



gtec

GTC TECHNICAL GUIDELINES

For Low Density Heat Networks

GTC Technical Guidelines and Safety Information
for House Builders and Developers

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SECTION ONE

Introduction

These guidelines provide you with information on the installation of the community heat hub, heat mains, services, Heat Interface Unit (HIU), and other parts of our heat networks to the home from heat generating plant within a centralised Community Heat Hub (Energy Centre). The guidelines also cover the safety aspects of GTC completing works onsite and specify your responsibilities in the delivery of the heat network. Each home will have a pair of service pipes with isolation valves connected to the district heating pipework and connected to an internal wall mounted Heat Interface Unit.

These guidelines provide the Developer with their requirements for the installation of the district heating infrastructure of a low-density development.

Should you wish to contact us, the telephone number is 01359 758757.

Disclaimer

Although the greatest of care has been taken in the compilation and preparation of this document, GTC respectfully accepts no responsibility for any errors, omissions or alterations or for any consequences arising from the use, or reliance upon the information in this document.

SECTION TWO

Communications

Our opening hours are from 08.00 to 17:00 every weekday (excluding bank holidays). The below is a list of contact details for various parts of the customer journey.

Heat Emergency

To report failure to supply heat or damage to or leakage from a heat pipe, please call **02920 100346** (24 hours).

Gas Emergency

If you can smell gas or believe a gas pipe has been damaged, please call **0800 111 999** (24 hours).

Electricity Emergency

To report No Supply or Electrical Damage, please call **0800 0326990** (24 hours).

Fibre Emergency

To report damage to a fibre plant or OSCP, please call **02920 028726**.

Water Emergency

To report a loss of supply or a burst or leaking water main, please call **02920 442716**.

Sales

To discuss your utility infrastructure solution needs and obtain a quotation, please contact **01359 240154** or **sales@gtc-uk.co.uk**.

Design

To discuss a utility design or request a variation, please contact **01359 300798** or **network_variations@gtc-uk.co.uk**.

Site Installation

To book in work on your site, please contact 0345 6022498 or **gtcworks@gtc-uk.co.uk**.

Heat Interface Unit Details

Request or query HIU details, or queries for HIU metering and billing, or HIU fault, please contact **heato&m@metropolitan-uk.co.uk** or **02920 100346**.

Finance Queries

For any queries regarding invoices or billing, please contact **01359 308144** or **credit.control@gtc-uk.co.uk**.

Customer Services

At GTC, we are committed to providing you with excellent customer service and we encourage feedback so that can ensure we are making our customers happy.

If you have any comments or complaints about our service please contact **01359 302640** or **customerservices@gtc-uk.co.uk**.

SECTION THREE

Safety

Safe Place of Work

GTC requires a safe place of work to be provided for all its staff and contractors. We will seek confirmation that the construction site is a safe place to work.

Upon arrival on site, staff and contractors will report to the Site Manager/Representative to discuss intended works. Prior to undertaking this work, a site-specific risk assessment will be undertaken. If, following this assessment, the works cannot be undertaken in a safe manner, the Site Manager/Representative will be informed. Until a safe working environment is achieved, no activities shall be undertaken.

Site Traffic Rules

All site traffic information should be made available to the team/operative when arriving on site, via a site induction or during the booking in on-site stage.

Equipment and Materials

All materials will be handled, transported, stored and fixed in accordance with the manufacturer's requirements. Any conflict between such requirements, this documentation and the British Standards Institution, shall be referred to GTC in writing for a decision.

The Site Manager/Representative shall ensure their equipment and materials are operated and stored in such a manner that they do not become a hazard within the working area of the GTC team/operative.

Scaffold

Ensure all scaffolding where the team/operatives are to work is removed prior to their arrival on site.

Waste

In most cases, GTC will make use of the waste collection and disposal facilities on site from the Principal Contractor. If this is not possible it should be discussed with your local Project Manager.

Welfare Facilities

Welfare facilities are to be made available on site from the Principal Contractor.

Utility Protection

Ensure all excavation works onsite are progressed using safe digging techniques. Refer to HSG47 Avoiding Danger from Underground Services. GTC utility plans are available via www.gtc-uk.co.uk/network-locations.

Competence

Any staff and/or appointed contractor working on behalf of GTC who attend site will have the appropriate training, technical knowledge and experience to discharge the intended works in a safe manner.

Construction Design Management (CDM) Regulations

GTC will act as the 'Designer' and 'Contractor' for the construction and commissioning of heat networks on new property developments.

The heat mains, services and HIU that will be installed on the development will remain the property of GTC as named in your quotation.

GTC will be responsible for the operation and maintenance of the network on behalf of the GTC.

The construction team should leave a marked-up copy of what is live in the site agent's office during the construction phase so that other construction workers have access to live plant information.

Damage to Heat Mains

It is imperative that the heat mains and services are not damaged following installation, and it is the responsibility of the Developer to ensure that ALL contractors working on site are informed of the location of the heat mains and services. The mains and services drawing should always be on site and updated to clearly show the installation progress.

Please note that other utility apparatus may be in close proximity to heat pipes particularly when services cross over other utility mains. The Developer should at the earliest stage establish the location of any non-GTC utility mains and services that may be affected.

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Damage to live heat mains and services must be reported immediately to the emergency contact number 0292 0100 346 who will arrange for the Emergency Service provider to attend site and undertake any repairs.

Damage to commissioned operational heat pipes may result in exposure to high pressure hot water at elevated temperatures. A significant leak to operational heat pipes will cause an interruption to the supply of heat service to end users. GTC must be immediately informed to arrange the restoration of heat supply.

Any damage to non-commissioned heat pipes, no matter how slight, must be reported immediately to GTC.

For further information refer to HSE publication HSG47 Avoiding Danger from Underground Services which gives detailed guidance on avoiding damage to gas mains and services, including information on detecting underground services and safe digging practices. Free information is available from the HSE Infoline on 0845 345 0055 or the HSE website <http://www.hse.gov.uk>

Ground Workers Safety

All heat apparatus **MUST** be treated as live.

- Any injury, damage to plant, however slight, must be notified to the Asset Owner and Site Manager immediately.
- Underground services, particularly electricity and gas can be extremely dangerous.
- Damage to heat pipes can cause scalding from the release of hot water under pressure and interruption to the supply of heat for end users. Damage to electrical cables can lead to severe burns or even death. Gas leaks can cause fire and explosion. Damage to heat network communication cables could cause interruption to the supply of heat for end users.
- Damage can result from excavation or penetration of the ground (e.g. by a road pin).
- Underground services may be commonly found in roads, footpaths and on sites or across open land.
- Make sure you have plans of the underground services in the area and make use of them. This may not always be possible for emergency or unforeseen works.
- Use approved equipment to confirm the position of electricity cables, metal pipes and any other detectable plant within and around the area of proposed excavation.
- Look for signs of service connection cables or pipes, e.g. heat, gas, electricity or water meter boxes, valve covers or a service connection entry into a house or streetlamp.
- Hand dig trial holes (as many as necessary), to confirm the exact position of services in close proximity to the area of your work. This is particularly important if there are plastic pipes which cannot always be found by electromagnetic location techniques.

All mains cables will have a marker tape laid above – this is a useful indication of the presence of a live utility apparatus in the vicinity and therefore you should avoid disturbing the tape.

It is possible that cables or pipes may be embedded in concrete. Electricity cables embedded in concrete

MUST be isolated before the concrete is broken out – please contact GTC at the earliest opportunity to arrange.

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Services are sometimes protected by concrete, polyethylene or earthenware tiles or a marker tape laid above the service - this is a useful indication of the presence of the service; you should avoid disturbing any tile or tape to expose the service if possible.

Do not use existing buried plant as a step to enter or exit any excavation.

SECTION FOUR

Definitions

Community Heat Hub	The Community Heat Hub (CHH) is the Energy Centre where the heat is generated and connected to the heat mains.
DNO / IDNO	District Network Operator / Independent District Network Operator.
DRP	Disaster Recovery Plan
ENC	Electricity Network Company (a BUUK Company)
Heat Box	A Glass Reinforced Plastic (GRP) box located externally and fixed to the dwelling which contains insulated pipework and isolation valves connected to the heat network. The heat box includes a 2m section of pipe fixed to the underneath of the heat box which connects to the service main pipework below ground level. Connections to the internal dwelling systems is made via penetrations in the wall.
Heat Interface Unit (HIU)	A heat transfer unit located within the dwelling which transfers heat from the primary district heating to the property heating and hot water system. The HIU is normally located within a room or cupboard specifically designed to accommodate the installation
Heat Main	Underground/buried pipe network for distributing heat throughout the property development.
Heat Service	Underground pipe for conveying heat to premises from the district heating mains system.
Heat Transporter	Independent Community Heating Limited (ICHL).
Installation Pipe	The pipe work within a consumer's premises between the outlet of the HIU and the appliances.
Internal Service Riser	A riser heat pipe installed within the structure of a building.
PI-TRV	Pressure Independent Thermostatic Radiator Valve
PM	Project Manager
UIP	Utilities Installation Provider

SECTION FIVE

Roles and Responsibilities

The matrix below identifies the roles and responsibilities for the Developer and GTC:

Ref	Planning and Pre-Construction Documentation	GTC	Developer
0.01	Construction Programme		Yes
0.02	Planning Permission Submissions		Yes
0.03	Environmental Surveys		Yes
0.04	Energy Strategy		Yes
0.05	Planning Conditions pertaining to Community Heat Hub		Yes
0.06	Site Noise Assessment / Requirements		Yes
0.07	Fire Strategy		Yes
0.09	Ground Condition Report (entire site)		Yes
0.10	Accommodation Schedule		Yes
0.11	Development Masterplan		Yes
0.12	Dwelling Layout Drawings		Yes
0.13	Site topography drawing		Yes
0.14	Construction phasing plan (identifying required heat-on date)		Yes
0.15	CDM Principal Contractor	As detailed in each section	As detailed in each section
0.16	Location of Community Heat Hub on site masterplan	To advise	Yes
0.17	Assessment and location for day one temporary Community Heat Hub	To advise	Yes
0.18	Easements	To advise	Yes
0.19	Infrastructure programme		Yes

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Ref	Community Heat Hub	GTC	Developer
	Community Heat Hub		
1.01	Principal Contractor (CDM)		Yes
1.02	Community Heat Hub Acoustic Attenuation	Excluded ¹	
1.03	Maintenance free ground surface	To advise	Yes
1.04	Perimeter fencing (including any acoustic mitigations identified by the Developer's acoustic specialist)	To advise	Yes
1.05	Access door/gates to the compound, including associated groundworks (such as holes for drop rods)	To advise	Yes
1.06	Design, supply and installation of external pipework including pipework, insulation, weatherproof finish and floor mounted supports	Yes	
1.07	Design, supply and installation of bases for external pipework floor mounted supports		Yes
1.08	Lightning Protection	Yes	
1.09	Fire Detection	Yes	
1.10	Security Alarm	Yes	
1.11	Vehicle Access & Van Parking Space		Yes
1.12	Maintenance free ground surface for disaster recovery plant area outside of heat hub		Yes
1.13	External Lighting (inside heat hub and on heat hub perimeter fence)	Yes	
1.14	All below ground duct requirements	To advise	Yes
1.15	Supply, and install of inspection chamber and valve chamber (chambers directly outside CHH)	To advise	Yes
1.16	Below ground drainage (foul and surface water)		Yes
1.17	Adequate street lighting outside of CHH		Yes
1.18	Means to prevent public parking in disaster recovery plant area, disaster recovery valves and access road to heat hub gates		Yes
1.19	All landscaping and regular ongoing maintenance to area surrounding the heat hub		Yes
1.20	Earthing design, specification, supply and installation	Yes	
1.21	Earthing trenches		Yes
1.22	Design and installation of all Community Heat Hub & disaster recovery area and associated surrounding area foundations and civils works	To advise	Yes

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Community Heat Hub – Utility Connections			
2.01	Mains water connection to street mains & DNO meter	Subject to contract ²	Subject to contract ²
2.02	Broadband/Fibre connection to street mains	Subject to contract ²	Subject to contract ²
2.03	HV Power connection to street mains & DNO meter	Subject to contract ²	Subject to contract ²
2.04	HV Power infrastructure e.g. Ring Main Units	Subject to contract ²	Subject to contract ²
2.05	Foul drainage connection to street mains		Yes
2.06	Rain/Surface Water Connection to street mains		Yes
2.07	Soakaway (where applicable) design and installation		Yes
Community Heat Hub – Pre-fabricated Plantroom			
3.01	Principal Contractor (CDM)		Yes
3.02	Specification, supply, delivery to site and off load into position	Yes	
3.03	Any ground works required for plant lift		Yes
3.04	Design of concrete base/foundation	To advise	Yes
3.05	Supply/construction of concrete base/foundation		Yes
3.06	Commissioning	Yes	
3.07	Low Voltage connection from transformer/s	Yes	
Community Heat Hub - Air Source Heat Pumps			
4.01	Principle Contractor (CDM)		Yes
4.02	Specification, supply, delivery to site and off load into position	Yes	
4.03	Attenuation	Excluded ¹	
4.04	Any ground works required for plant lift	To advise	Yes
4.05	Design of concrete base/foundation	To advise	Yes
4.06	Supply/construction of concrete base/foundation		Yes
4.07	Commissioning	Yes	
4.08	All mechanical/electrical connections (excluding below ground drainage)	Yes	
4.09	Drainage connection to mains foul drain infrastructure (including floor gullies)		Yes
4.10	Above ground drainage pipework	Yes	

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Ref	Buried District Heating Main and Service to Dwelling	GTC	Developer
8.01	Principal Contractor (CDM)		Yes
8.02	Principal Designer (CDM)		Yes
8.03	Route/design of district heating pipework	Yes ³	Yes ³
8.04	District heating pipe specification	Yes	
8.05	District heating pipe supply	Yes	
8.06	Delivery of district heating pipe to site	Yes	
8.07	Provision of suitably sized materials area, sizes to cater for coils, 12m sticks of pipe, valves and container		Yes
8.08	Off-loading and all moving pipes on-site to storage/trench		Yes
8.09	On site storage of district heating pipes		Yes
8.10	Excavation of trenches and safeguarding of trenches and required safe access and egress		Yes
8.11	Sanding bottom of trench (to specification) for district heating pipes		Yes
8.12	Dewatering of trench		Yes
8.13	Coordination of district heating pipework with existing services / building foundations, diversion of existing utilities		Yes
8.14	All pipework ducts / sleeves		Yes
8.15	Jointing of pipework connections	Yes	
8.16	Filling, flushing, pressure testing and treatment of district heating pipework	Yes	
8.17	Restrict access and/or barrier off ends of mains on test	To advise	Yes
8.18	Heat Network communication cables duct, pull chambers & cable supply and install	Yes	
8.19	Heat network communications pull chambers bases	To advise	Yes
8.20	Backfill of trenches with backfill material as specified by GTC herein		Yes
8.21	Supply district heating marker tape / sand	Yes	
8.22	Install district heating marker tape / sand		Yes
8.23	Installation of top cover/surface		Yes
8.24	Setting out and excavation of disaster recovery valve chambers		Yes
8.25	Provision and installation of valve and heat network disaster recovery plan / communication chamber bases, walls and lids	To advise	Yes

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8.26	Line and level of all chambers		Yes
8.27	Installation of pipework, valve arrangement and ducts through chambers	Yes	
8.28	Provision and installation of valve and heat network communication chambers including covers and access irons and setting to finished ground level		Yes
8.29	Setting out of service connection to properties where applicable		Yes
8.30	Excavation at dwelling for service pipework entry to dwelling		Yes
8.31	Fire stopping		Yes
8.32	Installation of house/building entry duct		Yes
8.33	Excavation for ends of pipe runs where required for commissioning	To advise	Yes
8.34	Setting cover of communication chambers to finished ground level		Yes
8.35	Supply and install of lids for all chambers (DRP valves and communications)		Yes
Ref	Dwelling Services	GTC	Developer
9.01	Principle Contractor (CDM)		Yes
9.02	Heat Interface Unit specification	Yes	
9.03	Heat box installation (where applicable)		Yes
9.04	Off-loading, moving and secure and watertight storage for HIUs and heat boxes (if applicable)		Yes
9.05	Restriction of access to HIU, first fix rail and service (primary) pipework during hydraulic (water) pressure test	To Advise	Yes
9.06	All boxing, covering, hiding of pipework and access hatches		Yes
9.07	Metering and Billing Platform Specification, supply and installation of hardware and aerial	Yes	
9.08	Metering and billing platform /aerial power and comms cabling	Subject to contract ⁴	Subject to contract ⁴
9.09	Metering and billing platform foundations and associated fence/gate (where applicable)	To advise	Yes
9.10	Metering and Billing Aerial Suitable Location for Installation	To advise	Yes
9.11	Room thermostat/programmer		Yes
9.12	Space heating valves (PI-TRVs, UFH PI cartridges)	To advise	Yes
9.13	Supply and install house/building entry pipe	Yes	

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9.14	HIU and HIU first fix rail procurement and delivery	Yes	
9.15	Radiators and/or UFH and associated zonal controls procurement		Yes
9.16	Radiator and/or UFH (and associated equipment) procurement, installation, air venting and commissioning		Yes
9.17	HIU and HIU first fix rail installation and including all power, water, waste, heat network, space heating and DHW supplies		Yes
9.18	Heat network service connection pipework installation (above ground)		Yes
9.19	Heat network service connection pipework pressure tested (air) (above ground)		Yes
9.20	Heat network service connection pipework connected to house entry valves (above ground)		Yes
9.21	Heat network service connection treated water fill for below ground service pipework (up to house entry valves)	Yes	
9.22	Heat network service connection flush for below ground service pipework (up to house entry valves)	Yes	
9.23	Heat network service connection treated water fill for above ground service pipework (from house entry valve to HIU FFR)	Yes ⁵	Yes ⁵
9.24	Heat network service connection flush for above ground service pipework (from house entry valve to HIU FFR)	Yes ⁵	Yes ⁵
9.25	Heat network service connection pressure test (wet) (below ground from submain to house entry valves)	Yes	
9.26	Heat network service connection pipework pressure test (wet) (above ground, from house entry valves to HIU)		Yes
9.27	Rectification of above ground pipework issues identified during hydrostatic test		Yes
9.28	Insulation lagging to all above ground heat network pipework		Yes
9.29	Connection of pipework earthing straps to appropriate earth terminals		Yes
9.30	Space heating pipework procurement, installation, testing, flushing, chemical treatment and insulation lagging		Yes
9.31	Domestic hot water pipework (to outlets) procurement, installation, testing, flushing, chlorination and lagging		Yes
9.32	Radiators (and associated equipment) procurement, installation and commissioning/balancing		Yes

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9.33	Cold water service pipework procurement, installation, chlorination and commissioning		Yes
9.34	Space heating zonal controls procurement, installation and commissioning		Yes
9.35	Space heating zonal controls wiring		Yes
9.36	Power and controls wiring connected to HIU		Yes
9.37	Space heating flow rate and pressure balancing		Yes
9.38	HIU commissioning	To advise	Yes ⁶
9.39	HIU witness and verification of HIU commissioning	Yes	
9.40	Issue of as built and commissioning documentation, certificates to GTC/Metropolitan		Yes

Notes

1. All attenuation is excluded from initial contract offer and is subject to site specific parameters and requirements. Attenuation mitigations identified by the Developer's acoustic consultant can be added to GTC's scope of works post-contract award as a variation instruction from the Developer.
2. Works subcontracted to GTC, or affiliate, will be the responsibility of GTC. Works subcontracted to alternative contractor will be the responsibility of the Developer.
3. The Developer shall work with GTC in optimising the district heating route. GTC will be responsible for the production of drawings, the Developer shall verify and agree the intended routes. Any deviation from the agreed routing shall be the cost of the Developer.
4. GTC's preference is to locate the metering and billing aerial on an appropriate building owned by GTC on the such as an electrical substation or the Community Heat Hub. In these instances, GTC will supply and install all power and comms requirements. In instances where GTC are not the substation asset owner, and/or the appropriate location is a residential or commercial building, the Developer shall provide all power and comms requirements necessary for the metering and billing aerial as designed/detailed by GTC.
5. Refer to the commissioning section within this document for the various scenarios and the scope of responsibility for each scenario.
6. HIU commissioning shall follow Metropolitan's procedures, guidance and commissioning certificate templates. GTC/Metropolitan shall provide training and site support.

SECTION SIX

Community Heat Hub

The Developer will carry out all civil and ground works associated with the Community Heat Hub. Community Heat Hubs will be built to GTC's specifications and drawings.

The Developer is to ensure all necessary site documents and drawings are made available to GTC at the earliest opportunity at contract award. All changes to site documents and drawings are to be issued to GTC as soon as possible to review and approve against impacts to design. Following a technical and commercial assessment for variations to the contracted design, the Developer shall confirm in writing to the GTC Project Manager to proceed with a variation to the contract.

The procurement, design, installation and setting to work will be carried out in accordance with CIBSE Heat Networks CP1 2020 which places responsibility and specific requirements on the Developer/Contractor/Energy Services Company (ESCo). A copy can be downloaded for free via the CIBSE knowledge portal at <https://www.cibse.org/knowledge-research/knowledge-portal/cp1-heat-networks-code-of-practice-for-the-uk-2020-pdf>.

Legals & Easements

All Community Heat Hub sites will be subject to a lease as detailed within the quotation. The Developer is required to obtain all relevant planning permission and building regulations compliance.

GTC requires legal rights over all its equipment to secure future ownership and maintenance abilities which are imperative to the continued supply of heat. Where this equipment is within private land, GTC will need to obtain such rights from the Developer (or landowner if different). To ensure these consents are completed efficiently and at the earliest opportunity, the Developer (or landowner if different) should assist with the following:

- Ensure their legal representative is instructed to act upon acceptance of the project.
- Ensure their legal representative responds to all correspondence received from GTC's legal representative without delay.
- Immediately advise GTC of any changes that may affect the legal title on which GTC's equipment resides.

The timescale of consent acquisitions for a project are of great importance as they may affect the required commissioning dates if not completed in good time.

Development Drawings / Documents

The Developer is to provide GTC with all architectural, landscaping and development masterplan drawings for the full development. Any changes to drawings must be notified to GTC at the earliest opportunity to review against impacts to design.

The development accommodation schedule for the full development should be used to generate GTC's quote and subsequently accepted by the Developer. If the development accommodation schedule has not been provided, the Developer shall issue the schedule to GTC as early as possible after quote acceptance. The accommodation schedule should include the following details for each individual plot:

- Number of bathrooms (including ensuites)
- GIAs (General Internal Areas) and NIAs (Net Internal Areas) of each dwelling
- Space Heating Emitter type (e.g. radiators, under floor heating, electric towel rail, etc.)
- Details of commercial spaces including GIA/NIA and the commercial type as designated for planning permission (e.g. A1, B1, D1, etc.); or if a design has already been undertaken, the space heating and domestic hot water loads in kW

We shall also require, but not limited to:

- Site layout detailing plot numbers for each dwelling and Community Heat Hub location(s)
- A schedule of plot numbers and their corresponding postal address
- Dwelling layout drawings for all house and apartment types (with proposed HIU and heat network building entry locations)
- Apartment layout drawings detailing proposed building entry locations and internal pipework routing to apartments
- Dwelling SAP calculations, including confirmation of dwelling heat loss parameter
- Dwelling space heating and domestic hot water annual demands (kWh)
- Construction phasing plan
- Topographic drawing showing finished development elevations
- Development phasing programme
- Commercial area locations and intended district heating connection point
- Design of commercial areas including calculated heat load, location for HIU or substation plant and building entry location for the heat network pipe
- Details of existing below ground services

Construction Programme

The Developer is to provide GTC with a construction programme which shall include the following milestones:

- If there is a requirement for early installation of district heating pipework
- Infrastructure programme of road buildouts
- Date for when the area designated to the Community Heat Hub compound is ready for plant installation

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- Date of when first heat on is required
- Date of when subsequent construction phases require heat
- Any requirement for temporary Community Heat Hub/plant (before build of the permanent Community Heat Hub)
- The anticipated number of dwellings at day one and the sequence of construction thereafter (i.e. the number of dwellings to be constructed in the weeks and months that follow day one)

It is imperative the programme is provided as soon as practicable.

At time of writing (April 2025) major heat hub plant is on a minimum of 40-week delivery time. The below ground services infrastructure (DRP valves) is on a minimum 12-week lead time. GTC will allocate resource and provide details of timescales based on the build out of infrastructure and plots.

Whilst we will endeavour to meet or better these timescales, actual timescales at the time of call off could differ.

Please check with GTC's project manager for the latest call off periods.

Development Phasing

The Developer is to provide GTC with the development phasing programme, detailing the intent to construct the number of units for each year until completion.

GTC shall design the Community Heat Hub and district heating infrastructure for the requirements of the entire development. However, the installation of the Community Heat Hub equipment and district heating pipework shall be installed in a manner to suit the phasing of the development.

The Developer shall refer to the current issue of the Technical Guidelines (which will supersede all previous revisions) for all future plant installations.

During pre-construction, GTC shall advise the Developer the build programme of the Community Heat Hub. The Developer shall follow the requirements of these Technical Guidelines for the installation of all future-phased plant.

Noise & Air Flow

GTC will provide the Developer with equipment noise data and operational run-times for all noise emitting plant.

The Developer is to provide GTC with their site Noise Assessment. The noise assessment shall include details of the background noise levels and the requirements / mitigations needed for all Community Heat Hub plant to be compliant with local and national conditions. Background noise level measurements should be taken at the precise proposed location of the community heat hub.

Mitigation requirements for plant noise (and vibration) will be subject to each site location and site specific background noise levels. As such, all noise and anti-vibration mitigations are excluded from GTC's initial contract offer and are to be developed with the Developer during the detailed design stage to achieve the required noise limits.

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The mitigation requirements will arise from the following:

- Site specific background noise levels
- Planning conditions
- British Standard 'BS4142 Methods for Rating Industrial and Commercial Sound'

Any mitigations required by GTC shall be costed as a variation to the contract offer. The hierarchy of mitigation measures applied will be:

- Acoustic treatment to Air Source Heat Pumps – a number of treatment options are available including fan attenuators and additional fabric treatment to the compressor housing
- Acoustic treatment of pre-fabricated plantroom
- Acoustic louvres to pre-fabricated plantroom
- Perimeter fence and access doors general fence construction of minimum 20kg/m², impervious and continuous
- Perimeter fence height increase to 5 metres high from ground level (standard fence height is 4 metres), louvres to be full height (final louvre area subject to size of CHH)
- Acoustic treatment to Air Source Heat Pumps
- Single bank or double bank attenuation louvres in the perimeter fence (acoustic louvres to have minimum 50% free area for air flow to air source heat pumps)

The perimeter fence louvres must not be obstructed by any means for a minimum distance of 1 metre to facilitate sufficient air flow to the air source heat pumps.

The elevations with perimeter fence louvres will ideally be oriented away from the nearest noise sensitive dwellings.

Fire Strategy

The Developer is to provide GTC with their site Fire Strategy and to include any specific requirements the CHH.

The pre-fabricated plantroom within the community heat hub shall be fire rated to 60 minutes (inside to out) and shall be in accordance with Building Regulations Approved Document Part B.

The Developer shall advise GTC of any site specific requirements for the CHH which may require a greater fire rating than 60 minutes.

Energy Strategy

The Developer shall issue the Energy Strategy where available to GTC. If an Energy Strategy has not been completed at the time of contract award, GTC can provide details to assist with the production of the Energy Strategy for the Developer to complete.

Ground Contamination Survey

The Developer is to provide GTC with the ground contamination survey of the development. The survey will need to cover the areas including:

- The Community Heat Hub compound
- The full buried district heating route

Any required remediations detailed within the ground contamination survey will be the responsibility of the Developer and must be undertaken prior to any GTC works. The Developer shall provide documentation showing any works undertaken to remediate ground contaminants including any treatments and post-treatment ground survey.

Environmental Impact Assessment

The Developer is to provide GTC with their Environmental Impact Assessment.

The analysis should include the following components as a minimum, the likelihood for occurrence and identify mitigations to ensure the continuous supply of heat is not interrupted in all scenarios:

- Flooding
- Heavy snowfall
- High winds
- Lightning strike
- Drought or prolonged hot and dry periods
- Subsidence

Any mitigations deemed required, because of these or any other adverse weather or environmental conditions, for the continuous plant operation shall be the commercial responsibility of the Developer.

Landscaping

The Developer shall undertake all landscaping designs as required to meet local requirements and the Developer's masterplan for the development. The Developer shall provide all landscape drawings and details for the area around the CHH and heat network route to GTC for review and comment. GTC can provide CHH elevation and plan layout drawings in 2D, in DWG file type or similar.

The Developer shall follow the guidance set out in GTC document 'BK-ENV-IG-0018 Tree Planting Guidelines' for planting guidelines within the vicinity of the CHH and Heat Network.

The landscaping designs shall be reviewed and approved by GTC prior to submission for planning permission.

Planning Permission

The Developer will be responsible for obtaining planning permission with the local authority for the heat network (including the community heat hub) and clearing any conditions which arise from the application. Where requested by the Developer, GTC will provide required information to clear applicable planning permission conditions associated with the heat network.

GTC can provide the following documents in advance to support the planning permission submission:

- Heat network design summary
- Heat hub layout and elevations
- Noise data for heat hub plant (noise survey and report by Developer)
- Heat network layout
- Carbon reduction calculation
- Heat network billing and metering aerial

As each local authority may have different submission requirements, the Developer shall advise GTC at the earliest opportunity of any additional information required.

GTC will provide a heat hub layout and elevation drawing, the Developer is responsible for producing landscaping layouts and elevations for the heat hub.

The heat network will require a metering and billing aerial which receives metering data from HIU heat meters across the development. The location of which will either be at the heat hub or on an electrical sub-station.

Drawings depicting the aerial will be provided by GTC which should be included in the planning submission at either location.

Existing Utility Services Drawings

The Developer is to provide GTC with utility drawings validated by onsite CAT Scans depicting below and above ground utilities including, but not limited to:

- Electrical Power Network
- Below Ground Drainage
- Natural Gas Network
- Mains Cold Water
- Communications / Fibre
- Underground tunnels
- Underground structures
- Unexploded bombs
- Mine workings

Incoming Utilities – Electrical Power

Where GTC are the Electrical Asset Owner

For sites where GTC are the appointed electrical network supplier and are contracted for the provision of HV (for DNO adoption) and LV power from the mains infrastructure, GTC shall include all LV power requirements to the Community Heat Hub as part of GTC’s scope of works.

Please see Figure1 below for a single line diagram showing scope of supply for electrical infrastructure.

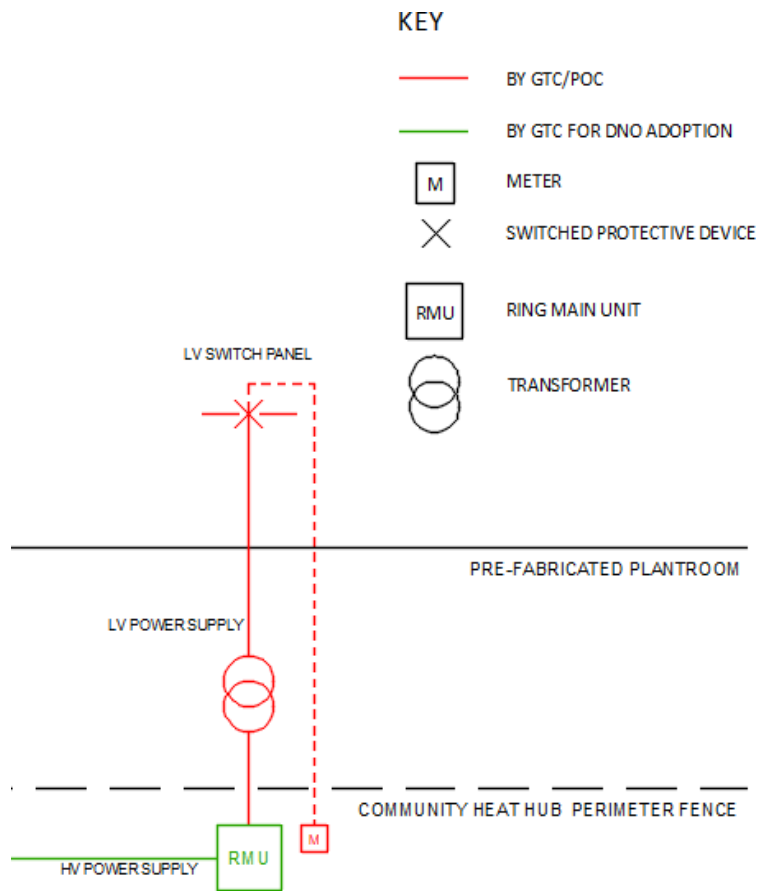


Figure 1. SLD of electrical supply to the Community Heat Hub where GTC are the asset owner

Please refer to the following GTC documents for requirements:

GE-TG-IG-0015 – Electricity Networks – GTC Technical Guidelines

GE-CIC-ES-0063 – GTC Appendix A for ENA Engineering Recommendation – G81-Part 1: Design and Planning

Where GTC are not the Electrical Asset Owner

Where GTC are not the appointed electrical network supplier, the Developer must ensure the heat network quote includes the supply of transformer and associated connections to the DNO/IDNO Ring Main Unit. It will be necessary for the heat quote to include the transformer within the quote for heat to ensure the heat hub transformer has a reliable standard of service. For GTC's heat networks, GTC have a transformer critical spare in storage at any given time. In the event of a transformer failure, the critical spare can be immediately deployed to site. Typically, to manufacture and deliver a replacement transformer could take approx. 8 months.

The Developer is responsible for:

- Confirming transformer and connection to DNO/IDNO RMU is included in the heat quote
- Connection to the network mains HV infrastructure and all associated cabling
- Supply and installation and energisation of DNO/IDNO Ring Main Unit (and all associated civils works) and associated infrastructure (such as Earthing)
- All civil and ground works for the RMU, transformer and electrical infrastructure to the heat hub

Following the Developer's instruction to GTC for the supply and installation of the transformer, GTC are responsible for:

- Supply and installation of the transformer, cabling/busbar and energisation of the heat hub
- Supply and installation of the incumbent's meter
- Enclosure for transformer (if required)

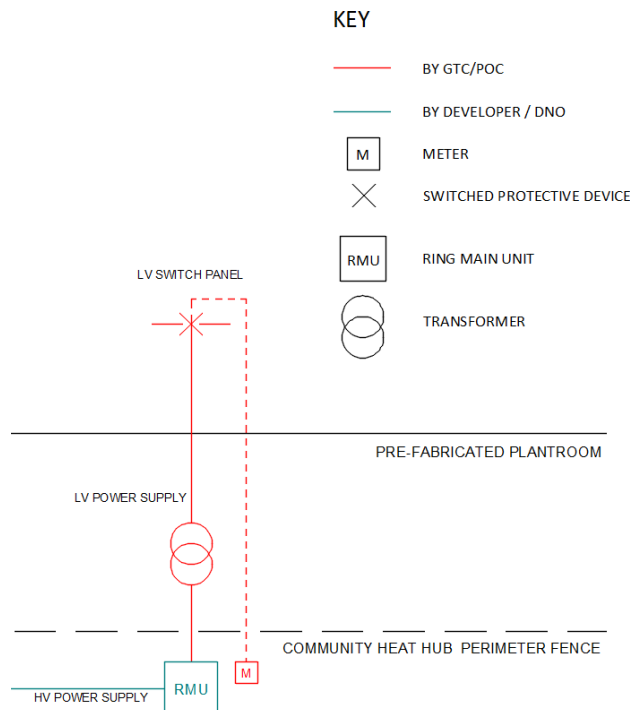


Figure 2. SLD of electrical supply to the Community Heat Hub where GTC are not the asset owner

GTC TECHNICAL GUIDELINES

Incoming Utilities – Mains Water to Community Heat Hub

Where GTC are the Mains Water Asset Owner

For sites where GTC are the asset owner and are contracted for the provision of mains water infrastructure, GTC shall undertake the required connection to the energy centre. The mains cold water connection from the mains shall be as detailed on the project drawings. The utility supplier's water meter will be included in GTC's scope of supply.

Please refer to the following GTC documents for requirements:

- GW-TGI-IG-0017 – Water Network – GTC Technical Guidelines

Where GTC are not the Mains Water Asset Owner

The Developer is to provide a Mains Cold Water pipework to the Community Heat Hub pre-fabricated plantroom, specified size shall be as detailed on drawings. The Developer shall provide and install the utility supplier's water

meter as part of their works in an accessible location external of the Community Heat Hub. Please refer to GTC's drawings for location of the Community Heat Hub connection and specific details. The Developer will be responsible for chlorination and treatment of mains cold water pipework, from connection to the mains supply to termination in the pre-fabricated plantroom. The Developer shall issue water treatment certificates to GTC for their records. Please refer to GTC's Water Network Technical Guidelines noted above.

Incoming Utilities – Communications / Fibre

Where GTC are the Fibre Asset Owner

For sites where GTC are the asset owner and are contracted for the provision of fibre/broadband communications, GTC shall undertake the required fibre connection to the energy centre. GTC will require 2 dedicated fibre/broadband lines with IP addresses and a connection speed of minimum 50mbps.

Please refer to the following GTC documents for requirements:

- GF-TGI-IG-0545 – Fibre Network – GTC Technical Guidelines

Where GTC are not the Fibre Asset Owner

The Developer is to provide 2 dedicated broadband lines with fixed IP addresses and a connection speed of minimum 50MBPS to the Community Heat Hub compound pre-fabricated plantroom. Refer to GTC's drawings for location and requirements.

Incoming Utilities – Foul and Surface Water

The Developer is responsible for all below ground drainage infrastructure for foul and surface water requirements. This includes pipework; connection to existing mains sewers; diversions; surface gullies; soakaways; and any requirements for gully trace heating.

The Developer shall provide the required gullies and drainage points as shown on GTC/GTC's drawings. All connections to the mains sewers, including diversions is the responsibility of the Developer.

The Developer is responsible for the supply, installation, operation and commissioning of any sump pumps and associated pipework required in association with the surface water and foul drainage infrastructure of the CHH. All commissioning documentation shall be issued to GTC upon Practical Completion.

Earthing

Where GTC are the Electrical Asset Owner

GTC will be responsible for the design, installation (excludes earthing required in foundation rebar), connections to plant and equipment, and testing of Earthing.

The Developer shall be responsible for all excavations, backfilling and installation of Earthing infrastructure as part of the civils/builders works (e.g. rebar within foundations).

Where GTC are not the Electrical Asset Owner

Where GTC are not the appointed electrical network supplier, the Developer must ensure the heat network quote includes the supply of transformer and associated connections to the DNO/IDNO Ring Main Unit. This ensures GTC will undertake the heat hub Earthing design, installation (excluding all rebar foundations earthing) and associated testing.

The Developer shall be responsible for all excavations, backfilling and installation of Earthing infrastructure as part of the civils/builders works (e.g. rebar within foundations).

Incoming Utilities & Earthing – Coordination

GTC shall coordinate all utilities and Earthing, excluding below ground foul and surface water drainage, inside the perimeter fence of the Community Heat Hub. Foul and surface water infrastructure shall be coordinated by the Developer and shall be as advised by GTC.

The Developer is responsible for the coordination of utilities and Earthing for the community heat hub outside of the perimeter fence with providing advice and guidance to the Developer.

Builders Works

The Developer shall be responsible for providing the following:

- All civils and structural requirements (excavations, foundations, plant bases, ducts, below ground drainage, earthing rebar in foundations, backfilling of excavations)
- Surface and foul/sewer water connections to the mains infrastructure
- All drainage pumping requirements (e.g. sump pumps)
- Perimeter fence and louvres around the Community Heat Hub
- Access gates to the Community Heat Hub
- All ducts inside and external to the Community Heat Hub (for below ground services) as detailed on GTC's Drawings

Outside of the perimeter, the Developer will need to provide:

- Electrical Ring Main Units (RMUs) (if not supplied by GTC as the IDNO), subject to DNO/IDNO confirmation
- Vehicle parking space for a GTC maintenance personnel van
- Below ground valve chambers for connection to temporary boiler plant/isolation of Community Heat Hub plant (as shown on GTC's drawings)
- Space for emergency temporary boiler plant (as shown on GTC's drawing)
- Bollards or similar anti-parking mechanism to the heat hub gates and disaster recovery / temporary boiler plant area
- Streetlighting to adjacent road/kerb leading to the community heat hub

The Developer will carry out all civil work and builders work associated with the Community Heat Hub compound and buried district heating infrastructure, including:

- Concrete bases and plinths
- Trench excavations and backfilling
- Chambers and chamber covers
- Paving and sub-base
- Granular fill on compacted base
- Foundations
- Sub-station buildings (if required)
- Duct installation

The Developer shall refer to GTC's Builders Works drawings, specifications and schedules and, where applicable, manufacturer's drawings and technical information supplied by GTC, for all builders works requirements.

The ground within the perimeter fence shall be as detailed on project drawings. For plant movement routes, the ground must be flat and with a fall for surface water to run off to designated drains, with a non-slip finish so that plant and equipment can be moved throughout the CHH.

GTC TECHNICAL GUIDELINES

The Developer shall use a concrete specification that is more sustainable and has lower embodied carbon to traditional on-site pouring methods. One such method is to utilise a pre-cast base for plant foundations which is poured and manufactured off site and delivered to site. The ground specification shall be suitable for the loads of each applicable equipment item.

Community Heat Hub Location

The Developer shall inform GTC of the Community Heat Hub locations. The locations of the Community Heat Hub should be sited with the following considerations:

- Located as centrally within the development as possible, the resultant benefits being:
 - Pipework will be of smaller diameter resulting in smaller trenches and lower network losses
 - Energy required for pumping plant will be reduced
- On land which has not been identified as a flood plain or presents a risk of flooding
- If the build out of plots is phased, the Community Heat Hub buried pipework and valving arrangement will require to be installed to suit the phasing, to ensure heat is provided to all early phase plots
- Located as with as much distance as possible to the closest dwelling:
 - Distance provides a natural noise reduction
 - ASHPs produce cold air discharge, typically 10°C lower than ambient temperature
- Identified space for a mobile crane, for plant replacement (this can be the same space for the temporary boiler plant)

The footprint and spatial requirements for the Community Heat Hub Compound is detailed on the Community Heat Hub Layout Drawing.

Please refer to the '**Noise and Air Flow**' section.

Perimeter Fence & Access Doors

The fence is to include the following with the final specification to be agreed with GTC:

- Secure in that it is to prevent unauthorised personnel from entering any part of the compound
- Non-climbable
- Vandal proof
- Minimum 30-year lifespan
- Low Maintenance
- Impervious and continuous (excluding louvre sections)
- Treated with fire protection treatment to Euroclass B-s2-d0, BS EN 13834 & 11925-2 Single Burning Item Equivalent to UK "Class 0" BS476: Parts 6 & 7

The Community Heat Hub access gates shall be of the same material identified for the barrier fence. The quantity and size of doors shall be as identified on the project drawings. Main single leaf door (adjacent to double leaf door) shall be key code entry, push-lever exit. All other single leaf doors shall have key entry, push-lever exit (all single leaf gates are emergency exits).

GTC TECHNICAL GUIDELINES

Gates next to louvres where the push-lever mechanism is next to the louvre shall have a barrier (such as a plate) between the lever and the louvre. All gaps around gates shall be covered as part of the fence works.



Figure 3. Gaps at top and bottom of single and double leaf gates covered; plate fixed next to push-lever on single leaf gate next to louvre

Double leaf access doors shall include a sliding lever for opening, including a hole for a heavy duty padlock. The gate shall include a protective cover/plate around the padlock to prevent tampering.

The area directly outside the perimeter fence shall be flat, kept clear and will be required for access at all times for maintenance purposes (please refer to the 'Noise and Air Flow' section above).

The Developer shall undertake all landscaping requirements internally and externally of the CHH.

Pre-fabricated Plantroom

The Developer will need to provide a reinforced concrete slab designed for the footprint and load of the pre-fabricated plantroom.

The Developer shall provide the foul and surface water below ground including connection to the mains for the requirements detailed on GTC's drawings.

GTC will endeavour to ensure architectural aspirations for the Community Heat Hub are accommodated. However, GTC reserves the right to specify the type of Community Heat Hub building, doors and ventilation systems to be used. Any architectural aspirations requested post-contract agreement and may incur additional cost or delay to the build of the pre-fabricated plantroom will be discussed with the Developer. If the Developer chooses to proceed, any cost and delay implications shall be submitted by GTC to the Developer and shall be costed as a variation to the contract offer.

The pre-fabricated plantroom will be fully constructed and built off site and transported to site. The pre-fabricated plantroom will be lifted into position by GTC. GTC will undertake a lifting plan in conjunction with the Developer and a specialist plant movement contractor. The Developer will need to ensure there is sufficient space and access for the completion of the lifting the pre-fabricated plantroom into final position.

Community Heat Hub Ground Works

The Developer shall ensure the ground in the Community Heat Hub is solid, level and capable of withstanding loads identified on GTC/GTC's drawings.

It is imperative that surface water will drain, and that surface pooling is prevented. Any damage to equipment which results in corrective remediation or replacement as a result of inadequate surface water drainage will be at the cost of the Developer.

Where GTC are the transformer asset owner, transformer ground works shall be detailed by GTC under a separate transformer (substation) specification. Please refer to GTC document GE-TGI-IG-0032 Substation Specification.

Where GTC are not the asset owner, the Developer is to liaise with the appropriate asset owner.

The Developer shall supply appropriate floor supports for external pipework to be fixed to. Pipework routing and required supports shall be designed at the Detailed Design stage of the project.

The Developer shall specify and install required covers for drainage such as grilles and covers.

Delivery of Plant and Equipment

The following plant will be delivered to site and lifted into position by GTC:

- Pre-Fabricated Plantroom
- Thermal Stores
- Air Source Heat Pumps
- Transformer
- Welfare Unit (if not part of plantroom)

GTC will undertake a site-specific lifting plan in conjunction with the Developer and a specialist plant movement contractor. The Developer will need to ensure there is sufficient space and access for the delivery of each equipment and the lifting operation of each equipment into final position. The following details are provided as a guide and will be superseded by specific requirements formulated from a Lifting Plan.

The Developer will be responsible for providing suitable access for delivery vehicles – the construction road to the heat hub shall be complete and there shall be no temporary or permanent blockages or obstacles along the access route. Should any areas require temporary works (such as ditches filling on ends) as identified on the delivery plan, this will be the responsibility for the Developer.

The Developer is to allow and prepare the space around the perimeter of the heat hub for appropriate options in locating two cranes and a plant delivery vehicle for the lifting and locating of plant and equipment (note thermal stores will be delivered to site horizontally and located in their final position vertically. This will take two cranes to perform a 'dual lift').

The following areas shall be provided as close as possible to the Community Heat Hub and as close to the plantroom as practicable. If space is not directly available adjacent to the Community Heat Hub, a larger crane for the main lifting could be required.

GTC TECHNICAL GUIDELINES

- 18 x 11m (primary lifting vehicle)
- 14 x 9m (secondary lifting vehicle)
- 4 x 16m (for the plant delivery vehicle)

The following snapshot below was taken from a site lifting plan which depicts a typical location of the crane to the vicinity of the Community Heat Hub and associated plant. The site-specific requirements will need to be assessed before the crane location is finally determined.

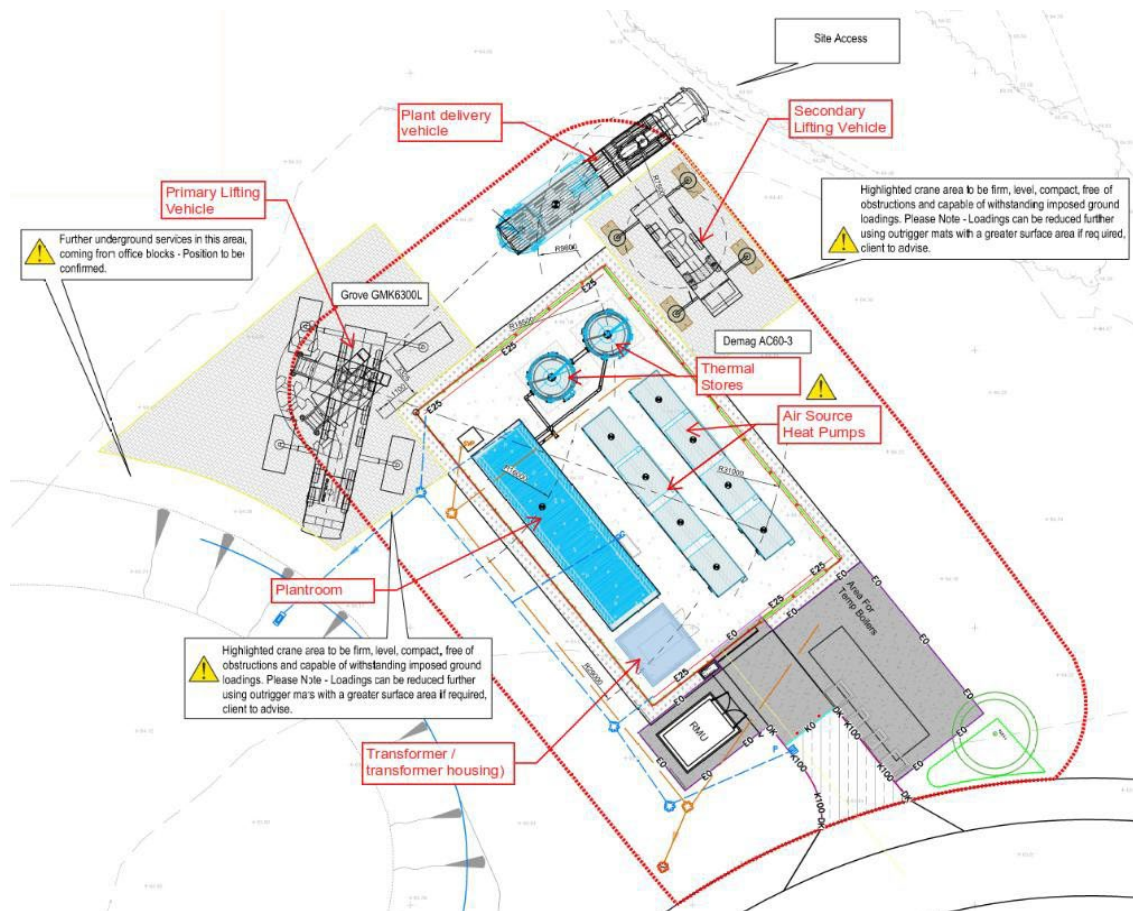


Figure 4. Community Heat Hub building and plant lifting drawing (site specific)

The Developer is responsible for the ground makeup and any utilities which are within the vicinity of the lifting plan area. The contractor shall ensure the ground is firm, level, compact, free of obstructions and upstands, and capable of withstanding ground loadings from crane lift operations. The Developer shall advise of any below ground utilities (permanent or temporary) within the vicinity in development of the lifting plan and shall be responsible for ensuring recommended protection is in place throughout the duration of the lift.

CHH Architectural Requirements

Architectural requirements for the Community Heat Hub equipment shall be advised to GTC prior to contract award, including specification of colour or material to visible cladding. Architectural requirements requested post-contract agreement may incur additional cost or delay to the build of the CHH and the impact will be discussed with the Developer. Any impacts to cost and programme of subsequent changes to the thermal store specification shall be notified by GTC to the Developer and shall be costed as a variation to the contract offer.

Transformer

Transformers: Where GTC are the Electrical Asset Owner

Where GTC are the transformer asset owner, GTC/GTC will be responsible for the supply, delivery, positioning of the transformer.

GTC/GTC shall off-load the transformer from the kerbside delivery vehicle via a forklift truck to the final position. The Developer is responsible for ensuring the route to the transformers final position is level, flat and suitable for an appropriate forklift vehicle.

The Developer will be responsible for all builders works associated with the Transformer Community Heat Hub, as detailed in Builders Works section.

Transformers: Where GTC are not the Electrical Asset Owner

As noted above, where GTC are not the appointed electrical asset owner, the Developer must ensure the heat network quote includes the supply of transformer and associated connections to the DNO Ring Main Unit.

The Developer is responsible for:

- Confirming transformer and connection to DNO/IDNO RMU is included in the heat quote
- Connection to the network mains HV infrastructure and all associated cabling
- Supply and installation and energisation of DNO/IDNO Ring Main Unit (and all associated civils works) and associated infrastructure (such as Earthing)
- All civil and ground works for the RMU, transformer and electrical infrastructure to the heat hub

Following the Developer's instruction to GTC for the supply and installation of the transformer, GTC are responsible for:

- Supply and installation of the transformer, cabling/busbar and energisation of the heat hub
- Supply and installation of the incumbent's meter
- Enclosure for transformer (if required)

Temporary Plant

The developer shall confirm the date when heat on is required from the CHH before contract award and should be noted on the developer’s construction programme.

Should GTC’s quote exclude temporary plant and is subsequently required, the costs of temporary plant will be advised by GTC and to be instructed by the Developer as a variation.

Disaster Recovery Plan

In the event that the heat hub is not able to operate and provide heat to the network, temporary boiler plant is required to connect to the network to supply heat. This is commonly referred to as a disaster recovery plan (DRP).

Part of this strategy is to ensure there is enough external space at the heat hub location to offload temporary plant to connect to the network. The sizing allowance is shown on all heat hub drawings. The requirements are that this area is kept clear and has access for vehicles at all times (24/7).

Valve chamber arrangements into separate construction phases will have connections for temporary boiler plant. This allows smaller temporary boiler plant to supply heat to just the phase of the development the valves are connected to, providing flexibility in how heat is restored across the development.

Street Lighting

The Developer shall provide street lighting on the road leading up to the community heat hub and aligned to the heat hub fence to the access gate elevation. This is to provide operatives with appropriate lighting during evening and nighttime works.



Figure 5. Street lighting locations for CHH

SECTION SEVEN

Buried District Heating Pipework

The district heating network, comprising of flow and return pipework, will route below ground throughout the development, as shown on GTC's district heating layout design.

Any deviations to the district heating distribution layout must be agreed in advance with GTC before construction.

It is the responsibility of the Developer to ensure all contractors working on site are informed of the location of the buried district heating pipework and services.

General

A pre-start site meeting will be arranged at the start of your development. At any stage of construction, you can contact GTC for advice and guidance.

It is essential that the Developer agrees a programme of construction which will enable GTC to co-ordinate procurement of materials and main laying activities, within our set timescales especially with regards to the infrastructure mains.

Developer responsibilities are covered in Section 4, Roles and Responsibilities. For any ambiguity or if an item isn't clarified, this must be raised and discussed with the GTC PM.

If there are any alterations to the agreed site layout, which may affect the route of the heat mains or services, then GTC must be advised immediately.

General Process

The general process for laying heat network pipe (dead) is as follows:

- Trench is made
- Pipe is laid in trench
- Pipe connections are joined
- Pipe is air tested
- Following successful air test, pipe connection is shrouded and insulated
- Pipe is backfilled

District Heating Trench

General

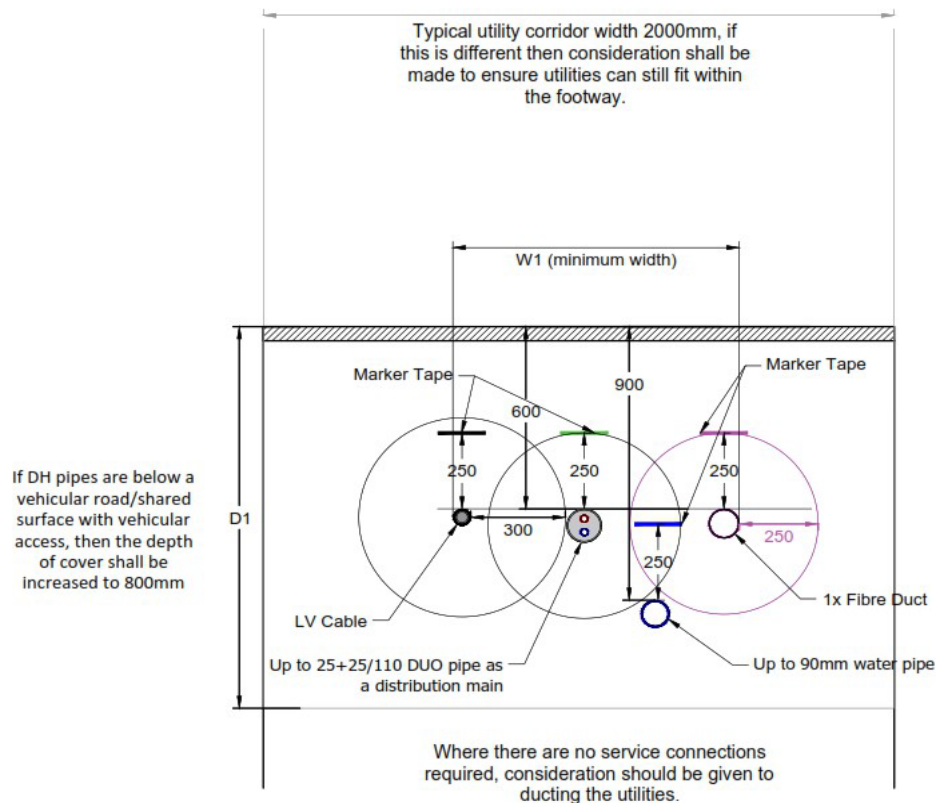
The Developer is to provide all trench requirements for GTC to install the district heating pipework including:

- Ensure kerb braces have been installed prior to scheduling work with GTC. IN EXCEPTIONAL CIRCUMSTANCES ONLY where this is not practical or reasonable and with the express written permission at Director level, GTC may accept a site-specific indemnity letter signed by the Developer accepting a “line and level” approach. In such circumstances the Developer will indemnify GTC against all costs relating to future relocation of all utility pipes, ducts, and cables and/or repairs to damaged pipes and ducts.
- Carry out all necessary excavation and backfilling work for the installation of district heating pipework mains, services, and associated equipment.
- Maintain an obstacle free route to allow installation work to be carried out in one visit wherever possible.
- Structural reinforcement of the trench as necessary to allow for safe operation of pipe laying.
- Removal of all sharp objects which will potentially damage the pipework
- Removal of any water pooling/flooding
- Valve chambers and covers
- Storage facility for pipework
- All safety barriers
- Ensure no work is carried out beneath scaffolding.
- Ducting, supplied by the Developer, can only be used for perpendicular road crossings; and to route the service pipe to a dwelling building entry location, and must have marker tape installed above ducting.
- For clarity, UNO pipes will require 2 No. ducts for road crossings; DUO pipe will require 1 No. duct (if unsure please check with GTC’s PM)
- Heat network communications duct will require 1 No. duct for road crossings
- Ensure that you have read, understood, and signed ‘CDM Construction Plan Parts C and D GU-DPR-FM-1014’.
- If the Developer is responsible for laying heat network pipework, ensure groundworkers are trained, competent and registered to lay ducting and/or services in accordance with the design drawing. The Developer shall provide details or relevant for individuals appointed to lay heat network pipework.
- Lay ducting for heat network mains, heat network communications and service connections in as detailed herein.
- Lay ‘district heating pipe’ marker tape, supplied by GTC, 250mm above district heating mains or ducting for mains before backfilling the trench.
- Lay ‘district heating pipe’ marker tape, supplied by GTC, 75mm above district heating service or ducting for services before backfilling the trench.
- All district heating mains and services should be distanced from other utility services as detailed in GTC’s multi-utility trench drawings.
- Provide a suitable safe access platform for installation of all district heating riser works.

GTC TECHNICAL GUIDELINES

Trench layouts and depths shall follow the details and requirements depicted in these Technical Guidelines and associated drawings issued by GTC.

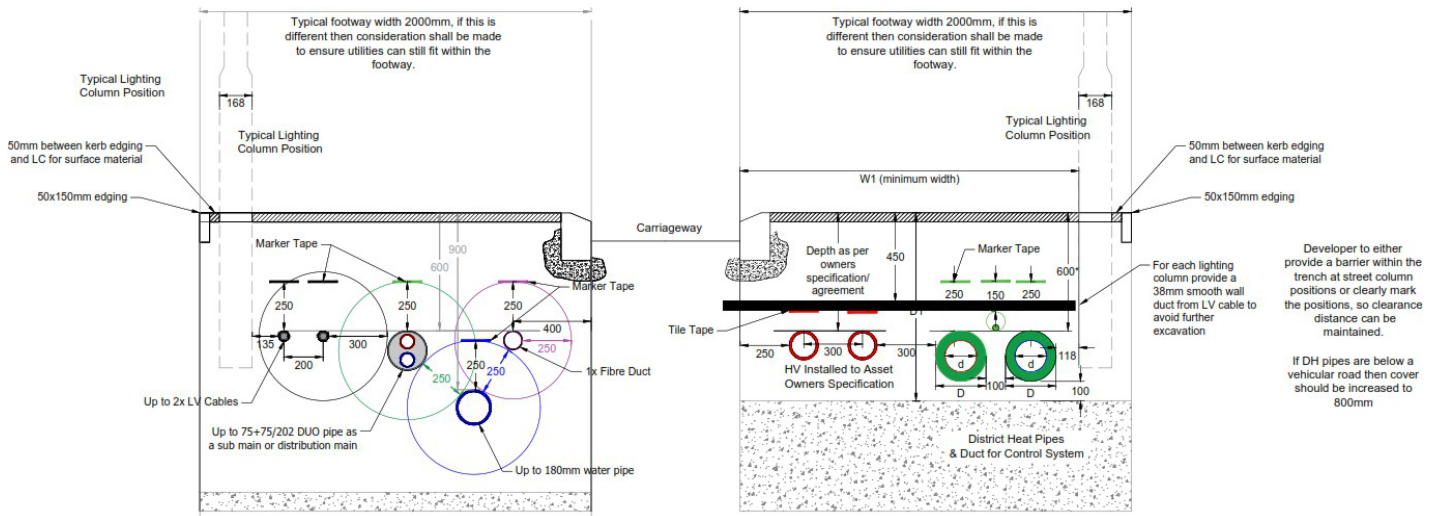
Trench dimension tables, depths and minimum distances to adjacent utilities are noted in the details below. The bottom of the trench should be trimmed to enable heat mains to be laid evenly and consistently throughout the trench, at the correct cover. Sharp stones should be excluded from the base of the trench. Where the base of the trench is unsuitable e.g. rocks and stones, the trench should be excavated a further 75mm and a bed of suitable fine material laid and compacted.



Pipe and Trench Dimenstions for PEX-a Pipework (DUO)				
Size	Outer Diameter of carrier pipe (d) mm	Outer Jacket Diameter (D) mm	Minimum Trench Depth (D1) mm Footway/Carriageway	Minimum Trench Width (W1) mm
20+20/111 DUO	20	113	813 / 1013	1200
25+25/111 DUO	25	113	813 / 1013	1200
32+32/111 DUO	32	113	813 / 1013	1200
40+40/126 DUO	40	128	828 / 1028	1500
50+50/162 DUO	50	164	864 / 1064	1500
63+63/182 DUO	63	185	885 / 1085	1500
75+75/202 DUO	75	202	902 / 1102	1500

Figure 6. Trench Utility Corridor and Trench Dimensions for DUO pipework (PEX-A specification, 20+20/111 to 75+75/202)

GTC TECHNICAL GUIDELINES



Pipe and Trench Dimensions for PEX-a Pipework (UNO)				
Size	Outer Diameter of carrier pipe (d) mm	Outer Jacket Diameter (D) mm	Minimum Trench Depth (D1) mm Footway/Carriageway	Minimum Trench Width (W1) mm
90/162 UNO	90	164	864 / 1064	1544
110/162 UNO	110	164	864 / 1064	1545
125/182 UNO	125	185	885 / 1085	1588
140/202 UNO	140	202	902 / 1102	1623
160/250 UNO	160	257	957 / 1157	1734

Figure 7. Trench Utility Corridor and Trench Dimensions for UNO pipework (PEX-A specification, 90/162 to 160/250)

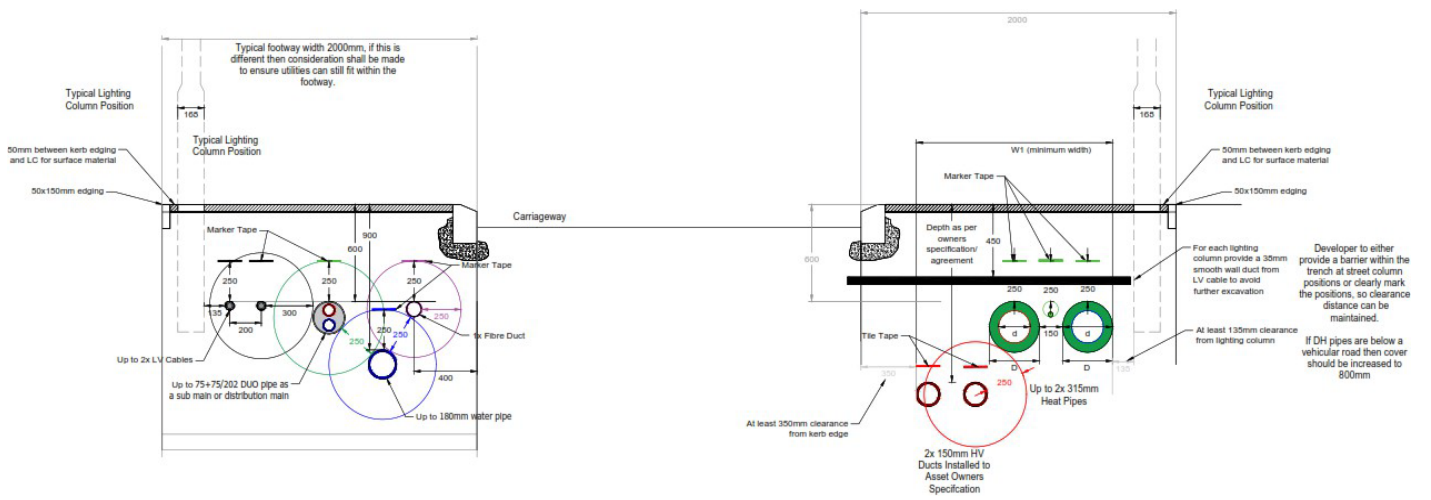


Figure 8. Trench Utility Corridor for UNO Pipework (PP-R specification, 200/315 to 355/500), HV Cables installed 1100mm depth (trench dimensions below)

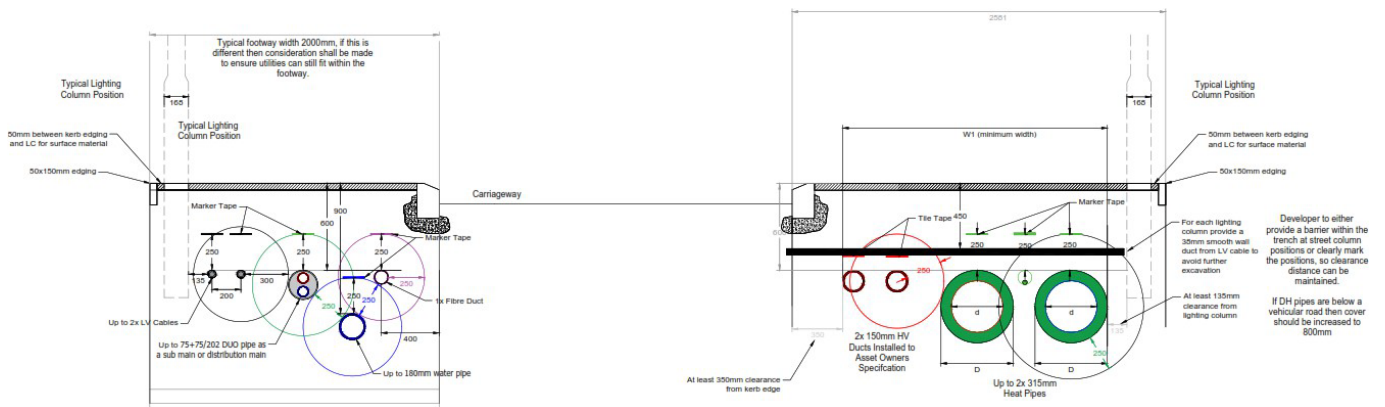


Figure 9. Trench Utility Corridor for UNO Pipework (PP-R specification, 200/315 to 355/500) HV Cables installed 600mm depth (trench dimensions below)

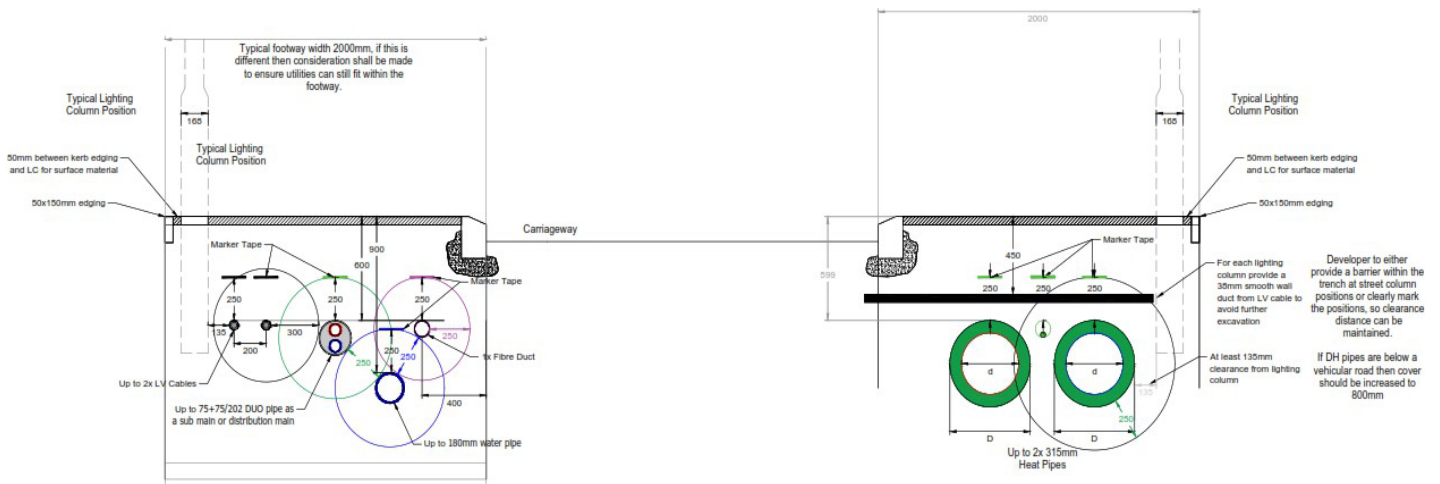


Figure 10. Trench Utility Corridor for UNO Pipework (PP-R specification, 200/315 to 355/500), no HV Cables in footway (trench dimensions below)

Pipe and Trench Dimensions for PP-R Pipework						
Size	Outer Diameter of carrier pipe (d) mm	Outer Jacket Diameter (D) mm	Minimum Trench Depth (D1) mm Footway/Carriageway	Min/Max Trench Width (W) Detail 3 (req. for jointing space)	Min/Max Trench Width (W) Detail 4 (req. for jointing space)	Min/Max Trench Width (W) Detail 5 (req. for jointing space)
200/315	200	315	1065 / 1265	1800 / 2500	1800 / 2500	1800 / 2500
250/400	250	400	1150 / 1350	1800 / 2500	1800 / 2500	1800 / 2500
315/450	315	450	1200 / 1400	n/a	1800 / 2500	1800 / 2500
355/500	355	500	1250 / 1450	n/a	1800 / 2500	1800 / 2500

Figure 11. Trench Dimensions for UNO Pipework (PP-R specification, 200/315 to 355/500)

It is permissible additional spacing is required in the trench to facilitate pipework jointing. It may not be possible to know exactly where this will be required at the design stage. If further trench spacing is required (e.g. for pipework jointing), GTC’s PM shall discuss and coordinate with the Developer’s site team and is to be fulfilled by the Developer.

The trench base is to be backfilled with a sand bed (max. grain size of 0.4mm) for the full width and length of the trench where pipework is laid. The trench base should be level and well compacted, the base of the trench must not be loose. Before the pipes are laid, any loose, cohesive soil is to be removed down to where the loose soil begins, and this is to be replaced with non-cohesive soil or a special pipe support. Loose, non-cohesive soil must be compacted again.

The depth of the trench base (i.e. from the underside of the outer district heating pipe to the bottom of the trench) is subject to the specification of pipework:

GTC TECHNICAL GUIDELINES

- A minimum sand bed depth of 100mm for:
 - All PEX-A DUO pipes (sizes 20+20/111 to 75+75/202)
 - All PEX-A UNO pipes (sizes 90/162 to 160/550)
- For all PPR pipework a minimum sand bed thickness of 150mm
 - All PP-R UNO pipe sizes (sizes 200/315 to 355/500)

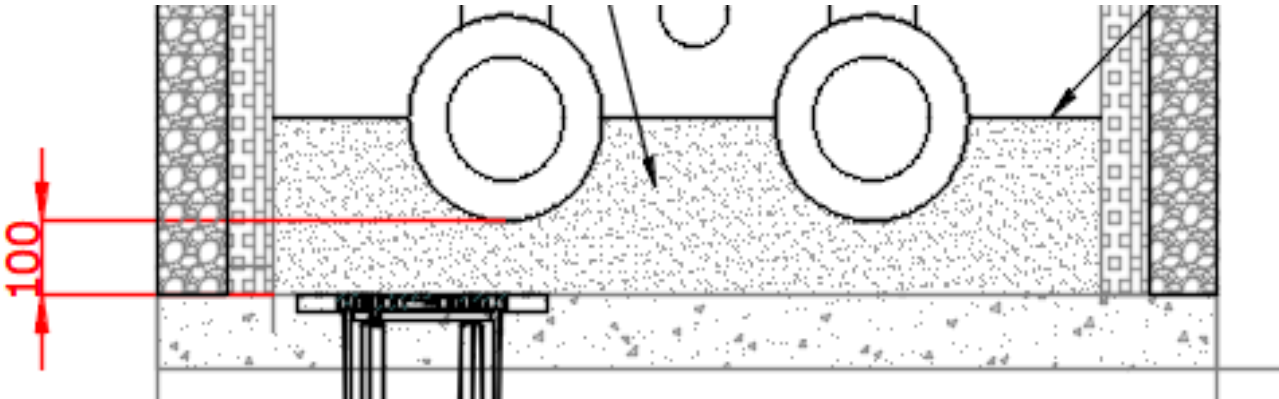


Figure 12. Bottom of trench sand depth requirement for PEX-A pipework, DUO and UNO.
For PP-R pipe, sizes 315/200 to 355/500, the depth increases to 150mm

It is recommended that the Developer uses an appropriate visual gauge to establish trench depths such as temporary paint or temporary posts with measures noted. This will also be used as a demonstrative aid for GTC's inspections of trenches.

The Developer should clearly mark the location of all intended streetlights within the open trench and before any pipe is laid. This is to prevent mains being laid directly below street lighting columns. GTC will not be responsible for any repercussions of mains laid directly below street lighting columns which had not been clearly marked in the trench.

Please ensure the site is ready for when any heat network activity is scheduled. All excavations and backfill should be complete, scaffolding removed where necessary and the area safe and secure.

The Developer has a key responsibility to correctly prepare the construction site for the agreed date. Construction work cannot go ahead if the site is not correctly prepared, and we reserve the right to leave site and re-programme the works if it is not.

Adjacent Utilities

District heating pipework will be laid alongside other buried utilities required for the development. Refer to multi-utility drawings in Figures 6-10. Pipework routing must follow GTC’s design, any deviation must be raised with GTC’s PM at the earliest opportunity and before construction.

The Developer shall follow the guidance depicted in GTC’s multi-utility trench drawings and details Figures 6-11 for minimum distances between adjacent services. If these distances cannot be maintained, GTC’s PM must be notified immediately to discuss and assess if an alternative plan is required. This could include assessing a re-route or if a form of shield is necessary between the utilities. Deviations from the design will be at the cost of the Developer.

Where utilities cross, the minimum depth of covers for the respective utilities must be maintained. This may result in a deeper trench for crossing utilities.

Where GTC are not the utility asset owner, the Developer shall request similar documents from the asset owner for verification by GTC. Should the utility asset owner not provide these drawings, GTC’s drawings shall be strictly adhered to by the utility asset owner.

The following tables depict heat transfer to the adjacent ground, based on the pipe sizes noted:

Pipe surface and adjacent ground temperatures based on 63+63/182 DUO		Pipe surface and adjacent ground temperatures based on 125/182 UNO	
Position	Adjacent Ground Temperature at 60°C water temperature	Position	Adjacent Ground Temperature at 60°C water temperature
Pipe Surface	14.5 °C	Pipe Surface	15.8 °C
+100mm	13.1 °C	+100mm	14 °C
+200mm	12.3 °C	+200mm	13 °C
+1000mm	10 °C	+1000mm	10 °C

Figure 13. Pipe Surface and Adjacent Ground Temperatures for various distances

Pipework laying below a road

GTC will work with the Developer in developing the heat network routes, from the main spine to sub-mains, to service connections. Heat network pipework shall be routed under a footway (pavement) along with adjacent utilities. Laying pipe in the road, other than road crossings, should be avoided for future access purposes. If this is completely unavoidable (e.g. if there is no footway) and no alternative route is available, heat network pipework shall be routed under the road for the shortest route possible, and prior agreed with GTC. Depths of covers for carriageways must be adhered to.

Mains Ducting

The laying of district heating pipework will be in an open trench excavated by the Developer. Rigid ducting shall be used for perpendicular road crossings. The Developer is responsible for the supply and installations of ducting.

A suitable standard for plastic ducting is BS 4962. Internal corrugated ducting must not be used for road crossings, all ducts for heat network pipes and comms must be internal smooth bore. Heat network duct pipes for road crossings shall be green for mains and black for communications (black should only be used for mains if green is unavailable). All road crossings (mains and comms) must have heat network marker tape above the duct.

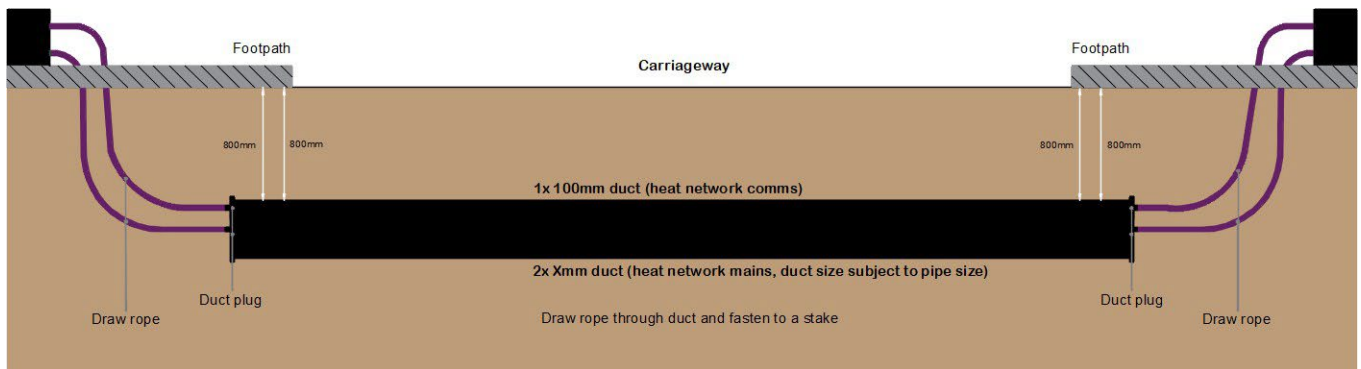


Figure 14. Heat Network Mains and Comms Road Crossing (Main Spine – UNO pipe)

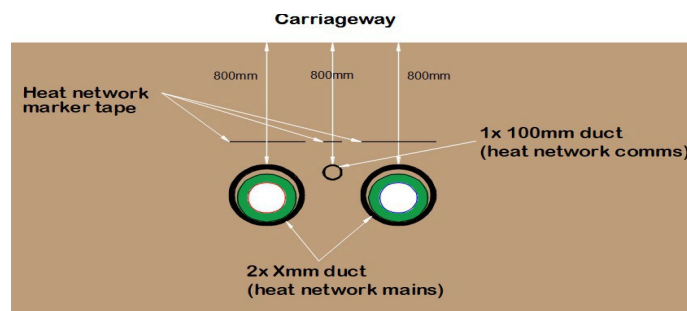


Figure 15. Heat Network Mains and Comms Road Crossing Cross Section (Main Spine – UNO pipe)

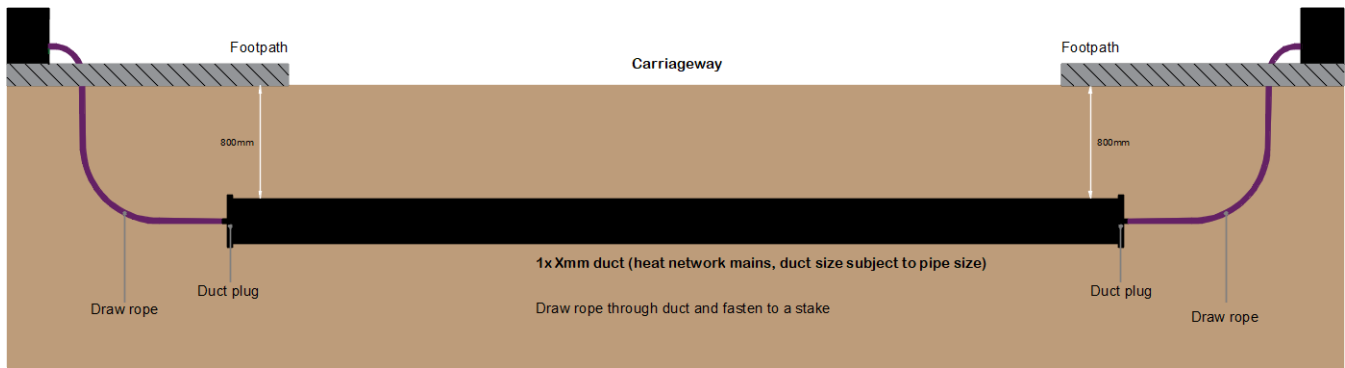


Figure 16. Heat Network Mains Crossing Section (Infrastructure – DUO pipe)

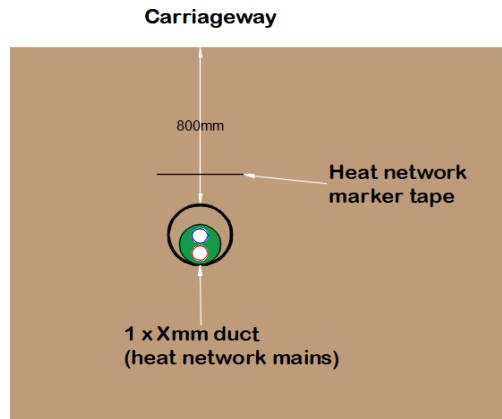


Figure 17. Heat Network Mains Road Crossing Cross Section (Infrastructure – DUO pipe)

Please note only 1 pipe may be laid in any duct. Heat network comms shall have its own separate duct and must not be laid in the same duct as the mains.

See the table below for duct diameters and corresponding pipework sizes.

Table 1 – Heat Network Duct Sizes

Pipework Size	Internal diameter of duct (minimum)
DUO 25+25/111 DUO 32+32/111 UNO 40/91 UNO 50/111	150mm
DUO 40+40/126 UNO 63/126	200mm
DUO 50+50/162 DUO 63+63/182 DUO 75+75/202 UNO 75/162 UNO 90/162 UNO 110/162 UNO 125/182	300mm
UNO 160/250 UNO 200/315 (PPR)	400mm
UNO 250/400	500mm
UNO 315/450	600mm

Upon request, GTC can provide capped pipe lengths that can be installed within the ducting.

Backfilling of Pipe Trenches

The Developer shall backfill the trench over the top of the pipes using sand of grade no more than 0.4mm and compact it by hand. Backfilling is not to commence until GTC have completed all pipework testing and commissioning. The Developer shall provide the specification for grade of sand procured and used for backfill.

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Backfill and sub-base materials must be free from any organic, perishable, or hazardous material.

The minimum fill of sand compacted above the top of the pipe is 100mm (for all pipe specifications).

A 'heat network' marker tape, supplied by GTC, must be incorporated within the backfill for all mains, heat network comms and road crossing ducts (both mains and comms), positioned 250mm above the main.

The following figures show minimum requirements for backfilling the trench. All measurements are in millimetres.

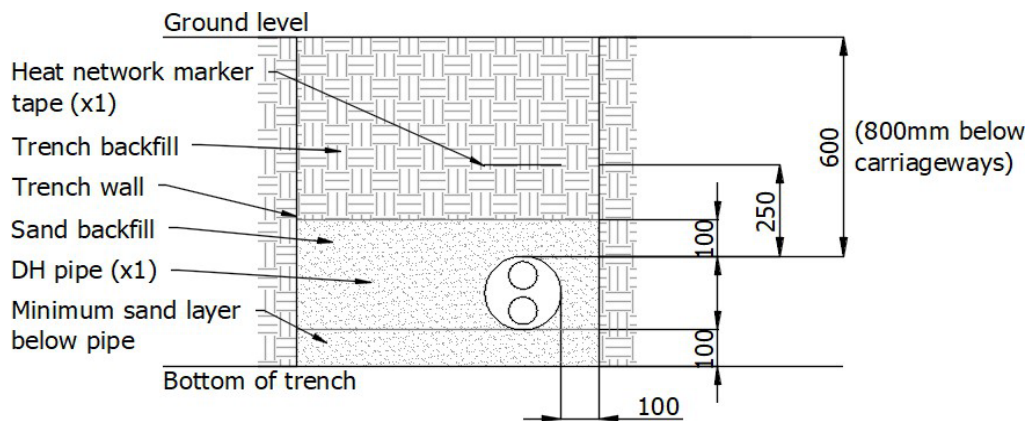


Figure 18. Trench backfill requirements for heat network pipe DUO 25+25/111 to 75+75/202

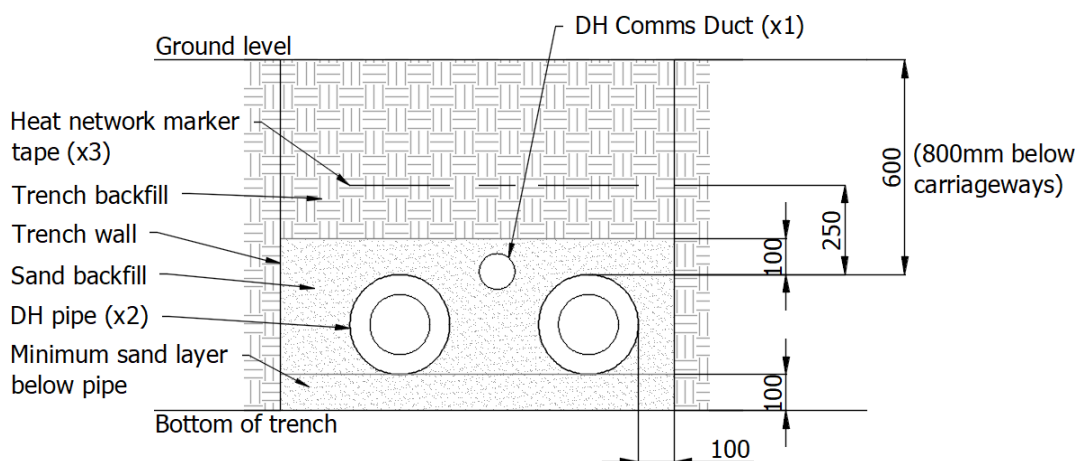


Figure 19. Trench backfill requirements for heat network pipe UNO 90/162 to 160/250

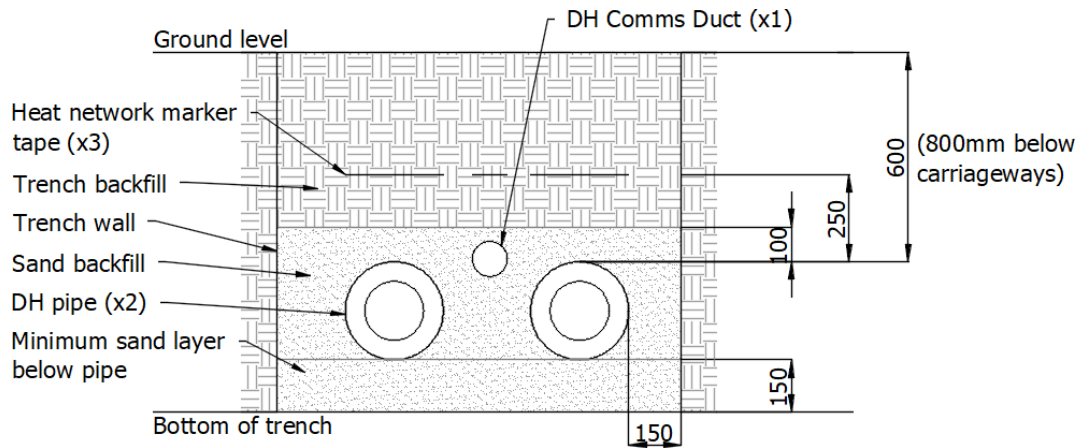


Figure 20. Trench backfill requirements for heat network pipe UNO 200/315 to 315/450

Materials Delivery & Storage

In preparation of GTC commencing work on-site, there is a requirement for the Developer to responsibly store pipe and fittings on site.

- Pipe and associated equipment will be delivered directly to site and must be visually inspected on delivery and any damage to be marked, set aside and immediately reported to GTC.
- Any loss or damage occurring after delivery will be chargeable to the Developer.
- Under no circumstance are pipe coils to be untied without the supervision of a suitably trained GTC operative.

Unloading

Before unloading, thoroughly inspect all material for shipping damage. Pay close attention to the inside radius of the coil – where damage may occur in the form of a rip or tear in the outer jacket.

Pipe coils are to be transported horizontally, lying completely flat on a load area, and must be secured to prevent slipping. The area must be cleared prior to loading.

Note: DH pre-insulated pipe coils are packaged with protective end covers and coiled, then fastened with nylon straps.

When lifting coils, lifting straps must be placed around the entire coil. When using a forklift, contact points must be protected (for example, fork tines may be padded, or inserted in a section of polyethylene pipe longer than tines, and so on); the lifting must be performed on the entire coil. Forks must not be inserted between coils in a stack, or between

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pipes in the coil.

Forklifts should be used in accordance with 'BK-HAS-MS-0142 Use of Forklift Truck'.

Always lift coils from the transport vehicle using wide straps around the coil. To avoid damage, do not drop from truck bed or from similar elevation, or drag the coils over coarse or sharp surfaces. For short distances, manually roll the coil.

Storage – General Guidance

The onsite storage facility provided by the Developer shall be a secure compound, the specific requirements and area dimensions are subject to the specifics of the project contract and shall be discussed with GTC's PM. The detail below depicts the typical storage area layout required by GTC for construction on a single phase of a development. Should GTC be working on multiple phases concurrently or the development has an accelerated build programme, additional or multiple storage space may be necessary.

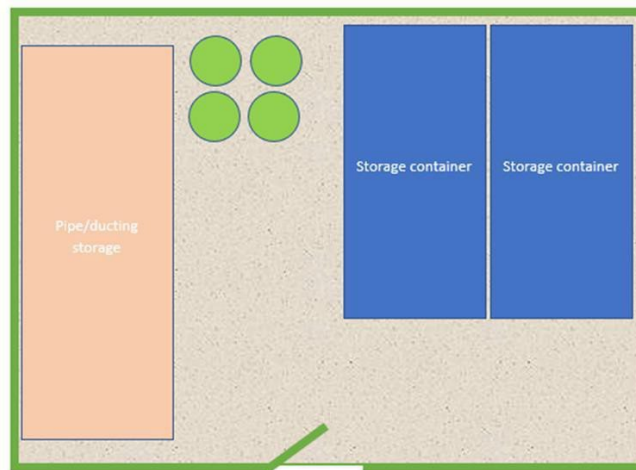


Figure 21. Typical Storage Compound Area

Careful consideration shall be given to the following:

- Security of all materials and equipment from theft, vandalism, accidental damage, or contamination. Precautions should be taken to prevent debris and water from entering pipe and fittings. (Pipe end caps on coils, intended to prevent ingress of contamination, should be kept in place during storage).
- Safety of the site workers, public, especially children and blind persons.
- The movement of traffic and construction equipment.
- All pipe store locations should be on a suitably firm hard standing, level ground, free from ground water, mud, and other damaging material with adequate access for construction vehicles and/or lifting equipment.

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- All pipework must be securely stored. Badly stacked pallets, coils or bundles may slip or collapse, causing injury to personnel and/or damage to the pipe.
- Pipe and fittings are not to be stored on the ground, suitable pallets or wooden battens should be the interface between the ground and material.
- Pipes and fittings should be stored away from exhaust outlets and other high temperature heat sources and where contact is possible with aggressive chemicals such as lubricating or hydraulic oils, chemical solvents, diesel or gas oils, etc.
- No other materials should be stored or placed on top of the PE pipe or fittings as this may damage or affect the dimensional stability of the pipe and fittings.
- Pipes must be kept sealed at cut ends to prevent foreign material entering the pipes and damage to the pipe from UV radiation.
- Care should be taken to prevent damage to, and distortion of, pipe ends and fittings.
- Stock should be stored in such a manner as to ensure adequate stock rotation on a “first-in, first-out” basis.
- All pipes are to be inspected for any storage and transportation damage before being placed in a trench. Any damaged pipework found in storage will not be used and is the Developer’s responsibility to return damaged items to the supplier or remove from site.

Storage – Individual Pipe Lengths

Pipe lengths stored individually should be stacked on clear level ground in a pyramid not more than one metre high, with the bottom layer fully restrained by wedges.

Sticks in bundled packs should be stored with the restraining battens in place. The bottom layer of pipes should be laid on timber battens at one-metre centres. Straight pipe lengths shall not be stacked in excess of 1m from ground.

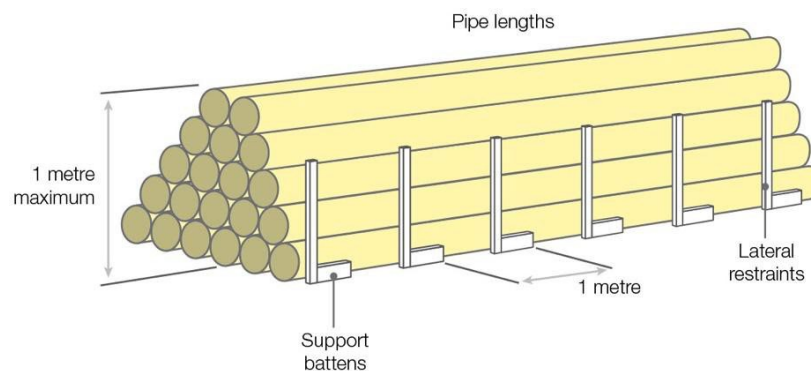


Figure 22. Storage of straight pipe lengths (loose)

Storage – Coiled Pipe

Coiled pipe should be stored flat and on firm level ground which has suitable protection for the bottom coil. Where space is limited, and coils are to be stacked, the height of stacked coils should be such that the stack is stable, and the uppermost coil can be safely handled. The maximum height of coils stored horizontally shall be 2 metres.

Wooden battens placed below the bottom coil and used as spacers between each layer will facilitate easy access for slinging. When the need for transportation is required, it should only be carried out by trained operatives.

Batches of coils delivered on pallets must remain secured to the pallet and only be broken at the time of use. All pipe coils are to be stored horizontally.



Figure 23. Coil storage

Prior to installation, some coils will require handling and loading on to a horizontal, or vertical, de-coiler. This work shall be undertaken by a competent GTC team onsite utilising appropriate lifting equipment and in accordance GTC procedures.

WARNING: Only authorised GTC operatives are authorised to cut the bands to the coils. Incorrect procedure of cutting the bands could result in serious injury or death.

Fittings

Where electrofusion and mechanical fittings are to be stored on site, they should be under cover in dry conditions, preferably on racking in a lockable container. They should be kept in their boxes/package until ready for use.

Fabricated fittings may be stored outdoors if they are protected against damage and prolonged direct sunlight.

Bundles

Where pipe lengths are to be removed from a bundle, it should be from a single bundle with no unbroken bundles

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underneath; stakes should be securely fixed to retain the bundle shape whilst stock is drawn from the bundle.

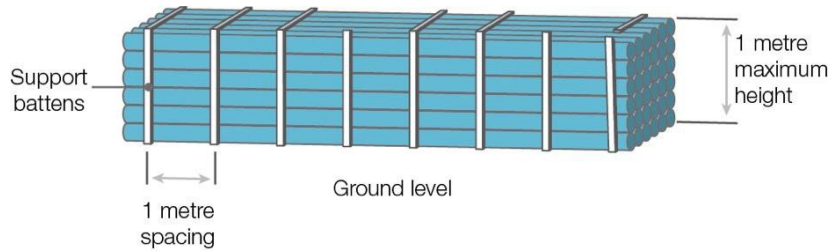


Figure 24. Broken bundles of pipes



Figure 25. Heat network pipe bundles

DRP (Disaster Recovery Plan) Valve Chambers

The DRP valves are for the heat network operator to maintain heat to the applicable part of the development during planned and unplanned outages of heat. Once live, the GTC/heat network operator will require access to all DRP valves 24 hours a day, 7 days a week. During site construction works, the valve chambers must be accessible and clear of site materials and waste.

The valve chambers form a point of isolation between the main spine network and the CHH/ housing phase. The CHH DRP valve chamber is a connection for temporary boiler plant, in the event the CHH cannot supply heat for a prolonged, temporary period. Temporary boiler plant will be supplied and connected to the heat network at the DRP valve chambers. Valve chamber locations are identified on the heat network layout drawing.

The DRP valve chambers at the phases will be the isolation from the heat network and connection to future phases.

The Developer shall undertake:

- Trenching

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- Supply and construct chamber bases
- Supply and construct chamber housing/walls
- Supply and install chamber lids
- Supply and install of soakaway
- Form the openings/holes in chamber housing for pipework/duct
- Supply and install of duct within the chambers to termination and the connection to the duct outside of the chamber
- Backfill inside chamber housing
- Backfill to outside of chamber housing
- Final finished ground level

GTC shall lay and install the pipework within the chamber after appropriate holes/openings have been formed in the chamber housing (chamber walls will be partially complete to allow pipework to be lifted and dropped into required locations). Following GTC's completion of laying pipework, the Developer can continue in finishing the housing and chamber.

The following details depict the DRP valve chambers for the various construction builds permitted for the chamber housing: polypropylene (Cubis Stakkabox™) and brick. Actual number of chambers and dimensions will differ for each site, please refer to the specific project drawings.

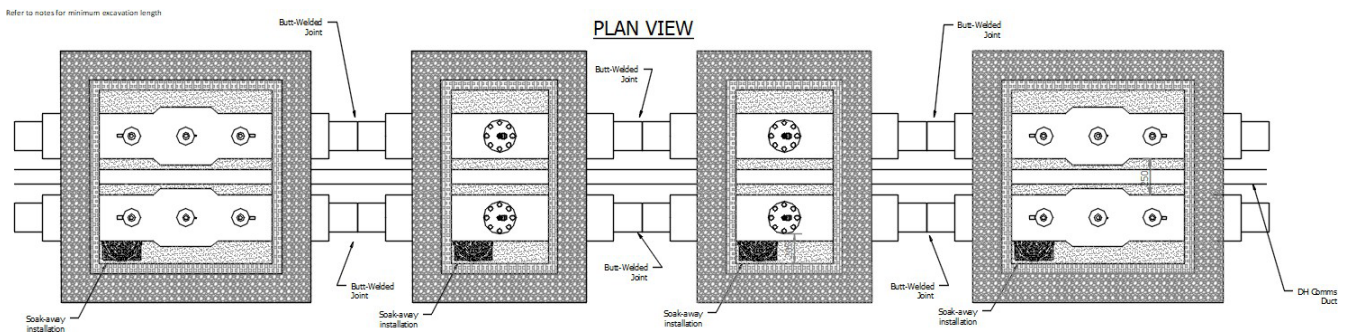
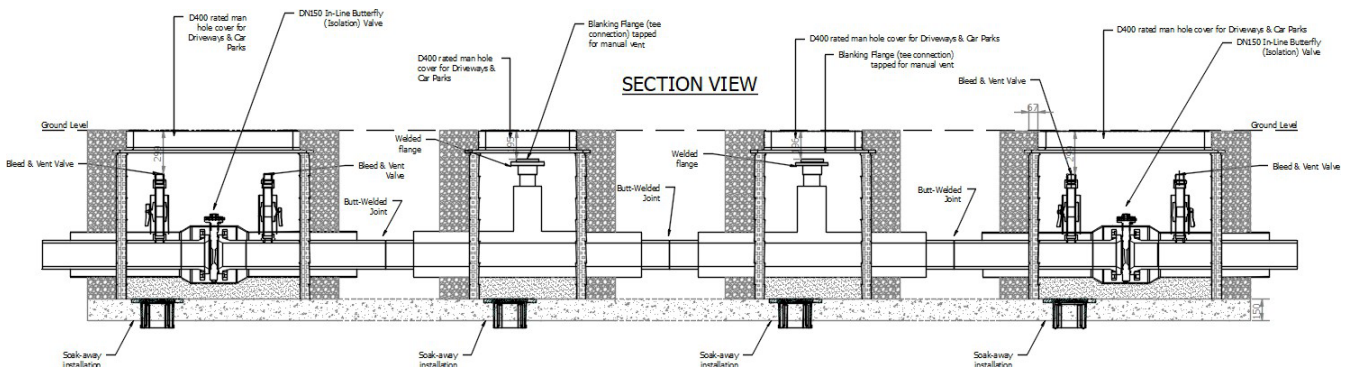


Figure 26. Typical Overview (plan view) for DRP Valve Chambers (adjacent to the CHH; Cubis Stakkabox™ build)



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Figure 27. Typical Overview (section view) for DRP Valve Chambers (adjacent to the CHH; Cubis Stakkabox™ build)

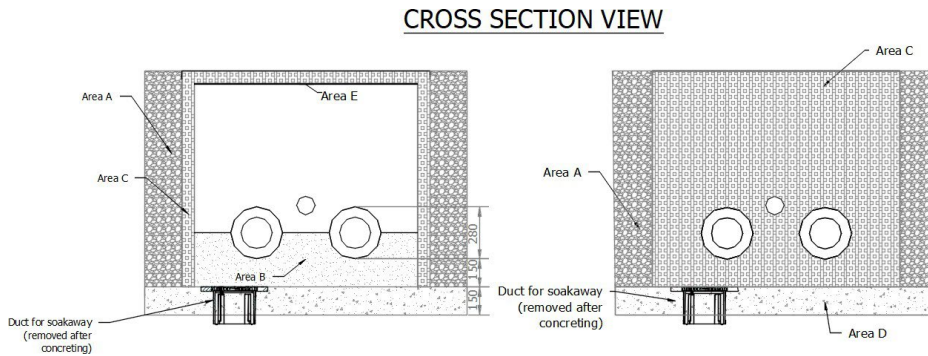


Figure 28. Typical Overview (section view) for DRP Valve Chambers (adjacent to the CHH; Cubis Stakkabox™ build)

The following is a typical detail of the valve chambers going into each phase of the development (some phases may have multiple chambers, refer to site specific project drawings).

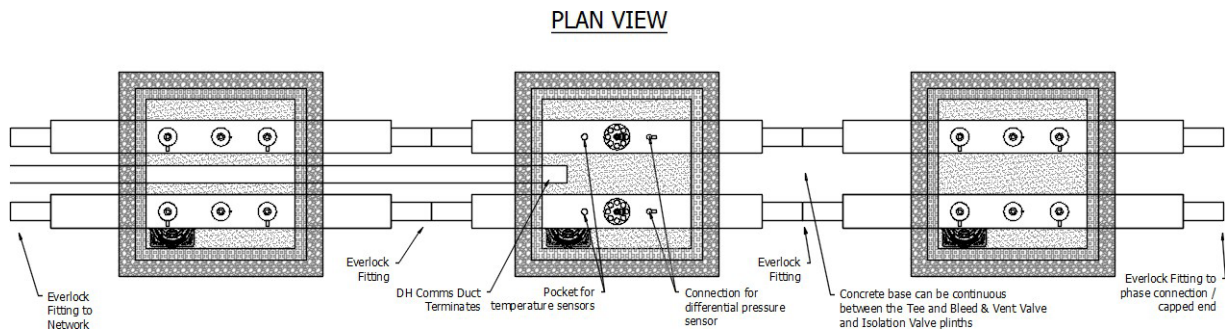


Figure 29. Plan view for DRP Valve Chambers (to Development Construction Phases; Cubis Stakkabox™)

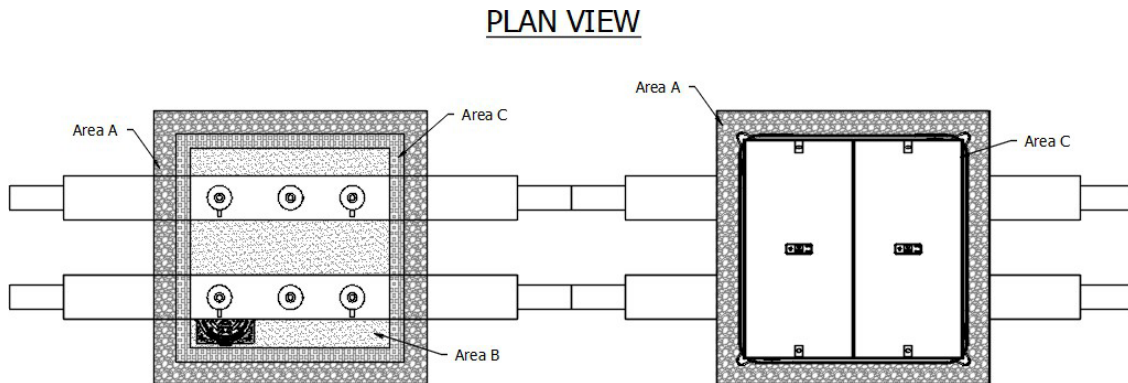


Figure 30. Plan View of typical DRP Valve (to Development Construction Phases; Cubis Stakkabox™)

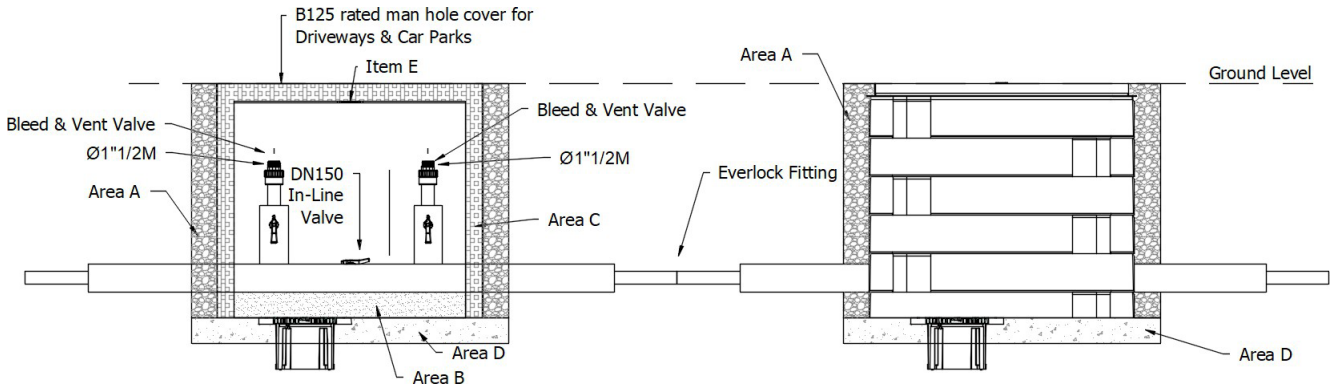


Figure 31. Section View of typical DRP Valve (to Development Construction Phases; Cubis Stakkabox™)

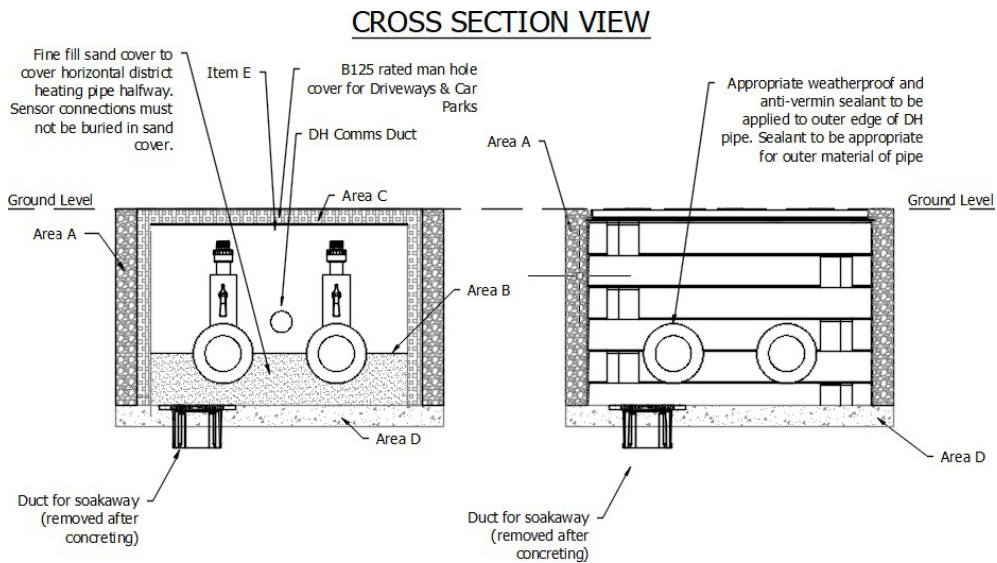


Figure 32. Cross Section View of typical DRP Valve Chamber (to Development Construction Phases; Cubis Stakkabox™)

Materials		
Area	Material	Hatch
A	Well compacted gravel	
B	Well compacted 0.4 grade sand backfill	
C	Cubis Stakkabox	
D	Dry lean concrete c20	
E	Central Support	x1

Figure 33. Materials Table cited in DRP Valve Chamber Details (to Development Construction Phases; Cubis Stakkabox™)

Minimum Phasing Valve Pit Dimensions for PEX-a Pipework (UNO) - Bleed & Vent						
Size	Outer Diameter of carrier pipe (d) mm	Outer Jacket Diameter (OD) mm	Valve Chamber Internal Width W(i) mm	Valve Chamber Internal Length L(i) mm	Valve Chamber Internal Height H(i) mm	Bleed Valve Separation (a) mm
50/111 UNO	50	113	1235	1235	1015	600
63/125 UNO	63	128	1235	1235	1015	600
75/140 UNO	75	164	1235	1235	1015	600
90/160 UNO	90	164	1235	1525	1015	900

Minimum Phasing Valve Pit Dimensions for PEX-a Pipework (UNO) - Tee							
Size	Outer Diameter of carrier pipe (d) mm	Outer Jacket Diameter (OD) mm	Valve Chamber Internal Width W(i) mm	Valve Chamber Internal Length L(i) mm	Valve Chamber Internal Height H(i) mm	Tee Flange DN(x)	Sensor Pocket Height (c) mm
50/111 UNO	50	113	1235	1235	1015	40	110
63/125 UNO	63	128	1235	1235	1015	50	110
75/140 UNO	75	164	1235	1235	1015	65	115
90/160 UNO	90	164	1235	1235	1015	80	122
110/200 UNO	110	164	1235	1235	1015	100	140

If valve pit is located under a road way increase H(i) by 200mm minimum.

Figure 34. Chamber housing dimensions (phase DRP) for pipework bleed & vent and tee connections (to Development Construction Phases; Cubis Stakkabox™)

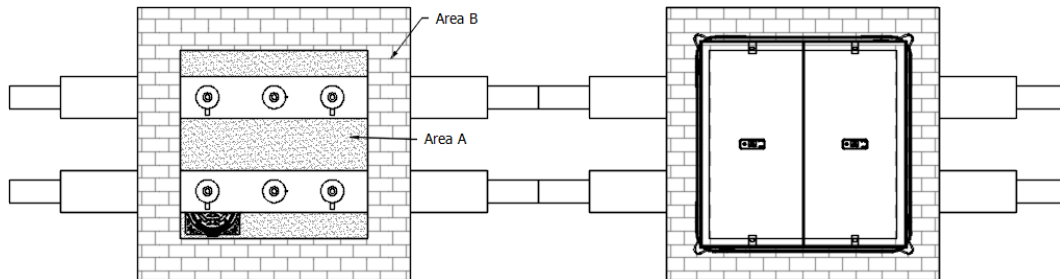


Figure 35. Plan View of typical DRP Valve (to Development Construction Phases; brick)

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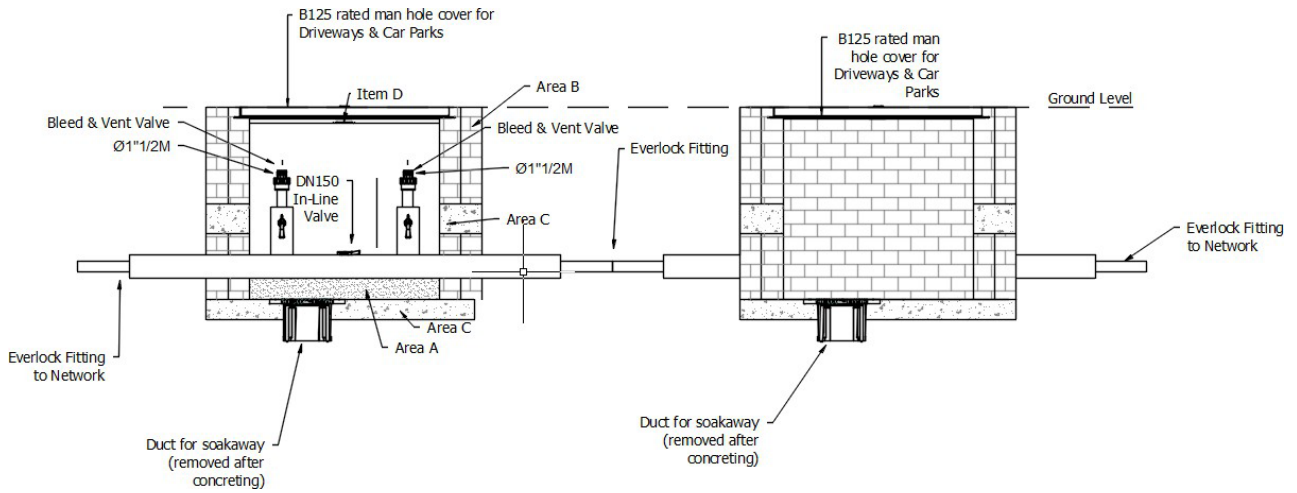


Figure 36. Section View of typical DRP Valve (to Development Construction Phases; brick)

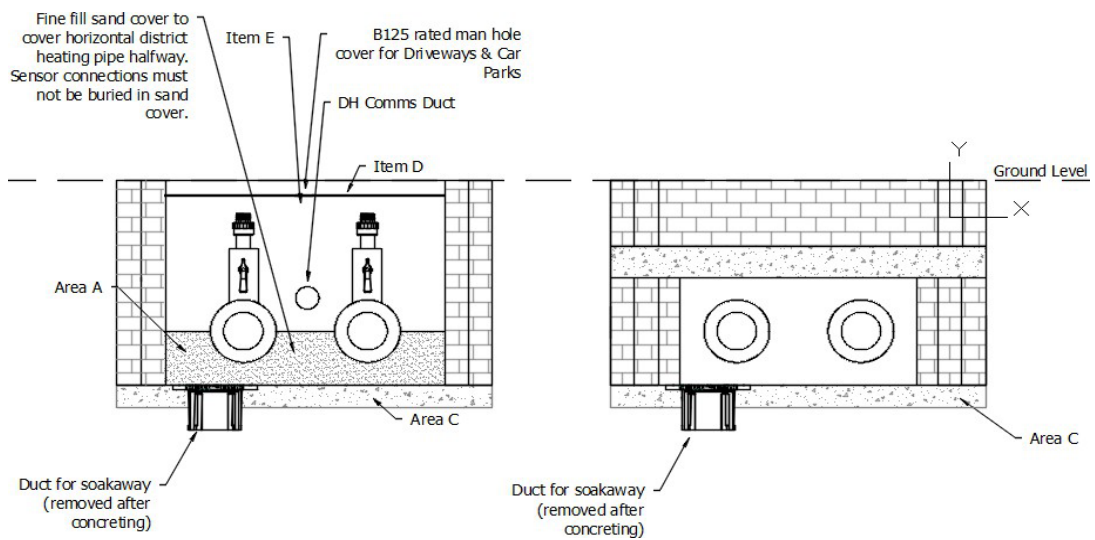


Figure 37. Cross Section View of typical DRP Valve (to Development Construction Phases; brick)

Materials		
Area	Material	Hatch
A	Well compacted 0.4 grade sand backfill	
B	Double brick built walls	
C	Structural Lintel + Concrete Base	
D	Central Support	x1

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Figure 38. Materials Table cited in DRP Valve Chamber Details (to Development Construction Phases; brick)

Minimum Phasing Valve Pit Dimensions for PEX-a Pipework (UNO) - Bleed & Vent							
Size	Outer Diameter of carrier pipe (d) mm	Outer Jacket Diameter (OD) mm	Valve Chamber External Width W(i) mm	Valve Chamber External Length L(i) mm	Valve Chamber External Height H(i) mm	Bleed Valve Separation (a) mm	Lintel Height above top of concrete base (e) mm
50/111 UNO	50	113	1307	1307	1015	600	313
63/125 UNO	63	128	1307	1307	1015	600	328
75/140 UNO	75	164	1307	1307	1015	600	364
90/160 UNO	90	164	1307	1597	1015	900	364
110/200 UNO	110	164	1307	1597	1015	900	364

If valve pit is located under a road way increase H(i) by 200mm minimum.

Minimum Phasing Valve Pit Dimensions for PEX-a Pipework (UNO) - Tee								
Size	Outer Diameter of carrier pipe (d) mm	Outer Jacket Diameter (OD) mm	Valve Chamber External Width W(i) mm	Valve Chamber External Length L(i) mm	Valve Chamber External Height H(i) mm	Tee Flange DN(x)	Sensor Pocket Height (c) mm	Lintel Height above top of concrete base (e) mm
50/111 UNO	50	113	1307	1307	1015	40	110	313
63/125 UNO	63	128	1307	1307	1015	50	110	328
75/140 UNO	75	164	1307	1307	1015	65	115	364
90/160 UNO	90	164	1307	1307	1015	80	122	364
110/200 UNO	110	164	1307	1307	1015	100	140	364

If valve pit is located under a road way increase H(i) by 200mm minimum.

Figure 39. chamber housing dimensions for pipework bleed & vent and tee connections (to Development Construction Phases; brick)



Figure 40. DRP valves laid prior to completion of chamber housing

The Developer shall undertake all groundworks required for the DRP chambers (note the dimensions will differ from the general heat network pipework as more space is needed to lay the pipe in DRP chambers. Details will be as indicated on GTC drawings), base and wall levelling, and chamber cover. The chamber must not be immediately backfilled as future access to valves will need to be made. The Developer shall undertake all backfilling requirements to the outside wall, inside the chamber and final ground level to chamber covers.

The Developer shall form the holes/openings necessary in chamber walls as identified on GTC's drawings.

A duct, supplied and installed by GTC up to the DRP valve chambers, is required for the heat network communications, which are essential for the operation and monitoring of the heat network. The Developer will be responsible for pulling through and installing the duct in the chambers to the locations shown on GTC's drawings. The heat network comms. shall route from the CHH and terminate at the DRP valve chambers as dictated on drawings. Heat network comms. duct is not required beyond the DRP valve chamber (to the infrastructure / development construction area). The comms infrastructure (cabling and components) shall be supplied and installed by GTC. The specification of the duct shall be the same as specified for road crossings.

The Developer shall supply and install the necessary chamber lid covers as identified on the drawings. Lids must not have a locking mechanism, locking mechanisms can become damaged/unusable over time and prevent access to the valve chamber in an emergency. All chamber lids shall have appropriate loading ratings, minimum B125.

All chamber lids shall include an identification badge affixed to the lid inscribed with 'ICHL HEAT' as shown below.

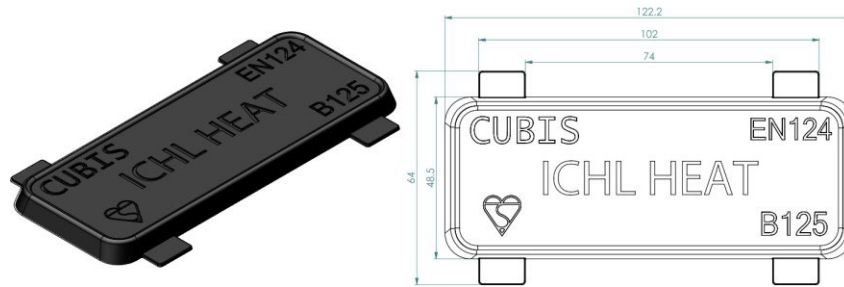


Figure 41. Chamber lid identification badge

Chambers are to be covered by their lids at all times and shall only be removed by GTC when needed. During the Developer's construction of the relevant phase/CHH, periods where work is being undertaken either by GTC or the Developer, the Developer shall provide a barrier around the perimeter of the chamber during periods of GTC works.

The Developer should note the DRP valve components are exceptional items to typical heat network pipe and more time could be required for the procurement of the components and up to 12 weeks. Please discuss with the GTC PM for current procurement timescales.

Spatial allocation is required for the set-down of emergency containerised boiler plant adjacent to plot valve chambers. Valve chambers on the operational network (supplying heat to end users) must be kept clear at all times so this operation can be achieved swiftly.

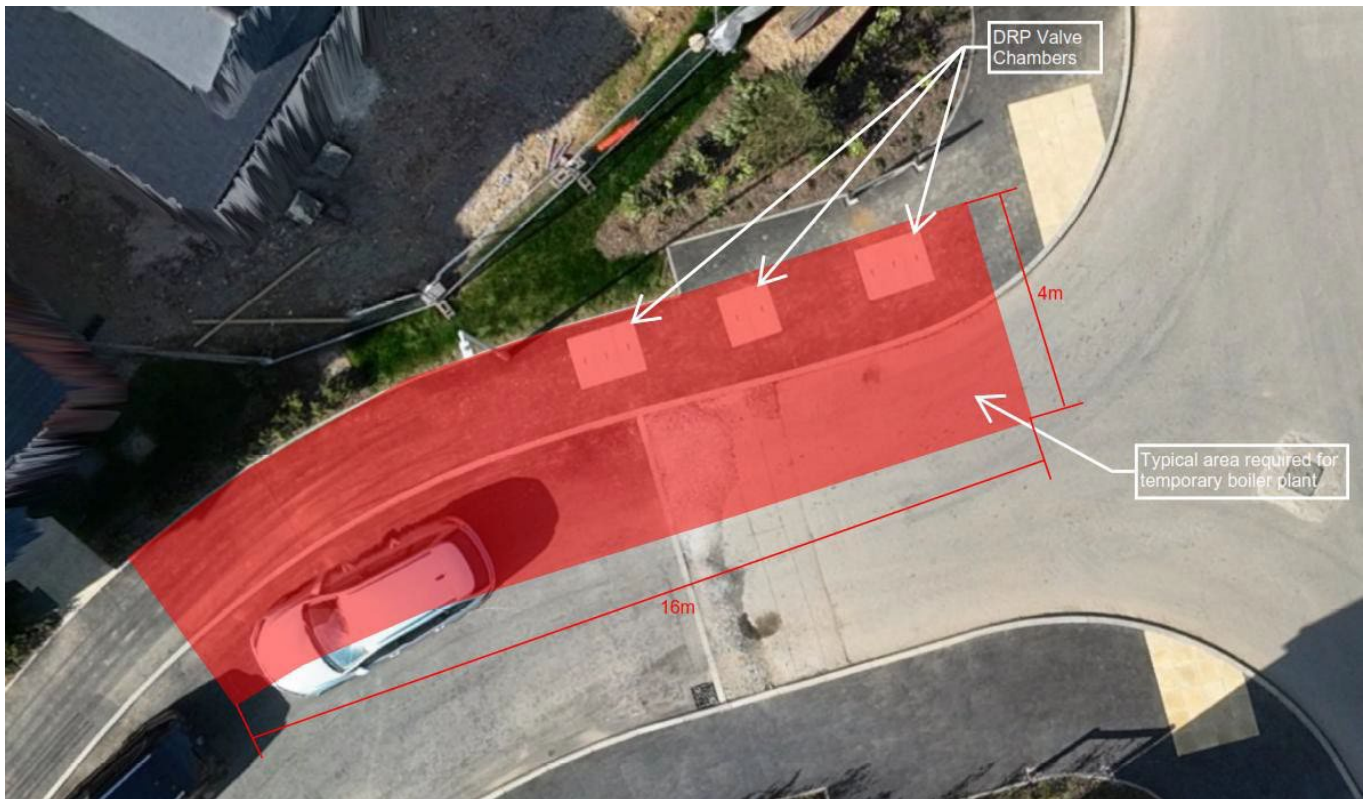


Figure 42. Typical area required for emergency DRP plant adjacent to DRP valve chambers

Ground Workers

Ensure ground workers have enough knowledge about safe working practices on site and that work is carried out safely.

- Ground workers must be aware of the large amount of stored energy in coils of pipe. Coils of pipe should be carefully restrained and unwound following the guidance in section Materials Delivery & Storage.
- Where connections are to be made to an existing heat main, the GTC Project Manager shall advise the Developer/groundworker of the type of connection to be undertaken and the dimensions of the excavation necessary to facilitate the connection.

Temporary Heat Network Equipment

During commissioning, GTC may require the use of a temporary equipment which would be used to commission the plant and equipment in the CHH. The temporary equipment could consist of:

- A dry air cooler (fan deck)
- Generator, fuel tank and associated cables

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- Pipework hoses (to connect the dry air cooler to the heat network)

The equipment will need to be located next to a heat network valve chamber; this may be adjacent to the CHH or adjacent to a DRP valve on the heat network. The Developer shall provide an area which is flat and level; access to the plant will be required at all times. GTC will work with the Developer so that this equipment does not conflict with the Developer's construction activities.



Figure 43. Example of heat rejection plant connected to DRP valves

Commissioning Mains & Sub-Mains (infrastructure)

After the heat network pipework has been laid in the ground and jointed, prior to operation the main will need to be commissioned. All heat network pipework commissioning will be undertaken by GTC. The commissioning process will follow this sequence for chemical free sites – sites which use chemical based water treatment shall be covered under a separate guidance document (note that dates are a guideline and subject to the conditions on site):

- Main spine – CHH to DRP valve chambers:
- Pipework water fill (1-2 days, subject to volume)
- Pressure test (1 day, subject to successful pressure test)
- Connect bypass loops to DRP valve chambers (1-2 days)
- Flush and circulate (3-10 days)
- Remove bypass loops to DRP valve chambers (1-2 days)
- Water chemistry sample analysis (on site 1 day, laboratory analysis approx. 14-21 days)

In the event a pressure test fails, it is likely a pipework joint (that has been backfilled and buried) will be the cause.

GTC TECHNICAL GUIDELINES

GTC will use leak detection equipment to establish an approximate location for the leak/joint. The Developer shall open up the ground to the joint when requested by GTC's PM. GTC will repair the joint, following which the pressure test will be repeated. The Developer will be responsible for backfilling and making good the ground upon completion. Infrastructure (sub-main from DRP valve chamber to service connections) – houses only (for chemical free sites – sites which use chemical based water treatment shall be covered under a separate guidance document):

- Pipework water fill (1 day, subject to volume)
- Pressure test (1 day, subject to successful pressure test)
- Connect bypass loops to service connections (1-2 days but subject to number of service connections)
- Flush and circulate (3-5 days subject to pipe length)
- Remove bypass loops to service connections (1-2 days)
- Water chemistry sample analysis (on site 1 day, laboratory analysis approx. 14 days) For service connection commissioning, refer to Section 8 Heat Service Connections.

For service connection commissioning, refer to Section 8 Heat Service Connections.

SECTION EIGHT

Heat Service Connection – Single Occupancy Dwellings

General

The Developer is required to undertake all excavation works on-site to enable the service pipe or service ducting to be laid, allowing the connection to the heat main and the service termination at the building to be completed.

The heat service must be laid in a straight line along a route as shown on the agreed design, any deviations must be agreed with GTC, prior to laying the service pipe or service duct. The route should be perpendicular to the property and take the shortest route practicable to the heat network main.

Services shall be laid, in trenches or inserted into ducts provided by the Developer.

The Developer shall supply and install all above ground pipework and insulation. This pipework connects to the isolation valves (adjacent to the dwelling entry pipework, isolation valves supplied by GTC) to the Heat Interface Unit.

Sleeving/Ducting & Excavation

A service pipe shall connect the district heating mains pipework to a dwelling. The Developer shall be responsible for the trenching to each dwelling for the installation of each service pipe. For trench and backfill requirements, please refer to section Buried District Heating Pipework above and GTC's standard drawings.

GTC shall supply and install the below ground service pipe as described in this section. The service pipe shall be kept as short as possible.

The service pipe shall be located such that replacement can be made if required or at the end of the pipe lifespan. The service pipe shall not be located under any buildings or structures which will prevent this access.

If the installed service pipe or ducting has insufficient cover, or no marker tape has been laid above the pipe or ducting, or the duct ends have not been sealed, then the heat mains service will not be connected/commissioned, and the Developer will be notified.

Service branches pipework tees to dwellings shall be laid from the mains at the time of mains construction to allow for the service connection to take place in the footpath or soft ground.

GTC TECHNICAL GUIDELINES

The service pipe shall route underground to the dwelling building entry location where it will rise vertically to above ground. The location of the service pipe shall be in conjunction with locating the Heat Interface Unit. Please refer to the Heat Interface Section below.

The Developer is responsible for all building Structural and Civils design, and coordination associated with pipework entry to the dwellings.

Service Pipe and building entry

The Developer shall supply and install all sleeve/ducting to route pipework under the dwelling footing or through the building wall line, including all fire stopping. Refer to section Buried District Heating Pipework above for duct requirements. The seal between the sleeve and pre-formed bend shall be by the Developer, the specification of which shall be submitted to GTC for approval. Please refer to GTC's standard drawings.

The Developer shall locate the buried pipework entry point in the dwelling at an external wall as close to the connecting sub-main pipe as possible. The entry point should be up against an external wall and allow for a 150mm duct for the heat network service connection. The duct shall have a bend radius no less than 0.3m to allow for pipework to be pulled through. Refer to Section Seven for further duct requirements.

GTC shall install 2x isolation valves (1x for flow pipework, 1x for return pipework) at the building entry connection. **ACCESS IS REQUIRED FOR THESE VALVES AT ALL TIMES.** These valves shut off the heat network to the dwelling in the event of an emergency (such as a leak). If the valves are located behind a plasterboard wall (or similar cover), there must be a removeable access hatch for quick and easy access. Under no circumstance shall these valves be concealed behind a cupboard, washing machine, or anything else which will prevent access in an emergency.

The Developer shall connect the above ground pipework to the isolation valves supplied by GTC. The pipework above the GTC supplied isolation valves shall include a capped tee and a further set of isolation valves on both flow and return pipework. This is to allow for system commissioning between the two pipework installations.

Capped tee to kept as short as possible (to minimise the dead leg) and located so that a temporary hose can easily be connected and removed during commissioning (i.e. tees shall not be directly facing each other).

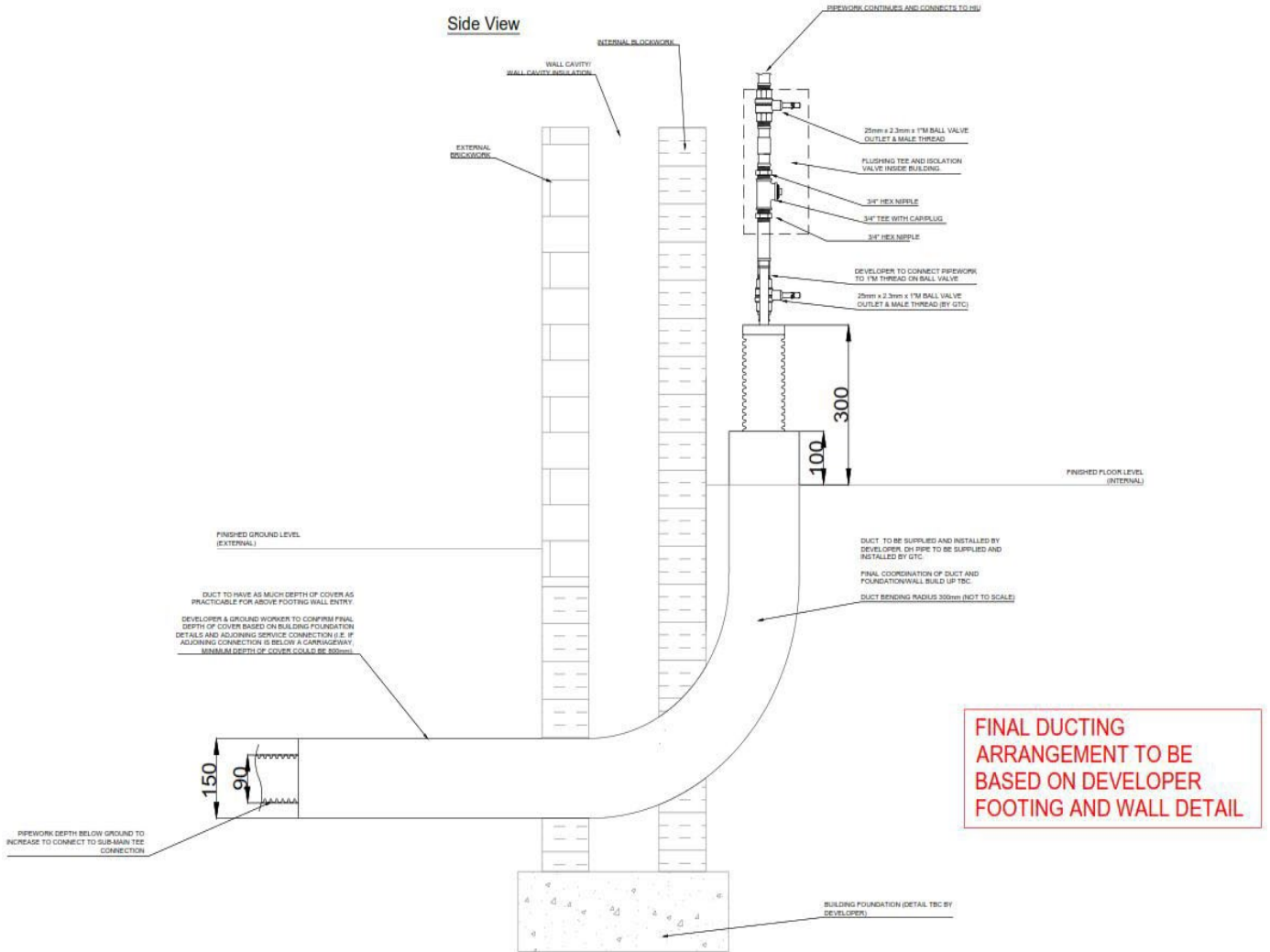


Fig 44. Typical house pipework entry detail, above foundation footing

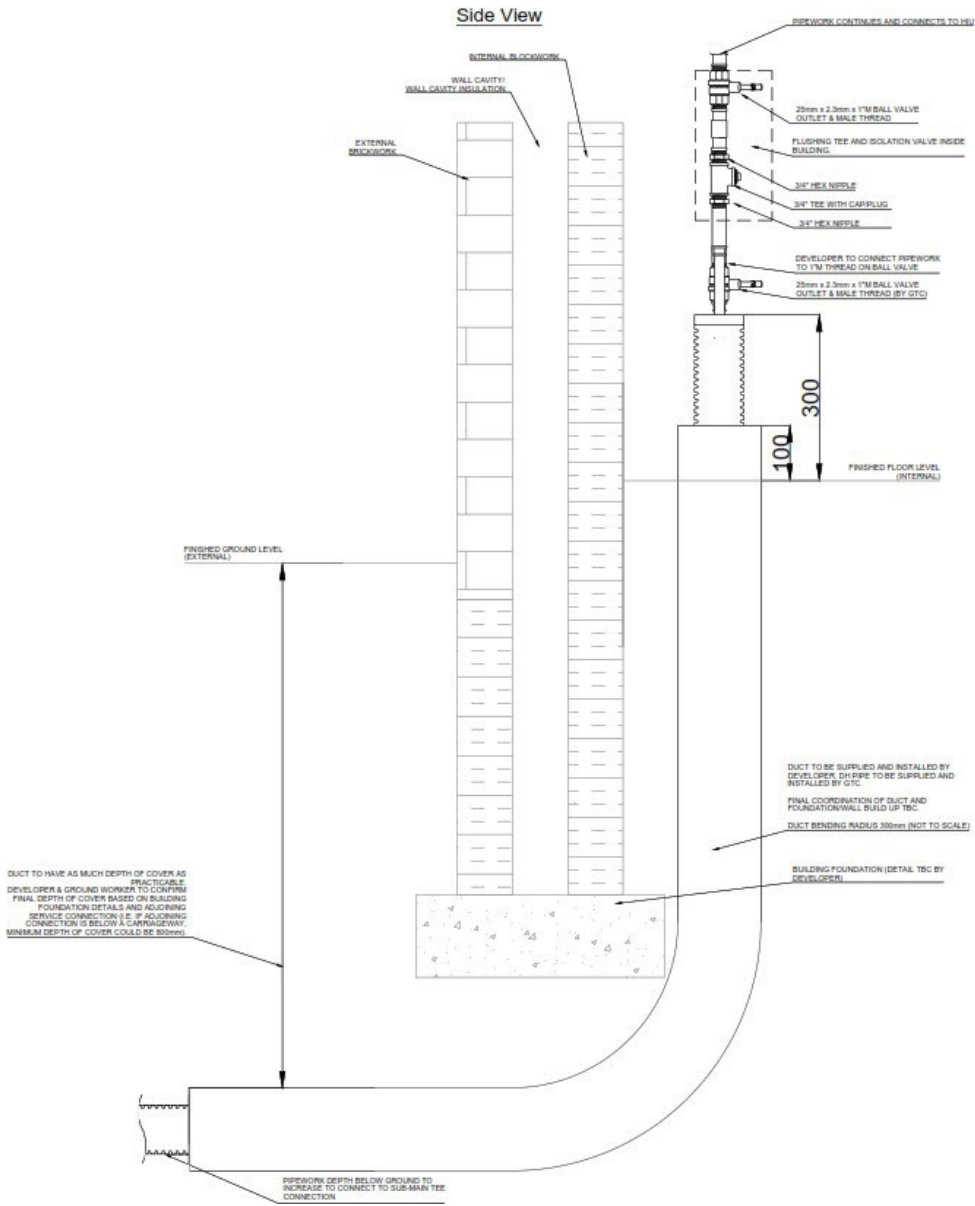


Figure 45. Typical house pipework entry detail, below foundation footing

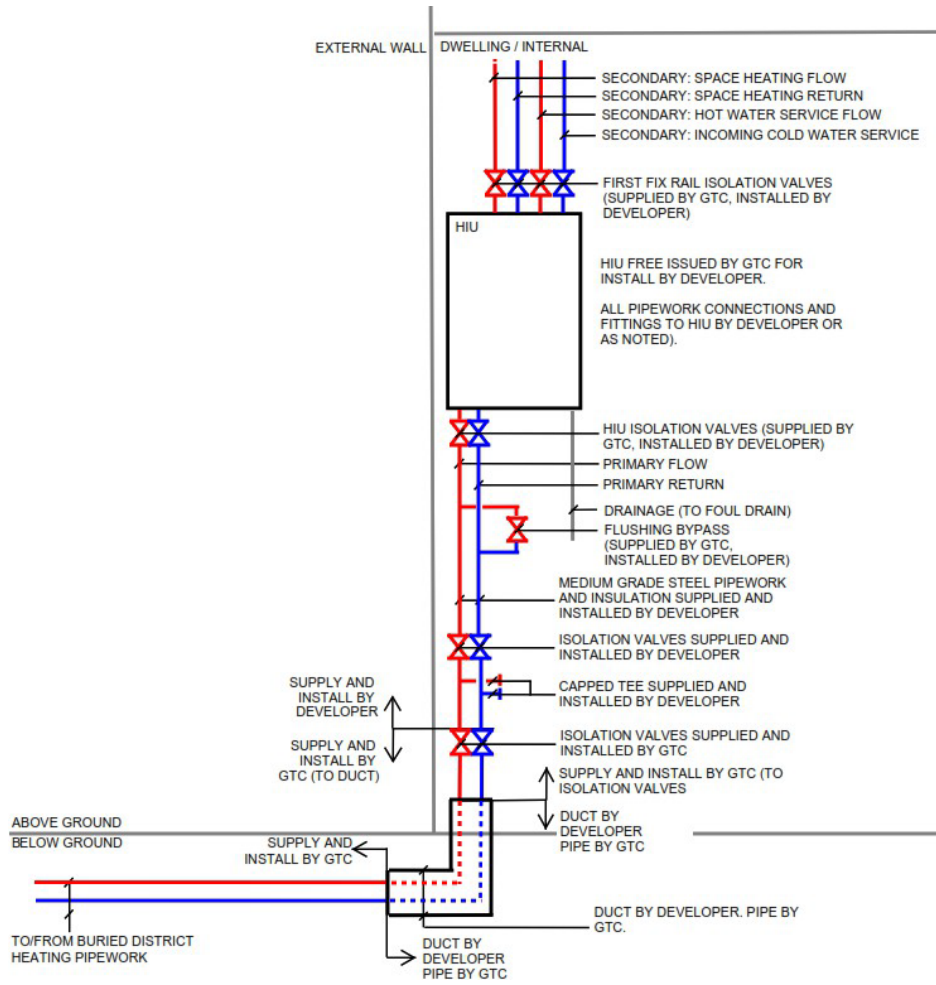


Figure 46. Scope of supply schematic of service pipe to / from the HI

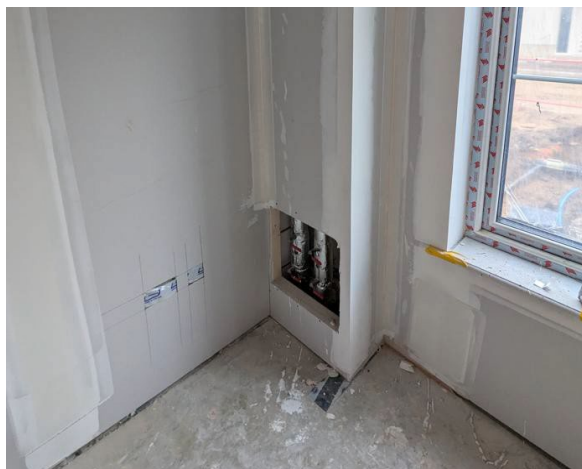


Figure 47. Access hatch hole preparation for heat network isolation valves

Commissioning

Service connections, from the sub-main tee to the building entry point will need to undergo the same commissioning process as the infrastructure. The service connection joint to the sub-main will be completed (by GTC) with pipework routing to inside the dwelling and commissioning process is to building entry point.

GTC endeavour to complete approximately 4 connections per day, with commissioning anticipated for a 1-2 day period. The following is an estimated timescale of service connection commissioning by GTC

- Pipework water fill (1 day, subject to volume)
- Pressure test (2-3 hours per dwelling, subject to successful pressure test)
- Connect bypass loops to service connections (half hour per plot)
- Flush (up to 1 hour, subject to pipe length)
- Treat (2-3 hours per plot) – only applicable for sites with chemical water treatment
- Remove bypass loops to service connections (half hour per dwelling)
- Water chemistry sample analysis (on site 1 day, laboratory analysis approx. 14 days, undertaken by GTC)
- Re-flush/treat (treat only applicable for sites with chemical water treatment) if required

Dwellings / apartment building / commercial (non-residential) pipework:

All pipework and commissioning requirements beyond the building entry point (for dwellings, apartment buildings and commercial/non-residential buildings) is the responsibility of the Developer.

The Developer shall undertake all processes identified above for the above ground pipework and provide photographic reports/certificates upon completion.

See further details in Sections 8, 9 10 & 11.

The quality of water shall be equal to or betterment to Metropolitan's water quality specification for the development. The Developer shall provide laboratory samples from a UKAS accredited laboratory of building pipework water, to include the parameters depicted in Metropolitan's specification. If the water quality is deemed detrimental to the water quality in the heat network, the two systems will not be opened and mixed until the items identified

Pipework Specification

The Developer is to supply, install, test and commission all above ground pipework and insulation from the dwelling entry isolation valves (isolation valves supplied by GTC), up to and including the HIU connections.

The above ground service pipework and fittings from the isolation valves to the HIU shall be:

If the HIU is located directly above the heat network building entry location and connects to the HIU via the bottom of the HIU: Copper pipework, minimum pressure rating PN10. Compression fittings are not permitted in any circumstance. Soldered fittings must utilise high temperature melting solders. Where copper pipework is sealed (e.g. in boxing) the plasterboard is to be steel plated and clearly labelled as a "DO NOT CUT" area.

GTC TECHNICAL GUIDELINES

If the HIU is located in a different location to the building entry location and connects to the HIU via the top of the HIU: **medium weight steel tube to BS2871 with screwed/threaded joints, PN10 rated.**

All pipework and fittings to be finished in anti-corrosive treatment (e.g. red oxide paint) throughout.

The schematic arrangement below depicts heat network pipework requirements where the HIU is located in the same location as the building entry pipework:

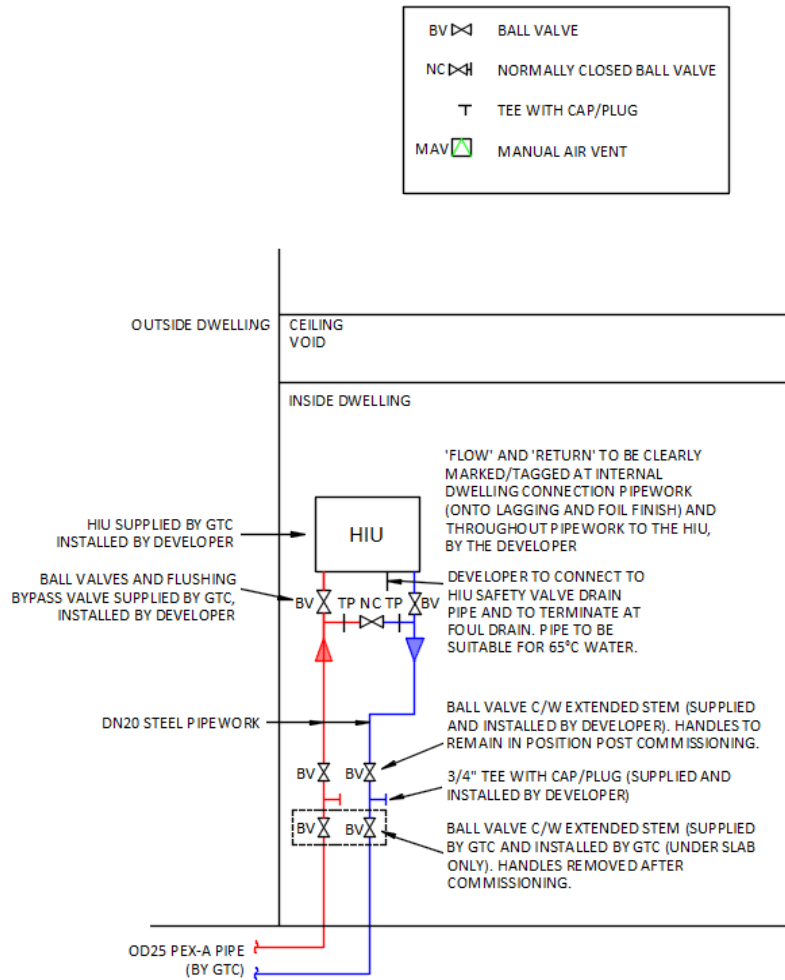


Figure 48. Schematic arrangement for heat network pipework where HIU is located in same location as building entry pipework

GTC TECHNICAL GUIDELINES

The schematic arrangement below depicts the requirements for connecting to the HIU where the HIU is located in a different location to the building entry:

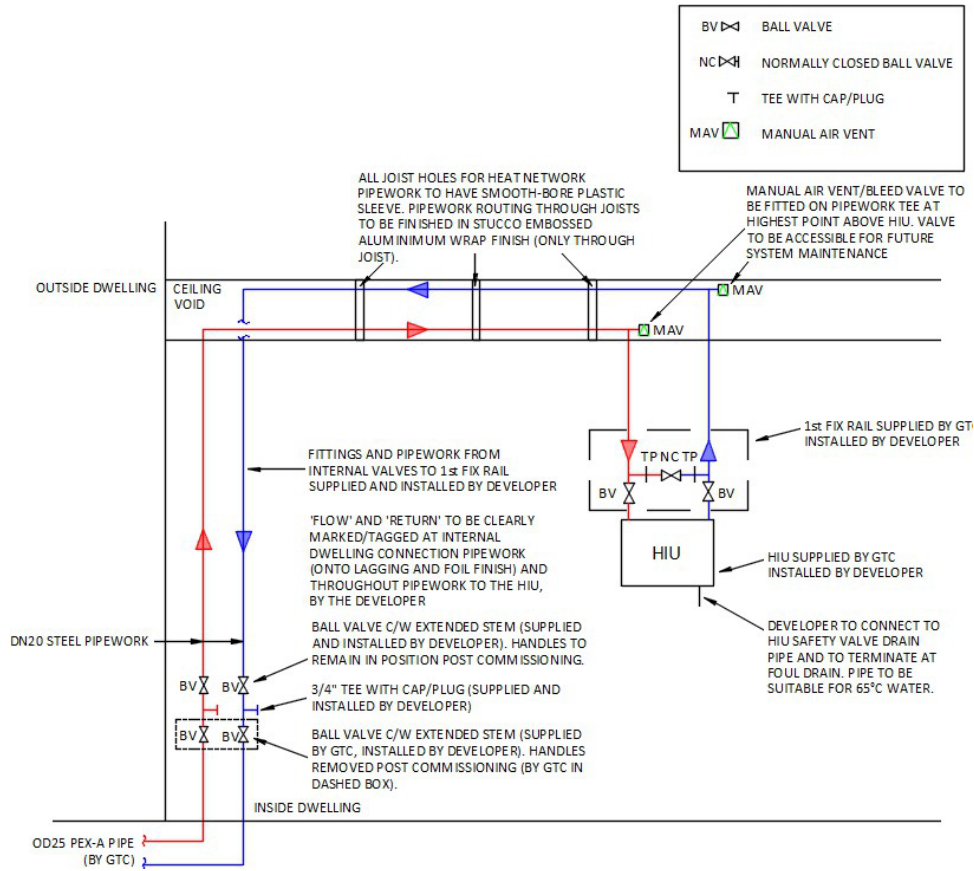


Figure 49. Schematic arrangement for heat network pipework to HIU located in separate location to building entry connection

Where pipework routes through joists, all joists must have a smooth bore plastic sleeve and insulation finished in a stucco embossed aluminium wrap to prevent damage to insulation from small movements caused by heat network operation. Note the joist hole must account for both pipework and insulation (approx.90mm diameter per pipe – TBC by the Developer).

Pipework routing horizontally at high level to the HIU shall include manual air/bleed vents as close as practicable to the horizontal/vertical elbow to the HIU. This is to allow air bleeding of pipework during commissioning. All air vents covered by a ceiling structure shall include an access hatch with removeable cover for future access.

GTC TECHNICAL GUIDELINES

The contractor shall provide certificates in the form of the report showing:

- Photos of complete pipework and fittings before lagging
- Photos of pipework and fittings after lagging

Care must be taken by the Developer's appointed contractors in the installation of heat network pipework and all other utility services / decoration during the construction of the utility services. Pipework within the HIU is stainless steel, if copper swarf makes contact with stainless steel it can cause galvanic corrosion, resulting in pinhole leaks on the pipework (the pipework component would then need replacing by the manufacturer, causing delay to completions). The developer will be responsible for any HIU components which need replacing because of the Developer's appointed contractor's lack of care during the utility installation and decoration phases of a dwelling construction. It is recommended the Developer, or their appointed contractor places a protective cover (ideally the box which the HIU is transported within or a dust sheet which fully covers the HIU) to prevent nuisance defects to

the HIU. The cover should remain in place and only removed when heat is required from the HIU, immediately reinstated and then removed and disposed of prior to HIU commissioning.

Pipework Testing and Treatment

The Developer shall pressure test pipework to 'BESA TR/6 Site Pressure Testing of Pipework'; and flush the pipework between the valve entry position and the HIU to BSRIA document 'BG29/2021 Pre-Commission Cleaning of Pipework Systems) and submit the following documents to GTC, identifying the applicable plot number on the document:

- Certification of pressure test, details on certificate to include:
 - Timestamped photos of gauge at start and end of test
 - Manufacturer and model of pressure gauge
 - Calibration certificate for gauge (showing gauge details and expiry/retest date)
- Certification of flushing, details on certificate to include:
 - Method for flushing
 - Timestamped photo of velocity achieved during flush

All water used must be demineralised water. Demineralised water is part of the treatment to water to minimise corrosion, scaling and bacteria growth versus mains water, all of which have negative consequences to heat networks. Demineralised water is achieved through either:

- a demineralised resin filter connected to a mains supply; or
- supplied in bowsers through a specialist supplier.

The resin filter is recommended to avoid running out of demineralised water on site. As the resin has a finite life span, resin will need topping up periodically.

GTC TECHNICAL GUIDELINES

Above ground pipework should not be filled with water until the connecting below ground service pipework is commissioned and ready to supply district heating water to the above ground service pipe. If there are challenges with this (i.e. the pipework insulation needs finishing and drywalling completing) this must be advised to GTC.

On occasion, GTC may undertake the fill, flush, water treatment and pressure test for above ground service connection pipework to the HIU on the behalf of the Developer. This does negate the Developer's responsibility for the testing and treatment of the pipework for other plots on the development.

If the above ground service pipe is flushed and commissioned more than 48 hours in advance of the connecting below ground service pipe the Developer shall be responsible for maintaining the integrity of the pipework and all corrosion prevention means e.g. filling with nitrogen gas or pre-commission cleaning agent such as Hydrosphere (or equivalent). Any pipework filled with a temporary anti-corrosive agent shall be clearly labelled on the pipework. The Developer is responsible for the removal and disposal of any anti-corrosion agent in the service pipework. The strategy and treatment requirements for completed pipework which will not be opened to the network for a period of time must be acknowledged and agreed with GTC ahead of time and before any pipework is tested.

Before opening to the district heating system, any service pipe which has had an anti-corrosion agent shall undergo water quality sampling by a UKAS accredited laboratory. The water quality shall follow the guidelines depicted in the current 'BSRIA BG29 Pre-Commission Cleaning of Pipework Systems'. If the sample does not meet the guidelines stated, the Developer shall treat and dose the pipework accordingly and undergo further testing until the water quality meets the guidelines.

All valves and components must be accessible post construction (i.e. not buried in solid floors, or behind drylining). If valves are to be concealed, they must be accessible in the event of an emergency e.g. triangle key or similar.

GTC shall supply and install isolation valves above ground (1No. on flow and 1 No. on return), which is where GTC's pipework supply and installation scope of supply ends. The Developer is responsible for all above ground steel pipework and insulation to the Heat Interface Unit, including testing and chemical cleaning. For the isolation valves, the Developer shall also supply and install a removable insulation jacket to the thermal conductivity noted in section Pipework Insulation below.

The Developer shall supply and install all Earth bonding required for above ground service connection pipework.

The Developer shall be responsible for all concealment of the void, pipework and isolation valves. Isolation valves must be accessible in an emergency e.g. located in an easily openable cupboard/box.

Pipework in the dwelling to the HIU shall be as short as possible, accessible and not permanently concealed (i.e. not routed in a building cavity, cast into screed, etc.).

Pipework Insulation

The Developer is to ensure all pipework is fully insulated. Insulation shall be applied to all above ground service pipework and isolation valves. The specification of the insulation shall be as a minimum **CFC free phenolic foam insulation (to BS EN 14314:2015) with a thermal conductivity minimum of 0.025W/mK, 30mm thickness.**

All phenolic foam insulation should include a factory applied vapour barrier and finished in alu-wrap foil or similar finish and shall be continuous such that there are no exposed sections of pipe and continuous when passing through pipe support brackets and pipe sleeves. It is recommended that phenolic foam bracket inserts are procured with the bracket (or clamps are fixed around the outside of the insulation).

GTC TECHNICAL GUIDELINES

Insulation is to be inspected by a GTC employee before any concealment is applied. If insulation has not been verified by a GTC employee, the method of concealment is to be removed and reinstated at no cost to GTC.

Fire Stopping

The Developer shall be responsible for complying with Building Regulations and undertake all fire stopping requirements associated with the service pipe to dwellings.

Where a service pipe is enclosed within a duct or an enclosure, the duct or enclosure must comply with the building regulations and shall be at least half hour fire resistant and comply with BS 8313; suitable removable access/inspection panels shall be made available.

The pipework insulation specification shall not be compromised through fire compartments. The Developer shall procure an appropriate fire stopping insulation which includes the minimum thermal conductivity requirements stated in section Pipework Insulation.

Under no circumstance shall intumescent fire stopping be used around heat network pipework as this will seriously risk the structural integrity of the pipework under fire condition

SECTION NINE

Apartment / Multi Occupancy Buildings

Apartment and multi-occupancy buildings are different to dwellings in that there are pipework runs routing in communal areas. As with the service connections for dwellings, GTC will be responsible for the supply and installation of pipework up to the building entry connection into the building. The Developer shall be responsible for the design, installation and commissioning of all above ground pipework, insulation and coordination to the HIUs.

Early consultation (at the design stage) with GTC should take place for to evaluate designs associated with the district heating infrastructure. GTC's District Heating guidance documentation should be requested and issued to M&E design consultants in advance of design production. The District Heating, space heating and domestic hot water design should follow the minimum requirements depicted in CIBSE Heat Networks Code of Practice CP1 throughout the design and project lifecycle.

Risk Assessment

A bespoke risk assessment is required for all flatted property installations. The Developer must provide the following information to the GTC Designer relating to the building/block.

Special occupancy type (e.g. elderly, disabled etc) expected in the building.

- How is 24/7 access guaranteed.
- The type of building construction.
- Detailed floor plans and building layouts.
- Proposed HIU locations.
- Isolation of service pipe to each dwelling.
- Other utility and service routes.

The Developer or the principal contractor acting on behalf of the client will be required to sign the GTC Risk Assessments as deemed appropriate.

Pipework Building Entry

A dedicated excavation inside of the building shall accommodate the service pipe transition from below ground to above ground. The location must be adjacent to an external wall so that no service pipe routes under the building where it cannot be later accessed.

A dedicated duct shall be installed by the Developer to route the heat network pipe to the building entry location. Duct requirements shall follow the requirements noted in Section Seven above. GTC shall supply and install the heat network pipe, connecting an isolation valve on the flow and the return. The Developer shall connect the above ground pipework to the isolation valves, as depicted on the schematic below.

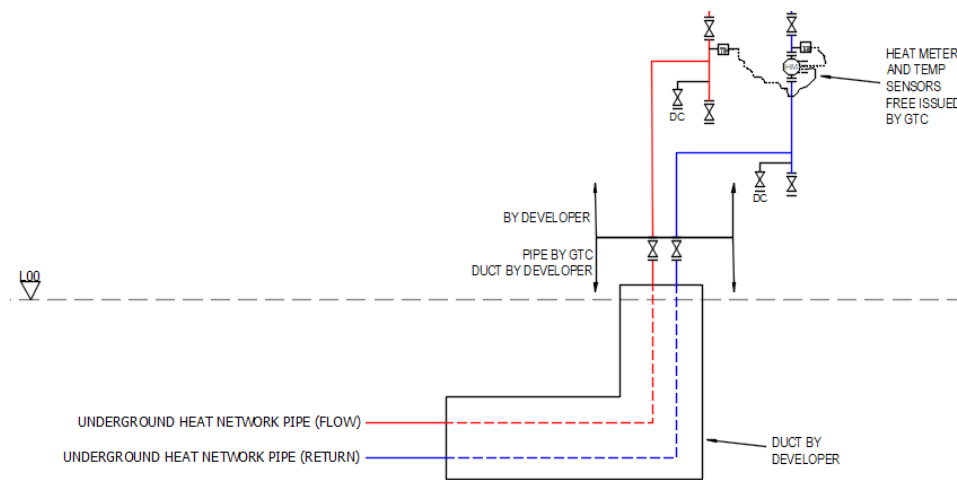


Figure 50. Schematic Arrangement of building entry for multi-occupancy and apartment buildings

A heat meter (with associated temperature sensors) will be required at the building entry connection and before pipework routes to end users or communal areas. GTC shall free issue the heat meter for the Developer to install. The Developer shall call off apartment building heat meters in advance of requirement on site, noting that delivery times could be up to 12 weeks. The Developer is to clarify the latest delivery timescales with GTC's PM.

The Developer shall undertake the power and wiring requirements for the heat meter, 230VAC power supply and a 3A fused fixed spur, the spur located next to the heat meter. The heat meter shall be located on its own individual electrical circuit from the local breaker panel.

The Developer shall be responsible for all mechanical and electrical infrastructure to the district heating connections in the riser.

Above Ground Pipework

Please refer to section Heat Service Connection and Pipework Specification for pipework specifications and detailed requirements. The apartment building shall use either medium grade steel throughout the building or copper, and that copper is only used in locations where pipework will be properly concealed in risers, ceiling voids, or similar protected areas, from the building entry up to apartment HIUs.

Water Quality

Please refer to section Heat Service Connection and Pipework Specification for requirements.

Pipework Insulation

The pipework insulation shall follow the same specification as depicted in the Heat Service Connection – Pipework Insulation, however, the insulation thickness for apartment buildings shall be 50mm throughout (from building entry connection to HIU). Insulation must be continuous throughout and there are no gaps or tears to the insulation.

Fire Stopping

The Developer shall be responsible for complying with Building Regulations and undertake all fire stopping requirements associated with the district heating pipework and routes.

Fire stopping and protection from fire must be constructed and in place prior to the commissioning of any riser/lateral pipework within multi-occupancy buildings, written confirmation is required from the Developer confirming fire stopping and ventilation is not compromised.

Risers and laterals shall be fire stopped between fire compartments in accordance with Building Regulations.

Where a riser or lateral is enclosed within a duct or an enclosure, the duct or enclosure must comply with the building regulations and shall be at least half hour fire resistant and comply with BS 8313; suitable removable access/inspection panels shall be made available.

Under no circumstance shall intumescent fire stopping be used around heat network pipework as this will seriously risk the structural integrity of the pipework under fire conditions.

Risers and Laterals

District heating pipework shall be in an accessible riser, dedicated only for district heating pipework. Under no circumstances shall district heating flow and return pipework be located in the same riser as mains cold water or LV/HV cabling.

The building entry pipework must be next to an external wall. This will improve system losses, aid the pipework installation and also mean no pipework is buried below the building slab (for future access purposes).

The architect and M&E designer shall assess the use for multiple district heating risers for reducing system energy losses.

To allow for movement a sleeve is required through any boxing/plasterboard for each lateral pipe passing through from the riser to the meter positions. The sleeve shall be filled with either fire retardant non-setting mastic or alternatively a fire-retardant silicone sealant to allow for movement of the lateral pipe installed. It is not acceptable for any plasterboard to be in direct contact with the lateral pipe resulting in restraining the lateral and preventing movement.

GTC TECHNICAL GUIDELINES

Risers and laterals shall be sleeved where they pass through any floor or wall.

Lateral pipework can route at high level, fixed to the soffit and should be as far as practicable from all other services.

Service connections to each dwelling or landlord use shall be complete with a lockable isolation valve on both flow and return outside of the premise boundary, so that a flat can be easily isolated in an emergency without entering the flat.

GTC shall require access to heat risers and laterals 24/7 post commissioning. All riser cupboards shall be fitted with locks, and all associated riser keys shall be issued to GTC upon system completion and handover.

Plate Heat Exchanger Plant

Plate heat exchanger plant shall be avoided where possible. Plate heat exchanger plant adds capital cost, reduces heat network system efficiencies and increases risk of continuous supply failure by having additional equipment (such as pumps, control valves, etc.).

The Developer shall request GTC's documentation of requirements and key design parameters of any plate heat exchanger plantrooms early during the design stage of the project.

GTC shall be invited at an early stage to discuss and review the design for the supply of heat to area multi-occupancy building. GTC's requirements and specifications must be strictly followed for all commercial area designs.

SECTION TEN

Heat Interface Unit (HIU)

General

The Heat Interface Unit shall be supplied (free issued) by GTC for installation by the Developer. The Developer shall store the HIU on site (in accordance with the storage requirements below) until required for their installation.

The Developer shall provide GTC with details of each dwelling connected to the heat network so the HIUs can be sized and procured accordingly:

- Dwelling size (m2)
- Number of bathrooms
- Heat emitter type
- Top or bottom heat network pipe connection to HIU

GTC will endeavour to specify a single type of HIU for the development. However, it may be necessary to specify multiple types of HIU specification for the development. It is the Developer's responsibility to ensure the correct HIU is installed at the correct dwelling.

The Developer shall consult with GTC to ensure that adequate provision is made for siting and installing the HIU. The Developer shall provide property layout plans showing the proposed HIU positions prior to the final design of the heat services. Once the design is approved, any variations required shall be submitted to GTC for approval. GTC shall be the sole arbiter of HIU entry positions.

The HIU installations shall be sited so that:

- It is in the same room as the heat network building entry pipework
- Fixed to a wall internally, the wall shall be an external wall, as close as possible to the below ground service pipework and the connecting sub-main.
- At the front of the property
- Above ground service pipework shall be kept to a minimum
- In a room where connected services (mains water, power, drainage and fibre) are readily available – e.g. a utility room is ideal, but a kitchen is also acceptable
- The optimum location in the dwelling is in a utility room where connected services are available (mains water, power and drainage)

GTC TECHNICAL GUIDELINES

- Alternatively, if a utility room is not available or is located at the rear of the property, the kitchen is an alternative location where connected services are available
- The HIU can be installed, adjusted, serviced, and exchanged
- The HIU is easily accessible for inspection and meter reading
- All functions of the installation can be easily operated
- Does not create an obstruction hazard along access and egress routes

A HIU installation shall not be sited:

- At the rear of a property from the service connection
- Where it might be outside the operating range of the HIU as specified by the manufacturer (to be advised by GTC)
- Where it might be exposed to accidental damage
- Where it might cause an obstruction
- Where it might be affected by a damp or a corrosive atmosphere
- Where it will constitute a danger to any person
- At a low level that there is a significant risk of it being submerged in the event of flooding
- Where an operative cannot easily access and service the HIU

The Developer shall provide an outline construction programme for each plot. This will give GTC the anticipated call off order for HIUs. When HIUs and first fix rails are required, the Developer shall inform GTC of the development name, phase/area of the development and the plot numbers called off. Call offs will have a minimum number that can be called off for a single order (typically 10No.) and delivery timescales can vary – typically 12 weeks (at time of writing, June 2025) and should be checked with GTC's PM.

HIUs will be delivered complete with insulation covers. The covers must remain intact and clean. It is recommended the HIU insulation covers are stored and protected until after the location has completed decorating.

Where HIUs are located in garages (e.g. FOG units), the HIU shall be wall-mounted on the rear external wall, directly opposite the garage door. Heat network pipework shall be protected within a galvanised steel frame to the boxing, extending from the building entry to the flushing bypass valves.

HIU Site Storage

The Developer is to provide a suitable facility and space for the storage of HIUs on site. The onsite storage facility shall be a secure compound, with careful consideration given to the following:

- Security of all materials and equipment from theft, vandalism, accidental damage, or contamination.
- Safety of the site workers, public, especially children and blind persons.
- The movement of traffic and construction equipment.
- All HIU store locations should be on a suitably firm hard standing, level ground, free from ground water, mud, weatherproofed and other damaging material with adequate access for construction vehicles and/or lifting equipment.

GTC TECHNICAL GUIDELINES

- Badly stacked pallets may slip or collapse, causing injury to personnel and/or damage to the pipe.
- HIUs are not to be stored directly on the ground, suitable pallets or wooden battens should be the interface between the ground and the equipment.
- HIUs must be fully covered to prevent foreign material entering or damaging the HIUs
- Stock should be stored in such a manner as to ensure adequate stock rotation on a “first-in, first-out” basis.
- All HIUs are to be inspected for any storage and transportation damage before being installed in a dwelling. Any damage identified to a HIU must not be used and reported immediately to GTC who will advise of subsequent action. The Developer will be responsible for all damages identified by GTC and the Developers HIU commissioning engineer at HIU commissioning.
- Upon delivery, the Developer shall locate the HIUs immediately to sheltered storage so that HIUs are not exposed for any length of time to adverse weather conditions.

HIU Dimensions

Below shows a typical dimensional drawing of the proposed HIU (physical dimensions only, does not show additional space required for maintenance access). An additional 100mm shall be made around each side of the HIU to allow for front cover removal access therefore the overall width space required for the HIU is 730mm.

GTC shall advise of the full HIU specification at the detailed design stage, following the Developer’s acceptance of GTC’s quote.

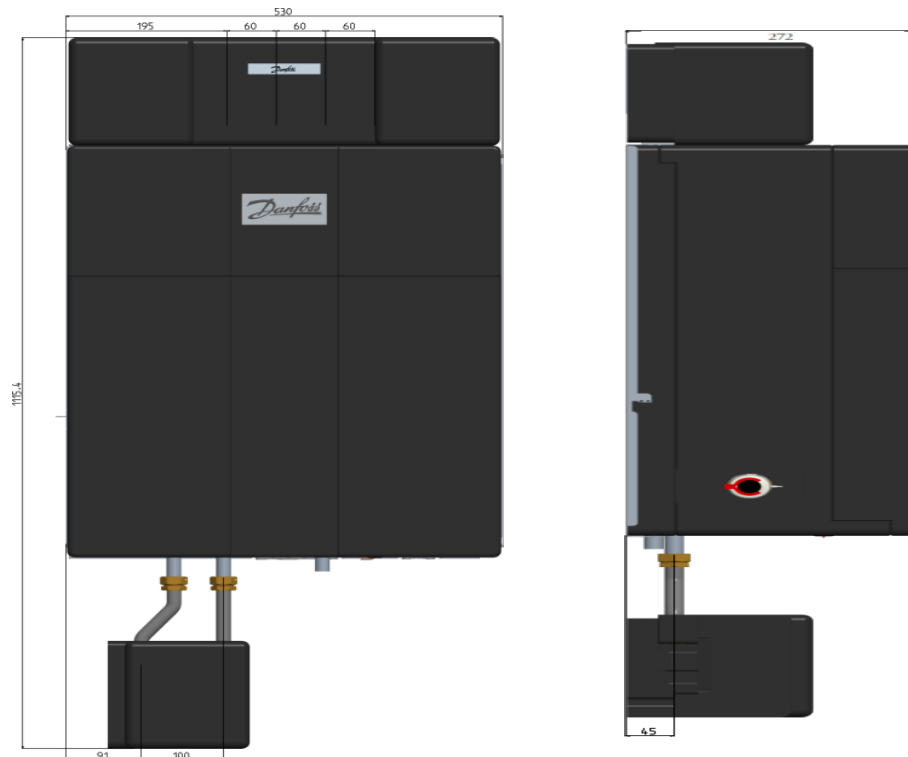


Figure 51. Typical HIU dimensions (actual HIU may differ from image shown above and shall

be confirmed at detailed design)

HIU Mains Cold Water

The Developer shall provide and install all pipework and fittings, connecting the heat interface unit (DN20 internal thread connection on HIU) to the mains cold water service, in each dwelling. An isolation valve should be included on the cold water service as close as possible to the HIU in the event of unit failure.

Cold water shall have a minimum pressure at the HIU of 1 bar(g) and maximum of 10 bar(g).

HIU Electrical Power

The Developer is to provide and install a single 230V 3A fused fixed spur from a dedicated MCB on the dwelling consumer unit to the electrical wiring box within the heat interface unit in each dwelling. A switched spur is not accepted as this is too easily switched off by an end user, causing unnecessary call outs.

The below is an example of a typical wiring schematic to the HIU, actual wiring connections will be subject to the requirements of the dwelling and the Developer should check with their electrical contractor. The Developer shall undertake all wiring external of the HIU and to the HIU Junction Box. All internal wiring within the HIU (i.e. from HIU Junction Box to energy meter, pump, PAYG actuator and heating actuator) is by the HIU manufacturer.

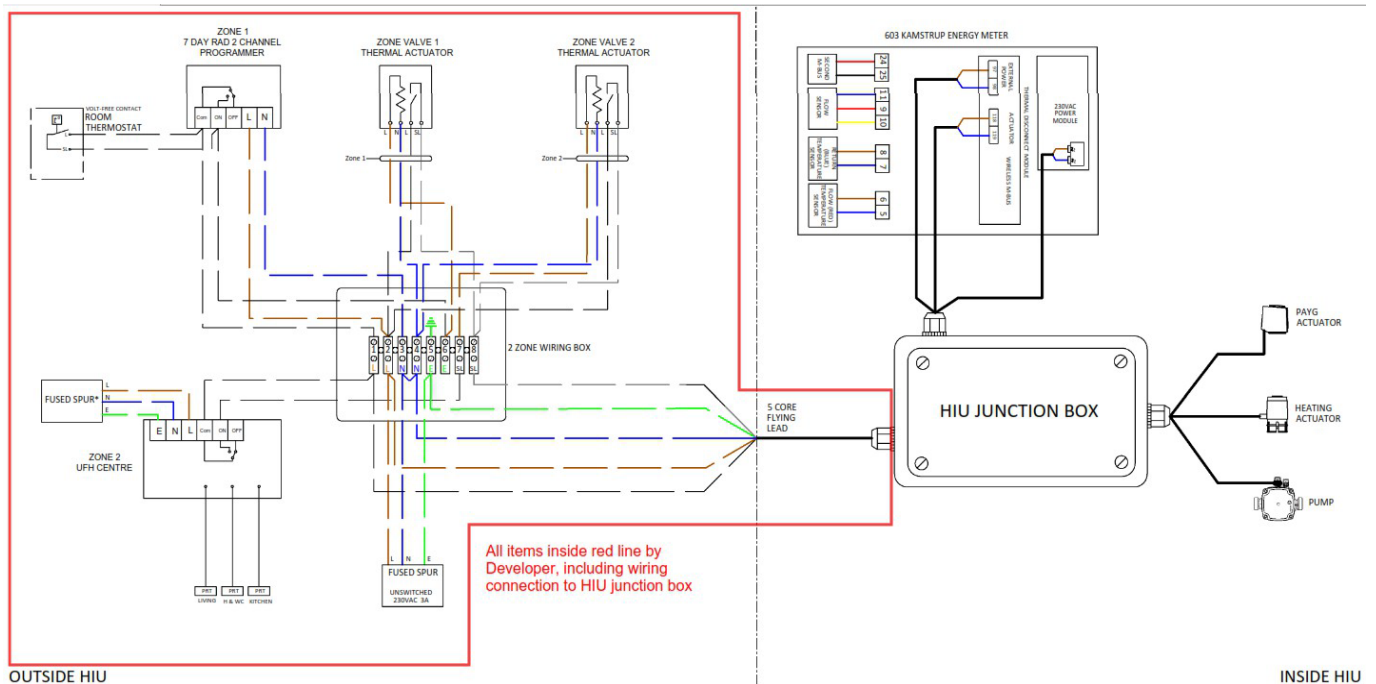


Figure 52. Typical wiring requirements for the HIU

HIU Drainage

The HIU includes a safety valve which, in the event of emitter heating system over-pressure, opens and releases system water. The Developer shall be responsible for a tundish and pipework connection from the HIU drain connection at the bottom of the HIU (DN15 connection) to a foul drain, and shall ensure the installation conforms with Part G of the Building Regulations. Pipework must be suitable for 50°C water and minimum PN10 rated.

HIU Commissioning

Correct commissioning of the HIUs is critical to the effective operation of the Heat Network - particularly in complex domestic systems (such as a mix of space heating emitter types).

Failure to achieve the correct performance of the HIU or not working to GTC's procedures could result in GTC's refusal to adopt the HIU and service connection until recognised issues have been resolved.

Our standard heat quotations are based on the Developer being responsible for commissioning HIUs. GTC shall assist the Developer in shadowing and overseeing commissioning by their appointed contractor so that GTC are satisfied the commissioning achieves the heat network and dwelling service requirements. GTC's oversight of this process does not replace the Developer's responsibility for commissioning and ensuring correct operation of HIUs. GTC is able to undertake HIU commissioning on behalf of the Developer to ensure that the HIU is performing as intended for both the Heat Network and the dwelling space heating and hot water services if required at an additional cost.

All HIU commissioning shall be carried out in accordance with GTC's commissioning procedures and documented/certified to GTC's document and audit process.

The Developer shall inform GTC of the commissioning programme for each dwelling, allowing GTC access for witnessing the commissioning of each HIU.

Prior to HIU commissioning, space heating and domestic hot water systems shall be installed, tested, chemically cleaned and inhibitor dosed and ready to receive heat from the HIU. The Developer shall follow the service connection and HIU commissioning procedure and roles and responsibilities guide for HIU valve setpoints and overall dwelling heating system commissioning. Documentation of all PI-TRV setpoints and certification of internal systems installation and testing shall be issued to GTC for their records in advance of commissioning.

The Developer is required to provide a schedule of all HIU and heat meter serial numbers against the plot number/dwelling postal address where they have been installed and this detail shall also be recorded on each HIU commissioning certificate.

Where the Developer has appointed a contractor to deliver HIU commissioning, details of the appointed HIU commissioning contractor shall be sent to GTC. All appointed HIU commissioning operatives shall undergo HIU manufacturer training and to have commissioning tools/equipment including:

- Clamp on sensor thermometer (e.g. Testo 115i or similar) for measuring pipe temperatures
- Stem thermometer (such as Arctic Hayes Stem Thermometer) for measuring tap water temperature
- Water flow rate gauge (e.g. Arctic Hayes U-Flow Water Gauge or similar) for confirming tap flow rate

Dwelling Space Heating and Domestic Hot Water

It is imperative that the Developer’s appointed designer and contractor undertaking dwelling space heating and domestic hot water design, installation and commissioning follow the requirements of this document. Any deviations must be reported to GTC at the earliest opportunity to review the operational implications. If the deviation(s) have a commercial impact, this will subsequently be the responsibility of the Developer.

The designer of the dwelling space heating and domestic hot water systems shall refer to the minimum guidance depicted in the current CIBSE Heat Networks CP1.

The design and setpoints of all space heating and domestic hot water systems shall be submitted to GTC for comment.

System Temperatures

System flow and return temperatures for dwelling space heating and domestic hot water are to follow the requirements shown in the table below – note the temperatures shown are at the HIU – any temperature loss between the HIU outlets and heat emitter/ hot water outlet should be accounted for in the Developer’s design.

Any deviations from these temperatures could have significant impacts on the operation of the Community Heat Hub plant and it is therefore imperative these temperatures are designed, implemented and verified:

Table 2 – HIU Space Heating and Domestic Hot Water temperatures

Type	HIU Flow / Outlet Temperature (°C)	HIU Return / Inlet Temperature (°C)
Space Heating (Radiators or Skirting emitter only)	50	≤30
Space Heating (Underfloor Heating only)	40	≤30

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Space Heating (Radiators or Skirting emitter with Underfloor Heating)	50	≤30
Domestic Hot Water	50	10

System temperatures noted are at the HIU. The Developer should account for temperature loss between the HIU and space heating emitters for the selections of the emitters. **It is strongly recommended that all space heating and DHW pipework is insulated in phenolic foam or mineral wool, with a thermal conductivity no worse than 0.045 W/mK and 30mm thickness so that temperature loss is minimised between HIU and emitter/outlet.**

Whilst temperature loss from pipework may be perceived as a 'non-loss' as it is still within the dwelling, this could be in a space which will not benefit from inherent temperature loss, typically a ceiling void or adjacent to an external wall and is robbing temperature from the space which requires this temperature, at the emitter.

Space Heating Emitter Underfloor Heating

The Developer is responsible for all space heating requirements in the dwelling. Underfloor heating is the preference for dwelling space heating emitter as they are the optimum emitter for district heating systems, owing to inherently low return temperatures.

All underfloor heating systems shall include a pressure independent heating balancing cartridge (e.g. SAV FT40) on UFH loops to mitigate underfloor heating overflow and high return temperatures. These cartridges allow for easy setting for flow rates and will balance UFH loops caused by pressure fluctuations.

The underfloor heating design should avoid loops with minimal flow rates as these are difficult to commission and verify the flow rate. The minimum flow rate for a single loop should be no less than 0.5 l/h for accurate commissioning.

The Developer shall ensure the underfloor heating design includes a strategy for ensuring return temperatures to the HIU.

Radiators

If space heating is provided by radiators, each radiator is to include a pre-settable pressure independent TRV (PI-TRV e.g. SAV PT40) and pre-settable lockshield valves on all radiators for accurate flow setting during commissioning. The specification of the PI-TRV shall be issued to GTC for verification.

Radiator inlet and outlet entry positions to the radiator are to be a 'top entry, bottom exit, same end connection' arrangement as shown below. This is derived from CIBSE's Code of Practice for Heat Networks, CP1, which states 'It is the most advised and used method, and in most cases, the most energy efficient'.

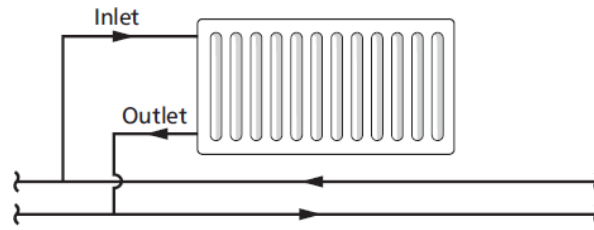


Figure 53. Schematic arrangement of 'top entry, bottom exit same end connection' radiator

For longer radiators, top entry, bottom exit, opposite end connections are only advised where the length of the panel radiator is 4-5 times more than the height e.g. for a 500mm high radiator, 2250mm long (which the length is 4.5x greater than the height).

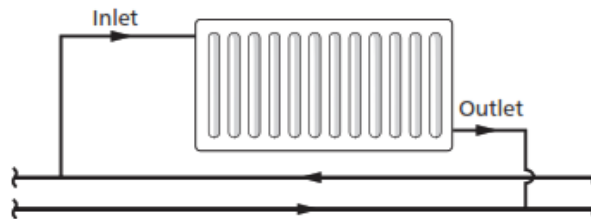


Figure 54. Schematic arrangement of 'top entry, bottom exit opposite end connection' radiator for longer radiators. Radiators with bottom opposite end connections shall not be used under any circumstance.

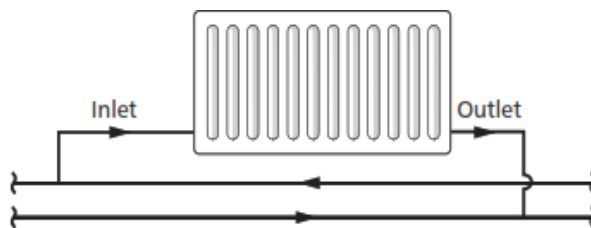


Figure 55. Schematic arrangement of 'bottom entry, bottom exit opposite end connection' radiator shall not be used.

Skirting Emitters

The use of a skirting emitter as a perimeter heating emitter is not as commonplace as radiators. Skirting emitters shall follow the same principles and requirements as radiators, with regards to flow/return temperature requirements depicted above, and to flow control and the use of PI-TRVs.

Should PI-TRVs not be feasible, a manifold shall be utilised to control flow rates to each skirting emitter. The requirements for the manifold shall follow those identified for 'Underfloor Heating' within this section. Skirting emitters connected to standard TRVs shall not be accepted.

Dwellings with both Underfloor Heating and Radiators or Skirting Emitters

Dwellings which utilise both underfloor heating and radiator emitters (e.g. underfloor heating on the ground floor, radiators on upper floors) shall ensure this is known to Metropolitan as this will impact the HIU selection.

The UFH design, and skirting emitter design where a manifold is used, must include means for restricting the flow rate, so that only the required flow for UFH loops is delivered on the space heating system (SAV's FT40 will provide this). If the UFH loops take more flow rate than they require, this will prevent the radiators from receiving flow rate and required heat.

Space Heating Pipework Inhibitor

The Developer shall dose inhibitor into the space heating system as depicted in the most recent version of British Standard BS 7593 (Code of practice for the preparation, commissioning and maintenance of domestic central heating and cooling water systems). The type of inhibitor and dosage volume will be dependent on each system

and can vary to pipework and emitter material, and volume of system. It is recommended a specialist water treatment contractor is sought for guidance.

Commissioning

The Developer is responsible for the commissioning and testing of all space heating systems and obtaining commissioning certificates. Heat Interface Units can only be commissioned after all space heating systems and hot water service equipment has been tested, commissioned and certified as operational by the respective contractors. The Developer shall issue all space heating certificates in advance of HIU commissioning.

Commissioning certificates detailing space heating valve settings, recorded flow rates, temperatures and installation photos shall be provided to GTC for all dwellings. GTC are to be invited to witness a sample of dwelling space heating commissioning, no less than 10% of the overall site. Any dwellings which have problems with commissioning or cannot meet the design parameters are to be reported to GTC.

It is recommended that a single contractor has commissioning responsibility of all space heating systems where multiple emitters are used to avoid conflict in the performance of the space heating emitters.

Radiator Towel Rails

Radiator towel rails should be of the electric type and not connected to the wet space heating system.

Space Heating Room Thermostat and Programmer

The Developer shall be responsible for the supply, installation and commissioning of all room thermostats. The Developer shall submit the technical specification to GTC that the thermostat is compatible with the proposed HIU before procuring. GTC will require a copy of the technical literature of the thermostat and programmer.

Domestic Hot Water

All dwelling domestic water flow rates shall be in accordance with Building Regulations and should follow the latest guidance depicted by the NHBC. Any deviation from NHBC's guidance should be reported to GTC at the earliest opportunity to assess the impact on plant sizing.

It will be the Developer's responsibility to flush and chemically treat/chlorinate and clean the tertiary (in dwelling) space heating system and submit to GTC water sampling certificates from a UKAS accredited laboratory prior to the tertiary systems being opened to the HIU.

Domestic Hot Water Storage

Under no circumstance is the Developer to specify hot water storage associated with the domestic hot water, or space heating. The HIU system temperatures detailed in Table 5 are based on an instantaneous HIU system with no storage facility in any dwelling.

Waste Water Heat Recovery

Waste Water Heat Recovery (WWHR) systems proposed must not pre-heat cold water to the HIU. If WWHR is proposed, the WWHR pre-heated water must directly connect at an outlet (such as a shower) as shown in the drawing below. All WWHR proposals shall be reviewed by GTC before proceeding.

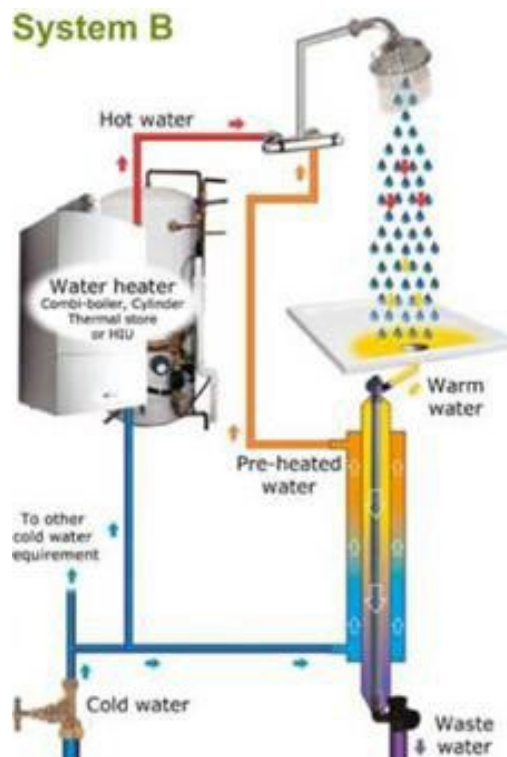


Figure 56. Acceptable arrangement for Waste Water Heat Recovery (WWHR)

Metering and Billing

The metering and billing system for the end user is all through the HIU heat meter. End user energy usage (in kWh) from each HIU heat meter is transmitted through an antenna (inside the heat meter) to a site meter via radio frequency. This is used to bill end users for their energy consumption. End users view their energy consumption via their Metropolitan account on the internet.

SECTION ELEVEN

Commercial Buildings

All commercial use buildings on a development which are connected to the district heating must follow the guidance depicted within this document, particularly with regards to the design of secondary systems.

Early Design

Details for the commercial area(s) should be provided to GTC at the earliest opportunity during the design stage, and no later than contract award.

The Developer shall need to provide GTC with the following:

- Hot water and space heating loads
- Building use type (such as school (D1), retail (A1), leisure and assembly (D2), etc.)
- Building areas for each use type (GIAs in m² (General Internal Areas))
- Any specific requirements for the heating and/or hot water services
- Programme for occupation

Building Entry

The requirements for building entry are the same as the Apartment Buildings, please follow requirements depicted in the Apartment Buildings section.

Above Ground Pipework and Insulation

The requirements for above ground pipework and insulation are the same as the Apartment Buildings, please follow requirements depicted in the Apartment Buildings section.

Water Quality

Please refer to section Heat Service Connection and Pipework Specification for requirements.

All commercial area systems must be fully pressure tested, flushed and filled with treated water of the same specification of treatment used for the district heating. GTC shall provide the technical submittal for the water treatment in advance and shall be requested by the Developer in a timely manner to the construction programme.

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The pipework system shall not be filled or tested until after a HIU or thermostatically controlled bypass valve (such as Danfoss FJV) has been installed to avoid water stagnation.

Fire Stopping

Please refer to section Multi Occupancy Buildings and for requirements.

Space Heating and Domestic Hot Water Parameters

Please refer to section Heat Interface Unit for requirements.

HIUs

Commercial areas shall have a Heat Interface Unit to supply the heating and hot water to the commercial area. Each individual area shall have its own HIU. The HIU will be of the same specification as the dwelling HIUs. GTC procurement and free issue to the Developer of the HIU will be a variation to the contract as detailed loads for the commercial area are generally unknown at the time of heat network contract award.

As per the dwelling HIU, the HIU will be complete with an energy meter which is used for metering and billing the commercial premise.

The HIU must be located in an accessible location which can be easily serviced/maintained by an operative.

All other requirements for the HIU shall be as noted in 'Section 10 Heat Interface Units'.

Plate Heat Exchanger Plant

Plate heat exchanger plant shall be avoided where possible. Plate heat exchanger plant adds capital cost, reduces heat network system efficiencies and increases risk of continuous supply by having additional equipment (such as pumps, control valves, etc.) which could fail.

GTC shall be invited at an early stage to discuss and review the design for the supply of heat to a commercial area.

GTC's requirements and specifications must be strictly followed for all commercial area designs.

SECTION TWELVE

Metering and Billing Antenna

All HIU heat meters across the site will transmit end user energy use and other heat network data through a radio frequency network within the development. Each HIU has an internal antenna within the heat meter, which transmits data to a centrally located receiver antenna on the development. The centrally located receiver antenna infrastructure allows GTC to accurately bill end users of their energy usage, meaning bills are accurate and prevents estimated consumption data or for personnel to regularly visit site to obtain this data.

Depending on the size of the development, multiple antennas may be required for full connectivity to all HIUs. The antenna shall be affixed to an asset of GTC, such as the Community Heat Hub or electrical substation (final location will be subject to best provision of antenna coverage) or in a location as high as practicable such as on the roof of apartment building (with a flat roof).

The metering and billing antenna consists of:

- Radio antenna (affixed to the outside of a building) – supplied and installed by GTC
- Antenna pole (affixed to the outside of a building, to achieve required height for the radio antenna) – supplied and installed by GTC
- Data collector and power supply unit (affixed to the outside of the building) – supplied and installed by GTC
- Security fence and gate – supplied and installed by the Developer

If GTC are not the electricity asset owner for the electrical infrastructure, the Developer shall obtain permission from the nominated asset owner DNO /IDNO for GTC to locate the antenna on a similar building located centrally on the development. GTC can issue drawings of the antenna affixed to a substation building.

The drawing below depicts a typical installation for the metering and billing antenna (all dimensions are nominal and subject to the development infrastructure).

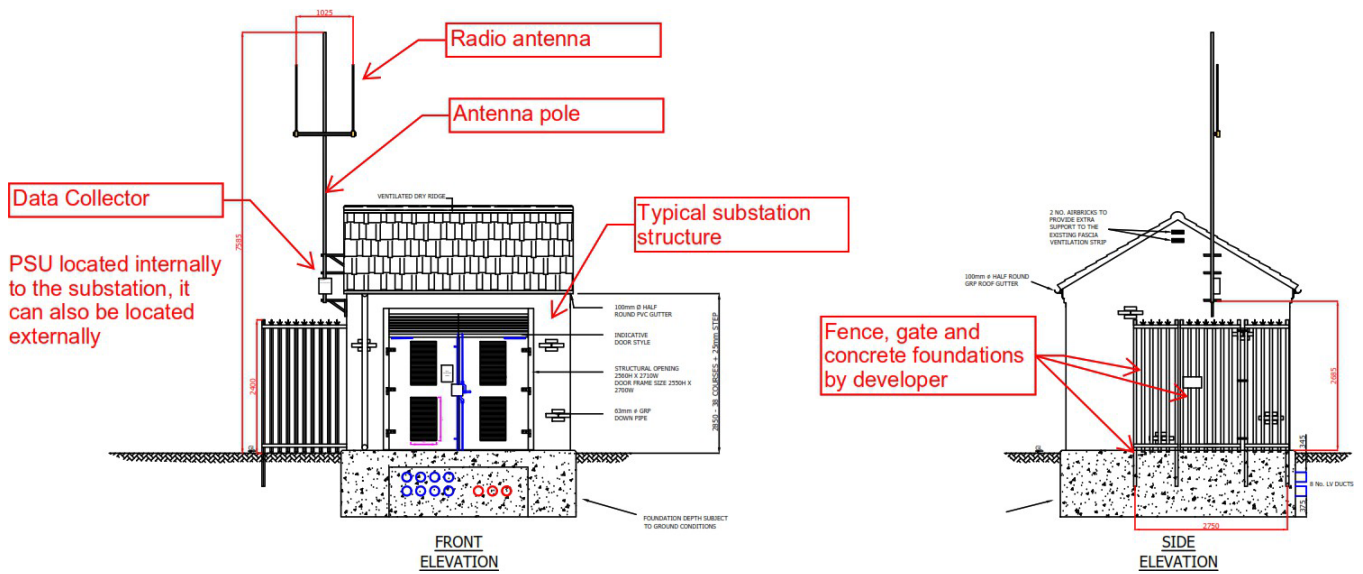


Figure 57. Metering and billing antenna affixed to a substation building

The Developer shall supply and install a fence with lockable access gate and associated foundations around the antenna infrastructure. The fence and gate shall be no less than 2.4m high, olive green or similar (BS 12B27; RAL 1003020) palisade to BS1722 Part 10 or BS1722-12:2006 Part 12, with Triple Pointed Poles.

The data collector and PSU will have electrical power and broadband communications connection requirements which shall be made by GTC from the substation.

gtc

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