considered a backbone extension and the appropriate size fiber should be used.

### 6.2.2 High Capacity Buildings

When designing high capacity buildings such as data centers, stadiums, and high-rise buildings, the cable should be sized with sufficient spare fiber to allow growth to the building. The minimum cable size for one of these types of high-capacity buildings is a 48-count fiber. The OSPE should consider the size and potential customer capacity of the building when designing the fiber to ensure future needs will be met.

### 6.2.3 Metro Backbone

For backbone design, the cable should be designed utilizing growth potential in the area combined with scalability and cost efficiency. For instance, if you are planning to build backbone in a downtown area where the construction will be costly and difficult, it may be a good idea to scale the cable up to eliminate the need for a larger cable in the near future. Care should be taken to place the cable along a route that will provide Lumen with the most opportunity. The minimum standard for backbone size is a 288-count fiber optic cable for many areas. There are some metro markets that require a higher count fiber. It also may be appropriate in some situations to install a smaller count to be utilized for backbone. However, this requires Regional VP approval. Planning and the OSPE should work together to determine the backbone cable size that is needed for each situation.

## 7. Dual Entry and Diversity

Statistical analysis conducted by A&E has shown that we can meet current SLA's with single laterals off of fiber rings up to ½ mile long. Therefore, Lumen will not build a second lateral to any site if the first (shortest) lateral is less than 2,500 lineal route feet.

If the first/short lateral is longer than 2,500 lineal route feet, then a second lateral should be completed. The second lateral should be built, at a minimum, to a point that it either enters the target building or intercepts the first lateral within 2,500 feet of the target building (cost savings preferred). Depictions of this approach are shown on the following pages.

The purpose of this policy is to lower the cost of new building adds while still supporting current Lumen Service Level Agreements (SLA's). Deviation from this policy must be pre-approved by one of the following:

- Vice President of Network Planning
- Vice President of Field Operations

The full Dual Entry and Diversity policy can be found by clicking on the following link:

[OSP Lateral Policy Single and Diverse 2015.02.06.docx](#)

## 8. Spurs off the Backbone

At times it becomes necessary to build a longer lateral or spur off of the backbone. These laterals are potential problems for the network and should be limited to only where absolutely necessary. Laterals over 1 mile require approval from the Field Ops Director.

## 9. Splicing

There are currently two Change Management processes that must be followed for splicing work that is done on the Lumen network. As we integrate Lumen and fLVLT processes, changes will be communicated and this document will be updated accordingly.

The fLVLT splicing template may be found by following the following link:

<http://portals/gfs/Shared%20Documents/GFS%20Support%20Teams/Supply%20Chain%20Management/Home.aspx>

The template contains location tabs for providing splicing instructions to the field and rate card units that will be used by the CPT team to input the splicing project into the PET. Once the splicing is completed in the field, the splicer must fill out the actual units and provide as built information on the template.

For Lumen National splicing, the following link will provide the requirements. [CTL National Change Management Process](#)

When splicing to a 3rd party leased fiber network, the Implementation Services 3rd Party Fiber and ROW Contract Acquisitions regional manager is to be engaged via NetBuild for contract review and splicing requirements. For example, Zayo, Lumos, and Wide Open West have specific requirements when requesting a new splice. Generally, Lumen cannot perform the splice on 3rd party leased fiber networks. Implementation Services 3rd Party Fiber and ROW Contract Acquisition is also responsible for paying 3rd party fiber splicing invoices. These are typically paid via the project code or FRM.

## 9.1 Fiber Identification Impairment Tickets

GCR's require information on the fiber down to the port at the equipment level so that we can correctly identify the customers that need to be notified for the GCR. If that information is not currently in our records, we need to gather it at the site. If you cannot safely trace out the fibers from the FDP to the equipment, you will need to notify the TNOC to do a verification. To do this, an impairment ticket must be opened prior to doing the tracing to ensure the TNOC is able to monitor the alarms on the fiber being verified.

### Impairment Ticket

To open an impairment ticket, you will need to call in to the TNOC and request an impairment case. Explain what the circumstances are and what you are doing as well as when. It is extremely helpful if you also provide an email with a spreadsheet of the fibers you will be verifying so that the TNOC can fill out what they find as the verification is being completed. These verifications will be done at night and require a minimum of 24-hour notice. When the impairment ticket is created, you will receive a ticket number. This number will be what is provided by the technician when they call the TNOC to let them know they are ready to do the work. Once the verification is completed, the TNOC will email the spreadsheet back to the OSPE with the updated equipment TID and port that goes into alarm. This is the information that needs to be added to the splicing criteria template for the GCR so that the smackdown report can be pulled.

**Note:** It is imperative that you update your records and re-label the equipment as needed once this is done within 2 business days.

## 9.2 Fiber Characterization Policy

Fiber Characterization (FC) test results are required in assessing fiber quality and correcting non-conforming events to insure high quality Network performance. FC testing allows us to determine the characteristics of the existing (installed) fiber and to correctly provision DWDM equipment upon installation.

- **Long Haul Systems:** All new DWDM Long Haul system deployments on fibers 30Km or longer OR new spans added to an existing Long Haul integrated network system (regardless of length) will require fiber characterization to be completed prior to the new system deployment.
- **Metro Systems:** Transport Planning has the option to forego fiber characterization testing for new DWDM METRO deployments only.

Given an existing ring is likely to carry live traffic, a SA (Service Affecting) GCR is required to be scheduled in order to complete the fiber characterization. The GCR will follow all current business policies (i.e. splice template).

Link to FVR DWDM Process (request for Fiber Characterization from Planning):  
[http://nextlevel.level3.com/gsl/GSLLibrary/L5JA\\_DWDM%20FVR%20Process.doc](http://nextlevel.level3.com/gsl/GSLLibrary/L5JA_DWDM%20FVR%20Process.doc)

Link to Fiber Characterization Process (how to complete characterization):  
[https://portals.level3.com/sites/GFS/DocumentStore/L5JA\\_PerformingFiberCharacterizationTesting\\_FieldTest.docx](https://portals.level3.com/sites/GFS/DocumentStore/L5JA_PerformingFiberCharacterizationTesting_FieldTest.docx)

## 10. National Implementation Construction Standards

Lumen has created National Implementation Construction Standards which are the standards that the construction contractors are required to follow. It is important for all Lumen OSPE's to become familiar with these standards. The Standards can be found via the following link.

[https://portals.level3.com/sites/GFS/DocumentStore/L5UG\\_National\\_Implementation\\_Construction\\_Guidelines.docx](https://portals.level3.com/sites/GFS/DocumentStore/L5UG_National_Implementation_Construction_Guidelines.docx)

## 11. Permitting

Permitting is done many different ways depending on the type of permit that is required and the local permitting authority regulations. Municipality, County, and DOT permits may be obtained by the contract engineer or construction firms in Lumen's name, or by the Lumen OSPE. Other permits may need to be reviewed by other Lumen departments, i.e.; Railroad permitting. The Implementation Services 3rd Party Fiber and ROW Contracts Acquisition Team can be of assistance in helping to determine the proper team to provide assistance in specialty types of permits.

There are several items that can help with getting permits approved in a timely fashion. The most important is knowing the permitting requirements. Each entity may have different submittal requirements and understanding what those are and delivering them appropriately is the best way to ensure your permits will be approved the first time. You may also find that there are peers in our organization that have experience with the authority you are working with. Bringing up your concerns or issues on company calls such as the OSPE call can help you identify others who may be able to help.

If you have a specific issue regarding permitting, please reach out to the Implementation Services 3rd Party Fiber and ROW Contract Acquisition Team. Implementation Services 3rd Party Fiber and ROW Contract Acquisition team may be engaged to assist with long lead times or challenges with the permitting authority.

### 11.1 Knowing your markets

One of the most important aspects of permitting is to know your market and the permitting authorities you will be working with. A great way to become familiar with your permitting authorities is to attend the meetings they hold for utilities. Many are monthly or quarterly and can provide you the ability to ask questions or bring up general issues you may have. These meetings also provide you a look ahead to future road improvement projects that may be planned to enable you to potentially avoid or prepare for relocation. It is also important that your vendor is knowledgeable of the permitting requirements and has built relationships with the various authorities in the area.

The following are just a few examples of the types of permits you may encounter in a market.

- City, County, State, DOT, Utility (Pole attachment), Bridge attachment
- Army Corps of Engineers
- Light rail
- Parks departments
- Department of natural resources.

## 12. ROW Requests

For new ROW requests including franchise agreements, license agreements, public ROW, easements and encroachments, the OSP Implementation Project Manager will engage [Implementation Services 3<sup>rd</sup> Party Fiber and ROW Contract Acquisition regional manager](#) to negotiate the Agreement. Ideally, any new ROW requirements should be identified during the initial review of the CAR or CAT and the ROW team notified at that time via CAT or 3D. If this does not happen, the Project Manager should be notified immediately upon verification that a new agreement is needed. The OSPE may also reach out to the Implementation Services 3<sup>rd</sup> Party Fiber and ROW Contract Acquisition regional manager for assistance with the due diligence or need for a new license/franchise agreement.

During the design engineering, the contractor is to confirm public ROW vs. private land. Private easements can include a long lead time, are not a guarantee, and therefore are risky. The Implementation Services 3<sup>rd</sup> Party Fiber and ROW Contract Acquisition regional manager will engage the private landowner with intent to secure the easement. However, easement requests can be rejected or can be too costly. When considering an easement, the design engineer needs to be aware of the entity, i.e. private owner, municipal owner, property management company, pipeline/utility provider. Easements on agriculture/farm land need to consider potential crop damage issues and pole heights due to farm equipment. Alternatives to an easement should always be considered and provided to assist in easement negotiations.

## 13. 3rd Party Agreements (Fiber, Pole Attachment, Duct, Access)

For new 3<sup>rd</sup> Party Agreements including Pole Attachment Agreements, Master Conduit Agreements, and Dark Fiber Agreements the OSP Implementation Project Manager will engage the [Implementation Services 3<sup>rd</sup> Party Fiber and ROW Contract Acquisition regional manager](#) at project kick off (or as soon as possible) via NetBuild to secure the Agreement. This is to also include splicing on existing 3<sup>rd</sup> party fiber.

Any new 3<sup>rd</sup> party fiber requirements should be identified during the initial review of the CAR. When the Implementation Services 3<sup>rd</sup> Party Fiber and ROW Contracts Acquisition team is engaged during the CAR process a 3<sup>rd</sup> party task is to be initiated and the [3<sup>rd</sup> Party Request Form](#) utilized. Typically, the Implementation Services 3<sup>rd</sup> Party Fiber and ROW Contract Acquisition regional managers work directly with the vendor for the new quote request and service orders for 3<sup>rd</sup> party. If this does not happen, the Project Manager should be notified immediately upon verification that a new Agreement is needed.

The Implementation Services 3<sup>rd</sup> Party Fiber and ROW Contract Acquisition regional manager will need the following identified as entrance criteria in the CAR or via Netbuild for \*new\* 3<sup>rd</sup> party fiber request:

- End user if not the Customer.
- Lumen or Affiliate serving facility address
- Customer location address
- Preferred provider if one
- Number of fibers (i.e 2, 4, 12)
- Carrier diversity if needed
- Configuration point-to-point or ring
- Term; typically, the longer the term the better the MRR rate
- Narrated scope of work

The Implementation Services 3rd Party Fiber and ROW Contract Acquisition regional manager will need the following identified as entrance criteria in the CAR for existing 3rd party fiber request:

Request for new fiber lease, or splice only for node insert

**Splice Only:**

- Customer location address
- We will help with identifying the closest 3rd party providers splice manhole.
- How many fibers each direction.

**New Fiber Lease:**

- End user if not the Customer.
- Lumen or Affiliate serving facility address
- Customer location address
- Preferred provider if one
- Number of fibers
- Carrier diversity if needed
- Configuration i.e. point-to-point or ring
- Term; typically, the longer the term the better the MRR rate
- Narrated scope of work

The Implementation Services 3rd Party Fiber and ROW Contract Acquisition regional manager will need the following identified as entrance criteria for new pole attachment agreements in the CAR:

- Pole owner identified by local OSPE or planner knowledge
- Proposed attachment route
  - For CAR cost purposes we assumed poles are 150' feet apart to assume the pole count and annual per pole fee total and possibly any application fees associated to attach.
- Engineering drawings, if engaged in the NetBuild only

Lumen/Qwest ILEC duct is handled internally thru Implementation Services manager Sam Faustino for the 14 Lumen/Qwest ILEC states. Exceptions are not made, and process is same as other CLEC's requesting occupancy.

For National Affiliate duct leasing, see the Cross Network Utilization section in this document.

The OSPE may also reach out to the [Implementation Services 3rd Party Fiber and ROW Contract Acquisition regional manager](#) for assistance with the due diligence or need for a new License/Franchise agreement.

## 14. Intercity

New intercity, formally known as long haul fiber, is built infrequently. However, you may run across the need to replace or utilize intercity fiber or conduit.

### 14.1 Intercity Fiber Builds

For any new Intercity fiber builds, the current cable standard is a 288 Hybrid with 240 fibers SMF-28 Ultra Max, and 48 SMF-28 Ultra Low Loss, however, a cost study should be completed to determine the best option for the cable and conduit depending on what is needed for your specific project. Minimum conduit placement for a new Intercity fiber build is 3-11/2" innerducts

placed at a minimum depth of 36". In some cases, it may be prudent to place more or less depending on the size of fiber being placed, location, and expectation of future needs. It may also make better sense to place a larger size duct, such as 2", to accommodate a larger fiber size. For the last span into a metro market – a consideration should be made to upsize the cable for metro consumption from the Gateway to the 1st ILA on the span. (i.e. a 288 ct could be upsized to a 432 ct with 289-432 being made available for metro consumption)

Any exceptions to the above minimum requirements must have DF Product and Planning approval.

## 14.2 Replacement

As a rule, when replacing Intercity Fiber and conduit, short sections less than 2 miles should be replaced like for like. For longer replacements or high cost builds, a feasibility study should be conducted to determine the best option for cable and conduit size. Each situation should be studied for best solution and design based on requirements of the company. The Transport & Infrastructure planning and product teams will provide the final approval for intercity fiber and conduit replacement if not using a like for like replacement.

For Relocations and Permanent Restorations, the guidelines in the L5 Policy Guide Permanent NETWORK Cable Restoration and Relocation Policy for Long Haul and Metro.doc will be adhered to.

[https://portals.level3.com/sites/GFS/DocumentStore/L5PG\\_Permanent%20NETWORK%20Cable%20Restoration%20and%20Relocation%20Policy%20for%20Long%20Haul%20and%20Metro.doc](https://portals.level3.com/sites/GFS/DocumentStore/L5PG_Permanent%20NETWORK%20Cable%20Restoration%20and%20Relocation%20Policy%20for%20Long%20Haul%20and%20Metro.doc)

## 14.3 Utilizing Intercity Fiber for Localized Sales Opportunities

If there is a desire to utilize intercity fiber for local/regional use that will result in stranding of intercity fiber, 24+ fibers must be available on the intercity span and the sale must generate \$50k or more of Monthly Recurring Revenue (MRR); use of Intercity fiber will require approval from the Dark Fiber Product team and notification to Transport & Infrastructure Planning.

## 15. Capital Approval Tool (CAT)

The Capital Approval Tool (CAT) is the tool that is used to estimate and approve capital for both Direct and Non-Direct opportunities. It is imperative that the fiber inventory systems be kept up to date for CAT to be able to do the auto-estimating correctly. Although it is the responsibility for the Field Planner to keep up the Polygons and the cost per foot updated, it is important for the OSPE to provide the feedback to the Field Planner when market costs need to be adjusted.

OSPEs may also receive a task from CAT to provide hard cost estimates when needed. The following link to the CAT User Guide can provide further instruction on working within CAT.

[https://portals.level3.com/sites/GFS/DocumentStore/L5UG\\_CAT\\_FieldTraining.docx](https://portals.level3.com/sites/GFS/DocumentStore/L5UG_CAT_FieldTraining.docx)

## 16. Netbuild/BPM

### 16.1 Permissions / Queues

All OSPEs will need the appropriate "roles" within NetBuild to receive tasks and perform the necessary work. The following is a list of those roles to process any either deployment or survey requests.

- Field Services

Check your current permissions:

- Login to <http://netbuild>
- Go to Settings (Upper Right-Hand corner, looks like a gear)
- Under User Profile, reference the list of roles, i.e. OSP Engineer, etc.

Submit access for NetBuild:

- Go to My Support Desk
- Report an Issue -> Report an Application Issue -> Functional -> Insufficient Permissions -> NetBuild LVLTL.
- In additional details request access to the department role -> OSP Engineer

BPM Portal Information:

[http://portals.level3.com/sites/GFS/DocumentStore/L5UG\\_BPMPortal\\_FieldServices.docx](http://portals.level3.com/sites/GFS/DocumentStore/L5UG_BPMPortal_FieldServices.docx)

## 17. Inspection

Having an inspector on a project is sometimes required based on the type of project that is being constructed. It is recommended that you utilize an inspector for the following projects:

- High Cost Builds
- Long Builds
- Relocation Projects with Relo PM approval (All Reimbursable Projects and Non-Reimbursable Projects deemed necessary due to high cost and/or due to field conditions).

The expectation of an inspector on a project is to provide daily reports including number of people on the project, work completed, and equipment used. The inspector must also inspect all work being done to ensure adherence to the Lumen specifications and permitting regulations are being followed.

## 18. References

Name	Link	Description
National Implementation Construction Guidelines	<a href="https://portals.level3.com/sites/GFS/DocumentStore/L5UG_National_Implementation_Construction_Guidelines.docx">https://portals.level3.com/sites/GFS/DocumentStore/L5UG_National_Implementation_Construction_Guidelines.docx</a>	OSP/ISP Construction Guidelines
AutoCAD Setup Instructions Manual	<a href="https://portals.level3.com/sites/GFS/DocumentStore/AutoCAD%20Setup%20Instructions%20Manual.docx">https://portals.level3.com/sites/GFS/DocumentStore/AutoCAD%20Setup%20Instructions%20Manual.docx</a>	AC Template Setup Instructions
Detail Drawing Standards Manual	<a href="https://portals.level3.com/sites/GFS/DocumentStore/Detail%20Drawing%20Standards%20Manual.docx">https://portals.level3.com/sites/GFS/DocumentStore/Detail%20Drawing%20Standards%20Manual.docx</a>	AC Drafting Standards
LISP Reference Manual	<a href="https://portals.level3.com/sites/GFS/DocumentStore/LISP%20Programs%20Reference%20Manual.docx">https://portals.level3.com/sites/GFS/DocumentStore/LISP%20Programs%20Reference%20Manual.docx</a>	List of LISP References

Template Master Unit List	<a href="https://portals.level3.com/sites/GFS/DocumentStore/NEWCO%20Template%20Master%20-%20NAT%2008-20-2018.xlsx">https://portals.level3.com/sites/GFS/DocumentStore/NEWCO%20Template%20Master%20-%20NAT%2008-20-2018.xlsx</a>	List of Engineering and Construction Units
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## 19. Version History

The latest version of this document can be found at:

[https://portals.level3.com/sites/GFS/DocumentStore/L5UG\\_National\\_Implementation\\_Engineering\\_Guidelines.docx](https://portals.level3.com/sites/GFS/DocumentStore/L5UG_National_Implementation_Engineering_Guidelines.docx)

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Date Published	Business Process Owner (Region)	Document Writer	Summary Of Changes
7/26/2018	Joe Meissner, Rick Cook, Gabe Schnelle, Gary Pace, Heather Seabury, Bill Chandler, Nancy Servantez, Bruce Carney, Rick Jurosky, John Nagel, Jon Ellingson	Veronica McClinton	First publication.
5/28/2019	Rodney Kinnett, Darrell Smith, Rick Spencer, Erica Stockford	Erica Stockford	Added section on matching fiber types
01/03/20		Andrea Llamzon	Updated to new CTL Word template
3/10/20	Erica Stockford	Erica Stockford	Added additional information on matching fiber types
9/24/20		Veronica McClinton	Updated to Lumen template

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