Gigaclear Engineering
PIA Build Guide

PIA/PON Trial Document

This document is a more recent version than that distributed in the Network Build Specification (NBS) or has not yet been distributed through the NBS and supersedes the contents of NBS 2019.12-1.

This document version must only be used for trial builds under close supervision of Gigaclear PIA/PON project teams while HSEQ guidance, as-built management tools, and other associated business processes are developed for safe and scalable build to be undertaken.

This document is provided to make internal teams, Contractors, and the wider supply chain aware of an upcoming change to the Network Build Specification and to allow for work to be conducted by Contractors as part of trial and soft-launch programmes.

Queries relating to this document should be addressed to the network-standards@gigaclear.com email address.

This document should not be solely relied upon to provide complete or adequate guidance on PIA network build operations.

Further guidance is required to successfully construct PIA network segments, including HSEQ guidance on safe working practices.

This document should only be used alongside guidance and supervision from Gigaclear teams during PIA/PON trial builds.

1. Table of Contents

2. Introduction

This document provides guidance on build methods to be used alongside other guidance in the Civils Construction Guide and Third Party Infrastructure Guide when working on PIA networks.

This document has been written to highlight the key steps and requirements for working practices in and around Openreach network segments, and should not be read as an exhaustive or complete method statement.

3. Safety Considerations

Working underground (UG) or overhead (OH) on the Openreach (OR/BTOR) network introduces many new safety issues and risks to the build process. All work planning and detailed procedure/method design must take into consideration these risks. The BT Access Network Risks document must be considered alongside Gigaclear risk assessments. This and other documents can be found on the technical portal here:

https://www.openreach.co.uk/orpg/customerzone/products/ductandpoleaccess/technicalspecifications/ductandpoleaccesstechnicalspecification.do

4. Overhead Builds

The procedures below are not exhaustive, and highlight the key steps and considerations that must be made in installing equipment and cables overhead.

All materials used at height must be formally approved materials, accepted by the Chief Engineer's Office for use on the overhead network. Failure to use correct materials can result in removal of apparatus by Openreach or safety defects that may be fatal to engineers or members of the public. Do not guess, assume, or allow new materials to be used without checking.

4.1. Pole testing

Pole tests should be performed prior to climbing a pole. The canonical document for these checks is maintained by Openreach ("Pre-climb or Pre-work check" document) and *must* be consulted and updated regularly from the Openreach portal. This document must be followed prior to climbing poles.

When surveying and as part of any routine pole tests, engineers should in particular look for:

1. Defective poles marked with a D label, or shallow poles marked S, which must not be climbed and may require replacement prior to use
2. Poles older than 17 years old with no A558 label (periodic testing markers) which must not be climbed
3. Poles with any visible damage, which must not be climbed and may require replacement
4. Power crossings on route, and joint user poles (usually marked with a J label)
5. 3m depth mark is at the correct depth on all poles (1.8m on metric and 1.83 on imperial)
6. Any low wires identified using height rods (minimum climb height for road crossing is 5.2m with a supporting A1024; wires below 5.2m must be reported to Openreach)
7. Existing wires and turns which may approach load limits set out in CP8
8. Safe climb zones around poles, and climbing hazards not crossing or within a 1m of poles or new cable routes (Chestnut palling fencing, spiked railings, greenhouses etc)
9. Poles leaning excessively
10. Space around poles for streetworks guarding, dropwire dispensers etc
11. Any safety issues on drop routes between poles and homes which may require additional management at the point of installation

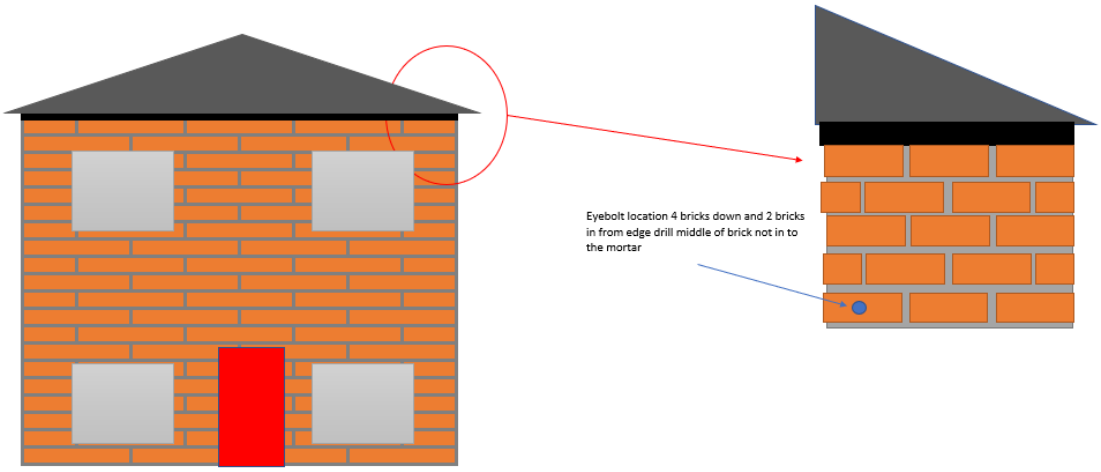
4.2. Route and pre-cabling checks

Overhead routes between poles or homes need to be checked prior to cable installation. Along each route you should look for:

1. Proximity of existing wires, power cables, and other utilities
2. Vegetation such as trees and hedgerows which may limit safe access to poles, or impinge on the cable route
3. Crossing of potential safety risks for laying out the sash line, e.g. electrical installations, play areas, pedestrian crossings, vehicle entries

At the house end check with the customer where the service will be installed and agree the overhead route making sure that there are no obstructions or other services. Ensure that all equipment to be used is safe and fit for purpose, and conduct any required risk assessments.

Fit the fixing to the wall as selected from the list below. Ensure that when installing eyebolts, the eyebolt hole is drilled 4 bricks down and 2 from the wall edge. Move further across (away from the edge) if clearance is needed from overhead power or existing fixings.



1. Fit Pulley number 6 (Mills p/n S83-2686) with clam-cleat locking mechanism at the house end, and proceed with the overhead route installation process.

4.3. Selecting house fixings

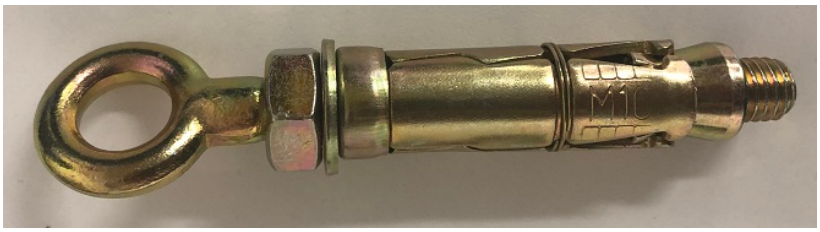
Fixings at the house must be agreed with the customer or building owner before any drilling into a wall is started. The options for brackets approved by Gigaclear are outlined below, along with their applications.

1. Crossing a garden or land with no vehicle access:

"Bracket 22" Mills p/n S83-2723 is fitted into wood if the barge board is solid and an eyebolt is not possible. 3 x no 8 1.5" screws would be a suitable fixing. A "J" bracket is also available e.g. for bungalows, "Bracket 32" p/n S83-2724

Eyebolt 1A, Mills p/n S83-2777: Used with an M8 masonry bit - remember the positioning of the fixing (4 down 2 in from the wall) on bricks. This eyebolt can only be used on exposed brick walls.

2. Eyebolt 2A, Mills p/n S83-0901: Road crossing or covered wall where brick work is not exposed e.g. rendered walls, using a M16 bit; also available as a standard bolt for fixing brackets where road crossings are required.



4.4. Installation procedures – overhead routes

4.4.1. Pole to house drop connection

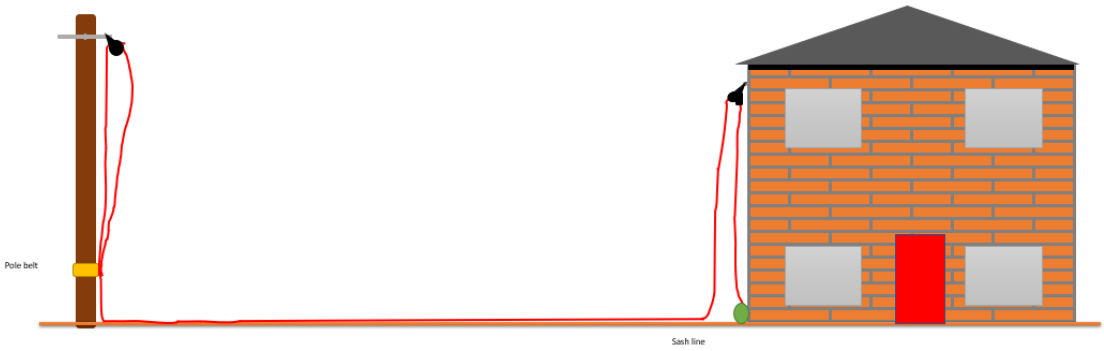
A sash line must always be installed prior to erecting the fibre cable and is used to establish a route under tension overhead. Installs start at the pole end. Perform all required safety checks.

1. Fit the pole belt around waist height. Note: arrow points up.

2. Install a pulley number 4 onto the pole ring
3. Using the sash line dispenser tie of the cut end onto the figure of eight locking mechanism
4. Take sash line up the pole through the pulley and back down tying off in the clam-cleat mechanism on the pole belt.

5. Run the sash line safely over the ground to the house; another person must monitor the line and ensure there are no risks to the public during this operation.

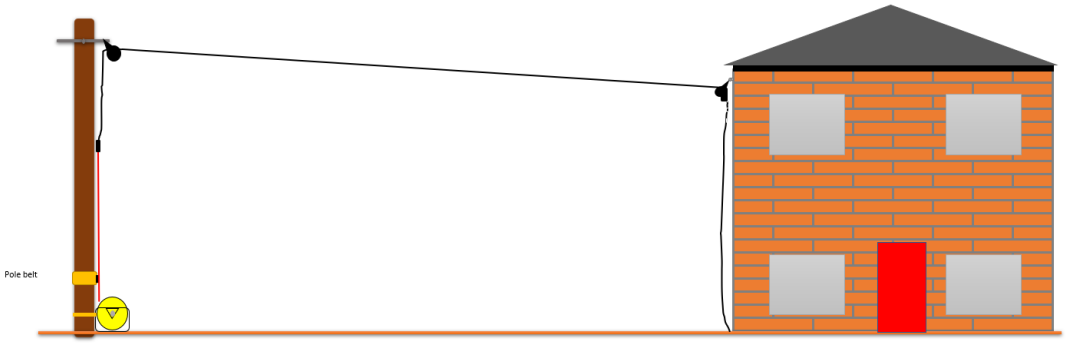
6. Install the sash line through the pulley no 6 at house end with the sash line going through the pulley then into the clam-cleat so the span can be pulled over through the pulley and locked off in the clam-cleat to set initial tension.



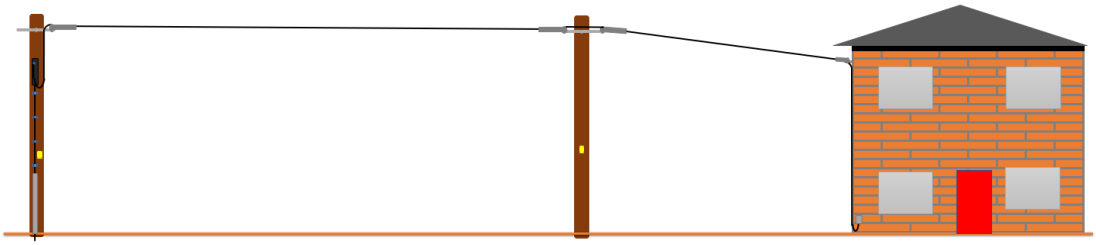
7. When the area is clear, and it is safe to do so, pull the sash line up from the ground and lock off in the clam-cleat of the pulley no 6 at the house end.

8. Check the height of the sash line that it is above the minimum height limits
9. Attached the cable reel to the sash line from the pole side so tension can be kept on the span as it is being pulled across. Set tension on the cable despanser.

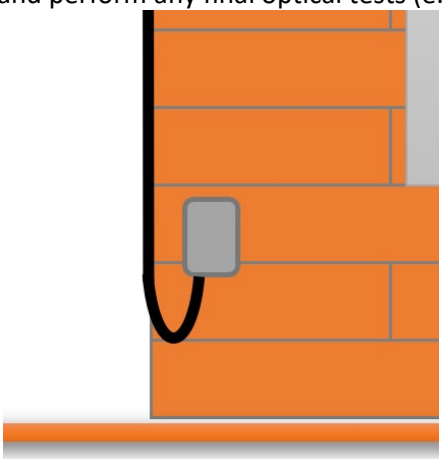
10. With one person at the house and one person at the pole, pull the cable over and use the sash line attached to the OptiTap connector to keep the tension on the span and length of cable required to be installed into the Drop terminal.



11. Clamp the span off from the house side then tension the line as required and clamp from the pole side. Once tension is set, measure cables to ensure minimum heights have been met. Remove the pullies once set.
12. Follow pole to pole guidance to install any additional spans as required.
13. Inspect the drop terminal port and the OptiTap connector using an automated inspection probe before connecting into the port on the drop cable. Make sure the the connector is fully inserted and that it is tightened up. Do not over-tighten the connector.
14. Dress the cable down the wall of the building using the appropriate cable fixings.



15. Form a drip loop before entering the wall box; splice on the required connector or pigtail and perform any final optical tests (e.g. power level measurement).



16. Tidy up all work site making sure that no fibre sharps have been left lying around.
17. Proceed to perform the in-home installation as normal from the wall box in.

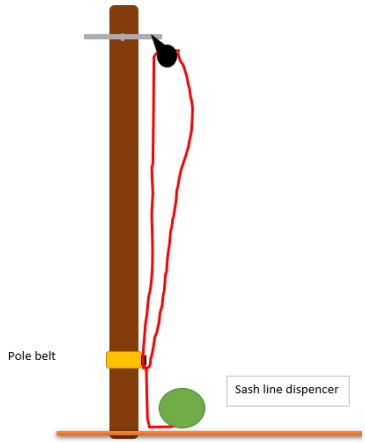
4.4.2. Pole to pole routes

This section covers both the Ultra-light weight cable (ULW) installation and the installation of overhead drop terminals with integrated tails.

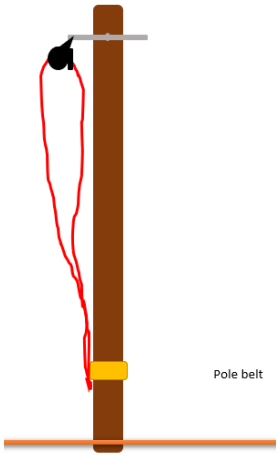
As with pole-to-home routes, safety of the proposed route and worksites must be established before starting work. Sash line is used to provide a route under tension at height for the cable installation.

1. Fit the pole belt around waist height on both poles. Note: arrow points up.

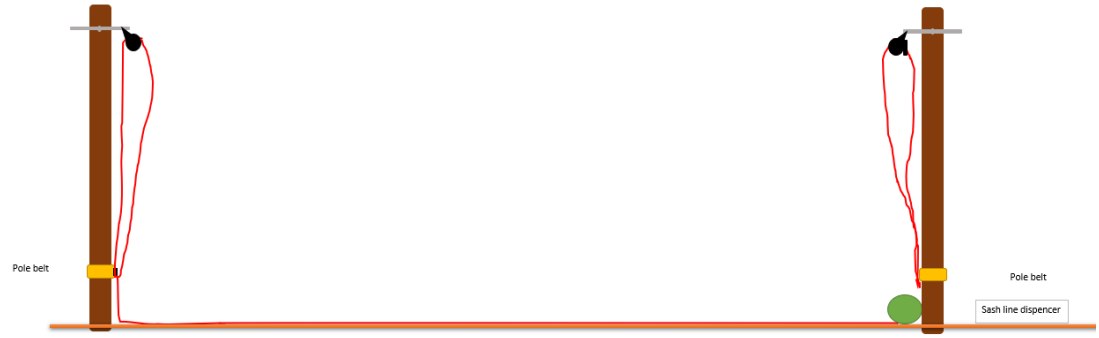
2. Install a pulley number 4 onto the pole ring on the starting pole.
3. Using the sash line dispenser, tie off the cut end onto the figure of eight locking mechanism
4. Take the sash line up the pole, through the pulley and back down tying off in the clam-cleat mechanism on the pole belt.



5. Fit pulley number 6 to the end pole and sash line.



6. With 1 person acting as a safety person the other person can lay the sash line to the other pole.



7. Tie the sash line to the sash line of the pole dressing and then when it is safe and working in conjunction with the other person lift the sash line. Lock this off and check the heights are compliant.

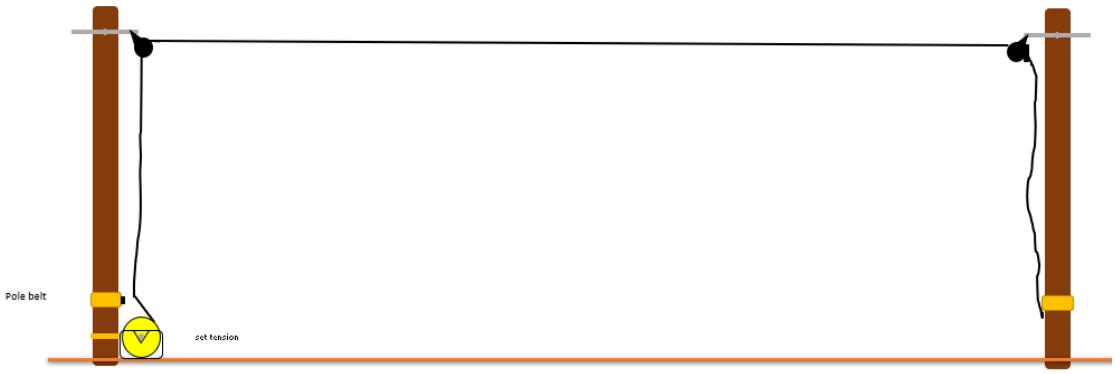
8. Check the height of the sash-line using the “Calibrated height rods”. These must be to the correct heights for the ground that is being crossed by the span. Remember always check the height at the lowest point on the route.

Terminating Ultra-Light Weight cable (ULW)

1. Install the anti-creepage device as specified in the Openreach training. The ”36F external locking device” needs to be 1 at the start of the overhead route and 1 at the end of the overhead route. Make sure that these to not hamper the access to climb the pole of where ladders will be positioned.

2. Using the cable dispenser fix this to the feed pole with dispenser belt. Then tie the ULW cable to the sash line and set tension on the dispenser.

3. Pull the ULW over keeping the tension on the cable as it goes overhead.



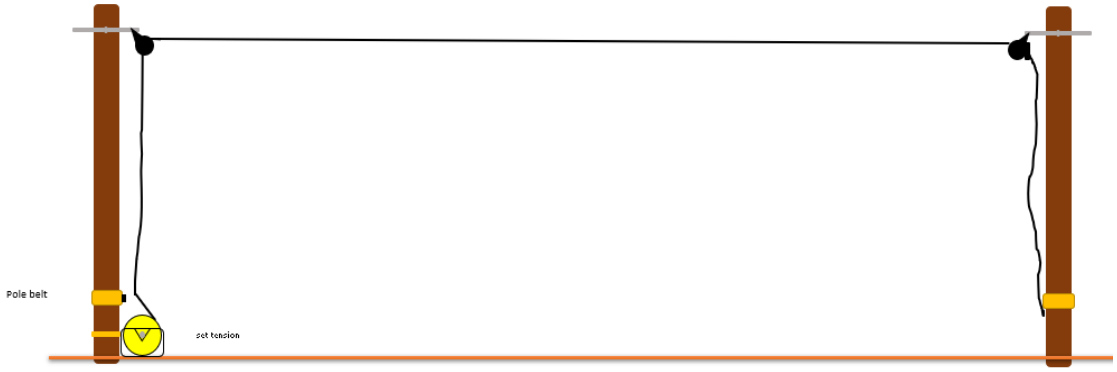
4. Clamp off at each pole making sure that the tension is correct and then recheck the height of the cable using the “Calibrated height rods”.
5. Route the ULW cable around the Anti-creepage device “36F external locking device”.
6. Spool off the cable slack required for access back into the closure in the Chamber. If this is a lot of cable the dress the cable into a figure of 8 on the ground inside your work site.

Installing drop terminals

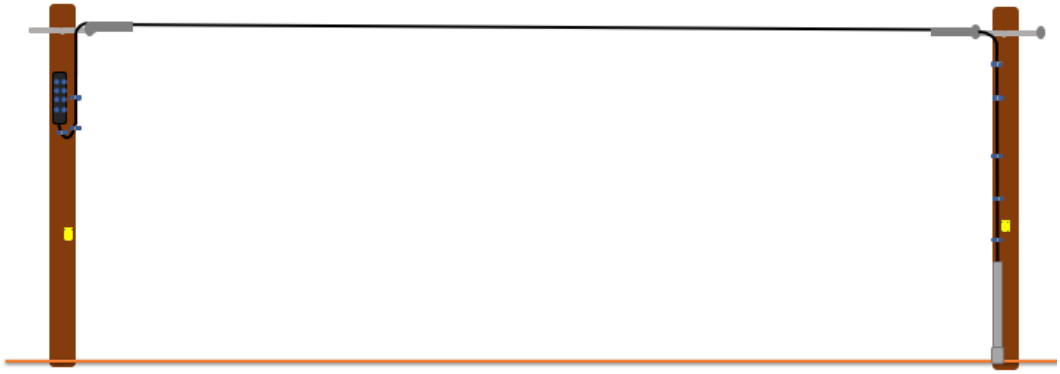
1. Using the cable dispenser or integral reel on the drop terminal cable, fix this to the feed pole with dispenser belt or Mills Polemate attachment. Then tie the Drop terminal cable to the sash line and set tension on the dispenser.

2. Pull the Drop terminal cable over keeping the tension on the cable as it goes overhead.
3. Clamp off at each pole making sure that the tension is correct and then recheck the height of the cable using the calibrated height measurement rods (or ultrasonic height gauge for DNO poles/wires).

4. Using a sash-line lift the Drop terminal up the pole and fit at the correct height, making sure that this does not cause interference with existing Openreach network cables. If working on DNO poles, ensure that minimum separation between cables is maintained across the span.



5. Dress the underminated cable into the underground network following the proccess in section 9 of this document.



4.5. Installation procedures – pole furniture

4.5.1. Pole hardware (rings, standoffs, etc)

Generally, modification of pole hardware such as rings

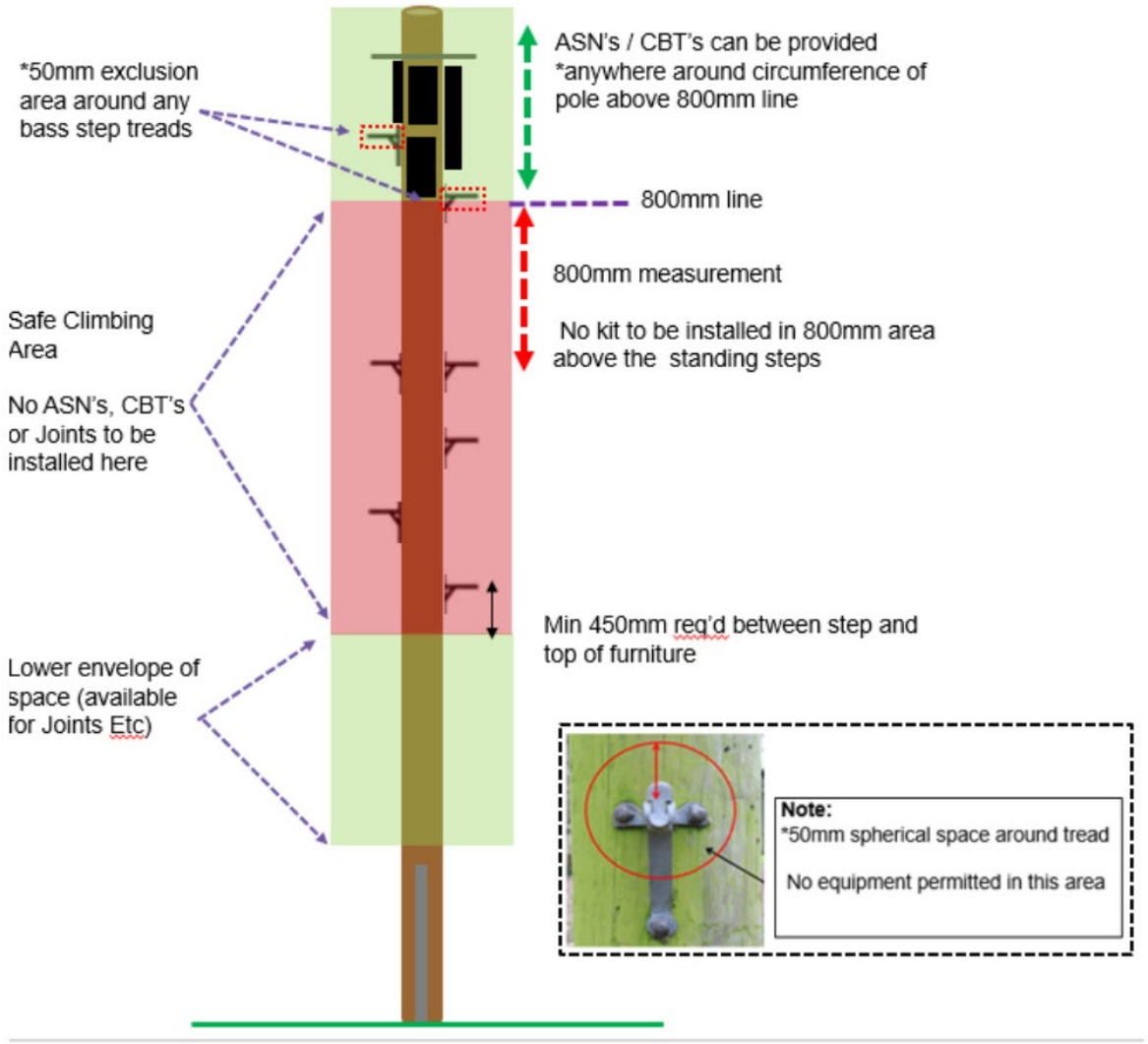
4.5.2. Drop terminals and splice closures

Drop terminals are normally fed from underground ducts. Where this is not possible, special care must be given to the clamps used to take drop terminal tails overhead.

On PIA poles, drop terminals are normally installed in the upper envelope of the pole (e.g. above 800mm from the top of the pole). Splice/drop terminals and splice closures are normally installed in the lower envelope (450mm from the bottom of the lowest step), on or with a cable coiling bracket.

On DNO poles, drop terminals and splice closures are not normally installed. Where they are unavoidable, however, they are typically installed at least 800mm from the lowest wire on the pole. See ENA guidance and the Third Party Infrastructure Guide for more details on asset positioning and clearances to uninsulated materials.

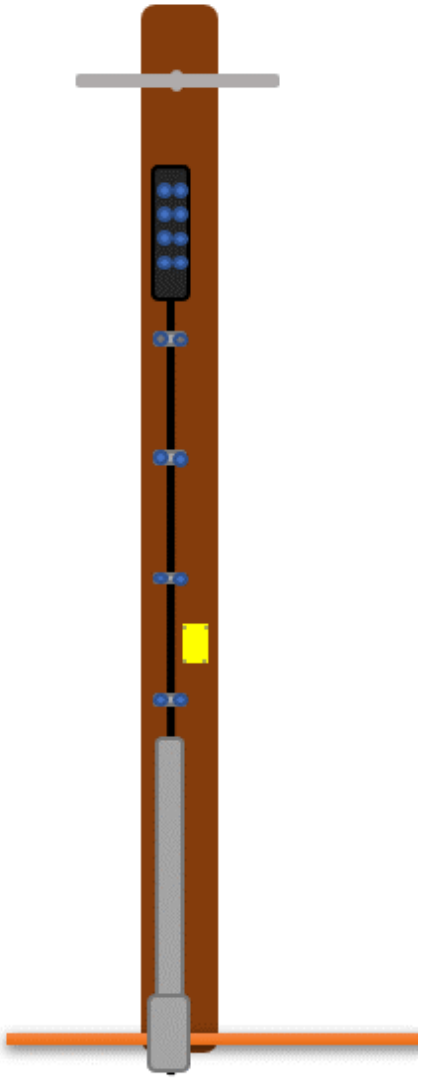
Separation between live apparatus and fibre cables or terminals must be maintained at all times
Follow ENA guidance and requirements set out by individual DNOs when fitting any apparatus to joint user poles



As with any installation procedure, first make sure the worksite is clear and safe and that the pole is safe to work on or climb as required.

1. If a 2-way/3-way bracket is required, lift this using a sash line and use the supplied fixings to fix the bracket in place as per Openreach guidelines for positioning (documented in CP8).
2. Lift the drop terminal up the pole using a sash line and install it as per Openreach guidelines for positioning (documented in CP8). Gigaclear generally assumes terminals are installed in the upper envelope, while splice closures are installed in the lower envelope. Make sure that the drop terminal will not interfere with positioning of ladders, is at least 50mm clear from steps, and will not interfere with existing Openreach infrastructure.

3. Dress the cable down the pole making sure to follow the cable fixing process in section 4.1 of this document.



4. Fix the “Caution Overhead fibre” warning sign to the pole.

4.6. Dressing cables on pole-to-duct transitions

All cables must be dressed to the pole using aluminium straps, galvanised washers, and nails bonding. Capping is installed on the lower section of the pole. Cleats, straps, and capping nail fixings must not be used.

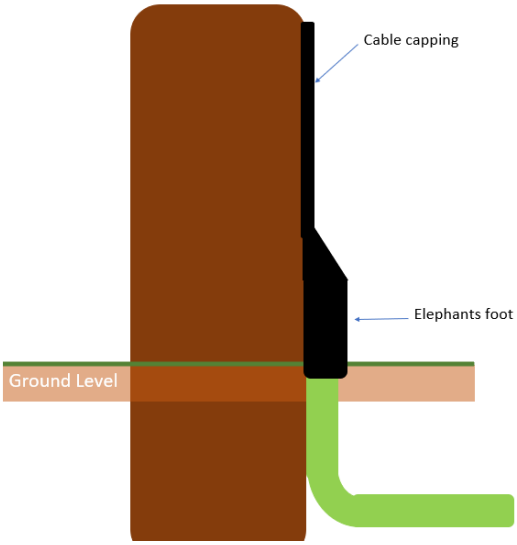
1. Making sure that the cable is in the correct location on the pole secure the cable. Use an Aluminium strap

2 nails bonding and 2 Galvanized washers

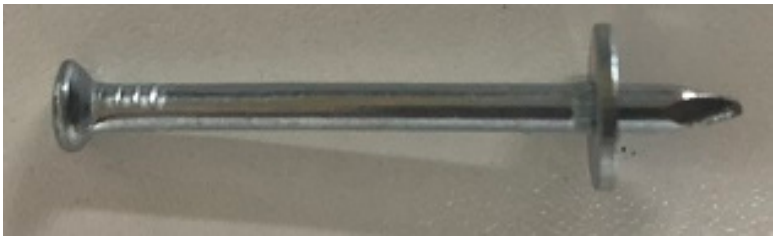
This must be fitted as shown and never folded over.

2. Dress the cable using these fixings at 450mm spacings down the pole to either the Drop terminal or the top of the cable capping. Installation of cable capping must be done with Nails bonding and a Galvanized washer

3. Ducts should be sealed with a re-enterable sealing mastic, e.g. Filoform Filoseal+.
4. An elephant's foot must be installed where the duct meets the cable capping so that it covers the duct into the cable capping. These must be installed using Nails bonding and a Galvanized washer to hold them securely in place. Every hole should have a Nails bonding and a Galvanized washer used to secure it to the pole.
5. On all overhead routes a warning label must be fitted to the pole. This is a "Caution Overhead Fibre" label, shown above, for BT poles; for DNO poles the Gigaclear-specific warning label supplied by Brady/Omser must be used.



6. This must be fixed to the pole using 4 Capping nails in the 4 holes at each corner.



The capping nails should be fully hammered in so the washer is flush against the label and the nail head.

5. Underground Builds

This document does not seek to replicate well-understood best practices with regards to fibre blowing and cable installation, which should be followed for PIA builds. The key methods and considerations for working in existing PIA ducting specifically are outlined below.

5.1. Working in manholes

Most chambers on the Openreach network are joint chambers no more than 450mm deep and easily accessed by foot or by one step in the chamber wall. These chambers do not present significant challenges, and are not high-risk spaces, so standard access procedures used for working in Gigaclear chambers are adequate.

However, there are manholes throughout the BT spine networks. These are high risk confined spaces and require additional safety equipment and procedures. Water removal and disposal is often required when accessing these.

Careful attention must be paid to routing of cable or subduct into or out of such structures for pulling operations; rollers must be used to ensure that the assets are protected on installation or removal.

5.2. Rodding and roping

Continuous “cobra” rods must be used. Where clearing blockages, cobra rods may not support much compression force, and duct clearing rods may be used. These must be of a locking type so that rods do not become detached while working.

Rope laid in must be 2kN minimum nylon draw rope.

All roping and cable pulling operations must be done with a fused swivel link so that torsion and tension forces are limited to safe ranges for the rope or fibre cable, and so that damage is not caused to existing plant. Link failure points must be appropriate for the cable or duct being pulled (e.g. 750N for 16/12mm duct).

5.2.1. Bellmouths and Guiding

All pit entry and duct entry points should be protected using cable rollers and smooth bellmouths to avoid damage to the duct, rope, or cable during installation. This is particularly key for manholes.

5.3. Chamber builds and break-throughs

Chambers are built to standard Gigaclear specifications when building on the Openreach network. However, all closures must be held in place and secured on a moving arm (e.g. Mobra or similar).

5.3.1. Sensitive areas

Break-throughs are not available as a self-service product in areas classed by Openreach as sensitive or secure, such as exchange manholes, deep level tunnels, etc. In these cases, a break-through must be ordered from Openreach.

5.3.2. Breaking into chambers – standoff chambers

Standoff chambers should be built as close to existing chambers as possible; survey the planned area and excavate safely using detection equipment or ground penetrating radar as appropriate, including the route up to the BT chamber. Follow instructions for build of the standard Gigaclear composite chamber found in the Civils Construction Guide.

Excavate to the outside of the BT chamber to be broken into, and install the required 96.5mm or 54.9mm ducting up to the entry point to the BT chamber.

Ensure that your build whereabouts are in place against the NOI before working on BT infrastructure. Photograph the condition of the chamber before any construction activities take place, and follow standard procedures for safe entry into Openreach chambers.

Use a core drill to make the required hole in the chamber wall. The hole should be of a size that matches the incoming duct, and any difference in size should be taken up with an approved mortar as the duct is installed.

Insert a section of the required duct, mating it to the incoming section, and mark it for a cut flush with the chamber wall. No more than 5mm of duct should protrude from the wall, and ideally there shall be no protrusion at all. Photograph the installed duct entry on both sides of the chamber wall.

Once the duct is installed and connected onto the network side, reinstate as required the route between chambers, taking care to compact backfill materials around the duct and chambers. Photograph the reinstatement around the duct and chamber walls prior to covering.

The duct mouth should be labelled or marked to indicate Gigaclear ownership of the route, using an approved adhesive label affixed within the duct or (in composite/plastic chambers) on the chamber wall. If cables/sub-duct are installed, this label may be affixed to these elements.

5.3.3. Duct break-in chambers

Where access to an existing duct is required, a chamber may be built over the top of existing ducting. This is done by excavating by hand or vacuum excavator around the existing duct, creating a cavity into which composite chamber rings may be inserted. Specific overbuild systems may be required, which use modular chamber rings that can be built up around existing plant; these may be obtained from Cubis.

Once the area is excavated to a depth providing access on all sides to the existing plant or Gigaclear's standard chamber depth (whichever is greater), photograph the asset in situ, and then form the required base, compacting carefully around the plant.

Insert the first chamber ring, which must be a complete and continuous with no penetrations. Then build up the rings around the existing plant to reach the required height, cutting entry slots using a holesaw and handsaw as required for existing plant. Cut any required entries for new plant at the same time and assemble over the existing plant. Photograph the excavated plant in situ.

Once the chamber has been built up ready to receive the frame, access to the plant may be carried out. This must be done carefully to avoid damage to existing plant. Cut into the top of the target duct with a depth-limited saw, setting depth from the nearest end of the duct accessible. As soon as any penetration is made, a gas detector unit (GDU) should be held near the penetration for 30 seconds to validate that no harmful gases are present; the GDU should be kept near the works as they progress. Remove the required section of duct to gain access and then carefully remove the remaining sections of duct only once clearances to existing cables/ducts have been confirmed until

the required access is achieved. Photographs should be taken of this process, showing the fully exposed plant.

Install the frame and lid as normal, and reinstate around the chamber. The chamber should be fully built and any material curing completed prior to cabling works.

5.4. Microduct and cable installation

When a route has been rodded, roped, and confirmed viable for installation works, the installation of sub-ducts (such as our 16/12mm duct) can begin.

Pulling socks or threading inserts should be secured to the microducts/cables to be installed. If more than one element is to be installed at once, then a pulling sling should be used. A fused rotary link with a breaking strain less than the cable's maximum tension force must be used, to prevent damage to cables through tension or torsion.

A tension-limiting winch should be used to protect the pulling operation and should be limited to just below the fused link tension load.

6. Lead-in installations

Lead-in installations follow a similar process to that outlined above for underground builds, and the same guidance should be followed. Rodding and roping is performed to install a draw rope, and the customer cable is then pulled from the home to the drop terminal.

The drop cable will normally be an OptiTap-fitted hardened drop cable. The OptiTap connector and corresponding drop terminal port is inspected with an inspection probe prior to connection and then mated. No slack should be left in the PIA duct network or chambers.

At the house end, the cable is cut to length, stripped back, and spliced onto a connector or pigtail in a wall box. From here, a standard installation can take place.

For MDUs and other installations where more than one fibre is required, a 8/4.5mm microduct is typically installed between the nearest Gigaclear closure and the property. Fibres up to 24F can then be blown through and secured in a wall box (normally a Commscope BUDI-1S/2S).

6.1.1. Duct sealing

Installers are responsible for sealing ducts once they have been accessed. Ducts should always be sealed to prevent water/debris ingress into the network and to prevent gas from exiting the network. Filoform Filoseal+ should be used for this purpose, but other re-enterable sealing mastics may be accepted on written request to the Chief Engineer's Office.

Ducts left without cables may be capped with a cold shrink or interference-fit cap.

6.1.2. Capping and externally visible plant

In all cases, for external installations, capping and an "elephant's foot" transition must be installed to visually hide the cable to the bottom of the wall box and cover the duct.

Where capping has already been fitted by BTOR, a hole should be made in the existing elephant's foot to break out to an adjacent elephant's foot with a minimum 300mm separation between the BTOR wall box and Gigaclear's. Alternatively, cable may be routed from the bottom of the existing elephant's foot to a nearby location for building entry.

7. Version History

Version	Date	Notes
1.0	2020-08-14	First issue
1.1	2020-08-21	Added detailed overhead parts, lead-in installs and further clarifications on sensitive areas/manholes