Gigaclear Documentation
Civil Construction Guide

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2. Scope and Purpose

This document provides guidance on how to construct Gigaclear's fibre to the home network. It focuses on the civil construction of the network (trenching, ducts, cabinets, chambers and cables), with optical construction (closure builds, splicing, cable termination) left to the *Optical Build and Testing Standard* document and supporting texts. Other aspects are detailed further in the *Third Party Infrastructure Guide*, *MDU Construction Guide*, and *Active Cabinet Guide*, as well as the other supporting documents packaged with this document pack.

This document is intended to be read by contractors as a guide alongside build instruction material, primarily maps and design packs showing the intended installation location and configuration of structures and equipment.

2.1. Objectives of Network Build

The objective of building a fibre network is to connect properties – homes and businesses – to a serving head-end site, typically referred to as an active cabinet. This site must itself be brought into service and connected back to the network core before it can provide services to any connected properties and deliver value to Gigaclear.

Typically, the network will be built out from another, already-live portion of the network (to connect to the core via an *aggregation* link); this means that a fibre route must be built from that networks' edge to the new cabinet, typically passing properties which are connected but cannot be made ready for service. Once the cabinet is reached and connected, these properties passed can be made ready for service, and further legs of the network can be built and completed.

The key objectives for the network build are to:

- Make properties *ready for service* as soon as possible, and avoid building large swathes of network which cannot be made ready for service imminently
- Minimise disruption to local communities during the build, in terms of excavation works, reinstatement, and traffic management
- Ensure that the quality of the built network is adequate to support reliable installation journeys for customers and to meet with the aesthetic approval of local residents

To allow review of completed works, and to enable maintenance of the completed network, the contractor will supply Gigaclear with:

- As-built maps, showing where the assets were finally placed
- Photographic evidence of completed builds and other information required to validate that the quality of build is adequate and that construction processes were followed correctly
- Optical test results, in accordance with the *Optical Build and Testing* document

This evidence and documentation will be used to determine if work has been completed properly and to the correct standard before payment is made under the contract.

2.2. Specified and Approved Materials

Gigaclear specifies specific suppliers, tools, components, and materials for the construction of the network. Where specific products or components are specified, contractors *must* use these. No deviation from the documented components is permitted without the explicit approval, in writing, of the Chief Engineer's Office. This includes small sundry items such as ducts, cables, couplers/caps, and seals.

Where materials such as backfill or concrete are specified, Gigaclear will specify the type or category of material that is required, and contractors may procure this material from whichever supplier they choose to – however, contractors are responsible for the quality and compliance of the materials that they supply, and may be asked to provide evidence of material quality (at point of use) where this quality is in question.

2.3. Risks and Safety

Working on Gigaclear's network generally involves outdoor work at the roadside, which is a risky activity. This document may highlight specific key risks related to construction methods, equipment being used, and so on.

However, it is not a health and safety guidance document, and should be read alongside Gigaclear's health and safety policies, risk assessments, and guidance issued by the HSEQ department.

3. Trenching and Reinstatement

Gigaclear's build methodology assumes that builds predominantly make use of soft ground and mechanised construction techniques. Contractors should *always* aim to use mechanised construction techniques such as mole ploughing and narrow trenching over traditional excavation techniques. Excavation of carriageway and footway is a last resort and must be avoided wherever possible.

All reinstatement of highways and nearby surfaces, including verges and unmade ground, must be conducted in accordance with the latest edition of the Specification for the Reinstatement of Openings in Highways (SROH), in accordance with the New Roads and Street Works Act (1991). Nothing in this guide shall take precedence over the SROH.

All works and reinstatement must be completed to a permanent state before invoicing.

3.1. Surface Definitions

Gigaclear uses the following definitions to classify surfaces:

- Footway – hard surface along the side of the road
- Verge/Rough unsurfaced ground – soft surface along the side of the road
- Type 1 or 2 carriageway – carriageway so classified in the National Street Gazetteer
- Type 3 or 4 carriageway – carriageway so classified in the National Street Gazetteer
- Rough track – soft carriageway down rural lanes, "greened" roads, etc, often costed as verge
- Agricultural land – soft surface away from the road

Other surface types may be identified ad-hoc and charged at another rate only when agreed in advance with Gigaclear as an exception. Examples may include "golden gravel" or block paving, where reinstatement costs may be higher.

3.2. Depth of Cover

Depth of cover shall be measured to the top of the *uppermost element* of the installed apparatus (duct or cable, excluding warning tapes). This shall be validated by measurement during construction when open trenching is used, with a 1-2 metre rule placed across the trench as the reference point.

The minimum depth of cover in surfaces is as follows:

SURFACE TYPE	MINIMUM DEPTH OF COVER	TYPICAL TRENCH DEPTH
Footway	300mm	500mm
Verge	300mm	500mm
Type 1 or 2 Carriageway	600mm	700mm
Type 3 or 4 Carriageway	450mm	550mm
Rough track	300mm	500mm
Agricultural Land	900mm	1000mm

These values must be considered as absolute minimum values, and depth of cover must be increased by the typical deviation of the construction methodology to ensure that all typical trenches achieve this depth of cover. This deviation will be dependent on the technology being used, but for traditional open trenching in soft ground may be 100-200mm. The "typical" depth of cover column in the table above illustrates suggested target depths.

When installing apparatus in open trenches in soft ground where bending of ducts or cable may affect depth of cover, care must be taken to ensure that backfill is applied with the apparatus at the correct depth to prevent subsequent movement.

When the height of the ground is variable – for instance, where high verges dip down to form drains – the depth of cover must be maintained along the entire length of the asset by following the ground height or increasing the depth of installation across the section so that the minimum depth is maintained.

Where the verge is higher than the carriageway and the trench is within 600mm of the carriageway, depth of cover shall be measured from the top of the carriageway surface to account for variation in verge height due to drainage cuttings and subsidence. Section S9.2.2 of the SROH should be referred to. Where there is any evidence of grips being constructed by the local authority, a minimum depth of cover of 450mm must be maintained across the whole width.

Where depth of cover cannot be achieved, plastic or fibre protection boards may be used, but Gigaclear should be consulted on a case by case basis. Boards should not be used for protracted sections; alternate routes should be sought to achieve minimum depth of cover. All variations from the standard depth of cover must be recorded in as-built documentation along with the reason for deviation and photographic evidence.

Insufficient depth of cover is the leading cause of costly re-work
All assets must be buried below the minimum depth of cover along their entire length

3.3. Trench Construction

The exact construction of trenches in terms of backfill material, depths and positioning of equipment will vary between construction methodologies.

In all trenches, the use of sand backfill is mandatory; failure to use a sand backfill will cause issues with cable blowing and is likely to result in revisiting of site at the contractor's expense to remediate issues with kinked ducts.

Marker tape must be installed 50mm above sand in soft trenches and on top of sand when class 1A backfill material is used. Marker tape found closer to the apparatus (such as wrapped around cables or laid directly on top of ducts) or found to be missing from the trench will require the contractor to revisit site at their expense to remediate.

3.4. Soft Surfaces

Mole ploughing shall be the assumed and preferred build methodology in soft ground.

Ground should be checked for suitability before starting to excavate; presence of large stones that could result in kinked ducts may require the use of traditional trenching.

Where mole ploughing cannot be used, this should be communicated to Gigaclear in advance of works starting and will be managed by exception. Photographic evidence will be expected to support decisions not to use mole ploughs.

Trenches in soft ground shall follow the trench guidance in the drawings supplied with respect to layout of plant within trenches and positioning of marker tapes.

Attention is drawn to the requirements of the SROH, section S9.2, which requires that any excavations within 600mm of a road shall be backfilled with sub-base materials up to a level where a 45 degree fall line from the road surface intersects the trench at its closest point to the road. Trenches in soft verge alongside roads should always be more than 600mm from the road where it is possible.

In agricultural land, a greater depth of cover is required to avoid interference with ploughing equipment, and all apparatus should unless instructed otherwise be installed in the perimeter of the field to minimise risk from agricultural operations.

3.5. Hard Surfaces

In hard surfaces, narrow trenching or micro trenching (slot cutting) are the assumed methods of construction and should always be used in preference to open trenches.

When narrow trenching cannot be used, this should be communicated to Gigaclear in advance of works starting and will be managed by exception.

Trenches in hard ground shall follow the trench guidance in drawing GC-OE-TRENCH01.

Surface and binder course reinstatement shall follow the guidance in the SROH. Backfill material above the apparatus and sand course shall be Type 1 Class A graded granular material or other material approved by SROH and the relevant Highways Authority. The contractor shall demonstrate that material is suitable and hold records to prove that suitable material has been used.

Recycling of excavated bituminous material as backfill may be permitted so long as the method of recycling is approved by the relevant Highways Authority and the backfill material produced complies with the requirements of the SROH.

Where alternative materials are required, such as to reinstate specialist surfaces, approval must be sought from Gigaclear and the relevant Highways Authority.

3.5.1. Coring

Contractors shall implement a coring programme including air void testing, using an approved UKAS company. Coring shall be undertaken every 250 metres in hard surfaces, unless agreed otherwise with the relevant Highways Authority and Gigaclear. Results must be shared with Gigaclear. Failures will be rectified and re-tested at the contractor's cost prior to acceptance of the assets into service by Gigaclear.

3.5.2. Bituminous Reinstatement

Bitumen and other temperature-sensitive reinstatement materials shall be supplied to site using a "hot box" vehicle to guarantee temperature of materials used on site. All materials shall be temperature tested at arrival and at point of rolling and kept within limits specified by the supplier of the material.

Gigaclear will spot check temperatures as part of the audit regimen.

Reinstatement with overbanding shall be used unless stipulated by the relevant Highways Authority and agreed with Gigaclear.

3.6. Road Crossings

Where crossings are made between sections of footway or verge across a road, 96.5mm ducts may be additionally installed to ease construction or afford additional protection to cables/ducts.

Minimum bend radius of multiduct assemblies must be considered carefully, as a wide turn into and out of the road crossing will be required to avoid severely impacting blowing distances; a bend radius of 50cm is recommended at minimum, but a wider radius is preferable.

Where there is concern about road conditions, or about the bend radius achievable, other construction methods such as impact moling or directional drilling may be preferable to allow a crossing to be made at an angle. This should be considered on a case-by-case basis with Gigaclear's involvement.

Where road crossings involve creating open trenches and re-opening lanes to traffic using plates across the road, such plates must be rated for carriageway usage and marked as such. Plates rated for driveways or footpath must not be used.

3.7. As-Built Records

Evidence should be recorded and submitted to Gigaclear:

- The as-built path of ducts should be recorded electronically and provided to Gigaclear in an agreed format or system; spatial data should be recorded in the OS National Grid, ideally captured using accurate GPS/GNSS receivers (targeting BSI PAS 128:2014 quality level QL-B2P or better), otherwise referenced to OS MasterMap Topo
- Where other utilities are found and the route has been altered from the design as a result, photographs showing the utilities in context must be recorded
- Road crossings should be photographed at each end showing duct entry and exit
- Trench reinstatement should be photographed at regular intervals
- Specialist reinstatement (e.g. kerbs) should be photographed
- Where ground height varies considerably, or where 96.5mm ducts are inserted, photographs showing depth of cover should be taken regularly
- Evidence of use of avoidance equipment e.g. cat and genny GPS logs may be requested at random by Gigaclear or routinely submitted, so must be collected

4. Microduct and Cable Installation

Gigaclear's network uses a microducted construction. In this construction, multiduct assemblies and individual microducts are laid in trenches. Cables are then installed, either on day one or as required for expansion of the network, by blowing the cable down the microduct.

Cable blowing works by passing a large quantity of air around a cable, providing reduced drag between the microduct and cable, while pushing the cable along the microduct. Successful blowing relies on low friction between the microduct and cable. For this reason, much of the detail of ducting and cable installation focuses on ensuring that the microducts have no internal sharp edges, kinks, burrs, obstructions, deformations, or sharp bends.

This section predominantly focuses on blown fibre microducts, but Gigaclear does also require the installation of 53.9/96.5/110mm duct in some cases; this is covered in this section.

4.1. Approved Products

Gigaclear currently only allows use of specified Emtelle microducts and couplings on the network, except in the drop network, where ducts from Hexatronic are additionally approved for final connections to properties.

Emtelle 7063D cleaning sponges are appropriate for validating main ducts; an Emtelle 72910 flow regulator and Emtelle 74319 integrity tester will be required for validating main tests.

For drop ducts, the 7063E cleaning sponge is required. The 73230 calibrator and catcher is used for integrity tests.

Emtelle 53.9, 96.5 and 110mm ducts should be used, for instance the EF450 series, but other suppliers may be used upon approval so long as the dimensions are identical, the colour of the duct is green, and the plastic used is suitable for >20 year direct burial service life. Grey ducting is not permitted.

FiloShrinkCE1 cold shrink caps may be used for sealing direct burial cables.

FiloSeal+ 125mm duct sealing kits should be used to seal 50, 96.5 and 110mm ducts.

4.2. Duct Ordering and Usage Sequence

Multiduct assemblies are coloured as per ANSI/EIA/TIA 598-D, consistent with our fibre cable colour coding standards. Ducts should be used in ascending order, e.g. blue, orange, green, brown.

4.3. Pre- and Post-Installation Testing

Before installing ducts, pressure testing should be conducted to verify that no damage has occurred to the duct in transit or storage. Procedures for pressure tests are found in the included appendix, "Emtelle Gigaclear Microduct Testing Procedure".

Once ducts are installed, air flow, pressure, and continuity (also known as integrity or calibration testing) tests – also documented in the appendix – must be conducted and the results documented. Any ducts that do not pass all of the tests must be investigated and issues resolved prior to invoicing and acceptance by Gigaclear. All sub-ducts of multiduct assemblies must be individually tested.

Note that catchers are mandatory for all testing operations in which items are blown through ducts, including sponges and duct calibrator rods or weights

Always perform tests in sequence – verify the duct, then pressure test, then check continuity. This ensures catchers are applied to the correct ducts and therefore safe working practices

Failure to use a catcher can result in serious personal injury.
PPE must be worn when working with compressed air and ducts.

4.4. Duct Installation

Ducts should be capped before installation begins with approved endcaps. These can be removed and reused after installation, if they are not damaged. Covering duct ends with tape is not enough.

Ducts must not be laid along the route to be installed into without adequate protection. Most Gigaclear ducts cannot tolerate more than 200kg of load over a 10cm section, meaning that crews standing on ducts are unlikely to cause issues but vehicles crossing ducts will cause damage to the ducts. Where ducts are laid out across driveways, rigid supporting covers must be used to protect ducts from vehicle loads.

Ducts are then laid into open trench or into a moleplough/narrow trencher guide. During installation, ducts shall not be subjected to tension exceeding 50kN. As per the trenching section above, the ducts must be laid into a bed of sand to ensure the duct can flex; this may be omitted for moleplough installations.

Ducts must be laid as straight as possible in both vertical and horizontal planes. If there are more than 15 bends greater than 45 degrees (in any plane) on a route, a FW2 or CW2 chamber should be installed, ideally at the centre of the section, to permit centre blowing. Routes longer than 1.5km or with significant bends will typically be designed with appropriate chambers. Additional chambers for blowing may not be added at build time (unless as a result of an instructed change in scope); any concerns on blowing specific routes must be raised as part of validation.

Ducts should be laid as a continuous length between structures unless the maximum supplied duct length is exceeded. Cuts should not be made unless absolutely required.

Five metres of spare duct shall be left at each end after installation to allow for stretch recovery. The duct shall be left for a minimum of 12 hours after installation before ducts are trimmed and cables installed. Ducts should be tested after 12 hours to confirm proper installation.

Ducts should never be left open. Always leave unused ducts capped or coupled to onward ducts.

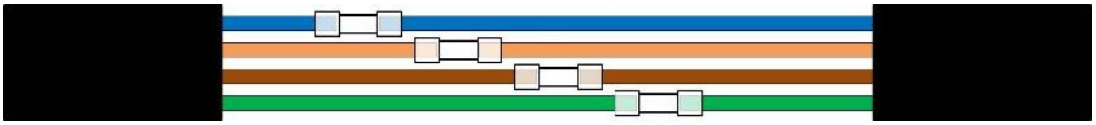
4.5. Joining and Capping Ducts

Ducts must be cut square/flush and deburred before couplers or end caps are installed, using a tube cutter and deburring tool. Pocket or Stanley knives must not be used. Emtelle 70768 thickwall microduct cutters are approved, but other suitable cutters are available. The cutter must not unduly distort the circular shape of the duct. Deburring can be achieved with a Mills duct deburring tool or similar abrasive tool. Ends must be square.

Push the ducts fully into the coupler or cap, and push the seal home until the seal clicks shut.

When joining multiduct assemblies, the location of cuts and couplers must be staggered so as to avoid the assembly of joints "bulging" and causing bends in the microducts which can cause blowing issues. The multiduct assembly's outer jacket should be cut back at least 30cm from the joints. Where the multiduct enters a chamber to be split or jointed, the jacket must be cut back to outside the chamber entry so that duct sealing can be installed around the individual ducts.

Couplers must never be installed on a bend or curve; the duct must be straight and flat for at least 50cm either side of the joint.



While joints may be directly buried without a chamber, the location of any joints must be marked on as-built records so that they can be found in the event of a fault in any coupler or joint.

4.6. Drop Microducts

Drop microducts are connected between a customer drop cabinet and the pot.

All properties served in an area require a drop microduct to be left, capped, in a customer connection point (pot) with approximately 1 metre of slack coiled in the pot.

Both ends of the microduct are to be capped and labelled with HellermannTyton TipTag 11x40mm labels, printed with the pot number; it is recommended to print all required labels for a CDC before commencing build, and to store the labels in the CDC until ducts are installed. Self-laminating adhesive labels or cable tie labels may also be used but must be printed in accordance with Gigaclear's label specification.

Microducts should be installed above the main multiduct assembly if installed in the same trench, with 25mm of sand between multiduct and microducts.

4.7. Blowing Main Cables (12-288F)

Blowing cables into ducts uses a combination of compressed air and drive wheels to push the cable into the duct and "float" the cable along with a stream of air flowing past the cable. This is performed with a specialised fibre blowing machine; suitable machines are available from Fremco, CBS, and others; Gigaclear can advise on specific machines. Machines should be suitable for use with 16/12mm ducts and with cable sizes of 4-10mm; machines must include buckling detection or other mechanisms to prevent damage to a cable in the event of a blockage. Examples include the CBS AirStream/Jetstream, Fremco MiniFlow RAPID. Some machines require both hydraulic and pneumatic power sources; this should be considered.

Compressors must be of a filtered, oil-free type, fitted with a condensation separator or air dryer unit if needed to maintain dry air output. Dryers are recommended when blowing in wet conditions on longer blowing runs.

Depending on the blowing system in use, installation distances will vary between 1.5 to 3km. For any route in excess of 1.5-2km, centre blowing should be considered to keep blowing distances within typical limits. Routes with significant bends may have reduced blowing distances.

Gigaclear will design to a limit of a 2km continuous blow; all cables and ducts are tested to allow a 2km blow even in the presence of significant bends and turns. This means that for 4km spans (the longest designed) centre blowing is required.

If there are more bends at one of end of a route, blowing from the end furthest from the bends may be preferable.

The instructions below should be read alongside any instructions from the blowing system's operating manual; take particular care to note any safety considerations. Compressed air, hydraulics, and cable blowing can cause injury in numerous ways and care must always be taken to prevent injury.

Failure to blow a cable through a duct must be treated as a failure of the duct installation and this must be remediated accordingly before re-blowing the cable.

Blowing through an alternate duct is not acceptable.
All ducts must be tested and usable at the completion of build.

4.7.1. Duct Preparation

Before cable is installed, duct ends should be cut square and deburred thoroughly to ensure no sharp edges remain.

The duct should be tested, and a sponge blown through after testing to ensure the duct is clean. Optionally, on longer runs, it may be prudent to lubricate the duct – this is done by fitting a catcher to the far end, inserting a sponge, filling the duct behind the sponge with Polywater Prelube 5000 lubricant, and then inserting a second sponge and blowing through. Around 30mL of lubricant should be added per kilometre of duct being lubricated for main ducts; this can be estimated by filling around 25cm of duct behind the first sponge with lubricant.

4.7.2. Cable Preparation and Blowing

Cables should be cut and sealed with PVC or self-amalgamating tape before blowing. The end should be smooth, with no projections.

Once the cable is prepared, blow the cable in accordance with the instructions from the blowing system.

4.8. Blowing Drop Cables (<12F)

Blowing drop cables/ballistic ferrule cables is similar to the process of blowing main cable, and the same approach should be used. The ballistic ferrule does not require any preparation for blowing. A smaller blowing machine, such as a Fremco NanoFlow, Fremco MicroFlow Touch/LOG, or CBS Accelair 2 should be used.

Lubrication is not typically required, but a small amount of lubricant may be used. If it is required, then Polywater Prelube 5000 should be used; around 10mL should be used per kilometre of duct being lubricated. This can be estimated by filling around 75cm of duct behind the first sponge with lubricant.

4.9. Sealing Large Ducts (56mm, 96.5, 110mm)

All ducts should be sealed after construction works are complete using a duct sealing system. This prevents ingress of water and gas into chambers and cabinets, as well as helping to stop rodents and dirt from getting into these spaces.

Multiduct assembly jackets should be trimmed back, so that a seal is formed around the sub-duct members and not the outer jacket. All ducts should be brought into the chamber and capped.

Filoform FiloSeal+ 125mm duct seals should be used; a foam insert is used to provide a basis for the seal, and cables and the duct should be lightly sandpapered to ensure a good contact prior to application. Cables and ducts should be moved during application to allow sealant to flow between all elements.

4.10. Directly Buried Cables

Cables rated for direct burial may be installed directly in ground, surrounded by a layer of at least 3-5cm of fine sand on all sides. Cables must avoid contact with any rocks or material that could cause crushing.

Any armoured cables that use a metallic outer armour jacket must be grounded in at least one splice closure along their length. Generally, one closure per 1km of cable must be grounded. Grounding kits are available for all Gigaclear splice closures.

4.11. Sub-Duct and Cable Installation

Where third-party ducts are used or self-built large-diameter ducts (50mm and above) are used, rodding, roping, and pulling is typically used to install cables or sub-ducts. Normally, this is used for construction of routes through BT Openreach ducting.

Sub-ducts and cables as specified in the *Third Party Infrastructure* guide must be used in third party ducts. Careful attention must be paid to the requirements laid out in this guide.

Rodding shall be performed with continuous rods, or lockable rods if continuous rods are not suitable. Draw rope shall be nylon and have a minimum breaking strain of 2kN.

When pulling cables or sub-ducts through ducts, tension-limiting winches and pulling fuses must be used. These protect the cable or duct from damage due to excessive pulling force and help avoid damage to other cables in the duct. A swivelling pulling eye must always be used to avoid torsion damage to plant. Tension limits must be set for the cable or duct being installed.

Pulling lubricant should always be used to reduce the friction between cables and ducts during pulling operations; tension can be reduced by over 50% with proper lubrication. Normally, lubricant should be applied to the cable or sub-duct being pulled as it is drawn into the duct using a divisible funnel or similar. Lubricant may also be pumped into the duct directly, though this tends to be more wasteful. Lubricant must be of a low residue type and be compatible with PVC/PE/HDPE jackets; Polywater F, CPL or LZ lubricants are suitable, but other compatible lubricants may be used.

Rollers may be required to manage the cable entry to the duct and avoid tight bends as cable is dispensed from a drum.

Other working practices may be required or stipulated by Openreach and other asset owners; these are covered in the *Third Party Infrastructure Guide* and *PIA Build Guide* documents.

4.12. As-Built Documentation

Ducts are generally covered by the trench, chamber, or cabinet as-built records.

However, where ducts have been jointed, capped, or sealed, contractors must photograph completed duct joints or seals and provide these photographs as part of the as-built documentation for the structure they are part of (trench, chamber or cabinet).

5. Cabinets

5.1. Purpose and Placement

Gigaclear uses street cabinets to host active equipment to operate services in its network, as well as to provide customer aggregation points at some locations within the network.

Placement of cabinets must be carefully considered and reviewed prior to works commencing, as moving a cabinet can be highly costly and time consuming, particularly if the issue is only identified late in the construction process.

Being our only major above-ground intrusion into the built environment, placement of cabinets must be carefully considered to avoid impacting the aesthetics of the area or having a negative impact on residents. Vehicle sight-lines at junctions or crossings, intrusion into views from properties, and pedestrian or disabled access along footways and grass routes must all be considered.

Safety of workers and the risk of the location to vehicle intrusion must also be considered during placement. For instance, placing a cabinet adjacent to a high speed or busy road junction, or at a risky corner, where accidents are more likely, would not be accepted. Measures such as orienting the cabinet away from the roadway can help to reduce risk to workers. Access and parking arrangements and their safety must also be considered. Cabinets must not be located such that signing, lighting, and guarding is required for routine access.

Active cabinets produce noise due to the equipment they contain as well as the cooling systems used to keep the equipment cool. Passive cabinets such as customer drop cabinets contain no powered equipment and produce no noise, but still have a visual impact on the environment, and are frequently accessed by engineers, which will produce disruption for local residents.

If the proposed location is near to properties who could be adversely affected by the noise or vibration of the cabinet, or the activity of engineers working at the cabinet, alternative locations should be sought before site selection is confirmed. Active cabinets should never be backed directly onto residential property walls or walls directly attached to properties.

All parties are encouraged to proactively raise concerns to Gigaclear as early as possible in the process, as retroactively moving a cabinet is best avoided due to the high cost and time impact of works.

5.2. Active Cabinets

Active cabinets are supplied by ICEE Managed Services, who construct the cabinets to Gigaclear's specification and prepare the equipment inside. ICEE are responsible for landing and securing the cabinet; once the cabinet is powered, ICEE are also responsible for commissioning the cabinet.

Power for all active cabinets is supplied by Ecotricity, who are responsible for arranging for the meter to be installed.

Contractors are responsible for:

1. Siting the cabinet in an appropriate location in line with the designed location
2. Conducting statutory utilities searches at the location, and using suitable underground detection equipment and trial holes to validate no other services are present
3. Constructing a cabinet base at that location, with earthing electrode
4. Coordinating with ICEE to land the cabinet on the base and affix it
5. Coordinating with Ecotricity for a power supply and meter to be installed

6. Coordinating with ICEE and PMO to commission the cabinet

5.2.1. Active Cabinet (Generation 2 Small)

The second generation (Gen2) family of cabinets replaced the first generation of active cabinets in 2020 and is now the only new cabinet type being deployed. Gateway cabinets have an identical construction process to access cabinets, but differing internal components.

Placement

The cabinet requires working space on the left and right sides (viewed from the front) and front of the cabinet. A minimum 900mm clearance should be provided on these sides. The rear of the cabinet can be placed against walls or backed against hedges so long as clearances on other sides are maintained (and likely to be maintained in the face of plant growth).

Cabinet Base and Ducts

The cabinet base is a multi-layered construction which provides safety earthing for the cabinet and a stable mechanical base for the cabinet itself.

The basic excavation is a 750mm pit, 1515mm x 835mm in size. Drawings supplied with this pack and the metal template supplied by ICEE are used to properly dimension the plinth and position ducts..

Ducts are placed to allow power and fibre cables to be brought into the cabinet; these comprise:

1. One 90 degree 100mm black duct for power
2. Two 90 degree 110mm green ducts for fibre cables
3. One straight 20mm or 50mm black duct from the conductive concrete earthing system

All ducts shall have a minimum bend radius of 300mm. Ducts should rise to at least 50mm above the level of the concrete surface and be capped during installation works to prevent debris entry.

A conductive concrete base is installed at the base of the pit and along the duct trenches. Refer to the Cubis San-Earth installation method statement (supplied with the Network Build Specification pack) for guidance on installation of the conductive concrete electrode, ensuring that the earth electrode cable and duct are brought up to the plinth to allow connection to the cabinet. No rebar shall be present in the concrete electrode, and photographs of the completed electrode should be taken during installation.

Upon the completed conductive concrete's top soil layer is installed a layer of sand, followed by a compacted granular sub-base, formed from a Type 1 sub-base aggregate.

Once the ducts and a rebar mesh are correctly positioned in the pit, shuttering to ensure a minimum 50mm rise above ground level shall be installed. Rebar should be a mesh type with wire sizes of at least 5mm and pitch of at least 200mm, such as A98 or A142 standard sheets. Plastic or concrete spacers shall be used to hold the rebar off the ground; care should be taken to ensure at least a 50mm gap between any pit surfaces or ground and the rebar, so as to ensure the rebar is fully encapsulated and unable to corrode.

Prior to installation of concrete, draw ropes must be installed within ducts and the ducts capped to prevent concrete ingress. All draw ropes shall be continuous non-rotting ropes with at least 2kN breaking strength.

Concrete shall be fully poured and settled with a vibratory poker before concrete sets, to ensure the integrity of the base as a single continuous pour. Concrete must be C32/40 or better and should not use cement of a fast-setting type; general purpose or "high strength" cements should be used. No

admixtures should typically be required, but where cabinets are installed near flood plains or in wet conditions such as near rivers or coastal areas, an inorganic pore blocking hydrophobic admixture may be included in the mix.

The concrete must cure for a minimum 3 days (72 hours) before the shuttering is removed and the cabinet is erected. In colder installation conditions below 2-3c, this should be extended by two days (48 hours). Accelerating admixtures may be used, but a minimum 48 hour cure time must be observed regardless of admixture usage, with a minimum 72 hour in cold conditions.

Hard standing

At the front and right sides of the cabinet, a suitable hard standing shall be constructed using 600x900mm paving slabs set into a 50mm minimum concrete base unless the cabinet is being built into existing hard surface (e.g. car parks) where reinstatement of the existing surface should be performed around the works. Concrete for hard standing should be constructed separately from the cabinet base. Cracked or damaged slabs must be replaced.

Electricity Meter and Earthing

Once the cabinet is installed, it is the responsibility of the contractor to order the power connection for the cabinet and arrange for meter installation from Ecotricity.

A qualified electrician must perform an electrical safety test as part of cabinet establishment and commissioning. It is the responsibility of the contractor to ensure that the cabinet is electrically safe until the cabinet has been accepted into maintenance. The cabinet must not be left in an unsafe state at any point.

Chambers

Generation 2 cabinets only require a FW4/FW6 chamber as needed to handle incoming ducts and break out cables for entry to the cabinet. Chambers should be sized to permit a minimum 10 metre coil of all incoming cables during construction activities. Splicing is performed within the cabinet, so external closures are not normally required.

Ducts

All ducts must be sealed to prevent gas and water entry once cables or microducts are installed. This should be performed with Filoform FiloSeal+, following the instructions provided in the supporting documents.

All microducts must be sealed, either in the adjacent chamber or within the cabinet, using gas blockers or caps.

As-Built Documentation

Evidence should be recorded and submitted to Gigaclear in the form of the following photographs:

- After pit excavation, showing the depth of the pit with a marker or ruler
- During conductive concrete installation, showing installation of the electrode element
- After conductive concrete installation, showing the top surface of the electrode and insulated cable routing to meet the duct location
- After compacted backfill and installation of ducts, prior to concrete pour, showing the backfill material and duct/rebar placement
- After the concrete shuttering has been removed and the base prepared for the cabinet landing
- After the cabinet landing, showing the cabinet bolted in place with hard standing installed

Once the cab is landed and cables installed, photographs showing duct entries for power and earth cables, plus duct seals placed around installed cables, should be taken and returned with the commissioning request document.

5.2.2. Active Cabinet (Generation 2 Large: Access/Central Office/Transport (DWDM))

The Large footprint cabinet is used in a variety of configurations to serve larger areas from a single site. There are several variants:

1. Access – supports up to two Keymile switches, effectively providing twice the capacity of a Small cabinet for access applications. Alternatively this cabinet can act as its own Gateway cabinet, at cost of half the capacity (making it equivalent to two Small cabinets sited side by side)
2. Transport (DWDM) – not used for access applications, but used to establish key network sites in the field for Gigaclear's core network and backhaul applications
3. Central Office (CO) – supports Passive Optical Network (PON) equipment for PON network deployments

All these cabinet variants follow the exact same procedure for construction and setup, but have a larger base. Drawings supplied with the Network Build Specification should be followed. Power and other aspects are also identical.

Transport and CO cabinets may require larger external chambers to host their required closures; this will be specified per cabinet as part of the design pack, but should be considered when siting cabinets.

The transport cabinet is identical mechanically to the other cabinets, but uses air conditioners rather than forced air for cooling. The CO cabinet hosts particularly noisy equipment. These cabinets *must not* be sited near residential areas, as they produce considerable noise year-round. As a rule we recommend a minimum distance of 100 metres between the Transport and Central Office cabinet types and any residential areas or properties; any concerns over cabinet siting must be raised with Gigaclear prior to build commencement. These cabinets are normally deployed well outside of villages, on industrial estates, or in other areas where noise is not a concern such as retail parks.

The Large Access cabinets are louder than the Small cabinets and we recommend they are placed at least 30-50 metres from the nearest residential property.

5.2.3. Legacy Active Cabinet (Generation 1)

The Generation 1 cabinet was Gigaclear's most commonly deployed cabinet. It was replaced by the Generation 2 cabinet family in 2020 and is no longer deployed. This guidance is left for maintenance and repair purposes.

The construction requirements for Generation 1 cabinets follow Generation 2 Small cabinet guidance but should be built to the Generation 1 drawings. Conductive concrete is used for all new or repair builds. Clearance is additionally required to the rear of the cabinet for access, with at least 900mm of space required.

5.3. Customer Drop Cabinets

Customer Drop Cabinets (CDCs) are provided by HellermannTyton/Eurocraft and are passive cabinets that house fibre splicing cassettes, a small fibre patch panel, and space to manage microducts and cables.

5.3.1. HellermannTyton/Eurocraft 48-port CDCs

These are the only type of CDC currently built in the network.

Base and Duct Installation

A base is excavated for the cabinet to 300mm depth. The dimensions of the pit should be 700mm wide and 400mm front-to-back.

53.9mm or 96.5mm 90 degree ducts are used to bring all sub-ducts and microducts into the cabinet. These must be installed in the directions required after the cabinet is installed but before the concrete is poured. A maximum of four ducts may be installed. All ducts must protrude to a minimum 50mm and maximum 70mm above the top of the concrete pour and should be capped (and installed with draw ropes if required) before the pour. Ducts being used for drop microducts must be centred under the drop microduct racks, to avoid ducts being bent or kinked when installed.

If metallic armoured cables will be installed in the cabinet, a further 150mm of depth should be excavated and a Cubis San-Earth conductive concrete electrode should be installed, using the incoming/outgoing trenches to achieve the required area. The electrode wire should be brought into the cabinet in a 53.9mm duct and terminated on an earth stud on the cabinet wall to ground the cabinet. Metallic sheaths should be clamped and wired to the earth stud.

Concrete of C32/40 type or better shall be poured to 250mm depth within the cabinet. As with active cabinets, admixtures shall not typically be required, but accelerating admixtures may be used.

The base should be allowed to cure for a minimum 48 hours before any work is performed on the cabinet or any shuttering is removed; if an accelerating admixture is used, this period may be reduced to 24 hours except in cold (<2-3c) weather. The CDC shall then be bolted securely onto the base, using the supplied neoprene seal and the supplied bolts. All bolts must be secure and tight; the cabinet shall not wobble or flex once bolted down.

Microduct Installation

Microducts should be installed through 53.9mm or 96.5mm entry ducts and secured with a cable tie on the microduct racks, starting from the back-most (highest) rack and working forward, left to right. Once secured the microduct should be cut square and deburred; lengths should be consistent on each rack.

All microducts must be capped with a compression fit end cap.

All microducts must be labelled using HellermannTyton TipTag 11x40mm labels, Brady BM71-10X60-7598-YL, or similar approved labels. Labels must be printed, not handwritten, with the pot number. Caps must not be used as labels.

Managing Multiducts

There is no facility for managing multiduct assemblies inside the CDC. The required 16mm ducts should be branched out from the multiduct assembly on approach to the cabinet; the remaining ducts should be left in the multiduct assembly and buried adjacent to the cabinet. If additional length is required to bring the required duct into the CDC, an offcut *of the same tube colour* should be coupled to the duct.

Where it is not possible to leave the ducts uninterrupted a cut may be made. If no branching is being performed the unneeded ducts may be coupled adjacent to the cabinet and directly buried. If a branch is being performed, a FW4 chamber should be installed in front of or next to the CDC and microducts managed within this chamber.

Under no circumstances should excess sub-ducts or multiduct assemblies be brought into the 53.9/96.5mm ducts and into the CDC. This can cause damage to the inside of the CDC, introduces bend radius issues, and makes duct sealing practically impossible. Only the sub-ducts being used within the CDC should enter the CDC. All other sub-ducts should be routed past the CDC.

Cable Installation

CDCs are typically fed with a subset of a cable's available fibre capacity, and therefore a mid-span cut should be made in the cable to achieve this wherever possible. Directions for mid-span cuts can be found in the Splicing SOP document. Where the CDC is attached to the end of a cable, a standard cable cut can be made.

The supporting document "HellermannTyton CDC Cabling Guide" shows correct cable routing for older CDCs; a label on the inside of newer CDC doors shows the correct route to follow and distances to cut back cables.

Buffer tubes are stored in the side of the CDC, using Velcro ties to secure them. Cable jackets and strength members must always be cut back to the strength member anchor points at the front of the side panel.

The required buffer tubes are taken across to the integrated routing backplate using spiral protective tubing which is anchored to the loop basket with foam tape and cable ties, and in the base of the integrated routing backplate.

Cables should be labelled with labels printed with the fully-qualified cable identifier.

The identification of the cabinet itself should be written into the space on the label on the inside of the door, or marked with a label at the top of the backboard.

Cabinet and Duct Sealing

So long as the concrete pour covers the base internally and consistently, there is no need to seal the cabinet base. Cabinet base sealant from Filoform may be used if there is a concern over water ingress into the base; kiln sand must be used to level the base prior to pouring sealant in accordance with the installation instructions.

All 53.9mm and 96.5mm ducts must be sealed to prevent gas and water entry. This should be performed with Filoform FiloSeal+, using the Gigaclear kit which contains foam blocks suitable for use with the CDC.

As-Built Documentation

CDCs should be documented during build and once cables have been installed. CDCs can be themselves claimed as built and installed only once cables have been installed.

Evidence should be recorded and submitted to Gigaclear in the form of the following photographs:

- The excavated pit prior to installation, with a depth indicator visible
- The interior of the cabinet base after duct installation, showing sealed ducts
- The exterior of the cabinet, showing the reinstatement
- The interior of the cabinet once fully installed, showing cable management, cable routing into the splice tray backplane, and microduct racks with labels

6. Chambers

Gigaclear uses chambers to house closures, microduct joints, and cable loops. Chambers are constructed from a sump and modular ring system, covered with a lid, and can be adjusted or broken into in a number of ways.

There are a series of standard chamber sizes:

DESIGNATION	USAGE	APPROX. INTERNAL DIMENSIONS
CW 1	Carriageway	600 x 600 mm
CW 2	Carriageway	1200 x 675 mm
CW 3	Carriageway	1800 x 675 mm
FW 2	Footway/Verge	610 x 445 mm
FW 4	Footway/Verge	915 x 445 mm
FW 6	Footway/Verge	1310 x 610 mm
FW 10	Footway/Verge	2300 x 750 mm

The selection of chamber size is typically performed by Design and instructed out. However, the smallest chamber required should be used if new chambers are required. Typical sizes are:

- Centre blowing, straight multiduct/duct access – FW2, CW1
- Closure hosting, corner multiduct/duct access – FW4, CW2
- Multiple closure hosting – FW6/10, CW3

However, introduction of closures should generally be conducted by Gigaclear's Design team as a design change.

6.1. Approved Types and Parts

FW chambers are of the Cubis STAKKAbox Fortress type, using AX-S concrete infill lids. AX-S recessed lids may be used where reinstatement of block paving or other complex surfaces is required.

CW chambers are of the Cubis STAKKAbox Ultima type, using AX-S ductile iron lids.

Chambers shall not be constructed from bricks, in situ concrete, or from chamber systems not specified by Gigaclear – chambers not built with approved materials will not be accepted by Gigaclear and will have to be re-built with the correct materials. Lids must also be the correct type and bear the GIGACLEAR logo in the inset label.

All chambers are supplied from Cubis as complete systems, including the required hardware for that chamber size (lid, rising frame, 3 rings, any cable hangers etc). These systems are the only approved products and must be used. Alternative products or systems will not be accepted.

All chambers are fitted with one or more cable hangers; larger chambers may be fitted with steps. All chambers should be constructed in accordance with the drawings supplied with this document.

96.5mm/54.9mm ducts are used for chamber entry and exit to allow for proper sealing of chambers with mortar and sealant. Microduct and cable should not directly enter or leave a chamber.

6.2. Positioning

Chambers should always, where possible, be located in soft ground or footways. Carriageway chambers are a last resort, and should only be used where access to the chamber is not likely to be

disruptive or require road closures/traffic management (e.g. on private driveways, or to provide additional protection against traffic in positions where a footway or verge may be heavily trafficked).

In soft ground, avoid placing chambers on junctions or adjacent to driveways where “corner cutting” is likely to lead to heavy trafficking of the chamber and premature failure or damage. Chambers should be set back from driveways so that vehicle incursions are unlikely.

6.3. Installation

Mark up the ground to excavate following the chamber drawing, noting the minimum backfill spacing required around the chamber (typically 150mm for footway and 200mm for carriageway, but this should be expanded if needed for wider compaction equipment). Ensure that space is left on either side of the intended lid position to allow a pit lifter to remove the finished lid and lay it to the side of the chamber.

Following guidance on safe excavation, excavate the pit to the correct depth for the chamber being installed. Depth should be measured from the finished ground level, minus the base material depth, minus the frame thickness and mortar level required for the frame/cover installation, to a straight rule across the pit.

The base is to be constructed from Type 1 material and thoroughly compacted to achieve the required depth, ensuring that the finished base surface is level. Where a soakaway is required in the drawings, a grate should be installed onto the backfill to enable water to leave the chamber.

For carriageway chambers only, a 150mm deep layer of dry lean mix concrete is used to provide a secure base for the chamber; the bottom ring should be gently tapped into the concrete approximately 10mm. A dry sand/cement mixture should then be spread over the concrete layer in the base of the chamber. The concrete should be allowed to set for a minimum of 48 hours before proceeding; ensure the site is left in a safe condition with appropriate guard rails. Footway chambers do not require a concrete base and compacted type 1 material is sufficient.

Once the concrete, if needed, is set, add additional rings, cutting holes with a hole saw of the correct size for entry of ducts. 96.5mm or 53.9mm PVC ducts are to be used to bring in any multiducts or microducts, to allow proper sealing of ducts. If gaps around ducts are left, close them with HA104 approved mortar or concrete adequately supported by compacted backfill material. Duct entry holes should be spaced at least 75mm apart.

After installation of ducts and the top ring, backfill around the chamber. In footway, type 1 material is used; for carriageway, dry lean mix C40 concrete must be used. Compact as you fill, ensuring that all layers of the material are compacted fully in accordance with the SROH, appendix A8. Backfill should be compacted to 50mm from the top of the top ring.

Place the frame assembly on top of the top ring. The frame must be bedded on 10-50mm of a HA104 approved mortar.; if using a rising frame, secure the frame in place with the supplied materials. Reinstate the surface in accordance with the surrounding environment; this reinstatement must comply with the SROH.

In soft surfaces, where a rising frame is not used or is inadequate, a final layer of C30 (or better) concrete should be installed on top of the backfill material in accordance with the drawing, with rebar as indicated, with shuttering installed to the top edge of the backfill material. This concrete layer must be left to set for a minimum of 48 hours; an accelerator admixture may be used. Use of a rising frame generally obsoletes this requirement, but a concrete edge may be required depending

on the situation (e.g. tilt required beyond what the rising frame can accommodate, or unstable surrounding surfaces).

In all cases, the lip of the frame must be fully covered by the reinstatement up to the top of the lid support; only a thin strip of metal should be visible around the edge of the lid.

The final lid height must be flush, and not protrude from the surface more than 5mm.

After final installation of all ducts, all open ducts should be sealed in accordance with the duct guidance. Any stubbed multiduct assemblies should have their individual sub-ducts capped or be cold shrink sealed with Filoform CE3 caps.

6.4. As-Built Records

Photographic evidence should be recorded and submitted to Gigaclear:

- Photograph the bottom ring in the bottom of the pit, with base and depth marker visible, after the concrete is poured
- Photograph the stacked rings and duct entries prior to backfill
- Photograph the backfilled and reinstated chamber, with lid removed and with lid fitted
- Photograph the interior of the finished chamber, showing duct seals and joints installed

7. Customer Connection Points (Pots)

Customer connection points – variously known as pots, toby boxes, POTs, or CCPs – are the demarcation point where Gigaclear's network ends before an order is placed.

7.1. Locating and Moving Pots

The location of the pot is important for customer satisfaction, as it will affect the cost of installation and the location of entry onto customer land. Moving pots after build is costly and should be avoided.

The ideal location for a pot shall minimise:

1. Cost of installation (total length and use of hard surface types)
2. Consumables required by the installations team (ducts, etc)
3. Time taken for the installation
4. Risk to the public (trip hazards, etc)

The pot should be positioned where there is open access to the front of the building, e.g. not against a wall, where soft dig can be used to install all the way to the building.

Where it is possible, building owners should be consulted as to the ideal location of the pot. The contractor may adjust the location of the pot to meet requests, so long as the requests do not cause significant changes to the design and pot locations still meet the requirements of this guide.

Pots should generally be installed between 75mm and 150mm from the property boundary. Pots may be installed flush to a property boundary if it does not affect the ability for installers to subsequently conduct an installation, and may be placed further away if a carriageway pot is required to enable proper reinstatement to be conducted in accordance with the SROH. For the avoidance of doubt, in scenarios where the boundary is not clearly defined by a feature such as a fence, hedge, wall, or other clearly-marked boundary feature, the property boundary shall be taken from OS MasterMap geometry and a GNSS receiver with sub-decimetre accuracy (using RTK or PPP).

Pots must be installed perpendicular to the boundary line, facing the highway or perpendicular to the serving trench. The "swept T" of the pot should sweep down to the trench serving the pot. Carriageway pots may be placed in any orientation.

Pots should be installed level with the surface, with a maximum protrusion of 5mm. Pots which are not installed flush with the surface will be rejected and must be reinstalled at the contractor's cost.

If there is any doubt about the correct pot location or type for a specific property, Gigaclear should be contacted to advise on the best location.

7.1.1. Pots in driveways and near carriageway

Where pots are located in driveways, privately owned carriageway, or sufficiently close to carriageways that vehicles may be reasonably expected to impinge on them – for instance, if there is evidence that vehicles cut a corner where a pot must be located – then a carriageway pot should be used. Relocation of pots to a location where a carriageway pot is not required will typically be preferable.

When pots are located in driveways and can be located within 50cm of a structure such as a gate/corner post or building, and so it is not likely that vehicle wheels would directly cross a pot, a standard pot may be used.

7.2. Multi-Dwelling Units, Multiple Occupancy Units, and Groups of Pots

Often, Designs may call for a group of pots to be placed next to each other. This is generally done at the edge of private land where multiple customers or properties are to be served, often outside of blocks of flats or other multi-dwelling units (MDUs). These groups of pots are sometimes present due to limitations in the design system which mean that designers are unable to indicate that an MDU is present. This will be addressed in a future release of the design system but designs already issued may not be updated.

Gigaclear's MDU guidance should always be followed when MDUs are encountered. Build will be performed *to the property* rather than the property boundary should permission be secured from the property owner.

Where it is not possible to build to a building, or an MDU is not present, groups of more than five pots should generally be replaced with the smallest suitable alternative chamber, normally an FW2. Where all pots serve the same building, a single pot may be placed for up to 12 connection points to be supplied through the same 8/4.5mm microduct using a blown 12 fibre unit.

Where multiple pots are placed, care must be taken to ensure that all the pots can be accessed and that microducts can be both brought into the pot and leave the pot in the direction of the served property. Pots which cannot be used by installers will not be accepted into service and must be remediated by the contractor.

Where more than 12 connection points are required, a chamber should be placed. If more than 12 connections are required to a single building, then a 16/12mm microduct should be left capped in this chamber to allow a suitable cable to be installed through to the building in future. If multiple buildings are being served from the chamber, suitable duct capacity must be left for each building so that all buildings can be served.

Where a chamber is used, it should replace all the pots adjacent to the chamber; pots should not be installed next to a chamber used for drops.

	STRUCTURE REQUIRED	DUCT REQUIRED
UP TO 12 CONNECTIONS	Pot	8/4.5mm microduct
MORE THAN 12 CONNECTIONS	Chamber (FW2)	16/12mm microduct

Where microducts terminate in a chamber, a short stub of 50mm duct should be installed to allow for proper sealing of the duct entries. A short stub should also be installed on the premise-facing side, extending beyond the chamber backfill, to allow installation without re-excavation of the chamber wall or disturbance of the compacted backfill.

In all cases, microducts should be connected back to the serving drop cabinet or chamber and tested as normal before being left capped with a compression fit cap.

Ducts should be labelled in the chamber and at the serving chamber or cabinet with the pot numbers being served or, in the case of MDUs, the building being served.

7.3. Prohibitions

Pots must under no circumstances be located:

1. In front of walls over 750mm thick
2. In front of a drainage ditch, culvert, or water channel, with no bridge suitable for accessing the property (e.g. owned by the property owner)

3. Near other utilities (water, gas, electricity, other telecoms) such that installation, maintenance or other activities would carry a risk of interference or a safety risk
4. In front of obstacles which would otherwise make the installation to the property impossible or difficult to perform without substantial civil engineering works

7.4. Types

Pots used in verge and footway surfaces are a plastic type supplied by Emtelle. Pots carry the Gigaclear logo in the lid; pots must be marked in this way or they will not be accepted into service. Pots damaged during installation will also not be accepted into service.

Pots used in carriageway, soft track, and in verge scenarios where there is evidence of frequent traffic use are a ductile iron type with a composite root supplied by Cubis. These pots are to be used as a last resort where the pot cannot be installed in an alternate location that avoids the use of the carriageway.

Carriageway pots should be treated, from a construction perspective, as chambers, and are supplied by Cubis as a complete system of base/root and ductile iron lid. Their use requires excavation sufficient to permit compaction of side backfill material in accordance with the SROH, and they must be installed on top of a compacted type 1 base.

7.5. As-Built Records

Photographic evidence should be recorded and submitted to Gigaclear:

- Photograph the pot, open, showing the installed microduct and printed label
- Photograph the context of the pot, showing the placement in relation to the building it serves

For chambers used to serve premises, as-built records for chambers should be followed, but with appropriate label photographs on ducts shown.

8. Version History

Version	Date	Notes
1.0	2019-05-03	First issue
1.1	2019-06-11	Revised and clarified duct sealing sections, fixed typos, clarified trench depths
1.2	2019-07-22	Clarified wording on as-built documentation of cabinets, and added section on as-built documentation of ducts clarifying that joints/seals must be included in chamber/cabinet/trench as-built photographs
1.3	2019-08-14	Added clarification on max designed blowing distance and cable blowing failure requiring remediation of the duct
1.4	2019-09-27	Clarified depth of cover in scenarios where the verge is higher than the carriageway. Added requirement to record deviations from planned depth of cover. Added reference to SROH on trenches within 600mm of the carriageway in unmade ground. Added rebar specification guidance to cabinet base construction notes. Added Generation 2 Small cabinet details. Allowed the use of 50mm ducts in CDCs, and increased the minimum protrusion of 50mm ducts from 30mm to 50mm from the base to allow compression seal usage. Removed Filoseal CE3 cold shrink for multiduct abandonment in favour of using end caps. Added note on acceptance into service of damaged pots. Added section on multi-dwelling units and clusters of pots. Added notes on carriageway pot construction and accepting damaged pots into service.
1.5	2019-10-25	Corrected duct dimensions to 8/4.5mm in some places where 8/4mm had been referred to
1.6	2019-11-25	Aligned chamber construction guidance with guidance from manufacturers, notably removing the requirement to use concrete bases in the construction of FW chambers. Added note on placing pots in driveways and when to use carriageway pots outside of the public highway.
1.7	2019-12-03	Added note on SROH S9.2.2 in section 6.2 surrounding depth of cover in verge within 600mm of carriageway.
1.8	2020-09-28	Clarified use of Cubis chamber systems and carriageway pots.
1.9	2020-09-30	Added note on rating of road plates in section 3.6. Adds requirement to collect evidence of use of avoidance equipment to align with HSEQ guidance on Cat & Genny usage and GPS record capture. Added note on protection of microducts during installation in section 4.4. Clarified permitted microducts and ducts, and requirement to use green coloured PVC ducts (53.9/96.5/110mm ducts). Revised cabinet descriptions for clarity and to avoid duplication with Active Cabinet Guide; added notes on placement guidance

	and CO cabinets. Restructured to place Gen1 cabinet instructions to the back and final Gen2 guidance in front. CDC guidance updated to reflect revised CDC product cable anchoring, duct placement, and labelling. Added note on chamber positioning in 6.2 to clarify avoidance of use of CW chambers and avoidance of high traffic areas for FW chambers. Relaxed pot placement 75-150mm rule for carriageway pots to allow SROH compliance to be more readily met and allowed flush placement of pots where suitable. Reworded introductory sections and collapsed into subsections. Added section 4.10/11 on sub-duct and cable installation in wide-bore (53.9/96.5mm) ducts for PIA to supplement PIA Build Guide/Third Party Infrastructure Guide.

9. Bibliography

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