UTOPIA Fiber Installation Standard

Rev. 2.0 October 16th, 2024

1. General Installation Scope

The installation of drop fiber and associated LAN infrastructure within the customer's premises is an integral part of UTOPIA Fiber's success. The details of the requirements and process of installation will be outlined throughout this document. It discusses in detail the professional manner in which all employees and contractors will conduct themselves when representing UTOPIA Fiber and its Service Providers. All installers working on the project will be required to be certified by UTOPIA Fiber prior to performing any work. This document provides:

a) List of referenced codes and standards
b) Installation guidelines and standards for the Utah Telecommunications Open Infrastructure Agency (UTOPIA) Fiber projects
c) Best Practices and standards for conduit drop installations
d) Best Practices and standards for fiber-optic home installations
e) Recommended hygiene and appearance standards
f) Reporting requirements

2. Code and Standards Responsibilities

Codes and standards encompass all aspects of the construction and telecommunications industry. Codes are mandated by law, whereas standards provide the rules, guidelines, and best practices. Standards become a directive if stated within a legal document or adopted as a corporate policy. The contractor and subcontractor are responsible for the following codes and standards while performing work on the projects, including but not limited to:

- The Engineering Standard
- National Electrical Safety Code
- National Electric Code
- Occupational Health and Safety Act (OSHA)
- Utah Blue Stakes Laws
- Worker's Compensation Board
- Applicable ANSI/TIA/EIA Standards including but not limited to:
    - ANSI/TIA/EIA-570 — Residential Cabling Standard
    - ANSI/TIA/EIA-569-A — Commercial Building Standard for Telecommunications Pathways and Spaces
    - ANSI/TIA/EIA-568 B.1 — Commercial Building Telecommunications Cabling Standard
    - ANSI/TIA/EIA-606 — Administrative Standard for the Telecommunications Infrastructure of Commercial Buildings
    - ANSI/TIA/EIA-607 — Commercial Building Grounding and Bonding Requirements for Telecommunications
- All state, city and local rules and regulations that may apply

3. Installation Guidelines and Standards

The following installation guidelines are best practices and standards that all contractors and employees will use when installing fiber to the home. Fiber to the home deployment consists of two separate fiber drop approaches usually determined by utility easement. Exceptions may exist only upon request during sales negotiation; the salesman then is responsible to inform GIS to update the customer's land type. If a change from the standard installation practice occurs at the request of the customer, it is required for the customer to sign off that they accepted the change. The contractor is expected to utilize UTOPIA Fiber's customer relationship management (CRM) software to properly provision equipment, track, log, and comment on work being performed and completed. This may require the contractor to furnish their employees with specialized equipment to do this, such as 10Gbps-capable iPads and connectors (or similar equipment). Each employee of the contractor is expected to have individual accounts and logins with CRM, both for security and for reporting purposes. The work being done should be promptly updated in CRM to provide UTOPIA Fiber and their Customer Service team with clear, up-to-date information that can be passed on to the customer. Any issues with the work which forces the contractor to deviate from the best practices outlined below should be promptly notated in CRM (along with what the contractor has been able to complete so far and what additional steps the contractor was not able to complete) so UTOPIA Fiber can properly provide support to the contractor and communicate with the customer.

UTOPIA Fiber is responsible for providing unimpeded uptime for CRM and addressing any bugs, issues, or suggestions for improvement that contractors might have. Contractors should provide specific details when reporting bugs, issues, or suggestions for improvement such as screenshots, what was being done immediately prior to the bug occurring, the time it occurred, and which customer project it occurred on. UTOPIA Fiber will work with contractors to provide a convenient way to submit these issues in a database so they can be tracked and followed up on.

4. Drop Conduit Installation Requirements

If the customer's premise has an underground power service drop, an underground fiber drop will be placed to the home. If the power utility is overhead, no conduit is necessary unless work order states differently. The customer does not need to be home at the time of the conduit installation but can request the installation occur when they are home if they would like. The following are best practices for placing a conduit drop at the customer's premise:

- 24 hours prior to installing conduit at a customer's premise, a phone call to the customer should be attempted and recorded on the work order by the contractor.
- On arrival the contractor shall attempt to contact the customer by knocking on the customer's door. A door hanger should always be left at the main door of the customer's home with a phone number the customer can call if they have concerns with the conduit installation.
- If the customer has requested to be present at the time of the conduit installation, then the installer will attempt to contact the customer thirty (30) minutes before arrival.
  - o Upon arrival the installer will walk the premises with the customer and perform their installation according to current processes and to the approval of the customer. If the customer is not home the installer will report this to the UTOPIA Network Operation Center to be rescheduled.
- A ¾ inch conduit will be installed from the network access point, utility pole or hand hole

that is designed to feed the premise.

- The conduit will be installed at a 12-inch minimum depth to avoid minor yard improvements in the future.
- Bends in the conduit must have a radius of at least 12 inches.
- Hand digging should be done in areas where delicate landscaping, irrigation systems, tree roots and other buried utilities exist. All work performed must be in compliance with Utah Blue Stakes Laws.
- Maintain and restore all landscaping and other customer owned facilities to as close as possible to the same condition as found prior to the installation.
- Placement of the conduit into UTOPIA Fiber hand-hole shall be made under the bottom edge of the hand-hole. At no time shall an installer drill, cut or hammer a hole into the side of a hand-hole. There may be some exceptions when the hand-hole is surrounded by concrete or other obstruction; then a drilled hole of sufficient diameter to place the conduit is permitted. Permission from UTOPIA Fiber's Installation Manager required before work is performed.
- At least two feet, but no more than four feet of conduit should be left protruding from the ground. Unless specified otherwise by end user.
- After conduit is installed a pull string will be installed in the conduit to facilitate the ease of the fiber to be placed in the conduit.
- Conduit shall be installed nearest to one of three options called out in the work order associated with each project. Exceptions must be approved by UTOPIA Fiber's Installation Manager prior to work being started.
    - Option 1: Cold Air Return
    - Option 2: AC Unit
    - Option 3: Gas Meter

5. Fiber-Optic Home Installation

5.1. Pre-installation Walkthrough

At the time of the scheduled fiber installation, the crew lead will complete a walkthrough with the customer to determine how the fiber drop, customer premises wiring, and equipment will be deployed on the premises. The following decisions will be made before and during the walkthrough:

- Call the customer approximately 30 minutes before arrival.
- Parking upon arrival
    - Position vehicle to drive forward when pulling away from curb.
    - Place safety cone approximately 6 feet behind vehicle and in front.
- Upon arrival for a service installation, each technician is required to introduce themselves to the customer at the homeowner's main entrance.
- Ensure that the customer or customer's representative is over 18 years of age and will be present during the entire installation.
    - If the adult present is not the customer, note this in the work order and ask if the adult present has permission to make installation decisions on behalf of the customer. If this is confirmed, continue with the installation.
    - If not, the installer will inform the adult present that the installation cannot continue and report this to the UTOPIA Network Operation Center, so that the

installation may be rescheduled.
- Explain installation process to the customer and have him/her walk you through the premise to identify:
  - o The desired location of the services on the work order for internet, video, and/or voice.
  - o To determine the location of customer Optical Network Terminal (ONT), also called a Customer Premise Equipment (CPE) be sure to take the following into account for a professional and neat installation:
    - ▪ Central area removed from living area such as a utility room
    - ▪ Power availability for the AP and ethernet switch
- Ensure power is not on a switched outlet.
    - ▪ Routing of the fiber optic cable
    - ▪ Routing of the CAT6 cable

Preferences for the placement of the ONT would include the utility room, furnace room and the laundry room. UTOPIA Fiber prefers not to place the ONT in living areas or the garage.

After the walk through, review with the customer the description of the work to be performed and receive verbal confirmation from them. When this is complete the installer can proceed with the installation.

5.2. Fiber Optic Drop Installation

UTOPIA Fiber will provide relevant excerpts of footprint maps in PDF format files available through our CRM software that will enable accurate identification of the network access point. Compare the location of the splice closure or multiport address (network access point) on the work order that provides service to the customer's premises with the map. If there are any discrepancies, the installer shall notify UTOPIA Fiber. The following steps are required when installing a fiber optic drop once the network access point is located:

- Determine proper re-entry kit to be used. (i.e., 400, 450, pre-term, etc.).
- Test light on assigned fiber or correct multiport assignment. Record the findings of light level on the work order.
- Fusion splice the drop fiber or plug in the connector for the drop cable.
- When fusion splicing the drop fiber make sure proper fiber management is practiced (i.e. place spliced fiber on bottom of the tray, followed by passthrough fibers, then future assigned fibers on top).
  - o Overhead – Attach fiber to the strand using an existing Q-clamp and wedge clamp. If there is not an existing Q-clamp, one must be installed. The fiber should be routed past the network access point and brought back to provide a slack coil in the fiber drop cable. The fiber will either terminate in a multiport using a pre-terminated fiber optic cable or fusion spliced in a splice closure. The fiber optic cable should be attached to the customer's premises on the eve of the house with a p-hook or a mast clamp.
  - o Underground – All underground drop fiber shall match existing tail length with an extra 3 to 5 feet of slack coil rolled up at the base of each tail. Each drop fiber will be identified inside or outside the closure or multiport tap with a hand-written cable tag specifying which address it serves. The fiber will either terminate in a multiport using a pre-terminated fiber optic drop cable or fusion spliced in a splice closure.

- When attaching fiber to the customer's premises or strand, maintain the minimum bend requirement for the fiber.
- The customer's premises wiring methods should be followed when installing fiber within the customer's premises.
- The fiber will be fusion spliced to a pre-terminated fiber optic pigtail.
- Light will be tested on the pigtail prior to connecting the ONT and recorded on the work order.

5.3. Customer Premise Wiring (CPW) Types and Methods

The contractor should determine installation methods (i.e., cable fishing, building wrapping, etc.), and concealment methods prior to work being done. The location of jacks and cable termination points of all CPW should also be determined at this time. Customer preference for these parameters should be considered and favored. CAT6 is the required cable type for all services.

- Cable runs should be as inconspicuous as possible and not detract from the aesthetic value of the home. Exposed cabling should be placed on the side or back of the building whenever possible to avoid visibility from the street and should be concealed to ensure the cable is protected, secure, and as hidden from plain sight as possible.
- Fiber/wire management will meet standard bending radius (determined by the brand and type of the fiber optic cable) and attachment specifications. Excess cable should be neatly bound and secured.
- Cables that cross hallways and doorways are not acceptable, except where specifically requested by the customer. A statement specifying this request should be handwritten and signed by the customer and uploaded as an attachment to CRM by taking a picture.
- When required and possible, exposed cables should follow natural profiles of the walls and ceiling and be run vertically and horizontally along the intersections of existing planes such as the mortar barriers bricks, siding beams, inside corners, along baseboards, etc.
- Entry holes should be covered with a grommet and silicone wherever possible.
- All exterior cables will be secured to premise every 12-24 inches with proper fasteners to minimize sagging.
- An RJ45 biscuit jack or faceplate is required at all CAT6 termination points as identified in the walkthrough. Biscuit jacks, when used, should be placed in low visibility areas with a minimal amount of exposed cable.
- An RJ11 biscuit jack or faceplate is required at all CAT6 termination points for newly installed Voice lines. Biscuit jacks, when used, should be placed in low visibility areas with a minimal amount of exposed cable. Where tying into existing systems, the contractor should use Scotch Locks of Dolphin style connectors to make the tie
- Where existing cable is used, the location and methods used to disconnect prior services should not prevent those same prior services from being reconnected in a reasonable manner in the future

5.4. Cable testing

- The fiber is required to be tested at the network access point (cabinet) and the ONT (home) to ensure proper light level signals to and from the network. These light readings

will be recorded on the work order in CRM.
- o Acceptable light level range: -8.5dB through -11.9dB
- Devices that are used to test light levels need to be in good working order and tested monthly against known good equipment.
  - o Results of the test should be documented and kept for a minimum of 6 months. UTOPIA Fiber reserves the right to request these tests to confirm there were no issues with the equipment at the time of installation.
- All newly placed and existing CAT6 which will be used to deliver services should be tested using industry-accepted methods. Cabling that does not test within tolerances should not be used and replaced with new. If an end is the problem, it should be re-crimped with a new end. Tools used to test CAT6 cabling should be in good working order and tested yearly against known good equipment.
  - o Results of these tests should be documented and kept for a minimum of 6 months. UTOPIA Fiber reserves the right to request these tests to confirm there were no issues with the equipment at the time of installation.
- Record the light levels and cable test on the work order in CRM

5.5. Service Installations

5.5.1. Data Service Installation

A CAT6 patch cable will be installed from the wall jack to the computer/router. The technician will verify the internet connection by using both the customer's own router or if necessary, the contractor-provided 10Gbps-capable iPads (or similar device) plugged directly into the ONT. Installers should follow the directions in CRM to connect, provision, test, and verify customer service has been set up correctly. This process includes:
- Accessing CRM and selecting the "Provision ONT" button from the specific work order task assigned.
- Scanning the barcode of the ONT being installed or manually entering the ONT MAC Address listed on the ONT, usually on the bottom or back of the device.
- Confirming with the customer the services they are receiving by showing on the installer's iPad the service to be configured.
- Connect the ONT to the customer's router and connect the iPad to the customer's router.
- Perform a speed test while connected to the customer's router through CRM.
- Review and complete the task.

Installers should also be able to complete the following:
- Verify the customer's router is set up properly as customers may not know how to configure their own routers or devices.
- Verify the ability to browse the internet by reaching Service Provider's web page and one other web page.
- Verify the appropriate IP address allocation to the customer's computer or laptop if internet browsing fails. Report this information to the UTOPIA NOC and, if directed, call the appropriate Service Provider for support.

5.5.2. Managed Routers

Some Service Providers provide managed routers as a product option for customers. When this is the case, it should be clearly specified in the work order in CRM ahead of time for the installer. This may require the installer to pick up specific equipment from the installer's or UTOPIA Fiber's warehouse in the morning before starting work or ensuring that the managed router is properly stocked in each installer's vehicle and restocking when necessary. Installers should follow the setup process specific to each Service Provider's managed router in addition to UTOPIA Fiber's installation process. This may include (but can vary by Service Provider):

- Plugging in the managed router and confirming proper boot-up.
- Taking a picture of or scanning the serial number label and sending that information to the Service Provider.
- Calling the Service Provider to confirm setup.

5.5.3. Voice Service Installation

Current phone service should be disconnected from the internal wiring at the demarcation point. Voice service from the new provider will be verified at every terminating location to ensure proper connectivity has been made. Testing of the services will include:

- On-net call to Service Provider – Installer will call from the newly installed line and be able to reach the Service Provider tech support number
- Off-net call to new voice line – Installer, when capable, will call the subscriber's new and/or ported number from his cell phone and verify that the new phone may receive calls
- Notification to Service Provider – If either the on-net or off-net call does not work then contact the appropriate Service Provider and note this failure in the work order.
- Record that the call tests have been completed.

5.5.4. Video Service Installation

If a custom CAT6 patch cable is made it will need to be tested and installed from the wall jack to the television location and connected to the set top box (STB).

- Where feasible, the connection from the STB to the ONT should be in the same manner and location as the customer currently receives service, unless otherwise requested by the customer. For example, if the customer currently receives service to a particular location though a coaxial cable that first connects through a VCR or DVD player, the STB should be connected to that device first.
- The technician will verify the STB is working properly, and the customer has video on the television set.
- The technician will program the universal STB remote with the assigned television set.
- The customer will receive basic operating STB instructions or orientation from the technician.
- All user guides and spare cables will be left with the customer along with all Service Providers' leave-behind material.
- Record on the work order these have been completed.

5.6. Installation Finalization

- The technician will complete a post-installation walkthrough of the premises with the

customer reviewing all work that has been performed. They will fix or adjust any items that do not meet the customer's approval.

- The service technician will demonstrate the basic functions of the new services installed.
- When the installation meets the customer's approval, the tech will mark the work order in CRM with the appropriate disposition and relevant notes.
  - The work order in CRM should be promptly completed with the appropriate disposition and notes before moving to the next installation.
    - If there are issues with the installation, they should be properly identified with detailed notes describing what work has been completed, what the installer has done to try to resolve the issue themselves, and what additional work needs to be done. Notes with minimal information such as "could not get light" are not acceptable.
    - Delays in recording installation information in CRM will not be tolerated. This hinders customer service from providing accurate information to the customer and harms the customer's experience.

6. Recommended Hygiene and Appearance Standards

Every installation technician working on the UTOPIA Fiber project will be representing UTOPIA Fiber, the Cites, and the Service Providers they are installing services for. The first impression will leave a lasting effect on the customer and is determined by how the installation technician presents themselves. Installation technicians should have their appearance well-kept to communicate respect for authority as well as give confidence to the customer in their abilities to perform the work. The customer needs to know that they have the "best installation technician" on the project and that they are lucky to have them there. The following dress codes and standards are required to perform installations:

- UTOPIA Fiber badge – to be worn at all times
- Maintain a clean and neat professional appearance
- Clothing should be freshly laundered and in good appearance
- Boots will need to be clean and appropriate (steel toed work boots)
- Head hair shall be neatly groomed
- Facial hair such as beards, goatees, or mustaches shall be neatly groomed.
- All tattoos shall be kept covered while working
- Remove all jewelry while working except watches and wedding rings. OSHA requirements dictate wedding bands be removed while working on aerial installations
- Shorts are not acceptable to wear during work
- A boot or shoe covering is expected to be worn when entering or working in a customer's premises.

7. Reporting Requirements

Every installation crew will be required to provide information back about the installation of inventory items and completion of the installation. Information gathered at the time of install may include, but not is not limited to, the following:

- Call ahead time

- Arrival time
- Light levels at ONT
- Speed test results
- Completion time
- Departure time
- Inventory installed
- Any issues encountered during the install
- Completed Customer survey

Reporting will be provided primarily through interacting with UTOPIA Fiber's CRM system. UTOPIA Fiber may request the contractor to track start and end times for each task via an integrated timer. Each work order task in CRM should be closed out and updated with pertinent dispositions and notes. If CRM is not available or there are extenuating circumstances, the installer should call UTOPIA Fiber's Network Operation Center promptly to log the information.

Detailed reporting will be available to the contractor for their own management purposes and the contractor may request specific reports from UTOPIA Fiber about their processes.