MAX FORDHAM

Mayford Estate

Employer's Requirements for the Mechanical, Electrical & Public Health (MEP) Installations

For London Borough of Camden

Aug 2022

SPEC-100

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INTRODUCTION

Project Overview, Design Philosophy and Key Aspects of the Brief

Mayford Estate is a residential Estate in Camden, North West London. The Estate is made up of 183no. residential dwellings.

Mayford Estate was built circa 1968 and is made up of low-rise blocks of houses, bedsits and maisonette dwellings (some with private gardens) and two tower blocks containing flats. The properties across the Estate are occupied by a mix of tenanted and lease holders.

Heat is currently supplied to dwellings using the original 1960's heat network which is largely unchanged apart from localised repairs. There is no hydraulic separation between the dwellings and the heat network. The original boilers have been replaced and this network is now supplied via a plate heat exchanger connection to the Somers Town district heating network. The connection was made in 2018.

Domestic mains water is supplied from two connections on the east and west side of the Estate. These connections feed the low-rise dwellings directly and supply a mixture of direct supply and communal water tanks in the towers. The original galvanised pipework is still in use.

The proposed works will provide heating network and domestic water distribution replacements for the Mayford Estate. This document is the MEP Employers Requirements Specification for the works and is to be read in conjunction with all other Max Fordham LLP documentation and the main project preliminaries.

Existing record drawings have been provided by Camden Council, and have been used to determine dwelling types and the site layout. A site wide external heating and water services survey was undertaken in December 2020 to assist the Contractor with their tender and coordination responsibilities. Max Fordham LLP have inspected the services in two maisonettes, one tenant occupied and one held by a leaseholder and have incorporated the inspection information into this specification.

Key MEP Design Strategies

The heating network element of the project will replace all distribution pipework. The new distribution pipework will be installed whilst the existing system continues to serve the Estate in order to maintain a continuous heating service for as long as possible. The heating network upgrade will include the installation of new below ground, external building mounted, external roof mounted and internal riser and dwelling pipe work, dwelling metered heat interface units and associated cabling, external and below ground cable ducts and a fully controllable dwelling space heating system.

The Two new mains cold water distribution systems will be extended from the existing site boundary meters and supply water tanks situated at the top of the 2no. towers. New booster sets installed in the towers will deliver boosted cold water to all properties. As with the heating network, domestic water pipework will be installed to run in parallel with the existing system as much as is practical in order to minimise the interruption of the dwelling supply during the works.

It is key that the existing heating and domestic water distribution networks continue to operate and serve the existing dwellings throughout the works, until the old pipework is removed and replaced on a riser by riser basis and the internal dwelling systems are installed and connected to a live riser. The existing heating and domestic water network distribution will be decommissioned in buildings as the new risers become live.

The Contractor shall allow in their tender for existing pipe work isolation, draining down, the addition of any isolation valves need to facilitate isolation works, and to refill and treat the existing and new heating network water as the works progresses.

A communal heating system remains hot 24/7, to allow tenants to draw heating for space heating and domestic hot water when required. They operate at a temperature regime that allows DHW to be generated at temperatures 45-60°C. As such there are standing losses associated with these systems. Influenced by a number of variables;

- pipe length;
- pipe sizes;
- insulation specification;
- installation workmanship;
- system temperature;
- ambient environment.

All effort should be made to maximise the robustness of the system, minimise the losses to improve the efficiency of the systems and reduce the cost of heat for Residents.

Communal heating systems rarely run peak load (Heating + Losses + Diversified DHW load), as such they should run variable volume pumping systems to minimise; flow through the systems; pumping energy; and return temperatures. Its therefore important that the system is designed and commissioned to deliver the peak loads but also to deliver efficiency at idle.

Monitoring of the communal heating systems as it is set into use is essential. The data available form heat metering is essential to understanding commissioning and the performance of the systems and proving the commissioning. All heat meters and data loggers must be operational throughout the commissioning process (post flushing & cleaning) and made available to the Client, designs, installer and the Camden maintenance team.

MEP documentation

This document "MEP Employers Requirements/Specification" (SPEC-100) provides a project-specific description of the MEP engineering services installation. This document forms part of the design information and should be read in conjunction with the Main Contract Preliminaries and all associated documents.

The MEP installations are also described by the following documents:

- SPEC-100 – Project specific description of the MEP installations
- SPEC-200 – Project preliminaries setting out the Contractor's responsibilities in relation to design, coordination, management and documentation.
- SPEC-300 – Reference specification setting out the required standards for installation, testing and workmanship for the MEP installations.
- Drawings and schedules listed in Appendix A of SPEC 100
- Camden's Heat Metering Specification Version 3, March 2019 including 4 appendices:
  - Heat Network Design Supplement
  - Standards for Data Cabling
  - Connectivity Specification
  - Data Format Specification
- Heat Networks (Metering & Billing)
- Metropolitan Decentralised Energy Key Design Parameters
- Camden Heat Networks - Design and Delivery Supplement Issue 10
- CIBSE CP1 2020, Heat networks: Code of Practice for the UK.

The Contractor shall alert the Contract Administrator to any discrepancies between Max Fordham LLP documentation and Camden's Heat Meting and Heat Networks specifications. Requirements in Camden's documentation have precedence over the Max Fordham LLP information with respect to billing data.

Basis of Tender and Contractor Design Responsibilities

With the exception of the performance specified MEP installations listed in clause 4.2 of SPEC-200, the tender documents for the MEP engineering services include MEP design developed up to RIBA Stage 3.

The contractor shall allow for the design responsibilities set out in Section 4 of SPEC-200 within their tender price.

All design responsibility for the correct design, operation and compliance with the Performance Objectives and Design Parameters within this specification is to rest with the Contractor. The contractor's design shall meet the Employer's Requirements for the MEP Engineering Services in full, including concepts, performance requirements, details, materials and equipment specifications. Any information relating to the size and duty of equipment that has been included within the tender information, has been included to indicate the assumptions used to establish the space requirements and distribution routes, and should not be relied upon for the purposes of the Contractor's design. The tender price must include for the cost of a complete working installation within the scope of the design described by the Employers Requirements as set out in clause 3.4 of SPEC-200, whether explicitly indicated on the drawings or not.

The contractor shall include for the provision of a complete working installation.

Complete in full the pricing documents (Tender Summaries in the following section) and return with tenders.

BREEAM Requirements

There are no BREEAM requirements for the heating network upgrade works.

General Duties

Refer to the Main Contract prelims and MEP prelims specification (Max Fordham Spec 200) for full descriptions of responsibilities of the Contractor relating to design and coordination, maintenance, drawing production requirements, record information, O&M manuals, commissioning (also Testing & Commissioning schedule J6828-MXF-XX-XX-SH-J-00001) and other information contained therein. The Contractor responsible for the works in this specification is responsible for the design and coordination of the builderswork associated with the systems specified. Provide all builderswork information in relation the systems in this specification, to the Main Contractor, in a timely manner.

The Contractor is responsible for all maintenance of all systems for 24 months following practical completion; refer to Spec 200 for further information. The information prepared for the tender has been developed up to a RIBA Stage 3 level to establish; the scope of works for MEP installations for this phase, the design strategies, space requirements and distribution routes. Refer to section 4 of SPEC-200 for further information.

The Contractor is to design, supply, install, test and commission the new installation in line with the intent described in this specification, MEP drawings, schematics and schedules. All design responsibility for the correct operation and compliance with the performance objectives and design parameters within the specification rest with the Contractor. Any information relating to the size and duty of equipment that has been included within the tender information, has been included to indicate the assumptions used to establish the space requirements and distribution routes, and should not be relied upon for the purposes of the Contractor's design. Refer to Max Fordham Spec 200 Section 9.1 for design and coordination drawing responsibilities, in addition to those required in Section 4.

Installation Site Works Mobilisation Period

The Contractor shall carry out an extensive site mobilisation period whilst the detailed design is finalised, and the installation drawings produced. This is to finalise distribution details and coordination before the installation works on site begin.

This mobilisation period will consist of the following but not be limited to:

- Full Estate existing buried services survey (incorporating 40 Seven survey, December ’20)
- Full Estate topographical and building surveys
- Pilot holes to confirm existing service routes that can not be confirmed through above ground surveying techniques
- Final site coordination drawings from buried services survey and pilot holes
- All Dwelling entry points confirmed through void dwelling opening up works
- Trial riser installations
- Detailed design calculations
- Installation dimensioned drawings
- Traffic and pedestrian access management plan
- Detailed installation phasing and sequencing plan

Refer to the MEP prelims specification (Max Fordham Spec 200) for further information on the two-stage contract procurement.

Phasing and Sequencing of the Works

Due to the nature of the existing occupied Estate, a detailed phasing and sequencing of the installation works is to be produced that will ultimately limit distribution around the Estate and retain a live heat supply to the residents throughout the works.

To minimise distribution trenching for new below ground services shall be programmed to install multiple services along the distribution routes with only one excavation process whilst limiting the time period trenches are left open before backfilling, this could include the trenching and laying of heating and cold water pipe work, comms ducts and electrical cable ducts. The Contractor’s traffic management plan shall identify how the excavation of trenching will affect access to and around the Estate, in particular with the emergency services.

To increase the efficiency of the distribution installation, off-site manufacturing shall be carried out where deemed suitable such as riser installations, dwelling entry points, pre-insulated below ground pipe work etc.

The installation sequencing intent of the heating and cold water network upgrade will facilitate the installation of the main distribution system below ground and within trenches, ducts, and voids to the base of external (or in some cases internal) risers. External pipework rises to roof level where it travels adjacent to the top of dwelling risers and branches to these building/dwelling entry points. The heating distribution system shall be installed with thermal bypasses at the end of each distribution branch to allow the supply to be brought online without the connection of all the properties and reduce a high return water temperature being sent back to the Somers Town district heating network throughout the works (which would result in reduced operating efficiencies of the network).

Both the new heating and water distribution systems shall be installed with the isolated and capped connections to each building/dwelling entry point and riser, to allow the extension into the properties across a phased program.

Once the distribution mains have been installed, it is anticipated that there will be a 1 week window where the capped connections are extended into the risers/properties and the existing systems are decommissioned and removed, with new dwelling installations installed and commissioned and brought onto the live mains.

An anticipated sequencing and phasing schedule has been produced to assist the Contractor with their tender and understanding of the phasing process. The Contractor is responsible for developing a detailed phasing and sequencing installation plan as part of the first stage of the contract.

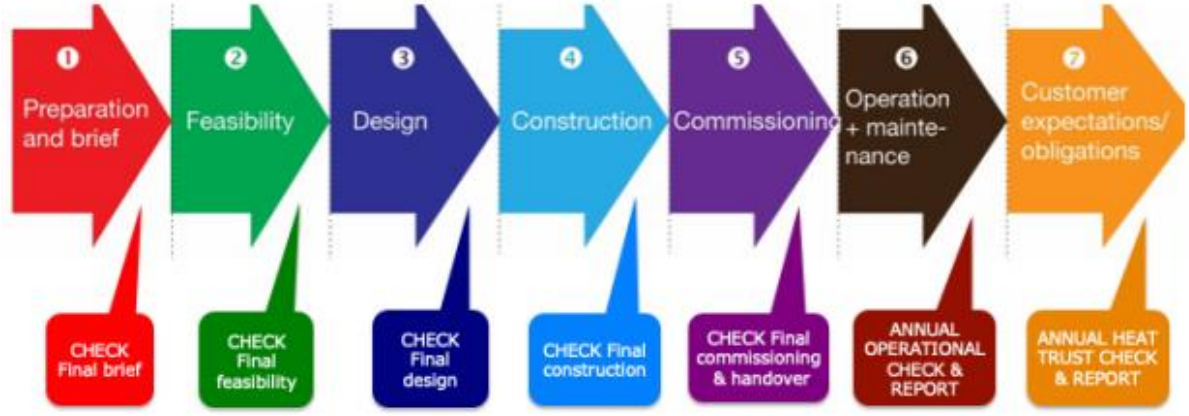
Acceptance Gateways and Delivery of Heat Network

Documentary evidence shall be produced at certain points during the project to demonstrate that the requirements of the CIBSE CP1.2 Code of Practice have been met. This will be interrogated by a suitable qualified professional staff for and on behalf of Camden.

Failure to provide this information will mean that the project will be delayed or stopped until these issues are addressed.

Failure to comply with this and the requirements ADE CIBSE Heat Networks Code of Practice for the UK will delay practical completion.

The design and delivery of a heat network passes through several distinct stages. These are out lined in the Code of Practice and are shown below.



The end of each stage offers an opportunity to review the work completed and to check that the objectives in the code of practice have been met.

The evidence provided creates an audit trail and evidence pack across all stages of development which makes integration of the supply chain easier.

The objective and outputs of each gateway are identified in the CIBSE CP1.2 Code of Practice document.

The Contractor shall agree with the client the method of submitting and approving documents and evidence for gateway acceptance, this method may use an internet cloud-based platform. The method must allow the evidence submission packs to be viewed, approved, rejected, commented on, and stored for reference.

Refer to the Camden Heat Networks Design and Delivery Supplement for further details of the required gateway outputs attached in Appendix E of this specification.

The Camden Heat Networks Design and Delivery Supplement also give extensive information of the heating network commissioning process that is to be adhered to in order to achieve compliance with Stage 5 commissioning.

Project Key Performance Indicators

The Contractor shall prove the project Key Performance Indicators (KPIs) at the commissioning stage and throughout the two year operation and maintenance period. A two year operational and maintenance period

along with a training program of the incumbent maintenance will be provided by the Contractor, with an extended two year defects liability period.

The following key performance indicators of the heating network project are vital to provide an efficiently operating heating network and it is the duty of the Contractor to ensure these are met. The acceptance gateways identified above and the submission packages required at each stage create a structured path to ensure each stage of the project is carried out to the highest standard to enable to the KPIs to be achieved.

The Max Fordham KPI tracker is also to be referred to.

KPI Description	**KPI Target**
Metered heat exchanger efficiency (annual)	98% (see MF KPI Tracker Schedule)
Metered distribution network efficiency (annual)	85% (see MF KPI Tracker Schedule)
Heat network loss per dwelling	200W
Annual average network return temperature	<40°C
Network bypass flow rates	<5%
Volume weighted return temperature from HIUs	<45°C space heating <25°C hot water draw
Proportion of dwelling and network level heat meters installed, commissioned and connected via remote meter reading.	100%
Time taken to achieve hot water temperature at outlets.	Sink 50°C @ <30 seconds Basin 40°C @ <30 seconds Shower 40°C @ <30 seconds Bath 40°C @ <30 seconds
Availability of heating water measured at each HIU	>99.8% in any year excluding maintenance tasks planned in advance

SUMMARY OF TENDER – MECHANICAL

The Contractor is to complete the following in full.

SPEC-200	MEP Preliminaries Generally	£	
	3.9 Provisional sums	£	
	Provisional sum, Asbestos Removal	£	
	4.0 Design Responsibilities	£	
	7.1 Surveys	£	
	7.6 Maintenance of existing services	£	
	7.7 Strip out of redundant services	£	
	9.5 Heating network compliance gateway submissions	£	
	11.1 Record Information	£	
	11.2 Operation and Maintenance Manuals	£	
	11.3 Building User Guide	£	
	11.4 Testing and Commissioning - Demonstration	£	
	12.1 Two-year network operation, maintenance and training period	£	
	12.4 Seasonal commissioning	£	
	CIBSE CP2.1 Performance Verification Post Completion	£	
	Domestic Cold Water – 2no. 3-month incoming mains water pressure surveys		
	Total of Preliminaries		£
Ac_10_10_15_00	New Utility Connections	£	
Ac_10_10_25_00	Identification, decommissioning and strip out of existing services - Mechanical	£	
Ac_10_10_35_00	Trenching of buried services	£	
Ac_10_10_45_00	Surveys of the condition of roof waterproofing, roof access and edge protection, walkways and landscape.	£	
Ac_10_10_45_00	Structural investigation of Towers 1 and 2.	£	
Ac_10_10_45_00	Provisional sum; bunding and waterproofing of tank room.	£	
Ac_10_10_45_00	Provisional sum; roof access and edge protection installation and or modification.	£	
Ss_25_00_00_00	Builderswork in connection (BWIC)	£	
Ss_50_30_04_00	Foul Drainage – Above Ground System	£	
Ss_55_70_38_65	Domestic Cold Water – Central Plant	£	
Ss_55_70_38_65	Provisional sum; installation of mains cold water boosters to meet tower pressure requirements.	£	
Ss_55_70_38_00	Domestic Hot and cold Water – Dwellings	£	
Ss_55_70_38_15	Domestic Cold Water – Distribution	£	
Ss_60_40_37_48	Low Temperature Hot Water Heating – Central Plant	£	
Ss_60_40_37_48	Low Temperature Hot Water Heating – Distribution	£	
Ss_60_40_37_48	Low Temperature Hot Water Heating – Dwelling	£	
Ss_75_70_54_10	Central control/Building management (BMS)	£	
Ss_75_70_54_20	Heat Metering and Monitoring	£	

Pr_25_71_29	Scaffolding	£	
	Total of Work Sections		£

Signed

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For & on behalf of .....

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SUMMARY OF TENDER – ELECTRICAL

The Contractor is to complete the following in full.

SPEC-200	MEP Preliminaries Generally	£	
	3.8 Provisional sums (Total of Appendix B)	£	
	3.11 Modelling responsibilities of the Contractor	£	
	4.0 Design Responsibilities	£	
	7.1 Surveys	£	
	7.6 Maintenance of existing services	£	
	11.1 Record Information	£	
	11.2 Operation and Maintenance Manuals	£	
	11.3 Building User Guide	£	
	11.4 Testing and Commissioning - Demonstration	£	
	12.1 Training of employer's staff	£	
	12.3 Seasonal Commissioning	£	
	12.4 Maintenance during rectification period	£	
	Total of Preliminaries		£
Ac_10_10_25_00	Identification, decommissioning and strip out of existing services – Electrical	£	
Ss_25_00_00_00	Builderswork in connection (BWIC)	£	
Ss_70_30_25_25	Earthing and bonding of extraneous metal	£	
Ss_70_30_45_45	LV Distribution	£	
Ss_70_30_80_00	Small Power Systems	£	
Ss_70_30_80_00	Adaptions to existing electrical infrastructure	£	
Ss_70_80_33_00	General Lighting	£	
Ss_70_80_33_12	Emergency Lighting	£	
Ss_75_50_28_29	Fire detection and alarm		
Ss_75_80_45_25	Earthing, Bonding, EMC and Surge Protection	£	
	Total of Work Sections		£

Signed

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For & on behalf of .....

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AC_10_10_15_00 NEW UTILITY CONNECTIONS

As part of the heating network and domestic water replacement works there maybe instances that the Contractor finds diversion works are required of below ground utility services. As part of the Contractor's detailed design coordination works a full buried service survey shall be carried out and used for final coordination of new services distribution. Any diversions will be carried out through application to the relevant utility provider.

AC_10_10_25_00 IDENTIFICATION, DECOMMISSIONING AND STRIP OUT OF EXISTING SERVICES

PERFORMANCE OBJECTIVES

The role of the strip out works is to identify, make safe, isolate, strip out and dispose of the existing services installations while maintaining operational services to all occupied areas.

Ensure safe occupation of the building for all building users, contractors and subcontractors during the period of the Works.

The contract sum is to include for complete strip out of the redundant services installations in all areas covered by the Works. Ensure all redundant services are removed on completion of the works.

Where redundant services can be traced beyond the areas covered by the Works, and reasonable access can be obtained to the redundant services (e.g. without disrupting fixed ceilings/floors/walls, or disrupting other live services), then strip put these services in their entirety.

There may be areas across the site that the trenching phasing does not permit the removal of redundant existing distribution pipe work as a result of minimising disruption by not leaving trenches uncovered for long periods of time. In these instances, the existing services can remain in situ.

To close, waterproof, fire stop and make good all redundant penetrations which are no longer required for services.

SYSTEM DESCRIPTION

At the beginning of the contract, carry out a full detailed survey of the existing services running through the site. The existing services in the buildings are to be stripped out once made redundant as identified by the initial sequencing plan.

The initial intent sequencing plan that has be produced as part of this documentation allows for the parallel heat and cold water supply to the Mayford Estate, which means that the residents can continue to live on the Estate for the majority of the works. The new distribution networks shall be installed with isolated capped connections to the risers and building entry points and made live. This allows an installation phasing programming of works within a group of dwellings and connections to the live mains once complete.

<u>General</u>
This section outlines the requirements for stripping out of the existing services installation generally.

- The contractor is deemed to have surveyed the existing building and building services installations to establish the extent of the strip out for inclusion within the tender price.
- The contractor is required to survey, isolate, strip out and dispose of all of the existing services in a safe manner.
- At the start of the contract the contractor shall survey, trace and identify all the existing services, and report any live services which may link to any adjacent buildings or areas out with the contractor's immediate site compound.
- Agree with the main contractor the sequence for the isolation and strip out of the existing services and issue method statements.
- Cap off and make safe any existing incoming supplies to the buildings that are not being re-used. Make the required arrangement with the utility companies and shippers on behalf of the client before disconnection. This includes mains water, gas, electricity, BT, etc. Contact utility providers and make the required arrangement with the utility provider before capping off any of the supplies.
- Asbestos removal:

- Seek full asbestos report from the main contractor and ensure safe working practices when stripping out services.
- Comply with:
  - The Control of Asbestos at Work Regulations.
  - The Asbestos (Licensing) Regulations 1983.
  - The Asbestos (Licensing) (Amendment) Regulations 1998.
  - Health and Safety at Work Act.
  - HSE L28 Work with Asbestos Insulation, Asbestos Coating and Asbestos Insulating Board.

- Seek confirmation from the client for a list of any of the sanitary ware or other existing mechanical and electrical equipment that the client would wish to salvage.
- See copy of the **asbestos survey** in the Main Contract for more details (Camden Apex Asbestos Portal).
- Contractor to ensure that all safety measures are taken into account when handling existing installations, in particular when there is asbestos present.

With the exception of the services noted below, the scope of the strip out includes all mechanical, electrical and public health installations, this includes but not limited to:

- Below ground district heating pipe work
- Below ground mains cold water pipe work
- District heating pipe work within service trenches and voids
- District heating pipe work in risers
- Mains cold water pipe work in risers
- Space heating pipe work in flats
- Existing radiators and hot water cylinders in flats
- Existing hot and cold water pipe work in flats
- Redundant heat network plantroom installations

Where the removal of redundant services leaves a penetration in a wall, ceiling or floor the Contractor shall close, waterproof, firestop (as appropriate) and make good the penetration. Particular attention should be taken to below ground penetrations and penetrations on fire compartmentation lines. For example, penetrations from Level 0 into dwelling risers and penetrations from Level 0 into landscaped areas.

<u>Distribution</u>

To minimise distribution trenching, the new below ground services shall be programmed to install multiple services along the distribution routes with only one excavation process whilst limiting the time period trenches are left open before backfilling. As a result, this could mean that the redundant district heating pipe work and mains cold water pipe work may end up being left in situ in places. However, where possible, the existing below ground buried mains pipe work shall be removed.

Below ground pipe work that is left in situ due to this matter must be fully drained down isolated and capped off.

Distribution mains within accessible service trenches and ducts shall have the redundant services removed.

Where redundant services enter buildings, they shall be removed and the Builderswork hole made good, weatherproofed and water tight.

As the riser installation sequencing works are carried out, all the redundant mains pipe work shall be drained down and removed.

<u>Dwellings</u>

The installation programming of the works within the dwellings shall see a group of dwellings being upgraded internally and connecting to a riser or building entry point on the mains distribution.

The Contractor shall determine whether the existing space heating pipe work and existing hot and cold water pipe work within the dwelling is acceptable to re-use. See work section Ss_60_40_37_48 and Ss_55_70_38_00 for further details.

If this pipe work is not being re-used it shall be drained down and stripped out. Redundant services within the dwellings are to be removed.

Along with the pipe work the existing radiators, hot water cylinders and water tanks shall be removed.

Where dwellings have a gas supply/gas meter which is no longer in use (where the dwelling has all electric kitchen appliances and a HIU is being installed) the gas meter shall be removed, and the gas pipework shall be stripped out to the closest live T. Where dwellings have a gas supply that is in use and an internal meter, the meter shall be removed from its internal position and reinstated externally.

Heat Network Plantroom

The heat network plantroom shall remain live throughout the majority of the heating network upgrade works to provide a parallel heat source to the residents limiting the down time of the heat supply.

Once all of the new installations have been made the redundant plant shall be removed.

The scope of the strip out includes all mechanical, electrical and public health installations, this includes but not limited to:

- All pipework
- Pumps
- Expansion and ancillary equipment
- Redundant switchgear, DBs, containment, cables, electrical accessories
- Redundant telecoms

Remove all redundant systems and information from the plantroom. This shall include but not be limited to any redundant:

- cabling;
- electrical containment;
- electrical equipment;
- lights;
- lighting controls;
- ductwork;
- ductwork supports;
- pipes;
- pipe supports;
- labels;
- drawings;
- water tanks;
- water tank supports;
- water pumps;
- redundant services insulation;
- redundant plinths;
- redundant miscellaneous fixings (such as bolts or metal protruding from the floor).

When redundant services travel through plantroom walls to other internal spaces remove the services from the penetration and make good, closing the BWIC hole with appropriately fire stopped material that matches the surrounding partition.

In the case of redundant services excluding ducts traveling to outside, remove the external portion of the system, make good and close the BWIC hole with appropriately fire stopped and weatherproof material that matches the surrounding façade.

Where ducts travel to plenums and grilles on the façade, remove as much as is required to close the BWIC hole with appropriately fire stopped and weatherproof material that matches the surrounding façade. Do not remove the grille or alter its appearance.

AC_10_10_35_00 TRENCHES/PIPEWAYS/PITS FOR BURIED SERVICES

PERFORMANCE OBJECTIVES
To ensure that all new services penetrations in and out of the building entry points are watertight, accessible and purpose built.

To provide suitable trenches for buried engineering services across the Estate to distribute the new LTHW district heating pipe work, mains and boosted water pipe work, electrical power cabling, district heating communication and data cabling.

To ensure that the making good, back filling and finishing of all trenching matches the existing surfaces in terms of quality and appearance, whether its concrete, tarmac or pedestrian walkway surface.

To ensure the sequencing of the below ground services efficiently allows the installation of new services without leaving open trenching for long periods of time throughout the works.

To provide the Builderswork In Connection with the MEP Engineering Services in an accurate and timely manner.

To provide accessible valve pits where valves/heat meters are located below ground.

The Contractor shall include for liaising with a Structural Engineer for the approval of opening up works and making good of risers and entry points within the existing building structure.

GENERAL DUTIES
The Contractor responsible for the works in this MEP employer's requirements specification is responsible for the design and coordination of the builderswork associated with the systems specified. Provide all builderswork information in relation the systems in this specification, to the main contractor, in a timely manner.

DESIGN PARAMETERS

Industry Standards

British Standards	BS 7671	2018	Requirements for electrical installations. IEE Wiring Regulations. 18th edition
	EN 12613	2001	Plastic warning devices for underground cables and pipelines with visual characteristics
	BS 50174	2003	Information technology. Cabling installation. Part 3 Installation planning and practices outside building
NJUG Street Works	All Volumes	2018	Underground services guidelines
Building Control / Local Authority requirements	The Building Regulations Approved Documents		B1 and B2 – Fire safety

SYSTEM DESCRIPTION

General

New LTHW district heating pipe work, mains and booster cold water, electrical cabling and data and communication cabling shall be laid across the existing Estate below ground in hard dig, soft dig, existing service ducts and garage pipe work voids.

The services will enter buildings above and below ground through a purpose-built entry point that will be accessible and watertight.

Above ground entry point finishes shall be agreed with the Client.

Where new external service ducts are used to distribute services, they shall be watertight and have sufficient drainage facilities to ensure there is no build-up of water within the ducts. Where existing external service ducts are used to distribute services, reinstatement and adaption shall be undertaken as required to ensure they are watertight and have sufficient drainage facilities to ensure there is no build-up of water within the ducts. Where ducts are shared with LTHW district heating pipe work and cold-water service pipe work, they shall be compartmented and ventilated to minimise this risk of heat gain to the cold-water service. The ventilation shall not impose a water ingress risk.

Instances where services are running exposed to reach trenching or building entry points this shall be agreed with the Client. All fixings, insulation, materials used shall be weatherproof and provide physical protection to the services.

The Contractor shall include for the making good, back filling and finish of all trenching matches the existing surfaces, whether its concrete, tarmac or pedestrian walkway surface. The finish of the trenching shall match the existing surfaces in terms of quality and appearance and shall be reinstated to the approval of the Client.

The builderswork requirement and the sequence of operations shall be as follows (where appropriate):

a) Site investigations and trial digs.
b) Setting out.
c) Breaking up of hard surfaces.
d) Excavation, trench supports, support of existing services and dewatering of trenches.
e) Preparation of trench bottoms.
f) Initial bedding or other support.
g) Pipe laying and jointing processes.
h) Install cable ducts and other ducts with draw cables free issued by the Electrical and Mechanical Services Contractors
i) Provide draw pits, with covers, in accordance with building requirements.
j) Cast concrete thrust blocks at each change of direction of water mains in the ground.
k) Inspection and preliminary testing of pipe integrity.
l) Completion of sand bedding, if required (including sidefill and first 150mm layer of bedding for district heating pipework).
m) Make good pipe penetrations ensuring wall entry sleeves / puddle flanges are in place around duct and pipe.
n) Backfilling of trench in layers and withdrawal of trench supports (including laying of warning tapes, free issued by Engineering Services Contractor).
o) Disposal of surplus soil.
p) Temporary reinstatement of surfaces.
q) Final testing and commissioning of the piping network.
r) Permanent reinstatement of surfaces.
s) Takeover and defects liability period.

The programme of excavation work shall ensure that the opening of trenches, and installation of the piping system, is only carried out over such lengths as can readily be completed in one continuous operation. It shall be organised so that there is sufficient labour, plant and material to keep the complete excavation ahead of pipe laying with the smallest possible length of trench standing open at any one time. Excavation of new sections of pipelines shall not be connected until an adequate supply of pipe and components are available. A reserve of appropriate materials and equipment shall be kept on site for immediate support of unexpected ground conditions.

Where work is likely to be suspended for any appreciable length of time, the construction schedule shall be arranged so that lengths of trench are not left open.

Pipe movement

The Contractor shall make the necessary provision to fully account for thermal movement of pipe casings within their design and installation.

Expansion shall be managed with expansion loops with the pipe running on rollers or cradle slides or within fill and void formers at bends.

Systems using underground voids, culverts, lubrication, bellows or non-bonded techniques, for expansion control, shall not be accepted.

Concrete anchor blocks and other associated builders work shall be shuttered and cast to details shown on the approved drawings. Anchors to comply fully with pipework manufacturer's specification.

Below ground draw pits and valve/metering equipment pits

Where valves, heat meters and other equipment are shown below ground (refer to schematics J6828-MXF-XX-ZZ-DR-M-15211 & 15212 and J6828-MXF-XX-ZZ-DR-P-50211 & 50212) builders work pits of a size suitable to allow access to for inspection, maintenance and adjustment of equipment shall be installed.

Buried cable routes located next to the heat network which carry heat metering data cables shall consist of contain draw pits at changes of direction and every 30 m (maximum) on straight runs to allow the installation of cabling. 1no. spare empty cable duct shall be included in the installation.

Stop valve surface boxes, access/inspection chambers and drawpits:

- Final size and depth to be selected/confirmed by Contractor to suit no. of ducts/cables/valves, required cable bending radius and size of equipment.
- Depth to be min 50 mm below invert level of lowest service duct.
- Cover to meet traffic loading.
- Install in accordance with manufacturer's recommendations.
- Minimum pit size 600 × 600 mm.

Covers to surface boxes and access/inspection chambers:
Access covers are to be ductile iron manufactured to BS EN 124 Class B125 with labels. The Client shall be provided with two sets of lifting keys for these covers at the end of the work.

Above ground entry points

Above ground service entry points are required for the boosted cold-water services and LTHW district heating mains to enter properties around the Estate.

The above ground entry points shall allow the pipe work to rise to above ground level with isolation valves before entering the ground floor property at low level.

The above ground entry points shall be fully enclosed with a purpose made construction that covers the pipe work and entry point. The enclosure shall be fully weather proofed and blend in with the building construction.

The enclosure shall be suitably sized to suit the incoming pipe work and valves and shall have a fully accessible front or top to allow the valves and entry point to be maintained without disruptive works.

Risers

Risers internal to dwellings shall be used to extend mains network pipe work to the above properties. Where mains pipe work is running within dwellings to reach the risers the pipe work shall be boxed in with a suitable boxing construction such as two layers of plywood to protect the service from any impact.

The existing SVP drainage, ventilation ducts and power cables shall remain in situ throughout the works and shall be protected to ensure no damage. Where risers are opened up to allow the installation of new services they shall be made good, with sleeved services and fire stopped.

Risers shall be fully accessible with purpose built boxing and access hatches to access service valves and control valves.

Fire compartmentation shall be in accordance with Part B of the Building Regulations between dwellings and between floors.

Provide and install a fully certified, traceable system of fire-stopping products which are LPCB / CERTIFIRE approved and CE marked – from a quality fire-stopping manufacturer, e.g. Astroflame, PFC Corofil or Promat.

Make sure that all intumescent pipe collars are suitably rated for their location, properly installed in accordance with manufacturers' instructions and standard details, and that these devices are LPCB certified and CE marked.

Riser boxing is to be complete with fire rated ventilation points to mitigate heat build up.

Ducting and trenching is to be provided as follows;

Solid bedded sleeves are to be provided to extend through the full thickness of wall/floors and be accurately positioned to give a minimum clearance around the all piped service.

All existing and new services penetrations as well as any penetrations created by the removal of existing services are to be filled/made good. Where ducts and pipes enter or leave the buildings water proofing details shall to be agreed with the Client and a structural engineer. All service penetrations shall be installed in accordance with these details. Any ground water ingress into any buildings shall not be deemed acceptable.

Trench depths are to vary to suit requirements of earth cover, frost protection and may vary to suit mains or distribution pipes and where pipes are to be laid together. Normally a minimum earth cover above buried pipes will be 900mm for water pipes under roadways.

Pipes shall be laid on level bed of sand, pea gravel or excavated earth, free from sharp stones or other objects, to provide 100mm clear thickness under and around the side of the pipe and 75mm over the top of the pipe.

Allowance is required for pockets at joints etc. in order that the pipe rests along its entire length.

Trench is to be backfilled with well rammed earth to a depth of 200mm and further backfilling to ground level.

Buried pipes shall be pressure tested with joints exposed before completion of backfilling of trench.

Plastic warning marker tapes 150mm wide, suitably labelled shall be laid in the trench during back filling at a depth of approximately 200mm below ground level. For plastic pipes the marker tape shall have a stainless steel insert wire brought out to suitable test point position at ground level. On no account shall insert wire be resting on the pipe.

Above ground pipeline markers shall be positioned at intervals along the line of the pipe trench change in direction etc. Non corrodible plates permanently marked with pipe size, contents, depth, direction of flow shall be attached to flush concrete blocks in level ground and raised concrete marker posts in unmade ground.

The external pipeline shall terminate close to the entry into the building space before or at the first isolating position (ie stopcock (water) or valve or meter (gas)).

The external main shall terminate with a suitable end connection adaptor for the attachment of the stopcock or valve for the internal mains or distribution pipework.

Polyethylene pipe taken inside the building shall be completely enclosed in a continuous metal sleeve (anti-corrosion protected) bedded in the pipe trench, extending a least 1 metre from the building and sealed with a mastic material. Inside the building the sleeve shall terminate in a approved adaptor before the isolating valve.

Ducting of buried services for cables and pipes should be within a Polypipe ridgiduct twin wall ducting system or equal and approved.

Service Trenches

- Ensure that trenches for cables and cable ducts are prepared, backfilled and reinstated.
  - Carry out all work to service trenches.
  - Supervise all work to service trenches by others.
  - Carry out all work in adopted streets to comply with the New Roads and Street Works Act 1991.
- Carry out walk over survey of trench route, dig trial hole in any area considered to be potentially difficult.
  - Establish location of any other underground service adjacent to service route.
  - Re-plan service routes after survey and trial holes.
  - Submit report of survey and trial holes.
- Carry out any instructed work to adjacent services. Set out service trenches, excavate trench carefully setting aside any materials required for backfilling or reinstatement.
  - Remove excess excavated material from site.
  - Excess excavated material removed from site by others.
- Layout and identify services as NJUG guidelines for positioning and colour coding of underground utilities apparatus.
- Minimum cover in service trenches
  - Water pipework900mm minimum; 1200mm maximum where practicable.
  - District heating branch pipework minimum 550 mm cover.
  - HV cables 800mm.
  - LV cables 500mm.
  - Communications cables 500mm.
  - All services 900mm under roadways.
- Trench
  - Separate trenches for each service.
- Grade trench bottom to a maximum slope of 1:12. Clear trench bottom of loose stones and place bedding to full width of trench.
- Bedding thickness
  - 100mm for ducts.
- Install services or ducts. Haunch services or ducts in bedding material to a minimum depth of 75mm above highest service or duct.
- Service or duct identification.
  - Provide a marker tape to identify buried pipe services.
  - Electrical cables.
  - Recovered plastic tiles.
  - Warning tape to BS EN 12613.
    - Yellow with black legend.
- Backfill trench using two layers 100mm thick hand rammed. Complete backfilling in layers and reinstate trench.
- Backfill material
  - As excavated from trench.
- Mark each change in direction of cables with
  - Pre-cast concrete 300 x 300 x 150 thick impressed with "LV CABLE" laid level with finished ground level.
- Provide service trenches to allow the services to be installed, including any necessary separation, in accordance with
  - BS 7671.
  - BS EN 50174-3.
  - The Water Regulations.
  - The Gas (Installation and Use) Regulations.

Service Cable and Pipe Ducts

- Duct work
- Carry out all duct laying.
- Lay ducts in the formation shown, on to newly prepared bedding. Joint ducts in accordance with the manufacturer's instructions.
- Ensure that ducts slope no more than 1:60 vertically or 1:30 horizontally.
- Ensure that pre-formed duct bends used at ends of duct routes meet the requirements of the cable manufacturer for bending radii.
- Construct manholes, draw pits and jointing chambers.
- Prove alignment of completed duct run by drawing through a mandrel 7mm diameter less than nominal duct bore for minimum length 250mm. Clean completed duct run by drawing through a circular wire brush 12mm diameter more than nominal duct bore.
- Install a draw wire of corrosion resistant material and minimum breaking strength 550N in each empty duct.
- Plug and seal all ducts with proprietary duct plugs, on completion.

For further details of trenching requirements of the electrical cable services refer to work section Ss_70_30_45_45 LV Distribution.

SYSTEM DRAWINGS / SCHEMATICS

- J6828-MXF-ZZ-ZZ-DR-M-15131 Proposed Estate Heat Network Layout
- J6828-MXF-ZZ-ZZ-DR-P-50131 Proposed Water Distribution Layout

AC_10_10_45_00 HOLES/CHASES/COVERS/SUPPORTS FOR SERVICES AND SERVICE AREA ACCESS

PERFORMANCE OBJECTIVES
Existing openings and new openings will be modified and formed in the structure of the buildings for the running of services. The openings are to be made good, sealed and fire stopped.

To establish adequate acoustic and fire separation between external plant and surrounding buildings.

To provide adequate fire separation between dwellings where openings and rising ducts are formed.

To provide a clean and dust free environment for the installation of new services.

Provide all builderswork (BWIC) and fixings associated with the mechanical services installation other than any structural penetrations. The BWIC provision is to ensure that all routes, fixings, supports, chases, etc. are provided to meet the requirements detailed elsewhere in this specification.

Where services are running at high level in existing service voids they shall be supported, fixed and anchored.

Determine the condition of any existing building fabric and structure which will interact with the new services.

Services are to be installed at roof level and adequate provision of roof access and edge protection is required for both services installation and maintenance.

To provide a safe, level surface on which to install, access and place services.

GENERAL DUTIES
The Contractor responsible for the works in this MEP employer's requirements specification is responsible for the design and coordination of the systems specified. Provide all information in relation the systems in this specification, to the main contractor, in a timely manner.

DESIGN PARAMETERS

Industry Standards

BS 6180:2011 Barriers in and about buildings. Code of practice.

BS 4211:2005+A1:2008 Specification for permanently fixed ladders.

BS 5395 - Code of practice for the design of stairs for limited access.

SYSTEM DESCRIPTION

General Provisions

The locations of all holes, chases and recesses are to be developed by the Contractor and shall be agreed between the mechanical and electrical contractors to ensure a coordinated distribution of systems with well thought out builders work openings.

The Contractor is to submit full builders work drawing to the CA for comment. These drawing are to include fire stopping details.

Solid bedded sleeves are to be provided to extend through the full thickness of wall/floors and be accurately positioned to give a minimum clearance around the service.

All new services penetrations are to be filled/made good.

The Contractor shall allow for all supports and fixing necessary to supply and install all the engineering services.

All types of fixing details are to be agreed with the structural engineer prior to installation.

All new central floor mounted plant and equipment shall be provided on new 100mm high concrete plinths.

Concrete infills shall be provided for pump inertia bases along with anti-vibration mounts.

The finishing of plant room walls, floors, riser walls, void walls shall be included for in a colour confirmed by the Client.

Supports include anchor points and guides for pipe work.

Roof Mounted Plant

All roof mounted plant shall be supported on inertia pads and anti-vibration mounts. The supports shall have flat feet with gravity and constraint bracing. Before supports are installed on a roof the contractor shall appoint a surveyor to confirm that the roof can take the additional weight from the proposed distribution system and supports and will not be damaged by any movement associated with this system (expansion, wind loading etc.). This is to ensure that the roof is not damaged by the additions. The roof's waterproofing condition shall also be surveyed prior to the works commencing and the results provided to the CA. An allowance for time required for any roof remedial works shall be factored into the programme.

It shall be possible to maintain and repair the roof with the plant, equipment and pipe work etc. in place.

Access to external plant shall be in compliance with BS 5395 including walkways and step overs.

All service entry points including roofs shall be fully weather proofed to an approved detail.

The builders work includes any plant enclosures that may require acoustic treatment to house external plant.

Fires Stopping

Provide and install a fully certified, traceable system of fire-stopping products which are LPCB / CERTIFIRE approved and CE marked – from a quality fire-stopping manufacturer, e.g. Astroflame, PFC Corofil or Promat.

Make sure that all intumescent pipe collars are suitably rated for their location, properly installed in accordance with manufacturers' instructions and standard details, and that these devices are LPCB certified and CE marked.

Rising External Pipework Enclosure

The first 2.6 m of rising external pipework shall be boxed in with a ventilated weatherproof construction. An FB key locked access hatches provided to allow access to all valves and meters. Meters shall be mounted at 1.3 m from the ground to allow inspection and maintenance without steps or ladders.

Water Services Plantrooms

It is proposed that new water plant be installed in water services plantrooms at the top of Towers 1 and 2 (Blocks N and C). Structural investigations and surveys shall be undertaken to determine if the new plant and water

loading can be supported by the building's structure. The survey shall also determine if the tank roof floor is waterproof. Any additional BWIC required by the proposed works shall be factored into this assessment.

If the tank room floor is found to not be waterproof the contractor shall undertake remedial works to create a waterproof, bunded, drained area around the tank which will prevent flooding of the Towers in case of a complete severance of the mains water pipe or catastrophic leak from the tank.

Roof Plant Area Access and Edge Protection

The Contractor shall ensure that safe access and edge protection is provided to roof top plant areas in accordance with BS 6180 and BS 4211.

Existing mechanical plant areas at roof level currently have permanent ladders and edge protection installed, however the state of these installations is not known. In addition, the new water and heating services distribution routes may interfere with the existing access or edge protection installations.

The Contractor shall survey the condition and location of existing permanent ladders and edge protection and determine if the:

1. existing installation is in adequate condition and meets current industry standards;
2. new services distribution routes will necessitate modifications of the existing installation.

If the existing installation is not in an adequate condition or clashes with the new services distribution routs the Contractor shall make all modifications and installations that are required to provide safe access to the roof top plant areas and barriered edge protection in line with HSE requirements, BS 6180 and BS 4211.

Any new access arrangements or edge protection shall be approved by the CA prior to installation. Any replacement or modifications to existing access arrangements or edge protection shall be as close in location and appearance to the original installation as is practicable and approved by the CA prior to installation.

Internal Plant Areas

The floors of the existing internal plant areas are somewhat damaged and contain trip hazards including holes and metal fixings. Trip hazards shall be removed, holes suitably enlarged to provide adequate volume for patching (requires specialist input, suggest minimum 60 mm deep, 100 mm long, 100 mm wide) and then filled with reinforcement and durable concrete suitable for floor construction and levelled off with the rest of the floor. Following patching and removal of trip hazards the entire plant area floors shall be cleaned and the surfaces painted with hard waring waterproof, flexible floor paint/sealant suitable for plant areas; use colour grey Watco Plant Room Coating applied to manufactures instructions (or equal and approved).

Any redundant sumps or pits within the plantrooms shall have access hatches installed to BS EN 124-1:2015 class B125.

SS_50_30_04_00 FOUL DRAINAGE ABOVE GROUND

PERFORMANCE OBJECTIVES

To provide an effective and efficient means of conveying foul water from floor gullies and mechanical equipment waste.

To minimise the risk of blockages and to ensure the system can be adequately tested, cleaned and maintained.

To prevent foul air entering the building.

To ensure appliances drain quickly, quietly and completely at all times without nuisance or risk to health.

For any below ground drainage connections, the Contractor shall include for the liaising with a Structural Engineer.

DESIGN PARAMETERS

Industry Standards

Statutory Acts	The Building Regulations		
Building Control / Local Authority requirements	The Building Regulations Approved Documents • H - Drainage and waste disposal		
Industry standards	Chartered Institute of Building Services Engineers (CIBSE) • CIBSE Guide G: Public Health and Plumbing Engineering :2014 Water Regulations Advisory Scheme (WRAS) • The Water Regulations Guide • Information and guidance notes		
British Standards	EN 12056-1	2000	Gravity drainage systems inside buildings. General and performance requirements
	EN 12056-2	2000	Gravity drainage systems inside buildings. Sanitary pipework, layout and calculation
	EN 12056-5	2000	Gravity drainage systems inside buildings. Installation and testing, instructions for operation, maintenance and use
	BS 8000-13	1989	Workmanship on building sites. Code of practice for above ground drainage and sanitary appliances
	BS 6465	Various	Sanitary Installations

Project Specific Requirements

Utilities	Requirements of • Thames Water
Compliance in accordance with	BS EN 12056-1 System Type III
NHBC	Part 8 - Services and internal finishes
All Manufacturer's recommendations and instructions	In particular • Specified above ground pipework manufacturer • Gully manufacturer • Heat interface unit manufacturer with regards to safety discharge

GENERAL DUTIES

The Contractor is to design, supply, install, test and commission the new installation in line with the intent described in this specification, drawings, schematics and schedules. All design responsibility for the correct operation and compliance with the performance objectives and design parameters within the specification rest with the contractor. Within this work section the installation requires existing system modifications and new connections to existing systems.

Any information relating to the size and duty of equipment that has been included within the tender information, has been included to indicate the assumptions used to establish the space requirements and distribution routes, and should not be relied upon for the purposes of the Contractor's design.

The Contractor responsible for the works in this MEP employer's requirements specification is responsible for the design and coordination of the builderswork associated with the systems specified. Provide all builderswork information in relation the systems in this specification, to the main contractor, in a timely manner.

Survey and provide a condition report on existing drainage within the plant areas. Allow for sundry remedial works including descaling, jetting and replacement of all covers flush with the floor.

SYSTEM DESCRIPTION

General
The Contractor is to confirm that the existing above drainage system is ventilated correctly with a suitable amount of soil vent pipes terminating at roof level.

<u>Plant rooms</u>

Design, supply, install, test and commission a complete new above ground soil and waste drainage system from the new LTHW central plant components to the existing floor gullies and below ground drainage connections in accordance with all regulations, relevant British Standards and manufacturer's instructions.

Drainage shall be provided from all the LTHW system components such as pressurisation units, safety equipment along with condensate wastes to floor gullies.

Overflow drainage is to be provided from cold water storage tanks to plant room floor gullies or a suitable external below ground drainage connection.

Service ducts

Design, supply, install, test and commission drainage points within the re-used existing concrete service ducts work service distribution around the site, to local below ground drainage or a soak-away.

Dwellings

Design, supply, install, test and commission the required modifications required to provide a complete above ground soil and waste drainage system from sanitary appliances and LTHW equipment within the dwellings to the existing stacks connecting to the below ground drainage connections in accordance with all regulations, relevant British Standards and manufacturer's instructions.

Safety vent discharge connections from internal heating and sealed hot water systems will be connected to a tundish and waterless self-sealing “Hepvo” traps via copper pipe work to nearby soil stacks.

All dwellings shall be left with a complete drainage system.

Above Ground Foul Drainage Strategy

- Safety vent discharge pipe work for the new HIUs shall be taken to existing local to soil stacks within the dwellings.
- Where modifications are required to the branch pipe work from sanitary appliances it shall be ran in boxing and connected to a vertical stack, in accordance with the installation & workmanship description below.

Installation & Workmanship

Install pipework fittings and accessories to ensure that:

- Appliances drain quickly, quietly and completely at all times without nuisance or risk to health.
- Discharge is conveyed without crossflow, backfill, leakage or blockage.
- Air from drainage system does not enter building.
- Pressure fluctuations in pipework do not vary by more than plus or minus 38mm water gauge and traps retain a water seal of not less than 25mm.
- System can be adequately tested, cleaned and maintained.
- Provide rodding and access points at all changes of direction to enable whole system to be maintained.
- Provide square door type access points as indicated on drawings at foot of all soil and ventilation pipes. Where practicable, locate access points and horizontal anti-syphon pipes above fitment flood level.
- In general make WC connections to drain points and soil pipes via flexible connectors.
- Access shall be provided where necessary to enable the system to be tested, serviced and maintained and to permit access to all automatic air admittance valves.
- Access shall also be provided at the base of all stacks, at junctions of 50mm diameter and greater and at changes of direction.
- The connection of the waste pipes to the soil pipes shall be via boss type connections or a factory supplied multi-connection waste manifold.
- Junctions between two pipes shall generally be made with radius branch fitting swept in the direction of flow.
- Expansion joints shall be provided as per manufacturers specification.
- Fire protection shall be applied to all plastic pipework between 40mm and 160mm diameter, in the form of an approved fire sleeve/collar, where it passes through a fire compartment.
- Provide and install a fully certified, traceable system of fire-stopping products which are LPCB / CERTIFIRE approved and CE marked – from a quality fire-stopping manufacturer, e.g. Astroflame, PFC Corofil or Promat.
- Make sure that all intumescent pipe collars are suitably rated for their location, properly installed in accordance with manufacturers’ instructions and standard details, and that these devices are LPCB certified and CE marked.
- Above ground drainage systems are all of the ventilated stack system.

Materials
Provide pipe work as indicated on the pipe schedule J6828-MXF-XX-XX-SH-J-41001.

- All soil and waste pipework and vent pipes and fittings shall be of fusion weld HDPE plastic to BS EN 1519-1.
- All pipework to be supported using factory supplied bracketry.
- Waste pipe work to be insulated in noise sensitive areas.
- Exposed foul pipe work to be cast iron pipe work within plant rooms to BS EN 877.
- High temperature condensate and discharge pipe work to be Copper to BS EN 1057.

TESTING & COMMISSIONING

Carry out testing and commissioning in line with J6828-MXF-XX-XX-SH-J-00001 - Testing & Commissioning schedule.

SYSTEM DRAWINGS / SCHEMATICS

- J6828-MXF-ZZ-ZZ-DR-M-15101 to 15106 – dwelling service layouts
- Record drawings and sections

REFERENCE SPECIFICATION CLAUSES

Also see the following Reference Specification SPEC-300 clauses for further details of Workmanship, materials standards, builders work standards, testing/ commissioning, and identification:

- PR_65_52_00_00 PIPELINES
- PR_20_85_00_00 PIPELINE ANCILLARIES
- PR_25_31_48_00 THERMAL INSULATION
- AC_60_00_00_00 TESTING AND COMMISSIONING
- PR_40_10_57_26 IDENTIFICATION - MECHANICAL
- PR_20_29_00_00 FIXING TO BUILDING FABRIC
- PR_35_31_68_72 PAINTING AND ANTI-CORROSION TREATMENTS

SS_55_70_38_15 COLD WATER – DISTRIBUTION

PERFORMANCE OBJECTIVES

To provide a source of wholesome potable water to all homes, at sufficient pressure and flow to generate a domestic hot water in all dwellings, and under peak diversified simultaneous conditions.

Extending the below ground mains cold water distribution system from the 2no. existing site boundary meters to serve the cold water services plant rooms (containing water storage tanks and booster sets) located atop the multi-storey blocks.

Ensuring that there is sufficient mains water pressure available to supply the cold water services plantrooms and providing a break tank booster to feed these plantrooms if it is found that sufficient mains water pressure is not available.

Provide new cold water storage tanks, booster pumps, and a boosted supply distribution system to serve the whole Estate, including all domestic residences and commercial installations.

Provide new packaged CAT 5 cold water break tank/booster sets in Tower 1 and Tower 2 as required to feed any existing outlets which provide water for Fluid Category 4 and 5 applications on the estate.

The mains cold water is to be used for normal domestic water requirements (WC flushing, washing and human consumption). It is also to be used for flushing and filling mechanical installation. Pressurisation units will also require a water connection.

To provide water sub-meters on a block basis level.

Ensure the water boosting plant is inaudible (air-borne and structure-borne) to the surrounding buildings.

All external pipework attached to building facades or located on building roofs shall be encased in weather proof cladding and arranged in a manner which minimises the possibility of water ingress (any ancillaries angled down to prevent water pooling/running into insulation).

To provide water services plantrooms at the top of Tower 1 and Tower 2 which are clean, weatherproof, waterproof, structurally sound and which have suitable provisions for plant and tank access, maintenance, cleaning and replacement.

DESIGN PARAMETERS

Industry Standards

Statutory Acts	The Building Regulations The Water Supply (Water Fittings) Regulations 1999 Pressure Equipment Directive (PED) 97/23/EC, implemented in the UK throught he Pressure Equipment Regulations 1999
Building Control / Local Authority requirements	The Building Regulations Approved Documents • G 2010 (Sanitation, Hot Water Safety and Water Efficiency) • H - Drainage and waste disposal • Part L1b Conservation of fuel and power in existing dwellings

- Part L2b Conservation of fuel and power in existing buildings other than dwellings
- The Water Efficiency Calculator for new dwellings
- Domestic Building Services Compliance Guide
- Non-Domestic Building Services Compliance Guide

Thames Water Requirements

Industry standards

Chartered Institute of Building Services Engineers (CIBSE)

- CIBSE Guide C: Reference Data
- CIBSE Guide G: Public Health and Plumbing Engineering
- Commissioning Code W: Water Distribution Systems
- TM 13: Minimising the Risk of Legionnaires' Disease

Building Services Research and Information Association (BSRIA)

- Legionnaire's Disease - Operation and Maintenance Log Book BG 58/2015
- Legionnaires' Disease - Risk assessment BG 57/2015
- Cold Water Storage Tanks TN 13/98

Water Regulations Advisory Scheme (WRAS)

- The Water Regulations Guide
- Information and guidance notes

Plumbing Engineering Services Design Guide

HSE ACoP L8 - Legionnaires' disease. The control of Legionella bacteria in water systems. Approved Code of Practice and guidance. 3rd edition (2012 reprint)

Swedish DHA F:101 Technical Requirements (diversity factors)

British Standards	BS EN 806 – all parts	Varies	Specifications for installations inside buildings conveying water for human consumption - All relevant parts
	BS 8558	2015	Guide to the design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages. Complementary guidance to BS EN 806
	BS 5422	2009	Method for specifying thermal insulating materials for pipes, tanks, vessels, ductwork and equipment operating within the temperature range -40°C to +700°C

Project Specific

Utilities	Requirements of water supply company
Design flow rates and volumes of appliances	Design flow rates and volumes of appliances:

	The following are suggested flow rates and volumes which would meet the 105l/person/day requirement: • Dual flush WC (6 litre / 3 litre); • Max 3.5 litre/min wash hand basin taps; • Max 8 litre/m shower; • Max 171 litre capacity bath; • Max 8 litre/min kitchen taps; • Dishwasher with 1.3 litre/place setting (where provided); • Washing machine with 7 litre/kg dry load (where provided). • Cleaner's sink tap flow rate 5 litres/minute See architect's information for the specification of Brassware, sanitary ware and white goods appliances (where provided).
Pressure available from the incoming main (west)	To be confirmed by 3-month summer season contractor survey.
Pressure available from the incoming main (east)	To be confirmed by 3-month summer season contractor survey.
Required minimum pressure at all heat interface units	2.0 bar minimum (or as required by HIU)
Required minimum pressure at all hot and cold outlets	0.5 bar (or greater to meet requirements of individual appliances & outlets)
Required minimum pressure at Hydraulic Interface Unit (HIU)	0.5 bar (Contractor to confirm with manufacturer)
Required maximum pressure differential between adjacent hot and cold outlets	0.2 bar
Maximum temperature for stored water, and water held within distribution system	20 °C
Maximum water velocity within pipework:	As BS806 part 3 • 2,0 m/s for header pipes, rising pipes, floor service pipes. • 4,0 m/s; connection pipes to one fitting (dead legs).
Pipework pressure loss	Select pipe sizes to ensure maximum velocities are not exceeded, to avoid water hammer, and to ensure adequate pressures are available at outlets.
NHBC	Part 8 - Services and internal finishes
All Manufacturer's recommendations and instructions	In particular • Booster set installation • Tenant Valve Assembly • Hydraulic Interface Unit (HIU) design guide
Cold water storage volume	130 litres/two bedrooms (+100 litres per bedroom)

Cold water storage time	3 hours
Cold water duration of peak draw	15 mins

GENERAL DUTIES

The Contractor is to design, supply, install, test and commission the new installation in line with the intent described in this specification, drawings, schematics and schedules. All design responsibility for the correct operation and compliance with the performance objectives and design parameters within the specification rest with the contractor. Within this work section the installation requires existing system modifications and new connections to existing systems, the Contractor shall allow for the isolation, draining down, connection, and refilling to make a complete working system.

Any information relating to the size and duty of equipment that has been included within the tender information, has been included to indicate the assumptions used to establish the space requirements and distribution routes, and should not be relied upon for the purposes of the Contractor's design. Refer to section 4 of SPEC-200 for further information.

The Contractor is responsible for all operation and maintenance of all systems for 24 months following practical completion; refer to the Max Fordham Spec 200 for further information.

Any information relating to the size and duty of equipment that has been included within the tender information, has been included to indicate the assumptions used to establish the space requirements and distribution routes, and should not be relied upon for the purposes of the Contractor's design.

Refer to Max Fordham Spec 200 Section 9.1 for design and coordination drawing responsibilities, in addition to those required in Section 4.

The Contractor responsible for the works in this MEP employer's requirements specification is responsible for the design and coordination of the builderswork associated with the systems specified. Provide all builderswork information in relation the systems in this specification, to the main contractor, in a timely manner.

The Contractor shall undertake the duties given in section Ac_10_10_45_00 with regard to water plantroom structural assessments, bunding, waterproofing etc.

SYSTEM DESCRIPTION

General
Design, supply, install, test and commission a cold distribution system to serve the Mayford Estate.

Main cold water is to be used for normal domestic water requirements (WC flushing, washing and human consumption). It is also to be used for flushing and filling mechanical installation. Pressurisation units will also require a water connection.

Hot water shall be provided for domestic water requirements through the use of HIUs located within the dwellings connected to the district heating network.

The distribution ducting and trenching shall be in accordance with Section Ac_10_10_35_00 and Ac_10_10_45_00 of this specification.

Incoming Mains Water
Log incoming mains water pressure at the Estate's two supply points for 3no. months over a summer period to determine if sufficient pressure is available to supply the proposed water services plantroom locations. If mains pressure is considered to be insufficient by the CA the Contractor shall supply 2no. packaged boosted break tanks

at ground level and extend and install electrical services as required to lift the incoming water to the proposed water services plantrooms.

Extend the existing wholesome mains water supply from the existing east and west boundary meters, in barrier pipe.

Provide below ground distribution in blue MDPE barrier pipe to BSEN 12201 with fusion-welded joints as indicated on the pipe schedule J6828-MXF-XX-XX-SH-J-41001.

Install marker tape with wire mesh embedded for future tracing of main.

Provide a main isolation valve and drain cock at the point of entry to each building.

Provide incoming stop cock to BS 1010 with all other isolation valves to be full bore ball valves.

Distribution Strategy
Extend the existing wholesome mains water supplies from the existing boundary meters to serve the 2no. new water services plantrooms at the top of the two towers with a mains pressure cold water supply suitably sized to provide adequate flow and pressure to meet the tank storage and peak draw off times. The water services tanks shall supply booster sets which pump wholesome domestic cold water use and domestic hot water production within all of the Estates dwellings and commercial spaces.

The boosted supply shall serve the existing external water points with the necessary back flow prevention devices.

The mains supply shall be extended to serve the district heating plantroom with a separate Category 5 boosted cold water system. This Category 5 boosted cold water system shall also supply local bin stores on the east side of the Estate.

A Category 5 boosted cold water supply shall be installed within Tower 1 (Block N) water services plantrooms to feed local bin stores at the western side of the Estate.

The existing mains cold water system is to be kept live during the works and so the below ground distribution pipe work needs to be connected and laid after the boundary meters and extended whilst the existing distribution is kept live. The new distribution system shall be brought online through a sequencing program with the existing supplies isolated as the new supplies are connected to the buildings and dwellings.

Distribution routes vary from buried below ground pipe work, external wall and roof mounted pipework, existing service ducts, high level distribution, building risers and within plant rooms. All exposed distribution pipe work shall be insulated through its full length from the protection of against freezing and mitigate the risk of heat take up to the cold water.

Where pipe work is within unheated areas or externally provide a trace heating system to described on MFLLP pipe work schedule.

All external water pipework shall be shaded from the sun and ventilated to minimise heat gains. The Contractor shall supply a shading proposal utilizing the district hating pipes, there supports and any other materials that may be required for review.

The mains and boosted cold water supplies shall be extended into the buildings and supply risers with multiple dwellings or individual dwelling connections. The supplies shall serve individual heat interface units (HIUs) with an isolation valve, pressure reducing valve (if boosted), double check valve, stop cock and drain cock before connecting to the HIUs.

Existing external landscape water points shall be replaced like for like. Distribution pipework shall runs in Level 0 taking account of the Safestore storage container layout. Connections to the landscape will be through existing

penetrations in the Level 0 ceiling. These penetrations shall be made water tight following the installation of the new pipework.

Cold Water Storage Tanks
The water storage volume in each water services plantroom shall be sized by the Contractor to contain 3 hours peak period supply or 6 m^3 of water, whichever is higher.

Cold water storage tanks shall be installed to provide a hydraulic break to attenuate the difference in incoming water flow rate ad peak draw off from the boosters. Cold water storage tanks shall be provided with all separate booster sets.

The water storage tanks will be a sectional GRP type, externally flanged type, with a minimum of 750mm clear space all around the tank for inspection and assembly.

All reservoir shall be split into two storage tanks, to allow a reliable water supply during maintenance / repair of the other tank.

Full tank sizes shall allow for the required active capacity, free board and venting. Connection shall be on opposing sides, and baffles inserted to ensure good flow through and turnover within the tank. The Vortex inhibitor outlets shall be used to minimise dead zones within the tank.

- Tank to be WRAS Approved to BS7491 Parts 1 & 2, manufactured to BS 13280:2001.
- All internal and external fixings to be stainless steel (316 grade)
- Tank(s) to be insulated on all sides, top & bottom with 25 mm (min) thick CFC & HCFC free insulation
- Tank(s) to have raised ball valve chamber fitted with ball valve chamber inspection hatches and inlet ball valve Aylesbury KB (or equal approved) type fully variable delayed action ball valve with easy clean strainer
- Sensor output on ball valve (alarm output to Mechanical Control Panel)
- Tank(s) to have drain cock and isolation valves to supply and discharge
- Outlet overflow to be opposite inlet
- Screen breather vent to be fitted
- High and Low Level switches to be fitted to each compartment of each tank (alarm output to Mechanical Control Panel)
- Tank(s) to include 1 no lift off manhole access (min dimensions 710 x 710)
- Warning pipe to be fitted to tank(s) below overflow. Warning pipe diameter 54mm
- Tank(s) to be self-draining
- Vortex inhibitors on main water supply inlet and all water supply outlets
- Tank(s) to be installed on steel frame or a concrete plinth
- Emergency shut off solenoid valves controlled from high level flow switches.
- Tanks shall have warning pipes which discharge in an obvious location, such an above an external door.
- Tanks shall have overflow pipes which discharge into a plantroom gully within the water services plantroom bund. The gully shall attach to a drainage system of sufficient size to remove the full incoming water flow rate.

Packaged Cold Water Pressure Booster Sets
Provided 2no. separate Category 5 packaged tank and boosted cold water system to serve hose connection tap outlets to serve bin storage, window cleaning points, and the Mayford Estate district heating plantroom.

Provide 2no. variable speed, packaged pump booster sets with integrated accumulation vessels as indicated on the MFLLP equipment schedule. There shall be multiple packaged booster sets and cold water storage tanks as serving various blocks on the Estate as shown mains cold water schematic.

The booster pump set will comprise of multiple (N+1) vertical multiple stage variable speed frequency controlled pumps, control panel, stainless steel manifolds with flexible connections, isolation valves, diaphragm tank.

The booster sets shall operate as 'Duty', 'Assist', ’Assist’ and ‘Standby’ with lead pump rotated by the proprietary booster pump controls. The number of heads provide shall suit the connected load with n+1 redundancy.

The pumps shall incorporate an accumulator to avoid the pumps running frequently in low flow conditions.

Provide a fully pre-wired control panel containing all necessary power and control wiring such that the only site work associated with the pump set is the final connection of the mains power cable to the panel.

The pumps must operate under all possible load conditions to provide water to the system in a smooth and continuous supply when there is a demand for water.

A steel base frame with anti-vibration mounts will be used to minimise noise. Isolation and non-return valves, electrical isolators to individual pumps. The booster set will operate under its own automated control, it’s run status and fault alarms shall be monitored by the BMS (where installed).

The booster set shall be sized to provide the peak domestic water flow rate (cold and hot water) based upon sized according to BS EN 806 and to be checked against the Swedish DHA F:101 Technical Requirements standard for diversified flow at the maximum HIU DHW flow rate, plus cold water to achieve blended temperature, plus a single domestic tap.

The pumps must be capable of coping with varying demands, including very low flow rates and very high flow rates. The pumps shall be controlled so that they do not start and stop too frequently or cause undue pressure variations in the system.

Provide flexible bellows between pumps and pipework connections to isolate the pipe work from pump vibration and prevent transmission of noise through the installation via pipe work.

The pump rig shall be isolated from the floor slab using anti-vibration mountings to prevent transmission of structure borne sound and vibration from the pump-set to the structure and surrounding dwellings.

Cold Water Isolation Strategy
The Contractor shall allow for isolation points to be installed in the existing mains distribution to allow the connection to the existing supply. This could include local drain downs to facilitate the connection.

The new distribution strategy shall include stop cocks at each building entry points above and below ground, the base of risers and on entrance to individual dwellings. This shall allow local isolation throughout the installation to facilitate the sequencing strategy and also reduce disruption with on going maintenance.

Provide incoming stop cocks to BS 1010 with all other isolation valves to be full bore ball valves.

Each entry point to the buildings whether it be for a single property of a shared rising main shall be provided with a isolation valves. The valve could be below ground with an access chamber, within an above ground entry point or at the base of the riser where mains are running internally. This shall allow the isolation of individual connection points to the distribution systems to improve maintenance efficiency and basis of supply improvement to adjoining properties when maintenance is carried out.

Cold Water Metering Strategy
The existing boundary meters shall remain and be the point of metering for billing purposes between Thames Water and Camden.

The following sub-meters shall be installed;

- Provide private sub-meters to the packaged booster set and cold water tanks
- Provide private sub-meters to the Category 5 break tank branch that serves the district heating pressurisation units to enable monitoring of water usage for top-up purposes.
- Provide private sub-meters as block entry points to improve the accuracy of proportion water usage to the residents

A Modbus connection shall be provided from the sub-meters to the central BMS system for energy monitoring. See section Ss_75_70_54_20 of this specification for more details on the meter strategy.

Installation & Workmanship
Provide local individual isolation valves to all appliances and outlets.

Provide drain down cocks and valves at low points in the system to ensure that the pipe work can be completely drained down.

Fire stop around services as they pass through fire compartment walls and floors.

Make provision for thermal movement within the pipe work.

Flush and sterilise the complete installation in accordance with BS 6700.

Provide sufficient back flow prevention methods to all services and appliances to satisfy the Water Regulations.

Isolation valves to be easily accessed within plantrooms, risers, in dwelling cupboards or via access panels.

Provide and install a fully certified, traceable system of fire-stopping products which are LPCB / CERTIFIRE approved and CE marked – from a quality fire-stopping manufacturer, e.g. Astroflame, PFC Corofil or Promat.

Make sure that all intumescent pipe collars are suitably rated for their location, properly installed in accordance with manufacturers' instructions and standard details, and that these devices are LPCB certified and CE marked.

Materials
Provide pipe work as indicated on the pipe schedule J6828-MXF-XX-XX-SH-J-41001.

- Ensure that all materials and fittings are WRAS approved and installed in accordance with the manufactures requirements.
- Provide internal pipework in table X copper as indicated on the pipe schedule J6828-MXF-XX-XX-SH-J-41001.
- Provide external pipe work as barrier MDPE as indicated on the pipe schedule J6828-MXF-XX-XX-SH-J-41001.
- Do not use boss white or paraffin based flux on water services pipework.
- Provide insulation to all pipework as indicated on pipework schedule. Use manufacturers thickness tables – see http://www.kingspantarec.com/tarecUK/literature.htm
- Provide and install insulation to flanges, bends, valves, etc using preformed bends and valve boxes in accordance with manufacturer's recommendations.
- All external pipework or pipework run in unheated voids is to be insulated and trace heated for frost protection.

Testing & Commissioning
Carry out testing and commissioning in line with J6828-MXF-XX-XX-SH-J-00001 - Testing & Commissioning schedule.

CONTROL REQUIREMENTS
Controls as section Ss_75_70_54_10 of this specification.

SYSTEM DRAWINGS / SCHEMATICS

- J6828-MXF-ZZ-ZZ-DR-P-50130 Existing Cold Water Services Network Layout
- J6828-MXF-ZZ-ZZ-DR-P-50131 Proposed Cold Water Services Network Layout
- J6828-MXF-XX-ZZ-DR-P-50211 to 50212 Proposed Cold Water Services Network Schematic

REFERENCE SPECIFICATION CLAUSES

Also see the following Reference Specification SPEC-300 clauses for further details of Workmanship, materials standards, builders work standards, testing/ commissioning, and identification:

- PR_65_52_00_00 PIPELINES
- PR_20_85_00_00 PIPELINE ANCILLARIES
- PR_65_53_00_00 PUMPS
- PR_60_60_38_00 STORAGE CYLINDERS AND CALORIFIERS
- PR_25_31_48_00 THERMAL INSULATION
- AC_60_00_00_00 TESTING AND COMMISSIONING
- PR_80_77_94_00 VIBRATION ISOLATION MOUNTINGS
- PR_40_10_57_26 IDENTIFICATION - MECHANICAL
- PR_20_29_00_00 FIXING TO BUILDING FABRIC
- PR_35_31_68_72 PAINTING AND ANTI-CORROSION TREATMENTS

SS_55_70_38_00 HOT AND COLD WATER - DWELLING

PERFORMANCE OBJECTIVES

Cold Water:

To provide a complete, sterile, safe and fully working balanced cold 'wholesome' water supply to all sanitary ware, appliances and white goods in the new residential building and landlord's plant.

Prevent freezing where pipework passes through unheated areas and control thermal expansion.

Ensure that the boosting plant is inaudible (air-borne and structure-borne) within the dwellings, with suitable vibration isolation if required.

Hot Water:

To provide a complete, sterile, safe and fully working balanced Hot 'wholesome' water supply to all sanitary ware, appliances and white goods in the new residential building and landlord's plant.

Domestic Hot Water shall be drawn off swiftly at a stable and thermostatically limited temperature, with adequate and balanced pressure.

Prevent freezing where pipework passes through unheated areas and control thermal expansion.

DESIGN PARAMETERS

Industry Standards

Statutory Acts	The Building Regulations The Water Supply (Water Fittings) Regulations 1999 Pressure Equipment Directive (PED) 97/23/EC, implemented in the UK throught he Pressure Equipment Regulations 1999
Building Control / Local Authority requirements	The Building Regulations Approved Documents • G 2010 (Sanitation, Hot Water Safety and Water Efficiency) • H - Drainage and waste disposal • Part L1b Conservation of fuel and power in existing dwellings • Part L2b Conservation of fuel and power in existing buildings other than dwellings • The Water Efficiency Calculator for new dwellings • Domestic Building Services Compliance Guide • Non-Domestic Building Services Compliance Guide Thames Water Requirements
Industry standards	Chartered Institute of Building Services Engineers (CIBSE) • CIBSE Guide C: Reference Data • CIBSE Guide G: Public Health and Plumbing Engineering • Commissioning Code W: Water Distribution Systems

- TM 13: Minimising the Risk of Legionnaires' Disease

Building Services Research and Information Association (BSRIA)

- Variable flow Water Systems - Design, installation and commissioning guidance AG 16/2002
- Commissioning Water Systems BG 2/2010
- Legionnaire's Disease - Operation and Maintenance Log Book BG 58/2015
- Legionnaires' Disease - Risk assessment BG 57/2015
- Cold Water Storage Tanks TN 13/98

Water Regulations Advisory Scheme (WRAS)

- The Water Regulations Guide
- Information and guidance notes

Plumbing Engineering Services Design Guide

HSE ACoP L8 - Legionnaires' disease. The control of Legionella bacteria in water systems. Approved Code of Practice and guidance. 3rd edition (2012 reprint)

British Standards	BS EN 806 – all parts	Varies	Specifications for installations inside buildings conveying water for human consumption - All relevant parts
	BS 8558	2015	Guide to the design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages. Complementary guidance to BS EN 806
	BS 5422	2009	Method for specifying thermal insulating materials for pipes, tanks, vessels, ductwork and equipment operating within the temperature range -40°C to +700°C

Project Specific

Utilities	Requirements of water supply company	
HIU Domestic Hot Water	Load	40 kW maximum
	LTHW flow	70°C (≤70°C summer)
	LTHW return	20°C
	BCWS	10°C
	DHW	50°C
Adjustable TMV setting temperatures	Baths	40°C
	Showers	40°C
	Wash Hand Basin	40°C

	Kitchen Sinks	50°C
Design flow rates and volumes of appliances	Design flow rates and volumes of appliances: The following are suggested flow rates and volumes which would meet the 105l/person/day requirement: • Dual flush WC (6 litre / 3 litre); • Max 3.5 litre/min wash hand basin taps; • Max 8 litre/m shower; • Max 171 litre capacity bath; • Max 8 litre/min kitchen taps; • Dishwasher with 1.3 litre/place setting (where provided); • Washing machine with 7 litre/kg dry load (where provided). • Cleaner's sink tap flow rate 5 litres/minute See Client's information for the specification of Brassware, sanitary ware and white goods appliances (where provided).	
Required minimum pressure at all hot and cold outlets	0.5 bar (or greater to meet requirements of individual appliances & outlets)	
Required maximum pressure differential between adjacent hot and cold outlets	0.2 bar	
Maximum temperature for stored water, and water held within distribution system	20 °C	
Maximum water velocity within pipework:	As BS806 part 3 • 2.0 m/s for header pipes, rising pipes, floor service pipes. • 4.0 m/s; connection pipes to one fitting (dead legs).	
Pipework pressure loss	Select pipe sizes to ensure maximum velocities are not exceeded, to avoid water hammer, and to ensure adequate pressures are available at outlets.	
NHBC	Part 8 - Services and internal finishes	
All Manufacturer's recommendations and instructions	In particular • Booster set installation • Hydraulic Interface Unit (HIU) design guide	

GENERAL DUTIES

The Contractor is to design, supply, install, test and commission the new installation in line with the intent described in this specification, drawings, schematics and schedules. All design responsibility for the correct operation and compliance with the performance objectives and design parameters within the specification rest with the contractor.

Any information relating to the size and duty of equipment that has been included within the tender information, has been included to indicate the assumptions used to establish the space requirements and distribution routes, and should not be relied upon for the purposes of the Contractor's design. Refer to section 4 of SPEC-200 for further information.

The Contractor responsible for the works in this MEP employer's requirements specification is responsible for the design and coordination of the builderswork associated with the systems specified. Provide all builderswork information in relation the systems in this specification, to the main contractor, in a timely manner.

Refer to Max Fordham Spec 200 Section 9.1 for design and coordination drawing responsibilities, in addition to those required in Section 4.

The Contractor shall survey and report on the existing installations within the dwellings for compliance with Water Bylaws and provide a condition survey noting any remedial works required. The Contractor shall fit new flow limiting ball valves to all outlets where not already present and repair all leaking taps.

SYSTEM DESCRIPTION

General
Design, supply, install, test and commission a complete new hot and cold water service system within the dwellings and the communal and commercial areas across the Estate.

The Contractor will review the hot and cold pipe work within each individual property, external tap and commercial premises and if deemed in an acceptable condition (no corrosion or physical damage) and of suitable size then the existing hot and cold pipe work shall be re-used. In dwellings the hot and cold pipe work shall be re-piped from the existing hot water cylinder installation to the new heat interface unit (HIU). Hot water cylinders shall be removed to make space for the new HIU.

Dwellings
Individual cold water service branches to dwellings shall enter where shown on the drawings. Typically the main service shall enter into the utility space/cupboard where the HIU is collated where a stop cock is located. The service shall supply the HIU and the cold water service to the dwelling.

Where the cold water service enters a ground floor property the service shall enter at low level above ground. The service shall travel beneath kitchen cabinets and be supported off the floor and and boxed in with a suitable boxing construction such as two layers of plywood to protect the service from any impact. The incoming service shall be fully insulated with foil faced mineral wool plus a vapour seal barrier. The incoming cold water services boxing shall be partitioned off from the incoming mains district heating pipe work.

In Camden tenants dwellings the preference for distribution pipe work is surface mounted within the bathrooms which are typically local to the HIUs. Where pipe work needs to reach opposing sides of the dwelling, the pipe work will aimed to be surface mounted however in some instances the pipe work shall have to run below the floors.

In leaseholders dwellings the existing distribution pipework configuration shall be recreated unless otherwise agreed to by the leaseholder.

The Fairheat specification gives specific criteria in relation to hot water delivery times. Systems must be designed so as to deliver 45°C hot water to outlets in <30 seconds. Calculations must be provided to demonstrate that this target is met. These calculations must take into account the time to deliver hot water from the HIU and the time for the hot water to travel from the HIU to the outlet. If a non-HIU keep warm strategy is utilised (i.e. where there is no Keep Warm function for the HIU, but the network is kept warm) it should be possible to draw off hot water and cold water from any outlet within 45s from opening, clearing any ambient dead leg. Excessive draw off periods wastes water, energy and detracts from the quality of the installation.

Hot water recirculation is NOT to be used on this development. In order to achieve the above requirements

smaller diameter pipework (e.g. 10-12mm should be considered).

The means of generating hot water is instantaneously without storage from the use of a HIU.

Provide HIUs as described in Section Ss_60_40_37_48 and MFLLP plant schedule. The HIUs provided must come complete with a dedicated indirect plate heat exchanger for domestic hot water (DHW) generation from the district heating installation.

Ensure the HIU comes complete with a control valve to control the temperature of the DHW produced. The control of DHW shall ensure a fast production of hot water and maintain a constant supply temperature of 52°C (minimum).

From an Acceptance Testing perspective, the requirement is that 45°C DHW is delivered to outlets in <45 seconds.

Provide a stop valve on the incoming service to the utility cupboard to allow hot and cold water to be isolated; ensure that the stop valve is easily accessible by the tenant.

Provide pipe work and valves as described by the water services schematic, see MFLLP drawings for typical flat water services schematic.

The distribution of pipework within the apartments shall be as detailed by MFLLP pipe schedule.

Provide pipe work and valves as described by the water services schematics.

Insulate all hot and cold water pipework within dwellings as detailed by MFLLP pipe schedule Y(5-)-500.
The installation must be in full accordance with the requirements Water Regulations, the water network operator Thames Water, NHBC technical standards, and guidance of the Water Regulations Advisory Service (WRAS) and the other technical standards referenced.

Double check valves shall be used for all WC cisterns, bath & shower connections, heating system filling loop connection where installed.

Shower hoses shall be restricted such than they cannot reach adjacent WC pans.

Existing baths and wash hand basins shall be checked for TMV's and installed where not currently provided. Provide thermostatic mixing valves (TMVs) on the hot water supply to the wash hand basins. Provide thermostatic mixing valves suitable for the hot water supply temperature and the hot water point of use heaters, the TMV's selected will have a minimum DT between the flow and return temperatures to achieve required maximum hot water deliver temperature. Set the TMVs to limit hot water supply water to 40°C (adjustable).

Installation & Workmanship
Provide local individual isolation valves to all appliances and outlets.

Provide drain down cocks and valves at low points in the system to ensure that the pipe work can be completely drained down.

Fire stop around services as they pass through fire compartment walls and floors.

Make provision for thermal movement within the pipe work.

Flush and sterilise the complete installation in accordance with BS 6700.

Provide sufficient back flow prevention methods to all services and appliances to satisfy the Water Regulations.

Isolation valves to be easily within the dwelling cupboards or via access panels.

Provide and install a fully certified, traceable system of fire-stopping products which are LPCB / CERTIFIRE approved and CE marked – from a quality fire-stopping manufacturer, e.g. Astroflame, PFC Corofil or Promat.

Make sure that all intumescent pipe collars are suitably rated for their location, properly installed in accordance with manufacturers' instructions and standard details, and that these devices are LPCB certified and CE marked.

Materials

- Ensure that all materials and fittings are WRAS approved and installed in accordance with the manufactures requirements.
- Provide internal pipework in table X copper as indicated on the pipe schedule J6828-MXF-XX-XX-SH-J-41001
- Provide external (including risers) pipe work as barrier MDPE as indicated on the pipe schedule J6828-MXF-XX-XX-SH-J-41001
- Do not use boss white or paraffin based flux on water services pipework.
- Provide insulation to all pipework as indicated on pipework schedule. Use manufacturers thickness tables – see http://www.kingspantarec.com/tarecUK/literature.htm
- Provide and install insulation to flanges, bends, valves, etc using preformed bends and valve boxes in accordance with manufacturer's recommendations.
- All external pipework or pipework run in unheated voids is to be insulated and trace heated for frost protection.

TESTING & COMMISSIONING

Carry out testing and commissioning in line with J6828-MXF-XX-XX-SH-J-00001 - Testing & Commissioning schedule.

CONTROL REQUIREMENTS

The dwellings hot water production is instantaneous and hot water temperature adjustment shall be set via the HIU controller.

SYSTEM DRAWINGS / SCHEMATICS

- J6828-MXF-ZZ-ZZ-DR-P-50131 Proposed Water Distribution Layout
- J6828-MXF-XX-ZZ-DR-P-50211 and 50212 Proposed Water Distribution Schematics
- J6828-MXF-XX-ZZ-DR-M-15218 Typical Dwelling HIU and Services Schematic
- J6828-MXF-ZZ-ZZ-DR-M-15101 to 15106 Dwelling Services Layouts

REFERENCE SPECIFICATION CLAUSES

Also see the following Reference Specification SPEC-300 clauses for further details of Workmanship, materials standards, builders work standards, testing/ commissioning, and identification:

- PR_65_52_00_00 PIPELINES
- PR_20_85_00_00 PIPELINE ANCILLARIES
- PR_65_53_00_00 PUMPS
- PR_60_60_38_00 STORAGE CYLINDERS AND CALORIFIERS
- PR_25_31_48_00 THERMAL INSULATION
- AC_60_00_00_00 TESTING AND COMMISSIONING
- PR_80_77_94_00 VIBRATION ISOLATION MOUNTINGS
- PR_40_10_57_26 IDENTIFICATION - MECHANICAL

- PR_20_29_00_00 FIXING TO BUILDING FABRIC
- PR_35_31_68_72 PAINTING AND ANTI-CORROSION TREATMENTS

SS_60_40_37_48 LOW TEMPERATURE HOT WATER HEATING – CENTRAL PLANT

INTRODUCTION

This section of the specification deal with the central plant housed within the Mayford Estate's heat network plantroom located below Tower 2 (Block C). This plantroom supplies the communal district heating system that will operate 24/7 to provide a continued service of LTHW for the production of space heating and hot water production.

The plantroom currently contains the heat exchangers which interface with the Somers Town heat network, the Estate side pumps and typical LTHW associated plant including pressurisation units, expansion vessels, dirt/air removal and control panels. This plant and associated pipework was installed in 2018 and attaches to the Estates original distribution pipework within the plantroom. It is proposed that the existing plate heat exchangers be cleaned and reused. All other plant connecting to the Estate's new heat network shall be new to prevent fowling of the new installation.

The main Estate side district heating flow temperature from the heat network plantroom shall be 70°C during winter and reduce to less than 70°C in the summer.

This section of the specification should be read alongside the following supplement documents.

i. Max Fordham KPI tracker
ii. The Camden Metering Specifications
iii. Camden Heat Networks - Design and Delivery Supplement Issue 10
iv. CIBSE Heat Networks Code of Practice CP1.2 (2020)
v. Swedish DHA F:101 Technical Requirements (diversity factors)
vi. Max Fordham Mechanical Public Health Equipment Schedule J6828-MXF-XX-XX-SH-M-10002

The Contractor is to understand the sizing, installation, commissioning and operational philosophy of the heating network as whole.

PERFORMANCE OBJECTIVES

This work sections describes the requirements of the LTHW primary distribution system works within the heat network plantroom.

The distribution system shall use the existing connection to the Somers Town heat network and the 2no. existing heat exchangers and associated existing and new plant to distribute heat to the Estate along parallel networks during the works. This shall ensure a continuous heating service to the Estate.

To generate and distribute primary LTHW water efficiently under good control of operation and in sufficient quantities to provide space heating and hot water for all connected dwellings and commercial spaces.

To provide an Estate-wide communal heating distribution system.

To modify, adapt and provide a controls which ensure that the heat producing and distributing plant is capable of responding to heat demand in a real time basis to avoid long delays in the production of heat versus the demand for the heat.

To provide the infrastructure necessary for a metering and billing company to individually meter each residence's use of heat, remotely monitoring the readings and to be able to adjust and commissioning heat interface units remotely.

Ensure compatibility with Camden's metering and billing in-house system and service.

To provide a system which is robust and contains sufficient redundancy such that an unexpected failure of a component or item of plant shall not significantly impair the operation of the system and adversely affect the service provided to the heat consumers.

To provide a system that is easily commissioning and maintainable in operation.

To utilise low return temperatures whenever possible to increase system efficiency.

To provide a continuous supply of heat whilst the works is being carried out on the Estate.

To provide a valved flow and return connection point to the new system which will allow the attachment of a temporary boiler/heat source. This shall allow that the Estate to easily connect (using mechanical means) to a temporary heat source in the event that either the Somers Town heat network or the plate heat exchanger stop functioning.

DESIGN PARAMETERS

Industry Standards

Statutory Acts	The Building Regulations Pressure Equipment Directive (PED) 97/23/EC, implemented in the UK through the Pressure Equipment Regulations 1999 Environmental Protection Act 1990, Environmental Protection Regulations 1991, Clean Air Act 1993 Clean Air Act Memorandum The Gas Safety (Installation and Use) Regulations 1998
Building Control / Local Authority requirements	The Building Regulations Approved Documents • Part L1a 2013 Conservation of fuel and power in new dwellings • Domestic Building Services Compliance Guide • Non-Domestic Building Services Compliance Guide
Industry standards	Chartered Institute of Building Services Engineers (CIBSE) • Commissioning Code W 2010 • CIBSE A guide • CIBSE B guide • CIBSE C guide • AM14 Non-Domestic Hot Water Heating Systems • KS07 Variable Flow Pipework Systems • KS09 Commissioning Variable Flow Pipework Systems • KS14 Energy Efficient Heating • CIBSE Code of Practice CP1.2 Swedish DHA F:101 Technical Requirements (diversity factors)

Building Services Research and Information Association (BSRIA)

- Commissioning HVAC Systems: Guidance on the division of responsibilities (TM 1/88.1)
- Commissioning Water Systems (BG 2/2010)
- Commissioning Management (AG 5/2002)
- Energy Efficient Pumping Systems (BG 12/2011)
- Variable Flow Water Systems - Design, installation and commissioning guidance (AG 16/2002)
- Commissioning of Pipe Work Systems (AG 20/95)
- Pre-Commission Cleaning of Pipework Systems (BG 29/2012)
- Water Treatment for Closed Heating and Cooling Systems (BG 50/2013).
- Selection of Control Valves in Variable Flow Systems (BG 51/2014)

British Standards	BS 5422	2009	Thermal insulating materials for pipes, tanks, vessels, ductwork and equipment operating within the temperature range -40°C and 700°C
	BS 6880	1988	Code of practice for low temperature hot water heating systems of output greater than 45kW
	BS EN 12828	2012	Heating systems in buildings - Design for water based heating systems
	BS EN 12831	2003	Heating systems in buildings - Method for calculation of the design heating load
	BS EN 14336	2004	Heating systems in buildings Installation and commis sioning of water based heating systems
	BS EN 1264	2011	Water based surface embedded heating and cooling systems

Technical Parameters

Primary Flow Temperature from Somers Town heat network	90°C
Return Temperature to Somers Town heat network	70°C (nominal)
Secondary (Estate Side) Flow Temperature (Winter)	70°C
Secondary (Estate Side) Return Temperature (Winter)	40°C (nominal)
Secondary (Estate Side) Flow Temperature (Summer)	≥70°C
Secondary (Estate Side) Return Temperature (Summer)	≥40°C (nominal)
System cold fill pressure	2.5 Bar (TBC by Contractor)
System hot final working pressure	5.0 Bar (TBC by Contractor)
Pipe work velocities	See MF KPI Tracker Schedule

Pipe work pressure drop per meter length	See MF KPI Tracker Schedule
Metered Somers Town energy centre network efficiency (annual)	95% (see MF KPI Tracker Schedule)
Metered distribution network efficiency (annual)	85% (see MF KPI Tracker Schedule)
LTHW peak heating network thermal demand including losses	1226 kW (TBC by Contractor)

The main heating flow temperature shall be reduced to less than 70°C in summer. The contractor shall determine what minimum flow temperature is required to facilitate the production of domestic hot water at 55°C at the HIUs and use this value as the minimum summer flow temperature.

Plant Sizing
The Contractor is to understand the sizing, installation, commissioning and operational philosophy of the heating network as whole.

It is important that the plant selection is sized to meet the peak system heat load. It is also important that the system is not oversized. The contractor is required as part of their Stage 4 design duties to submit detailed calculations as to how the heating system (plant and distribution) has been sized.

The plant sizing shall be based upon space heating load + domestic hot water load + system losses.

Domestic hot water load is to be sized based on the Swedish DHA F:101 Technical Requirements standard defined above in the design parameters to this section of the specification refer also to the Fairheat specification for further details relating to plant sizing.

Peak space heating shall be determined on a dwelling type basis including diversity.

System distribution losses shall be calculated to suit network based on pipe lengths, diameters, insulation and ambient temperature. Sizing to account for losses.

The pumping stations will be sized to deliver peak flows along with minimum flows which could be as low as 3% of the peak. This will be achieved by operating a number of pumps in parallel.

Spare and redundant capacity needs to be considered within the design so that unexpected failures of single items of plant will not affect the operation of the heat network plantroom, or delivery of LTHW to dwellings.

Pipe sizes to be optimised to minimise losses due to pumping energy and pipe heat loss.

Pump sets will be sized to deliver peak flows and flows as low as 5% of the calculated peak flow. This will generally be achieved by operating a number of pumps in parallel.

For the purpose of peak load sizing across the development the hot water plate heat exchanger with the heat interface units shall be considered as 40kW.

Pipes shall be sized in accordance with CIBSE Heat Networks Code of Practice CP1 & Fairheat specification. Sizes will be optimised to minimise losses due to pumping energy and pipe heat loss.

Pressure rating of components within the heat network plantroom to be a minimum of PN10.

Space heating heat loss is to be based on relevant 1960's 'U' Values taking into consideration the building structure, glazing type and roof insulation.

For further information on heat loss sizing parameters see work section Ss_60_40_37_48 LTHW – dwellings.

Space heating diversity factors shall be used in accordance CIBSE CP1.2 for central plant sizing.

The central plant sizing shall consider that adjacent dwellings will be at a set back temperature of 16°C.

GENERAL DUTIES

The Contractor is to design, supply, install, test and commission the new installation in line with the intent described in this specification, drawings, schematics and schedules. All design responsibility for the correct operation and compliance with the performance objectives and design parameters within the specification rest with the contractor. Within this work section the installation requires existing system modifications and new connections to existing systems, the Contractor shall allow for the isolation, draining down, connection, and refilling to make a complete working system.

Any information relating to the size and duty of equipment that has been included within the tender information, has been included to indicate the assumptions used to establish the space requirements and distribution routes, and should not be relied upon for the purposes of the Contractor's design. Refer to section 4 of SPEC-200 for further information.

The Contractor is responsible for all operation and maintenance of all systems for 24 months following practical completion; refer to the Max Fordham Spec 200 for further information.

Any information relating to the size and duty of equipment that has been included within the tender information, has been included to indicate the assumptions used to establish the space requirements and distribution routes, and should not be relied upon for the purposes of the Contractor's design.

Refer to Max Fordham Spec 200 Section 9.1 for design and coordination drawing responsibilities, in addition to those required in section 4.

The Contractor responsible for the works in this MEP employer's requirements specification is responsible for the design and coordination of the builderswork associated with the systems specified. Provide all builderswork information in relation the systems in this specification, to the main contractor, in a timely manner.

SYSTEM DESCRIPTION

General

The Contractor shall fully design, supply, delivery, installation, setting to work, commissioning, testing, making good of defects, fine tuning and handing over of a sealed LTHW plant room that will serve a district heating distribution system incorporating the connections and associated ancillaries including circulation pumps, automatic control system, isolation and regulating valves, pressurisation and expansion sets, filtration, safety valves and control valves.

The Estate's heat network system shall be variable volume and variable temperature circuit.

The Contractor shall provide new power, BMS/Controls, mains water and system connection feeds to for new all new equipment as required.

The Contractor shall provide all pipework, equipment electrical and controls equipment to provide a complete and functioning installation.

All system components to be rated PN 10. All LTHW pipework to be mild steel to BS EN10255.

All pumps to be supplied c/w inertia bases, anti vibration mounts and steel wire re-inforced flexible connectors.

All pumps are to be single head pumps supplied c/w VSD inverter drive.

Insulate all pipework, valves, pumps, fittings, components and ancillaries to prevent heat loss.

All external pipework or pipework that runs through unheated voids is to be insulated, and electrically trace heated for frost protection. All external pipework and equipment is to be suitable weather protected.

All external system ancillaries (valves, fittings, motorised valves, sensors, control panels etc.) are to be suitably protected against adverse weather and rain ingress.

Ensure all valves are accessible.

All pipework to be insulated with foil faced rigid insulation. All insulation is to be protected by hammer clad aluminium sheeting.

All valves, flanges, strainers, fittings, orifice plates, pump casings, heat exchangers and equipment to be insulated with removeable thermal jackets available. All jackets to be manufactured in accordance with BS 5422 and installed in strict accordance with manufacturer's recommendations. All components that are hot are to be insulated.

Provide dosing pots for water treatment to maximise the efficiency and life of the boiler plant, heating distributions and the emitters.

Provide dirt separator with magnets to protect the new heating, circulation and control plant from pipework debris, products of corrosion and contaminants.

Provide all necessary flushing loops and bypasses to allow the flushing and cleansing of the system prior to filling and commissioning.

Ensure system is adequately treated with biocide and corrosion inhibitor.

All major items of plant (pumps, HIUs, heat exchangers etc.) are to be protected by strainers. Strainer mesh size is to be advised by plant item manufacturer. All strainers are to be installed with binder test point and isolation valves before and after the strainer.

Provide automatic chemical dosing plant to monitor and dose the system as appropriate to maintain LTHW water quality in line with BSRIA BG 50/2013.

A bespoke water treatment regime shall be established by a qualified chemical specialist. This shall be in accordance with BSRIA BG29/2012 and BG50/2013. All water treatment arrangements for the filled system at handover, as well as plant for ongoing treatment post-handover, shall conform to this regime. The regime is to be agreed with the Employer prior to implementation. As a minimum, the following quality criteria shall be met:

a. pH 9-10
b. Alkalinity HCO 3/l (mg/l) < 60
c. Oxygen µg/kg < 20
d. Total FE mg/kg < 0.1
e. Total chlorides CL, mg/l < 50
f. Total hardness dH < 0.1

Water treatment plant shall be included in the system to enable management of network water quality, for protection of the system plant and pipework. This shall include both the primary and secondary networks.

All sub circuits to individual heat exchangers shall be fitted with energy meters. These sub circuits are also to be fitted with orifice plates so the flow to all major components can be measured.

Binder test points are to be provided across all ports of motorised valves, differential pressure control valves, strainers, coils and all other equipment.

Flush, pressure test, and add water treatment.

Issue drawings, manuals, testing and commissioning sterilisation certificates.

Fit ID bands and label all valves and equipment.

The Contractor shall prepare a full set of installation drawings, plant schedules, valve schedules. These are to include a 3 dimensional CAD drawing of the boiler room. This information shall be submitted to the CA for comment 15 working days before the works commence on site or plant is ordered.

Refer to work section Ac_10_10_25_00 for details on the decommissioning and striping out of redundant services across the Estate.

Primary circulation pumps

Design, supply, install, test, commission and set to work a complete new a primary district heating circulation pumping set to meet the flow required of the whole Estate.

The pumping set shall be a package skid type arrangement with multiple (4No.) pump heads in parallel that provides the main district heating circulation.

The pumping set shall control the parallel pumps via a packaged controller that varies pump speed to provide a variable volume system based on demand sensed by the differential pressure at multiple points within the distribution network. The controls shall stage the pump heads in the most efficient configuration to meet the required volume flow. The distribution network shall be a 2-port system that maintains pressure on a proportional slope.

The pumps shall modulate in a parallel configuration to meet the flow requirements and also operate in run and standby operation and sequence to rotate lead pumps. Redundancy shall be included within the design to ensure that the failure of a pump head will not significantly reduce the flow service provided by the pumping set. The Contractor is to size and select the number of pump heads to cover the wide range of flow conditions and variable return temperatures that will be experienced by the system.

The minimum pump flow shall be maintained between 5 and 10% of the best efficiency curve.

Pressurisation and expansion

Design, supply, install, test, commission and set to work an automatic pressurisation unit to monitor and maintain the minimum required system pressure. The pressurisation system will be able to cold fill to 2.5Bar.

Design, supply, install, test, commission and set to work suitably sized expansion vessels for the entire volume of the Estate's LTHW district heating distribution system.

At the end of the works the existing pressurisation set shall be cleaned and kept as a standby unit for redundancy purposes. The change over shall be manual.

Dual pumps are provided within the unit. The unit will automatically monitor pump status and report if one of the pumps has failed the remaining pump will serve the unit until the fault is repaired.

The installation shall include the mains water and LTHW system connection feeds for the pressurisation equipment.

The vessels shall conform to BS EN13831 and be PN 10 rated in the main plant room.

The Contractor shall allow for pressurisation equipment where separate primary circulation loops are configured within the LTHW system.

Filtration and water cleanliness

The Contractor shall include for dosing the LTHW system with a suitable inhibitor to the Manufacture's recommendations with the initial fill of the district heating system.

The Contractor shall include for the disinfection of hoses and fittings used during filling and flushing, and use suitable and effective doses of biocides at all stages of flushing, cleaning and final treatment along with suitable dispensing agent and inhibitor.

The Contractor shall include for a water treatment program once the installation is complete.

Where the existing systems are modified, the Contractor is responsible for the flushing, chemical injection and re-dosing to ensure the water quality is maintained. The Contractor is required to work alongside the incumbent water treatment specialist.

Refer to the Max Fordham Spec 200 Section 8.0 PR_60_55_96_00 Cleaning and Chemical Treatment.

Vacuum Degasser

The Contractor shall include for vacuum degasser located within the heat network plantroom that services the whole LTHW system.

Dirt Air Separator

The Contractor shall include for dirt separator with magnets located within the heat network plantroom that serves the whole LTHW system.

Dosing pot

A new dosing pot shall be used to introduce chemicals to the new heat distribution circuit.

Side stream filtration

The Contractor shall design a side stream filtration unit that will assist with quality and be located within the heat network plantroom that serves the whole LTHW system and separate primary circulation loops.

The side stream filtration unit serves two key purposes, one it is provided as a system filter and two it is provided as a pump bypass to ensure minimum pump flow requirements are catered for within the plant rooms. At times of low demand it is to be assumed that no flow will be required/provided outside of the plantroom.

The side stream filter is provided with a motorised bypass valve for further pump protection. The motorised bypass valve is only to operate if the side stream filter is blocked/damaged or isolated. It is not to be operated under ordinary operation.

Monitoring
The Contractor shall design and allow for a high speed internet connection the heat network plantroom, along with a BMS visual head end and a system monitoring and analytics platform.

Ventilation
Refer to work section SS_60_40_36_00 Ventilation for plant room ventilation requirements.

Commissioning
The commissioning process of each individual element of a heating network project is key for the successfully delivery of an efficiently operating heating network.

A commissioning plan is to be produced for the central plant, distribution network and dwelling systems.

The extensive commissioning regime is to be in accordance with CIBSE CP1.2 Code of Practice for Heating Networks, and failing to comply with the commissioning stage gateway and outputs required for the submission package will not allow the project to pass on to the operational and maintenance stage or the acceptance and hand over stage.

Refer to the Camden Heating Network Design and Deliver Supplementary document for more information.

Materials

- Provide LTHW screwed heavy grade steel pipe work pipework in the heat network plantroom up to 50mm as indicated on the pipe schedule J6828-MXF-XX-XX-SH-J-41001.
- Provide LTHW welded heavy grade steel pipe work pipework in the heat network plantroom up 65mm and above as indicated on the pipe schedule J6828-MXF-XX-XX-SH-J-41001.
- Provide insulation to all pipework as indicated on pipework schedule J6828-MXF-XX-XX-SH-J-41001 and as per CIBSE CP1.2.
- Provide and install insulation to flanges, bends, valves, etc using preformed bends and valve boxes in accordance with manufacturer's recommendations.
- Insulation to external pipe work is to be weatherproofed.
- All insulation to have a global warming potential of less than 5.

Workmanship & Installation

- The Contractor is responsible for the design and installation of all pipework supports, bracketry and anchors.
- Sleeves in fire compartment walls shall be fire-stopped using a certified system with a provision made for pipe thermal expansion.
- The Contractor shall be responsible for the control of thermal expansion.
- Access shall be allowed for around all items of plant and equipment in accordance with the manufacture's recommendations at minimum for maintenance, inspection, repair and replacement.
- All equipment and plant shall to be installed on purposes made bases or supports.
- Provide ID bands and label all valves, pipe work and equipment.
- Provide drain down points at all system low points and vent points at high points.
- Boilers are to be complete with Manufacture's expansions and safety relief set.
- The Contractor shall undertake a program of proving and fine tuning of the complete LTHW heat network plantroom systems to ensure the Mayford Estate heat network and Somers Town energy centre are operating at their optimum efficiency.

CONTROL REQUIREMENTS

A variable flow control strategy will be adopted using a pump capable of variable flow control. A centrifugal pump with variable speed drive will be used to match heat supply to demand.

Controls as section Ss_75_70_54_10 of this specification.

SYSTEM DRAWINGS / SCHEMATICS

- J6828-MXF-ZZ-ZZ-DR-M-15217 Plant Room LTHW Integration Schematic
- J6828-MXF-XX-ZZ-DR-M-15211 and 15212 District Heating Distribution Schematics
- J6828-MXF-ZZ-ZZ-DR-M-15131 Proposed Estate Heat Network Layout
- J6828-MXF-ZZ-ZZ-DR-P-50131 Proposed Water Distribution Layout

- J6828-MXF-XX-ZZ-DR-P-50211 and 50212 Proposed Water Distribution Schematics
- J6828-MXF-XX-ZZ-DR-M-15218 Typical Dwelling HIU and Services Schematic

REFERENCE SPECIFICATION CLAUSES

Also see the following Reference Specification SPEC-300 clauses for further details of Workmanship, materials standards, builders work standards, testing/ commissioning, and identification:

- PR_65_52_00_00 PIPELINES
- PR_20_85_00_00 PIPELINE ANCILLARIES
- PR_65_53_00_00 PUMPS
- PR_60_60_38_00 STORAGE CYLINDERS AND CALORIFIERS
- PR_60_55_96_00 CLEANING AND CHEMICAL TREATMENT
- PR_25_31_48_00 THERMAL INSULATION
- AC_60_00_00_00 TESTING AND COMMISSIONING
- PR_80_77_94_00 VIBRATION ISOLATION MOUNTINGS
- PR_40_10_57_26 IDENTIFICATION - MECHANICAL
- PR_20_29_00_00 FIXING TO BUILDING FABRIC
- PR_35_31_68_72 PAINTING AND ANTI-CORROSION TREATMENTS

SS_60_40_37_48 LOW TEMPERATURE HOT WATER HEATING – DISTRIBUTION

INTRODUCTION

This section of the specification deal with the heating network distribution from the Mayford Estate's heat network plantroom located below Tower 2 (Block C) up to the dwelling Heat Interface Units (HIUs).

This existing heat network consists of the original 1960's distribution pipework as well as some more recently installed replacement pipework. All existing pipework that continues to service Estate blocks shall remain operational throughout the works. As a result new and existing pipework will function in parallel 24/7 to provide a continued service of LTHW for the production of space heating and hot water production.

The new pipework shall run in a number of configurations: exposed at high level in Level 0 (steel + mechanical grooved couplings); in buried trenches as it makes its way to accommodation blocks (pre insulated steel with HDPE casing + welded joints); externally mounted pipework on the façade and roof of existing blocks (pre insulated steel with HDPE casing + welded joints); within risers (copper + lead free capillary soldering or brazing joints).

This section of the specification should be read alongside the following supplement documents.

i. Max Fordham KPI tracker
ii. The Camden Fair Heat Heating Network Design Supplement
iii. The Camden Metering Specifications
iv. The Camden Heat Networks Design and Delivery Supplement Issue 10
v. CIBSE Code of Practice CP1.2
vi. Swedish DHA F:101 Technical Requirements (diversity factors)
vii. Max Fordham Pipe Schedule J6828-MXF-XX-XX-SH-J-41001

The Contractor is to understand the sizing, installation, commissioning and operational philosophy of the heating network as whole.

The distribution ducting and trenching shall be in accordance with Section Ac_10_10_35_00 and Ac_10_10_45_00 of this specification.

PERFORMANCE OBJECTIVES

To obtain heat from the Estate-wide district heating network via a connection to the Mayford Estate heat network plantroom.

To distribute primary LTHW efficiently and in sufficient quantities within systems to serve all dwellings and communal and commercial spaces connected.

To provide each dwelling a reliable point of space heating and domestic hot water production with swift response and stable temperature control.

To provide a system that is easily commissionable and maintainable in operation.

To achieve a metered efficiency greater than 80%, (once system is fully complete with minimum 80% occupancy).

To provide controls which ensure that the heat producing and distributing plant is capable of responding to heat demand in a real time basis to avoid long delays in the production of heat versus the demand for the heat.

To provide the infrastructure necessary for Camden's inhouse metering and billing team to individually meter each homes use of heat, remotely monitor the readings and isolate their heat supply if necessary.

Ensure compatibility with the clients chosen Heat Metering and Billing system and service contracts

To provide a continuous supply of heat during the accommodation phase of the works. The supply of heat to accommodation blocs which are attached to the network shall not be interrupted as a consequence of works to other accommodation blocks, including as a consequence of the connection of the new blocks to the network.

To provide a distribution network in parallel to the existing network whilst the works are being carried with a phasing strategy that will allow the continued supply of heat to the dwellings connected to the Mayford Estate heat network plantroom.

To provide a robust and weatherproof external installation which minimises the chance of pipe corrosion through selection of materials and positioning of valves and ancillaries.

To enable the remote detection of leaks (both from system pipes and from outside the installation into the jacketing) and the identification of the leak's location and provide a warning system which indicates when leaks or water ingress has occurred.

All external pipework attached to building facades or located on building roofs shall be encased in weather proof cladding and arranged in a manner which minimises the possibility of water ingress (any ancillaries angled down to prevent water pooling/running into insulation).

DESIGN PARAMETERS

Industry Standards

Statutory Acts	The Building Regulations Pressure Equipment Directive (PED) 97/23/EC, implemented in the UK through the Pressure Equipment Regulations 1999 Environmental Protection Act 1990, Environmental Protection Regulations 1991, Clean Air Act 1993 Clean Air Act Memorandum The Gas Safety (Installation and Use) Regulations 1998
Building Control / Local Authority requirements	The Building Regulations Approved Documents • Part L1a 2013 Conservation of fuel and power in new dwellings • Domestic Building Services Compliance Guide • Non-Domestic Building Services Compliance Guide

Industry standards

Chartered Institute of Building Services Engineers (CIBSE)

- Commissioning Code W 2010
- CIBSE A guide
- CIBSE B guide
- CIBSE C guide
- AM14 Non-Domestic Hot Water Heating Systems
- KS07 Variable Flow Pipework Systems
- KS09 Commissioning Variable Flow Pipework Systems
- KS14 Energy Efficient Heating
- CIBSE Code of Practice CP1.2

Swedish DHA F:101 Technical Requirements (diversity factors)

Building Services Research and Information Association (BSRIA)

- Commissioning HVAC Systems: Guidance on the division of responsibilities (TM 1/88.1)
- Commissioning Water Systems (BG 2/2010)
- Commissioning Management (AG 5/2002)
- Energy Efficient Pumping Systems (BG 12/2011)
- Variable Flow Water Systems - Design, installation and commissioning guidance (AG 16/2002)
- Commissioning of Pipe Work Systems (AG 20/95)
- Pre-Commission Cleaning of Pipework Systems (BG 29/2012)
- Water Treatment for Closed Heating and Cooling Systems (BG 50/2013).
- Selection of Control Valves in Variable Flow Systems (BG 51/2014)

British Standards

BS 5422	2009	Thermal insulating materials for pipes, tanks, vessels, ductwork and equipment operating within the temperature range -40°C and 700°C
BS 6880	1988	Code of practice for low temperature hot water heating systems of output greater than 45kW
BS EN 12828	2012	Heating systems in buildings - Design for water based heating systems
BS EN 12831	2003	Heating systems in buildings - Method for calculation of the design heating load
BS EN 14336	2004	Heating systems in buildings Installation and commis sioning of water based heating systems
BS EN 1264	2011	Water based surface embedded heating and cooling systems

All Manufacturer's recommendations and instructions

In particular

- Booster set installation
- Tenant Valve Assembly
- Hydraulic Interface Unit (HIU) design guide
- Logstar pipe work design manual

Technical Parameters

Secondary (Estate Side) Flow Temperature (winter)	70°C
Secondary (Estate Side) Return Temperature (winter)	50°C (nominal)
Secondary (Estate Side) Flow Temperature (summer)	≥70°C
Secondary (Estate Side) Return Temperature (summer)	≥50°C (nominal)
Pipe work velocities	See MF KPI Tracker Schedule
Pipe work pressure drop per meter length	See MF KPI Tracker Schedule
Metered heat network plantroom efficiency (annual)	95% (see MF KPI Tracker Schedule)
Metered distribution network efficiency (annual)	80% (see MF KPI Tracker Schedule)
Peak network heat demand (hot water and heating)	1226 kW Contractor to calculate and confirm load. Note existing heat exchangers provide 1467 kW when primary 90/70°C secondary 67/80°C.

Sizing

The Contractor is to understand the sizing, installation, commissioning and operational philosophy of the heating network as whole.

It is important that the distribution system is sized to meet the peak system heat load. It is also important that the system is not oversized. The contractor is required as part of their stage 4 design duties to submit detailed calculations as to how the distribution system (plant and distribution) has been sized.

The distribution sizing shall be based upon space heating load + domestic hot water load + system losses.

Domestic hot water load is to be sized based on the Swedish DHA F:101 Technical Requirements standard defined above in the design parameters to this section of the specification refer also to the Fairheat specification for further details relating to plant sizing.

Peak space heating shall be determined on a dwelling type basis including diversity.

System distribution losses shall be calculated to suit network based on pipe lengths, diameters, insulation and ambient temperature. Sizing to account for losses.

Pipe sizes to be optimised to minimise losses due to pumping energy and pipe heat loss.

For the purpose of peak load sizing across the development the hot water plate heat exchanger with the heat interface units shall be considered as 37.5 kW.

Pipes shall be sized in accordance with CIBSE Heat Networks Code of Practice CP1 & Camden Fairheat specification. Sizes will be optimised to minimise losses due to pumping energy and pipe heat loss.

Pipework will be designed to minimise losses. The Contractor will be required to demonstrate via calculation that the network design losses are less than 200W per dwelling from the district heating plantroom heat meter. It is

a project KPI that once complete the standing network losses are less than 200W per dwelling. If this cannot be demonstrated remedial measures will be required to achieve this target.

The distribution system shall be designed, installed, commissioning and operated with no open bypasses. Thermally controlled bypasses shall be utilised at the head of risers to keep the mains warm, along with minimum pump flow bypass across the district heating pumping skid in parallel with the side stream filtration unit.

GENERAL DUTIES

The Contractor is to design, supply, install, test and commission the new installation in line with the intent described in this specification, drawings, schematics and schedules. All design responsibility for the correct operation and compliance with the performance objectives and design parameters within the specification rest with the contractor. Within this work section the installation requires existing system modifications and new connections to existing systems, the Contractor shall allow for the isolation, draining down, connection, and refilling to make a complete working system.

Any information relating to the size and duty of equipment that has been included within the tender information, has been included to indicate the assumptions used to establish the space requirements and distribution routes, and should not be relied upon for the purposes of the Contractor's design. Refer to section 4 of SPEC-200 for further information.

The Contractor is responsible for all operation and maintenance of all systems for 24 months following practical completion; refer to the Max Fordham Spec 200 for further information.

Any information relating to the size and duty of equipment that has been included within the tender information, has been included to indicate the assumptions used to establish the space requirements and distribution routes, and should not be relied upon for the purposes of the Contractor's design.

Refer to Max Fordham Spec 200 Section 9.1 for design and coordination drawing responsibilities, in addition to those required in section 4.

The Contractor responsible for the works in this MEP employer's requirements specification is responsible for the design and coordination of the builderswork associated with the systems specified. Provide all builderswork information in relation the systems in this specification, to the main contractor, in a timely manner.

SYSTEM DESCRIPTION

<u>Pipe work and distribution</u>

An LTHW district heating flow and return pipe work connection shall be made to the new Mayford Estate district heating plantroom, estimated at DN 150mm mild steel. This shall extended with the materials detailed in the Max Fordham Pipe Schedule J6828-MXF-XX-XX-SH-J-41001 (exposed at high level in Level 0 [steel + mechanical grooved couplings]; in buried trenches as it makes its way to accommodation blocks [pre insulated steel with HDPE casing + welded joints]; externally both on building facades and along building roofs [pre insulated steel with HDPE casing + welded joints]; within risers [copper + lead free capillary soldering or brazing joints]).

New pipe work BWIC shall be installed as required to internally link the flow and return pipework between the Estate's heat network plantroom the Level 0 basement (Safestore) and the Level 0 basement and new external buried services trenches.

The buried and external service shall consist of pre-insulated single steel pipe complete with a leak detection system throughout its entire length. Where pipe work Ts to serve 2no. dwellings the leak detection shall not cover these runs within the building envelope.

The service entry points to the Level 0, plant rooms, buildings and dwellings shall be sleeved with puddle flanges and water tight. For further information see work section Ac_10_10_45_00.

Where suitable to the architecture of the Estate, off-site manufacturing of the distribution pipe work lengths and configurations is to be utilised to minimise on site works with regards to trenching, welding, installation time and disruption to residents.

The new LTHW district heating mains pipe work distribution routes have been indicated on the proposed site pipe work routes layout drawing. The routes shown are indented to be the most suitable and practical in terms of installation, phasing, distribution and isolation. The Contractor is to investigate further the distribution routes shown and confirm the layout of the new network by carrying out further investigations such as pilot test trenching, riser installation and entry points before completing the installation drawings and starting installation works on site.

Risers shall be utilised to serve groups of dwellings within the blocks and shall be vertical and fully accessible. The strategy allows for short lateral pipe runs from the risers to the Heat Interface Units.

The Contractor's detailed design of the LTHW district heating distribution network shall be carried out to incorporate provision for access to plant for inspection, maintenance, repair, removal and replacement. Clear access of 50 mm either side for the removal of the HIU cover, and 1000 mm clear in front for access to the unit and pre-fixed isolation rail and integral valve and strainer.

Draw ducts shall be allowed for communication and controls cabling.

Air vents are be provided to all system high point and drain cocks to all system low point, to facilitate venting and draining down of the entire system.

All pipe work is to be supported with proprietary measures in accordance with the manufactures guidelines and the Contractor shall include for the necessary thermal expansion measures and the associated calculations to support the expansion philosophy.

The distribution pipe work installation includes the flow and return connections to the HIUs including isolation valves.

See work section Ac_10_10_25_00 and Ac_10_10_45_00 for details and workmanship of trenching, building entry points, risers and service supports.

Phasing

The distribution phasing strategy shall facilitate the extension of the district heating pipe work from the main plantroom horizontally below ground and to the base of all vertical risers, building entry points or external risers, and along building roofs. This shall be classified as the main distribution runs.

The main distribution system shall include isolated and capped connections to all the vertical risers and building entry points, this will allow the mains to be brought online and a phasing program to be put in place allowing the connection of groups of properties. All isolated and capped connections shall be fully accessible with valve chambers where required.

The main distribution system shall have thermally controlled bypasses at the end of each horizontal branch to allow the extension to be opened up and made live from the Mayford Estate district heating plantroom. Thermally controlled bypasses shall be used to limit the flow volume through the branches that will in turn will stop a high return temperature going back to the Somers Town energy centre. These bypasses shall be isolated and removed as the building connections are brought online.

The excavation of the trenching shall be carried out to minimise distribution around the Estate and the new buried LTHW heating network pipe work and data and communication ducts shall be buried and backfilled immediately once services are laid so that trenches shall not be left uncovered for longer than the length of time

required for the services installation. Access chambers shall facilitate the access to isolation valves and end of run bypass arrangements.

Anny connections to new live pipework shall be carried out via a connection method of 'hot tapping' that allows the mains to stay live without isolation or drain down.

If for unforeseen instance new pipe work connections cannot be carried out on the live system via 'hot tapping' then down time of the network shall be limited to works during day time hours and the heat supply must be live before 4pm that afternoon.

Isolation

The Contractor shall allow for isolation points to be installed in the existing mains distribution to allow the existing system to be sequentially shut down as the new system comes online. This shall include local drain downs and where practicable removal of the existing pipework.

The new distribution strategy shall include isolation valves on the branches to each building entry point above and below ground, the base of risers and on entrance to individual dwellings. This shall allow local isolation throughout the installation to facilitate the sequencing strategy and also reduce disruption with on going maintenance.

All isolation valves to be full bore valves.

External pit isolation valves shall be complete with recessed pit covers to receive the landscape finish.

Each entry point to the buildings whether it be for a single property of a shared rising main shall be provided with isolation valves. The valves could be below ground with an access chamber, within an above ground entry point or at the base of the riser where mains are running internally. This shall allow the isolation of individual connection points to the distribution systems to improve maintenance efficiency and basis of supply improvement to adjoining properties when maintenance is carried out.

Network level heat meters

Heat meters shall be provided across the distribution network on the main building entry points or at the base of each riser, depending on access and entry point. These heat meters shall be connected to data loggers to facilitate automatic meter reading.

The meters shall be used to accurately calculate the operating efficiency of the network and monitoring heat generation and use around the network.

Heat meters shall be installed on the building entry points to the Estate's blocks to provide a complete network that can be fully metered and analysed.

See work section for further details on the heat metering specifics Ss_75_70_54_20.

Regulated flow and system bypasses

A differential pressure sensor installed across the most remote HIU will minimise pump energy consumption. Pump speed should be controlled to maintain the required minimum pressure differential across the most remote HIU. Further differential pressure sensors shall be installed across the tops of risers to monitor the pressure at extremities due to the index of the circuit constantly changing with response to demand, this will maintain the required pressure differential at the HIUs.

The built in 'idling' keep warm facility on the HIUs shall be turned off and the rising mains shall be kept live with thermally controlled bypasses at the head of each riser for a quick response with a change in demand. The thermally controlled bypasses shall ensure that a large temperature difference is maintained across the flow and return distribution pipe work. The bypass and valve arrangement shall be enclosed and tamper proof by within a locked accessible access hatch.

The thermally controlled by-pass located at the top of the distribution network risers will provide a path for flow under minimum load conditions i.e. when all radiator control valves are closed and there is no demand for hot water.

By locating the bypasses close to the differential pressure sensors, the pressure differential across the bypasses, and hence the flow rate through it, will remain roughly constant under all operating conditions.

An additional constant flow by-pass set to pass 5-10% of the maximum flow rate should be provided across the main circulation pumps. The bypass flow should be as close as possible to the minimum limit advised by the pump manufacturer. When the flow drops below 10% a DPCV will ensure the pressure differential across the constant flow bypass remains consistent with LTHW differential pressure set point so as not to cause unnecessary pump speed increase.

As a variable volume constant pressure circuit with differential pressure control valves on each service (integral to the HIUs), normal commissioning stations will not provide constants repeatable meaningful signals. As volume flowrates constantly changed based upon use, heat meters shall be used to demonstrate adequate flowrates, flow and return temperatures.

Heat interface units

Heat interface units shall incorporate a thermostatically controlled indirect plate heat exchanger for instantaneous hot water heating, and a plate heat exchanger for an indirect connection from the LTHW distribution system to the dwellings central heating circuit.

A high quality HIU, correctly installed and fully commission is essential to hassle free communal heating systems.

HIUs shall include the specific features as described below.

Primary LTHW system connections shall have facility for installation of pressure test points on flow and return connections for checking of pressure differentials across the units.

Primary LTHW system connections shall have a fixed full bore by-pass to allow flushing of the system pipework without having to circulate flushing water through the heat interface unit.

Heat interface units shall be supplied with ball valves in all pipework connections to and from the units.

Heat interface units shall have moulded thermal insulation casings with a thermal conductivity around 0.039 W/m*K and an average casing thickness of 30mm.

Maintain a constant pressure differential across the heating circuit, regardless of variations in pump speed or valve closures in other parts of the Estate's heating system.

A 2 port on/off control valve on the return of the primary side pipework to prevent energy loss when no heating is required.

Thermostatic control of hot water temperature enabling a constant, a 50°C supply temperature at all times, regardless of temperature or pressure variations in the Estate's heating system and cold water supply.

Thermostatically controlled by-passes to ensure a constant, low level flow of water from the Estate's heating system through the unit, ready to cope with sudden demands in hot water (this feature shall be disabled however).

A wiring box with connection to separate timer, which energises the primary control valve.

An energy meter in the primary side pipework to monitor the heating energy consumption to the apartment. The measuring accuracy of the energy meter must meet the requirements of EN 1434 (MID) class 2.

A strainer in the return side pipework to protect the control valves.

An intelligent electric control function with a MODBus connection that allows remote commissioning and ongoing parameter adjustment remotely.

The ability to set a maximum allowable primary return temperature to be set independently for both space heating and domestic hot water functions. This allows the distribution network to be protected from low primary delta Ts.

Maximum pressure differential of 600kPa and a minimum pressure differential of 50kPa.

The design life of all components shall be greater than 10 years. The reliability of components stall be demonstrated by the manufacturer as being greater than 99.8% in any one year over the 10 year period following installation. The manufacturer shall guarantee that spare parts shall be available for a minimum of 20 years from the date of hand-over. The manufacturer shall provide access to a UK based support team and engineering network.

See work section for further details on the heat interface units specifics Ss_60_40_37_48 LTHW dwelling.

Network acceptance

Pipework will be designed to minimise losses. The Contractor will be required to demonstrate via calculation that the network design losses are less than 200W per dwelling. It is a project KPI that once complete the standing network losses are less than 200W per dwelling. If this cannot be demonstrated remedial measures will be required to achieve this target.

The distribution system shall be designed, installed, commissioning and operated with no open bypasses. Thermally controlled bypasses shall be utilised at the head of risers to keep the mains warm, along with minimum pump flow bypass across the district heating pumping skid in parallel with the side stream filtration unit.

Refer to introduction section of this specification for further details on project acceptance and KPIs.

Water treatment

Where the existing systems are modified and new systems are connected, the Contractor is responsible for the flushing, chemical injection and re-dosing to ensure the water quality is maintained along with providing a complete system that is of an acceptable water quality. The Contractor is required to work alongside the incumbent water treatment specialist.

Refer to the Max Fordham Spec 200 Section 8.0 PR_60_55_96_00 Cleaning and Chemical Treatment.

Commissioning

The commissioning process of each individual element of a heating network project is key for the successfully delivery of an efficiently operating heating network.

A commissioning plan is to be produced for the central plant, distribution network and dwelling systems.

The extensive commissioning regime is to be in accordance with CIBSE CP1.2 Code of Practice for Heating Networks, and failing to comply with the commissioning stage gateway and outputs required for the submission package will not allow the project to pass on to the operational and maintenance stage or the acceptance and hand over stage.

Refer to the Camden Heating Network Design and Deliver Supplementary document for more information.

Materials

- Provide LTHW copper pipe work pipework in internal risers up to 50mm as indicated on the pipe schedule J6828-MXF-XX-XX-SH-J-41001
- Provide LTHW welded heavy grade steel pipe work pipework in plantrooms up as indicated on the pipe schedule J6828-MXF-XX-XX-SH-J-41001
- Provide LHTW heavy grade steep pipe work with mechanical grooved coupling joints in Level 0 as indicated on the pipe schedule J6828-MXF-XX-XX-SH-J-41001.
- Provide insulation to all pipework as indicated on pipework schedule J6828-MXF-XX-XX-SH-J-41001 and as per CIBSE CP1.2.
- Provide LTHW pre-insulated single steel pipe work by Logstar or Durotan for the below ground distribution complete with leak detection as indicated on pipework schedule J6828-MXF-XX-XX-SH-J-41001
- Provide and install insulation to flanges, bends, valves, etc using preformed bends and valve boxes in accordance with manufacturer's recommendations.
- Insulation to external pipe work is to be weatherproofed.
- All insulation to have a global warming potential of less than 5.
- Exposed pipework run exposed in plantrooms, the car park voids etc. to be protected with 3M VentureClad Jacketing aluminium cladding pipework protection or (equal and approved).
- Valves to be mounted in rigid expanded polystyrene insulation boxes.
- Pipe supports are to be thermally broken; wooden thermal isolation blocks (for load bearing pipe supports) high density phenolic foam blocks (for non-load bearing pipe supports). E.g. Sikla or Cresta, Munsen ring pipe supports. Pipe insulation is to butt-up tight to pipe support. Provide an additional 150mm wide 25mm thick insulation band wrapped around the fitting.
- Finished with self-adhesive zero perm multilayer laminate, with 75mm overlap along full length of pipe fittings.

Workmanship & Installation

- The Contractor is responsible for the design and installation of all pipework supports, bracketry and anchors.
- Sleeves in fire compartment walls shall be fire-stopped using a certified system with a provision made for pipe thermal expansion.
- The Contractor shall be responsible for the control of thermal expansion.
- Access shall be allowed for around all items of plant and equipment in accordance with the manufacture's recommendations at minimum for maintenance, inspection, repair and replacement.
- All equipment and plant shall to be installed on purposes made bases or supports.
- Provide ID bands and label all valves, pipe work and equipment.
- Provide drain down points at all system low points and vent points at high points.
- Boilers are to be complete with Manufacture's expansions and safety relief set.
- The Contractor shall undertake a program of proving and fine tuning of the complete LTHW heating distribution system and its thermal control to ensure both the Mayford Estate heating network and Somers Town energy centre are operating at optimum efficiency.

CONTROL REQUIREMENTS

A variable flow control strategy will be adopted using a pump capable of variable flow control. A centrifugal pump with variable speed drive will be used to match heat supply to demand.

Controls as section Ss_75_70_54_10 of this specification.

SYSTEM DRAWINGS / SCHEMATICS

- J6828-MXF-ZZ-ZZ-DR-M-15217 Plant Room LTHW Integration Schematic

- J6828-MXF-XX-ZZ-DR-M-15211 to 15212 District Heating Distribution Schematic
- J6828-MXF-ZZ-ZZ-DR-M-15131 Proposed Heating Network Layout
- J6828-MXF-ZZ-ZZ-DR-P-50131 Proposed Water Distribution Layout
- J6828-MXF-XX-ZZ-DR-P-50211 and 50212 Proposed Cold Water Services Network Schematic
- J6828-MXF-XX-ZZ-DR-M-15218 Dwelling HIU and Services Schematic

REFERENCE SPECIFICATION CLAUSES

Also see the following Reference Specification SPEC-300 clauses for further details of Workmanship, materials standards, builders work standards, testing/ commissioning, and identification:

- PR_65_52_00_00 PIPELINES
- PR_20_85_00_00 PIPELINE ANCILLARIES
- PR_65_53_00_00 PUMPS
- PR_60_60_38_00 STORAGE CYLINDERS AND CALORIFIERS
- PR_60_55_96_00 CLEANING AND CHEMICAL TREATMENT
- PR_25_31_48_00 THERMAL INSULATION
- AC_60_00_00_00 TESTING AND COMMISSIONING
- PR_80_77_94_00 VIBRATION ISOLATION MOUNTINGS
- PR_40_10_57_26 IDENTIFICATION - MECHANICAL
- PR_20_29_00_00 FIXING TO BUILDING FABRIC
- PR_35_31_68_72 PAINTING AND ANTI-CORROSION TREATMENTS

SS_60_40_37_48 LOW TEMPERATURE HOT WATER HEATING – DWELLING

PERFORMANCE OBJECTIVES

This work section defines the requirements of the LTHW distribution system from the communal heat network to each dwelling's heat interface unit and the heating system within the dwelling.

To provide each dwelling and the communal and commercial areas a reliable heat source for space heating and domestic hot water production with swift response and stable temperature control.

To ensure homes are of comfortable temperature in winter and efficient and affordable to heat.

Allow heating to be controlled for the whole home and individually within each room.

Ensure compatibility with the clients chosen Heat Metering and Billing system and service contracts.

To provide a system that is easily commissionable and maintainable in operation.

This section of the specification should be read alongside the following supplement documents.

i. Max Fordham KPI tracker
ii. The Camden Fair Heat Heating Network Design Supplement
iii. The Camden Metering Specifications
iv. The Camden Heat Networks Design and Delivery Supplement Issue 10
v. CIBSE Code of Practice CP1.2
vi. Swedish DHA F:101 Technical Requirements (diversity factors)

DESIGN PARAMETERS

Industry Standards

Statutory Acts	The Building Regulations Pressure Equipment Directive (PED) 97/23/EC, implemented in the UK through the Pressure Equipment Regulations 1999 Environmental Protection Act 1990, Environmental Protection Regulations 1991, Clean Air Act 1993 Clean Air Act Memorandum The Gas Safety (Installation and Use) Regulations 1998
Building Control / Local Authority requirements	The Building Regulations Approved Documents • Part L1a 2013 Conservation of fuel and power in new dwellings • Domestic Building Services Compliance Guide • Non-Domestic Building Services Compliance Guide

Industry standards	Chartered Institute of Building Services Engineers (CIBSE) • Commissioning Code W 2010 • CIBSE A guide • CIBSE B guide • CIBSE C guide • AM14 Non-Domestic Hot Water Heating Systems • KS07 Variable Flow Pipework Systems • KS09 Commissioning Variable Flow Pipework Systems • KS14 Energy Efficient Heating • CIBSE Code of Practice CP1.2 Swedish DHA F:101 Technical Requirements (diversity factors) Building Services Research and Information Association (BSRIA) • Commissioning HVAC Systems: Guidance on the division of responsibilities (TM 1/88.1) • Commissioning Water Systems (BG 2/2010) • Commissioning Management (AG 5/2002) • Energy Efficient Pumping Systems (BG 12/2011) • Variable Flow Water Systems - Design, installation and commissioning guidance (AG 16/2002) • Commissioning of Pipe Work Systems (AG 20/95) • Pre-Commission Cleaning of Pipework Systems (BG 29/2012) • Water Treatment for Closed Heating and Cooling Systems (BG 50/2013). • Selection of Control Valves in Variable Flow Systems (BG 51/2014)		
British Standards	BS 5422	2009	Thermal insulating materials for pipes, tanks, vessels, ductwork and equipment operating within the temperature range -40°C and 700°C
	BS 6880	1988	Code of practice for low temperature hot water heating systems of output greater than 45kW
	BS EN 12828	2012	Heating systems in buildings - Design for water based heating systems
	BS EN 12831	2003	Heating systems in buildings - Method for calculation of the design heating load
	BS EN 14336	2004	Heating systems in buildings Installation and commis sioning of water based heating systems
	BS EN 1264	2011	Water based surface embedded heating and cooling systems
All Manufacturer's recommendations and instructions	In particular • Booster set installation • Tenant Valve Assembly • Hydraulic Interface Unit (HIU) design guide		

Technical Parameters

Primary Flow Temperature from heat network plantroom (winter)	70°C
Return Temperature to heat network plantroom (winter)	≤40°C (nominal)
Dwelling Space Heating Flow Temperature	65°C
Dwelling Space Heating Return Temperature	≤40°C
Maximum Pipe Work Pressure Drop per Meter Length	300 Pa/m

Environmental Design

Room	**Temperature (°C)**	**Ventilation and Infiltration Rates (ACH)**
Living/Dining Room	22	-
Bedrooms	20	-
Hall and Landing	20	-
Kitchen	18	30 l/s intermittent over 20 mins
Bathroom and Shower Room	22	15 l/s intermittent over 10 mins
WC	18	15 l/s intermittent over 10 mins
External Winter Design	-3°C db	
Adjacent Property	10	
Infiltration Rate		0.5
Include a warm up margin of +30% to output.		

Building Fabric

When calculating the thermal load of the Mayford Estate dwellings the following parameters shall be considered.

Existing record layout and elevation drawings as issued by Camden Council.

Space heating heat loss is to be based on relevant 1960's building regulations 'U' Values taking into consideration the building structure, glazing type and roof insulation.

The central plant sizing shall consider that adjacent dwellings will be at a setback temperature of 16°C.

GENERAL DUTIES

The Contractor is to design, supply, install, test and commission the new installation in line with the intent described in this specification, drawings, schematics and schedules. All design responsibility for the correct

operation and compliance with the performance objectives and design parameters within the specification rest with the contractor.

Any information relating to the size and duty of equipment that has been included within the tender information, has been included to indicate the assumptions used to establish the space requirements and distribution routes, and should not be relied upon for the purposes of the Contractor's design. Refer to section 4 of SPEC-200 for further information.

The Contractor is responsible for all operation and maintenance of all systems for 24 months following practical completion; refer to the Max Fordham Spec 200 for further information.

Refer to Max Fordham Spec 200 Section 9.1 for design and coordination drawing responsibilities, in addition to those required in Section 4.

The Contractor responsible for the works in this MEP employer's requirements specification is responsible for the design and coordination of the builderswork associated with the systems specified. Provide all builderswork information in relation the systems in this specification, to the main contractor, in a timely manner.

Simple and clear instructions on the operation of the dwelling heating systems shall be presented in a Home User Guide.

The contractor shall survey all dwellings and determine for each dwelling:

- if it is occupied by a lease holder or a Camden tenant;
- its heat source (heat network or local boiler);
- its heat emitter type (radiators/UFH);
- the dimensions of radiators in Camden tenant residences;
- the qualitative condition and approximate age of the heat emitters, including photographs;
- the qualitative condition of the pipework, including photographs;
- if an internal gas meter is present and if gas is in use, what it is used for;
- arrangements required to access the dwelling's riser and plant cupboard;
- the size of the dwelling's riser and plant cupboard.

The Contractor shall present this information in the form of a schedule. The Client will assess if replacement heat emitters are required. If replacement heat emitters are required the Contractor shall remove all pipework and heat emitters before undertaking reinstallation. If replacement hat emitters are not required, the Contractor shall flush, clean and pressure test and make good the existing system prior to connection to the new Heat Interface Unit.

Any internal gas meters shall be removed and either installed externally and reconnected to the dwelling if gas is required or the gas pipework stripped back to the T from any remaining in use gas lines and made safe.

The Contractor shall base their Tender on all pipework and heat emitters being removed from all dwellings and replaced. This shall be presented as be a cost per dwelling type and cost for the whole Estate. The contractor shall also present the cost of flushing, cleaning, pressure testing and a making good allowance for existing installations on a dwelling type basis. Following the Contractors heat emitter survey and Client comments, the Contractor shall reduce their cost to reflect the number of dwellings for which complete strip out and reinstallation is required.

SYSTEM DESCRIPTION

The system descriptions within this section refer to the new heating system to be installed within the dwellings that are connected to the new heating network upgrade. The dwelling installation shall not be carried out until the local heat network installation has been complete with live capped and isolated connections to the mains that are ready to be extended to the dwelling. The dwelling installation includes the investigation of the condition

of the internal existing space heating and hot and cold pipe work, along with the decommissioning and strip out of the existing installation to make room for the new installation.

Heat interface unit

Heat interface units are to be provided for every property connected to the heating network upgrade on the Mayford Estate. They provide a means of controlled separation between the heating network and the properties space heating and domestic hot water service

Heat interface units shall incorporate a thermostatically controlled indirect plate heat exchanger for instantaneous hot water heating, and a plate heat exchanger for an indirect connection from the LTHW distribution system to the dwellings central heating circuit.

A high quality HIU, correctly installed and fully commission is essential to hassle free communal heating systems.

HIUs shall include the specific features as described below.

Primary LTHW system connections shall have facility for installation of pressure test points on flow and return connections for checking of pressure differentials across the units.

Primary LTHW system connections shall have a fixed full bore by-pass to allow flushing of the system pipework without having to circulate flushing water through the heat interface unit.

Heat interface units shall be supplied with ball valves in all pipework connections to and from the units.

Heat interface units shall have moulded thermal insulation casings with a thermal conductivity around 0.039 W/m*K and an average casing thickness of 30mm.

Maintain a constant pressure differential across the heating circuit, regardless of variations in pump speed or valve closures in other parts of the Estate's heating system. This is achieved by incorporating an internal DPCV across their connections to the primary district heating flow to maintain a constant differential pressure across their control valves to maintain close control of water heating and achieve a self-balancing primary district heating system in operation.

A 2 port on/off control valve on the return of the primary side pipework to prevent energy loss when no heating is required.

Thermostatic control of hot water temperature enabling a constant, a 50°C supply temperature at all times, regardless of temperature or pressure variations in the Estate's heating system and cold water supply.

Thermostatically controlled by-passes to ensure a constant, low level flow of water from the Estate's heating system through the unit, ready to cope with sudden demands in hot water (this feature shall be disabled however).

A wiring box with connection to the propriety electronic controller and timer, which energises the primary control valve.

The HIU is to be fully electronic with space heating return temperature limiter.

Electronic HIU to be provided with MODBus connection to allow remote commissioning and operating parameter adjustment.

An intelligent electric control function with a MODBus connection that allows remote commissioning and ongoing parameter adjustment remotely.

The ability to set a maximum allowable primary return temperature to be set independently for both space heating and domestic hot water functions. This allows the distribution network to be protected from low primary delta Ts.

Provide HIU with adjustable hot water delivery temperature.

HIU will be provided with keep warm facility (but not activated), thermally controlled bypasses on the vertical risers provide means of keeping the mains live (hot).

The heat interface units have been specifically selected based on their tested and recognised performance with BESA (Building Engineering Services Association) testing schemes. The HIU supplier shall include documentation of testing of the HIU's DHW and stand-by performance against an established standard, such as UK HIU Test Regime (2016) administered by the Building Engineering Services Association (BESA).

Key performance metrics include (but are not limited to):

- VWART (Volume weighted average return temperature)
- Heating return temperature
- DHW return temperature
- Keep warm return temperature
- DHW speed of response

The HIU will be enclosed in a fully insulated enclosure provided by the HIU manufacture.

An energy meter in the primary side pipework to monitor the heating energy consumption to the apartment. The measuring accuracy of the energy meter must meet the requirements of EN 1434 (MID) class 2.

A strainer in the return side pipework to protect the control valves.

Maximum pressure differential of 600kPa and a minimum pressure differential of 50kPa.

Cold fill system pressure of the dwelling space heating system to be 1.5 to 2bar.

<u>Heat meter and ultrasonic metering station</u>

Heat meters shall be provided to all HIUs within the dwellings.

The ultrasonic metering (UMS) shall be connected to a Kamstrup 603 meter within the HIU, which can connect to two ultrasonic flow pieces and 3 temperature probes.

The second flow piece shall be installed in the heating circuit return (if required).

The UMS flow piece shall be manufactured in brass and approved according to MID and EN1434.

The calculator shall be capable of displaying and recording all data from the second flow piece. Including, flowrate, volume and error codes.

The third temperature probe shall be PT500 and installed with a strap on device to the heating return circuit (if required).

The calculator shall be capable of displaying and recording all data from the third temperature probe.

All data from the calculator, including the two flow pieces and three temperature probes must be able to be extracted through the M-Bus telegram.

The energy meter must be approved according EN 1434 and MID class 2 and the M-Bus module according to EN 13757-2:2005 and EN 13757-3:2013.

The calculator must include an integrated M-Bus connection, with the option for 2 additional, communication module slots.

Communication modules shall be interchangeable to flexibility post-installation (e.g. change from wired to wireless M-Bus, pulse input/output, etc.)

Both flow sensors can be detached from the calculator allowing the flow piece to be changed independently of the calculator and vice versa.

To avoid faulty pulse value settings, e.g. when changing the flow sensor, the calculator should be able to recognise the flow sensor's size automatically (Auto Detect).

Battery and mains power supply shall be interchangeable.

If battery powered the energy meter shall have 16 years battery lifetime. Communication shall not reduce battery lifetime of the meter (intervals ≥ 10 seconds).

Energy meters shall include programmable datalogging of years, months, days, hours and minutes. It must be possible to read/export logger registers from the meter.

Protection class of calculator: IP65. Protection class of flow sensor: IP68.

For wired M-Bus, the calculator and the M-Bus module must be galvanic isolated.

Shall be capable of calculating the VWART (Volume Weighted Average Return Temperature) and VWAFT (Volume Weighted Average Flow Temperature) directly from the registers on the energy meter.

The energy meter shall be able to show the VWART and VWAFT for the year and month on the calculator display.

When metering a heat source, the energy meter shall be able to calculate the COP (coefficient of performance) based on a pulse input of the energy consumed.

The heat meter shall be mounted on the HIU in a position where it can be read by the end-user without the need to open or remove the cover of the HIU.

The heat meter will be provided with two ultrasonic metring bodies.

See work section Ss_75_70_54_20 for further information on the complete automatic metering strategy of the heating network.

<u>Radiators and towel rails</u>

Following the Contractors survey and scheduling of heat emitters described in the General Duties section, for dwellings where the existing heat emitters and pipework are to be removed.

New wall mounted radiators shall be the means of provide the space heating to each individual room within in the properties along with wall mounted towel rails in the bathrooms. The dimensions of new radiators shall match or exceed the size of existing radiators in order to minimise any redecoration or making good requirements.

Radiators generally shall be white powder coated pressed steel panel convectors with top grilles and side panels. They shall be of a design and manufacture such that they are suitable for the working and test temperatures and pressures of the heating system. They shall be sized to provide sufficient heating surface to achieve design temperatures under design conditions. They shall also be selected to sympathetically fit into the space available. Typically fitted at least 150mm above floor level and above the level of the skirting, similarly at least 100mm below a projecting sill or shelf.

Radiators shall be sized and selected with the output correction factor to account for the lower system flow and return temperatures. Correction factors shall be attained from the manufacture.

The system should include all necessary controls and fittings for the heating and hot water installations.

Provide a system of emitters to meet the intent shown by the Max Fordham LLP heating layout drawings and schematic of arrangement of components.

All emitters shall be installed with pressure independent flow limiting thermostatic radiator valves and matching lock shield valves. Tower rails shall be fitted with flow liming and return limiting temperature valves.

Where radiators systems are connected via a direct HIU to a communal LTHW systems must have TRVs in accordance with EN 215 of suitable specification for all anticipated system pressures and flow rates

The piping arrangement connections to the radiators is to be 'top entry opposite bottom exit' to improve the heat distribution across the emitter and maximise the delta T. The flow is to be connected to the top entry and the return to the opposite site bottom exit.

Space heating pipe work

The Contractor will review the existing space heating pipe work within each individual property and if deemed in acceptable condition (no corrosion or physical damage) and of suitable size to serve the local emitters then the existing space heating pipe work shall be re-used and re-piped the new heat interface unit (HIU). This requires the Contractor to allow for a flushing and water treatment process to determine the internal quality of the pipe work.

The routing of the space heating pipe work is generally to be surface mounted, exposed and clipped to the walls with surface mounted clips.

The exposed pipe work shall be painted to the finish specified by the Client.

Where the pipe work routing requires the runs to cross the dwelling between doorways, the pipe work shall either be run up to high level and surface mounted at high level to the wall or the ceiling and boxed in, or ran below the floor.

The existing floors are raised so do facilitate the running of services below the floor finish, however many residents have improved their floor finish and so the Contractor shall be responsible to replace the floor finish to the exact standard as existing.

Pipework routes shall be kept as short as practical, heating services are to be installed a minimum of 300 mm away from cold water services.

Air vents shall be installed at high points on the system, drain cocks, complete with hose unions shall be installed at all low points, including below the HIU.

Heating controls

See below Control section.

Dwelling and network acceptance

In accordance with CIBSE CP1.2 Code of Conduct for Heating Networks, no installation shall be accepted without sign off at individual staged gate ways.

The HIUs are to be installed, accepted and commissioned in safe, reliable and maintainable way in accordance with the specific and detailed manufactures guidance. The Contractor is responsible for producing a method statement and logbook for the installation and commissioning of the HIUs. Acceptance will not be achieved

without these. All dwelling level heat meters are to be tagged, referenced to the dwellings address and meter serial number and documented prior to commissioning.

Refer to introduction section of this specification for further details on project acceptance and KPIs.

Dwelling existing system decommission and strip out

See work section Ac_10_25_00 of this specification for details on the strip out of the existing dwelling installation.

Water treatment

Where the existing systems are modified and new systems are connected, the Contractor is responsible for the flushing, chemical injection and re-dosing to ensure the water quality is maintained along with providing a complete system that is of an acceptable water quality. The Contractor is required to work alongside the incumbent water treatment specialist.

Refer to the Max Fordham Spec 200 Section 8.0 PR_60_55_96_00 Cleaning and Chemical Treatment.

Mains distribution pipe work

Where incoming and rising district heating pipe work enters a property to serve the HIU within that property and then continues and rises to serve further dwellings within in the building, the pipe work shall be boxed in with a minimum of two sheets of ply wood and be compartmented from any mains cold water pipe work. The boxing and risers shall be ventilated with fire rated (where required) vents to mitigate heat build up.

See work section Ac_10_10_25_00 and Ac_10_10_45_00 for details and workmanship of trenching, building entry points, risers and service supports.

Commissioning
The commissioning process of each individual element of a heating network project is key for the successfully delivery of an efficiently operating heating network.

A commissioning plan is to be produced for the central plant, distribution network and dwelling systems.

The extensive commissioning regime is to be in accordance with CIBSE CP1.2 Code of Practice for Heating Networks, and failing to comply with the commissioning stage gateway and outputs required for the submission package will not allow the project to pass on to the operational and maintenance stage or the acceptance and hand over stage.

Refer to the Camden Heating Network Design and Deliver Supplementary document for more information.

Materials

- Provide internal dwelling pipework in table X copper as indicated on the pipe schedule J6828-MXF-XX-XX-SH-J-41001
- Provide LTHW copper pipe work pipework in internal risers up to 50mm as indicated on the pipe schedule J6828-MXF-XX-XX-SH-J-41001
- Provide insulation to all pipework as indicated on pipework schedule J6828-MXF-XX-XX-SH-J-41001 and as per CIBSE CP1.2.
- Provide LTHW pre-insulated single PEX pipe work by Logstar or Durotan for the below ground run offs to dwellings and block entries as indicated on pipework schedule J6828-MXF-XX-XX-SH-J-41001
- Provide and install insulation to flanges, bends, valves, etc using preformed bends and valve boxes in accordance with manufacturer's recommendations.
- Insulation to external pipe work is to be weatherproofed.
- All insulation to have a global warming potential of less than 5.
- Pipe supports are to be thermally broken; wooden thermal isolation blocks (for load bearing pipe supports) high density phenolic foam blocks (for non-load bearing pipe supports). E.g. Sikla or Cresta,

Munsen ring pipe supports. Pipe insulation is to butt-up tight to pipe support. Provide an additional 150mm wide 25mm thick insulation band wrapped around the fitting.
- Finished with self-adhesive zero perm multilayer laminate, with 75mm overlap along full length of pipe fittings.
- Space heating pipe work downstream of the HIU within the dwelling can be un-insulated where it is surface mounted with the same room as the serving radiator.

Workmanship & Installation
- The Contractor is responsible for the design and installation of all pipework supports, bracketry and anchors.
- Sleeves in fire compartment walls shall be fire-stopped using a certified system with a provision made for pipe thermal expansion.
- The Contractor shall be responsible for the control of thermal expansion.
- Access shall be allowed for around all items of plant and equipment in accordance with the manufacture's recommendations at minimum for maintenance, inspection, repair and replacement.
- All equipment and plant shall to be installed on purposes made bases or supports.
- Provide ID bands and label all valves, pipe work and equipment.
- Provide drain down points at all system low points and vent points at high points.
- Boilers are to be complete with Manufacture's expansions and safety relief set.
- The Contractor shall undertake a program of proving and fine tuning of the complete LTHW heating distribution system and its thermal control to ensure the Mayford Estate heating network and Somers Town energy centre are operating at optimum efficiency.
- The commissioning of the dwelling heating system is to be carried out by a fully trained specialist who understands the district heating system as a whole.
- The dwelling heating system is to be commission in parallel with the distribution network.

CONTROL REQUIREMENTS

Each dwelling is to be provided with a user programmable room thermostat and with a simple 7 day 24 hour electronic programmer which is capable of:

- 2No. on and 2No. off programmable heating periods per day
- Water heating only mode (controls HIU keep warm on/off)
- Space heating only mode
- Heating and hot water together

A separate room thermostat should be provided and located in a position that is not unduly affected by draughts and not near a heat source.

The HIU shall have a remote access function that allows parameter adjustment of the following:

- Space heating flow temperature
- Primary return temperature limiting from the space heating circuit and domestic hot water function
- Domestic hot water set point adjustment

SYSTEM DRAWINGS / SCHEMATICS

- J6828-MXF-ZZ-ZZ-DR-M-15217 Plant Room LTHW Integration Schematic
- J6828-MXF-XX-ZZ-DR-M-15211 and 15212 District Heating Distribution Schematic
- J6828-MXF-ZZ-ZZ-DR-M-15131 Proposed Heating Network Layout
- J6828-MXF-ZZ-ZZ-DR-P-50131 Proposed Cold Water Services Network Layout
- J6828-MXF-XX-ZZ-DR-P-50211 and 50212 Proposed Cold Water Services Network Schematic
- J6828-MXF-XX-ZZ-DR-M-15218 Dwelling HIU and Services Schematic
- J6828-MXF-ZZ-ZZ-DR-M-15101 to 15106 Dwelling Services Layouts

REFERENCE SPECIFICATION CLAUSES

Also see the following Reference Specification SPEC-300 clauses for further details of Workmanship, materials standards, builders work standards, testing/ commissioning, and identification:

- PR_65_52_00_00 PIPELINES
- PR_20_85_00_00 PIPELINE ANCILLARIES
- PR_65_53_00_00 PUMPS
- PR_60_60_38_00 STORAGE CYLINDERS AND CALORIFIERS
- PR_60_55_96_00 CLEANING AND CHEMICAL TREATMENT
- PR_25_31_48_00 THERMAL INSULATION
- AC_60_00_00_00 TESTING AND COMMISSIONING
- PR_80_77_94_00 VIBRATION ISOLATION MOUNTINGS
- PR_40_10_57_26 IDENTIFICATION - MECHANICAL
- PR_20_29_00_00 FIXING TO BUILDING FABRIC
- PR_35_31_68_72 PAINTING AND ANTI-CORROSION TREATMENTS

SS_70_30_25_25 EARTHING, BONDING, EMC & SURGE PROTECTION

PERFORMANCE OBJECTIVES

Provide everything as necessary to form COMPLETE systems to;

- Provide a complete earthing and bonding system in accordance with the design parameters
- Ensure enhanced equipotential bonding is included in all special zones as required by BS 7671 and BS 7430.
- Provide surge protection to all LV and ELV/data cabling within the building, in accordance with BS EN 62305
- protect sensitive electronic equipment from current and voltage surges.
- minimise EMC interference between LV and ELV/audio-comms installations
- be safe, reliable and efficient in operation
- enable safe ongoing inspection and maintenance
- comply with all statutory requirements and design criteria
- Provide lightning protection bonding of pipework located on building roofs

DESIGN PARAMETERS

Industry Standards

The electrical contractor must be an NICEIC Approved Contractor

Industry Standards

Statutory Acts	The Building Regulations (England & Wales)
	The Electricity at Work Regulations 1989
Building Control / Local Authority requirements	The Building Regulations Approved Documents
	Non-Domestic Building Services Compliance Guide
	The Memorandum of guidance on the Electricity at Work Regulations 1989 (the Memorandum)
Industry standards	Chartered Institute of Building Services Engineers (CIBSE)
	CIBSE K guide
	Building Services Research and Information Association (BSRIA)
	BSRIA Power quality guide (AG 2/2000) Design Checks for Electrical Services - A quality control framework for electrical engineers (BG 3/2006)
	Health and Safety Executive
	HSG85 Electricity at work: Safe working practices
	NICEIC
	Technical Guidance

	Energy Networks Association		
	Distribution Code: Engineering Recommendation G12/4 (Requirements for the application of protective multiple earthing to low voltage networks) – a review of Engineering Recommendation G12/3		
British Standards	BS 7671	2018	The Wiring Regulations 18th Edition
	BS 7430	2011 & 2015	Code of practice for protective earthing of electrical installations
	IIEC 61936-1		Common Rules for Power Installations Exceeding 1kV ac
	BS EN 50310	2006	Application of equipotential bonding and earthing in buildings with information technology equipment.
	BS EN 62305	Varies	Protection against lightning. All parts
	BS IEC 61643-32	2017	Low-voltage surge protective devices. Surge protective devices connected to the d.c. side of photovoltaic installations.
	BS EN 50539-11	2013 + A1: 2014	Low-voltage surge protective devices. Surge protective devices for specific application including d.c.. Requirements and tests for SPDs in photovoltaic applications

Project Specific

Electricity DNO	**UKPN**

SYSTEM DESCRIPTION

Design, supply, install, test, clean, commission, demonstrate and set to work complete Earthing, Bonding and Surge Protection system for newly installed plant and equipment.

Provide all equipment, components, devices, hardware, cabling, electrical accessories, fixings, fittings, components, ancillary equipment, accessories, sundries etc. as necessary to form a COMPLETE system.

UKPN Transformer Substation Earthing and Bonding
There are 2no. UKPN electrical plantrooms within the Mayford Estate, one beneath Tower 1 (Block N) and one beneath Tower 2 (Block C). The existing electrical supply to the estate will not require upgrading.

Main LV Earth Bars

- The Contractor shall identify existing Main LV Earth Bars and terminal and ensure that they are adequate for the Mayford Estate earthing.

Local LV Earth Terminals

- Local LV Earth Terminal bars (LETs) are to be installed in the mechanical plant rooms and other areas as required. The earth bars are to be wall mounted.
- All the local earth terminals are to be connected to the existing main earth terminal with an equipotential bonding conductor.
- The connection between each LET and its respective MET is to be a continuous run without daisy chaining between LETs. This is to allow the earth connection at each LET to be tested separately.

- LETs are to be interconnected allowing an alternative current path back to the main earth terminal. Resistances are to be tested without interconnections, test links will facilitate this.
- Test links at the LET are to facilitate this testing without having to disconnect local main bonding conductors.

Earthing to Incoming Metallic Building Services/Ducts
Connect the metalwork of all incoming services to the local earth terminal. Test all connections at each stage of the installation process.

Main Equipotential Bonding
The main building earth bars are to be connected directly to the earth termination system using a main earthing conductor with a cross-sectional area which is related to the cross-sectional area of the supply neutral conductor in accordance with BS7671 and any overarching requirements provided by the DNO.

Within the building, the following equipment is to be electrically connected to the main earth bar via local earth terminals:

- all conductive parts of electrical load casings
- all conductive parts of buried incoming water and gas pipes
- all conductive parts of incoming telecoms
- all metal structures within the building
- all metal floor grids, step ladders/cat ladder etc.
- all ventilation air ductlines
- all heating and water services pipework
- all above and below ground drainage pipework if cast iron.

Conductive parts of electrical load casings to be electrically connected to the main earth bar via secondary earthing bars on the distribution boards and main switchboards. Other extraneous metal parts within the building will be connected using supplementary bonding to local earthed conductors, such as water pipes. Supplementary bonding is to be avoided as a primary bonding element; systems are to be testable avoiding the use of supplementary bonding.

Test all connections at each stage of the installation process as work proceeds.

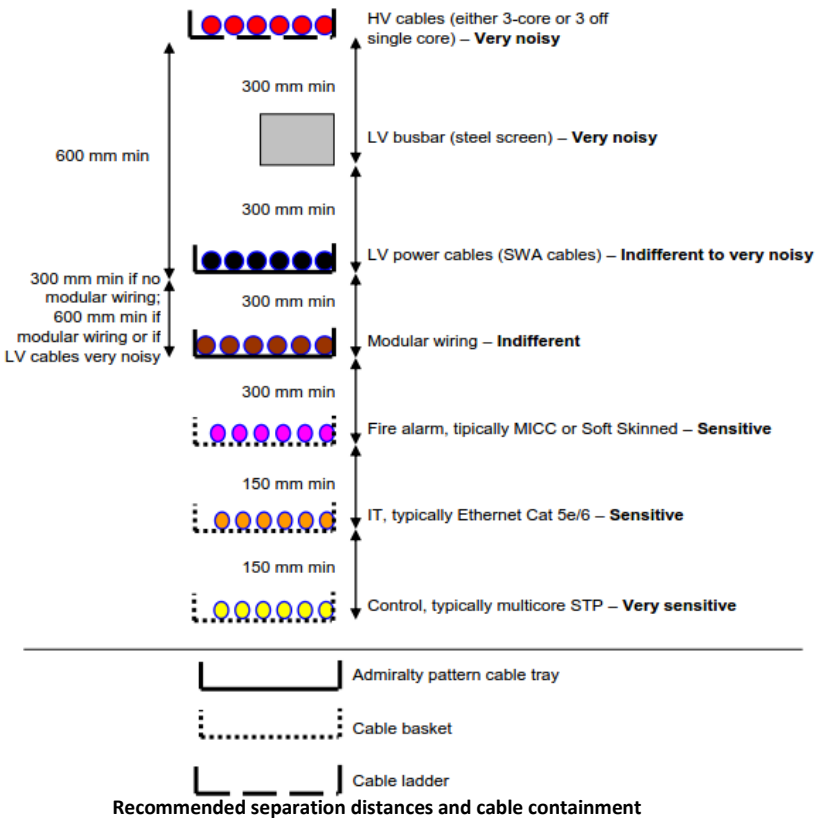
Surge Protection

Cascaded Surge protective devices (SPDs) are to be selected and installed at the main and secondary LV switchgear panels and to the external switch panels/ distribution boards as indicated to comply with BS 7671 Section 534. SPDs are to be enclosed within the compartments of the electrical switchgear panel. Where this is not possible, they are to be supplied and installed within dedicated enclosures adjacent to the switchgear. All SPDs must have status displays visible at all times. The electrical subcontractor is to coordinate the selection of these devices.

To prevent transient damage, enhanced SPDs are to be fitted on all copper power, data communication, signal and telephone lines where they enter or leave a building including, but not limited to mains power, data or signal lines, telephone lines, CCTV cables, coaxial RF lines and Ethernet networks.

Containment Separation Distances/ Electromagnetic Screening – General Electrical Services.

- Power and mains cables, including power feeds and lighting circuits shall not be grouped with sensitive cables (i.e. data or control cables).
- Cables of different categories (e.g. IT and power cables) shall not be in the same bundle or conduit.
- Different bundles shall be separated electromagnetically from each other, either by using suitable cable containment as a screen, or by placing the cables in different conduits.
- All cabling to avoid any proximity to radio or television transmitters, beacons and overhead transmission lines.
- The longer cables run in parallel to other cables, the more likely interference by cross-talk may occur. Therefore, long parallel runs of cables shall be avoided. If not practicable, either/both the noisy or/and the sensitive cables shall be enclosed in conduits/trunking.
- Cables, when crossing (which should be avoided as much as possible), shall cross at right angles.
- Screened coaxial signal (and control) cables carrying HF signals can be bundled. An additional shield around the bundle reduces the coupling to the environment by providing a good path for any overall CM current.
- Twisted pair (signal and control) leads can be bundled, provided that each pair is twisted separately.
- Cable separation distances shall be at least those presented. If cables are laid out horizontally (as opposed to vertically as shown, the same distances shall apply.
- Comply with the requirements of BS EN 50174-2 and BS 6701.



Recommended separation distances and cable containment

Electromagnetic Screening

- Provide best practice separation and screening of cables.
- Minimise the risk to IT equipment and interconnecting cables from electrical hazards.
- Provide the IT installation with a reliable signal reference and adequate immunity from electromagnetic interference carried by the earthing network.
- Provide earth tape below raised access floors for bonding of IT&S Equipment.
- Implement recommendations of BS EN 50310, BS EN 50173 and BS EN 50174.

CONTROL REQUIREMENTS

No specific control requirements.

SYSTEM DRAWINGS / SCHEMATICS

- J6828-MXF-XX-ZZ-DR-M-15211 and 15212 district heating distribution schematics
- J6828-MXF-XX-ZZ-DR-J-30210 Heat Metering Schematic

REFERENCE SPECIFICATION CLAUSES

Also see the following Reference Specification SPEC-300 clauses for further details of Workmanship, materials standards, builders work standards, testing/ commissioning, and identification:

- PR_65_70_36/48_00 HV/LV CABLES AND WIRING
- PR_65_70_11_00 SUPPORT COMPONENTS - CABLES
- PR_60_70_48_00 LV SWITCHGEAR AND DISTRIBUTION BOARDS
- SS_70_30_25_25 EARTHING AND BONDING OF EXTRANEOUS METAL

- AC_70_65_00_00 TESTING AND COMMISSIONING OF ELECTRICAL SERVICES
- PR_40_10_57_24 IDENTIFICATION - ELECTRICAL
- PR_20_29_00_00 FIXING TO BUILDING FABRIC

SS_70_30_45_45 LV DISTRIBUTION

PERFORMANCE OBJECTIVES

To provide a complete, fully functioning and safe system to distribute low voltage electrical power to all new plant and equipment.

- Provide a safe and reliable LV power distribution system, satisfying all regulations & statutory requirements. It is intended for the design, installation and testing of the LV systems to be compliant with the 18th Edition of BS 7671 (The Wiring Regulations).
- Provide circuit protective devices such that full discrimination is achieved.
- Protect occupants and equipment from the effects of short circuits and fault currents.
- Protect systems against overload.
- Protect sensitive electronic equipment from current and voltage surges.
- Minimise the generation or amplification of harmonics in the electrical distribution installation, and safeguard the client's plant and installation against overheating and over voltages in accordance with the limits detailed in the Energy Networks Association Recommendations G5/4.
- Enable safe ongoing inspection and maintenance.
- Be metered and monitored and compatible with both the BMS and AM&T systems.
- Comply with the design parameters.

DESIGN PARAMETERS

The electrical contractor must be an NICEIC Approved Contractor.

Industry Standards

Statutory Acts	The Building Regulations (England & Wales)
	The Electricity at Work Regulations 1989
	Health and Safety at Work Act 1974
Building Control / Local Authority requirements	The Building Regulations Approved Documents (latest version)
	NHBC Requirements
Industry standards	Chartered Institute of Building Services Engineers (CIBSE)
	CIBSE K guide
	CIBSE TM39: Building Energy Metering
	Building Services Research and Information Association (BSRIA)
	BSRIA Power quality guide (AG 2/2000)
	Design Checks for Electrical Services - A quality control framework for electrical engineers (BG 3/2006)
	Health and Safety Executive
	HSG85 Electricity at work: Safe working practices
	NICEIC
	Technical Guidance

British Standards	BS7671	2018	The IET Wiring Regulations 18th Edition
	BS 7430	2011 +2015	Code of practice for protective earthing of electrical installations
	BS EN 50085-1	2005	Cable trunking systems and cable ducting systems for electrical installations. General requirements +A1:2013
	BS EN 50085-2-1	2006	Cable trunking systems and cable ducting systems for electrical installations. Cable trunking systems and cable ducting systems intended for mounting on walls and ceilings+A1:2011
	BS EN 60947-6	2005	Low-voltage switchgear and controlgear. Multiple function equipment. Transfer switching equipment

Plant/Equipment Life: Will be of a standard capable of a minimum of 20 years without major replacement.

System Life: Will be capable of a system life in excess of 25 years.

SYSTEM DESCRIPTION

Mayford Estate Heat Network Plantroom

New mechanical equipment is to be installed within the heat network plantroom (below Tower 2, Block C) as part of the project. This includes but is not limited to:

- pumps;
- valves;
- controls.

The contractor is to design, supply, install, test, clean, commission, demonstrate and set to work complete Low Voltage (LV) primary and secondary power distribution for the Mayford Estate heat network plantroom.

Provide all switchgear, protective devices, containment, cabling, electrical accessories, fixings, fittings, components, ancillary equipment, accessories, sundries etc. as necessary to form a COMPLETE system.

All cable and equipment shall be installed in a neat and workmanlike manner. All methods of construction not specifically described or indicated in the contract documents shall be subject to the control and approval of the Client. Equipment and materials shall be of the quality and manufacture indicated.

The installers shall adhere to all Manufacturers', IET guidance and regulatory recommended installation practices when installing cabling and equipment unless specified otherwise by the authority having jurisdiction.

Electrical switchgear & distribution boards shall be segregated from gas & wet services.

Supplies to large items of mechanical equipment will be served directly from the Main Switch Panels. Supplies to other mechanical plant will generally be fed from a local mechanical control centre (MCC).

Main Switch Panels
The contractor is to supply and install a new bespoke cubicle intake switch panel (**MSP/ME/INTAKE)** in the LV switch room currently feeding the heat network plantroom**.** New incoming cables are to be run from this position to the new intake switch panel by the contractor.

The incoming cables are to be de-rated for grouping, location and ambient temperature as required. The incoming cable ladder must only carry low voltage supplies and under no circumstance shall any private equipment or cables be attached. The contractor will supply and install the incoming LV cables.

The Shipper meter associated with the LV bulk supply is to be located adjacent to **MSP/ME/INTAKE.**

MSP/ME/INTAKE will feed

- **MSP/ME/HEATNETWORK** which is to be located within the Boiler House;
- **MSP/ME/T1WATER** which is to be located within Tower 1 (Block N) water services plantroom;
- **MSP/ME/T2WATER** which is to be located within Tower 2 (Block C) water services plantroom.

MSP/ME/HEATNETWORK is to be a new bespoke cubicle switch panel designed to supply all of the mechanical equipment, mechanical control centres, small power and lighting within the Mayford Estate heat network plantroom.

MSP/ML/T1WATER is to be a new bespoke cubicle switch panel designed to supply all of the mechanical equipment, mechanical control centres, small power and lighting within the Mayford Estate Tower 1 water services plantroom.

MSP/ML/T2WATER is to be a new bespoke cubicle switch panel designed to supply all of the mechanical equipment, mechanical control centres, small power and lighting within the Mayford Estate Tower 2 water services plantroom.

All primary switch panels will feed submain cables via lockable moulded case circuit breakers (MCCB's) to BS EN 60947-2. Power will be distributed from the primary switch panels to panel boards (PBs) and to miniature circuit breaker (MCB) final circuit distribution boards and distributed point loads throughout the Estate's plantrooms.

The contractor is to survey the delivery route and design the switch panel with appropriate split points to facilitate delivery.

Switchgear general requirements
The breaking capacity of all distribution equipment is to be rated sufficiently for the incoming supply and fault conditions. The Contractor is to confirm with the DNO at the earliest opportunity.

All switchgear to have a form of separation of at least Form 4 Type 2.

All circuit breakers are to be provided with adjustable electronic trip units which enable appropriate coordination between circuit protective devices and the loads that they are protecting. All protective devices will be set by the electrical sub-contractor. Once set, ALL such devices must have plastic tamper resistant covers locked and sealed with a proprietary wire and lead seal so as to prevent accidental adjustment.

All LV switchgear and protective devices shall be supplied by the SAME manufacturer. The design of the low voltage distribution has been prepared by the Consultant. The Fault Protection scheme design is based upon the coordination of upstream and downstream protective devices to limit fault currents to those which can be safely handled by each device at its respective location in the installation.

This will be achieved through the application of Cascading and Enhanced Protection & Discrimination techniques to coordinate upstream and downstream energy let through and fault current limitation defined by the device manufacturer. It is essential that all fault protective devices installed are from the same manufacturer in order that the basis of the design is maintained. The design is to be based on protective devices manufactured by **Schneider Group**.

If the electrical sub-contractor wishes to offer alternative switchgear, all protective devices must be set by the electrical sub-contractor after undertaking his own coordination study in accordance with the information provided on the drawings and schedules and with his own calculations. By taking this approach the electrical sub-contractor will assume all design responsibility for the electrical installation.

The main switch panel is to be provided with thermal imaging windows for all major internal busbars. Provide peep hole windows into each functional unit enclosure to allow thermal imaging outgoing cable terminations.

Final Circuit Distribution Boards

- Provide a final circuit distribution board within the Mayford Estate heat network plantroom.
- Provide a final circuit distribution board within the Mayford Estate water services plantroom Tower 1.
- Provide a final circuit distribution board within the Mayford Estate water services plantroom Tower 2.
- Provide all protective devices, accessories, blanking plates, locks, traffolyte labels, etc.
- Incoming device to distribution board to be 4 Pole, fully rated to distribution board busbar rating.
- Allow a minimum of 2 spare ways or 25% spare ways capacity (as % of total number of ways the board can hold), whichever is the larger, in outgoing ways from the distribution board.
- Allow for dedicated circuits to local controls outstations and mechanical equipment, e.g. pump sets. The electrical contractor is to liaise with the mechanical contractor to obtain plant electrical requirements.
- Distribution board is to be 3-phase.
- IP31 rating as minimum.
- Full discrimination is to be provided between higher rated devices and lower rated devices throughout as much of the installation as is reasonable and practicable to do so.

Volt Drops & Circuiting
The Low Voltage design is to allow for the following;

- Minimum of 3% volt drop available from distribution board for final circuiting.
- Maximum earth fault loop impedance at distribution board 0.35Ω.

The Electrical contractor is to;

- Ensure simultaneously accessible parts at different potentials shall not be within 2.5m of one another. All power points within 2.5m of each other to be on a common phase. Labelling to highlight an increased touch voltage will not be accepted.
- Install all final circuits so that cables can be terminated without the need for local change in cable size.

Mechanical Control Centres
Supply and install a new power Mechanical Control Centre (MCC) in the heat network plantroom. The power Mechanical Control Centre (MCC) is to be 3-phase/4 pole with form of separation to at least Form 4 Type 2. The power Mechanical Control Centre (MCC) will feed all items of mechanical plant via lockable moulded case circuit breakers (MCCB's) and (MCBs) to BS EN 60947-2. Refer to BMS/Control information.

Sub-metering
Provide electrical meters as shown on the schematics. All electrical meters are to be connected to the BMS via a Modbus connection.

Earthing & Bonding
Refer to Section Ss_70_30_25_25 Earthing, Bonding, EMC & Surge Protection.

Rubber Floor Mats
The Electrical Contractor is to supply and install insulated rubber floor safety mats adjacent to all LV switch panels. Floor mats will comply with BS 61111:2009. Floor mats to be at least 1.5m wide (or room width) and not less than switch panel length in length.

Apartment HIU and Heat Meter Installation

New mechanical equipment is to be installed within each apartment as part of the project. This includes but is not limited to:

- Heat Interface Unit (HIU)
- Heat Meter

An initial survey within one of the existing flats has found that the original consumer unit has been replaced with a modern style consumer unit. However, the contractor is to make allowance to survey all flats to establish the type and condition of all consumer units.

Existing Flat Consumer Unit – Based on Limited Survey

The initial survey found that the consumer unit has spare ways that could be used for the connection of the new mechanical supplies; however this requires conformation for each dwelling by the Contractor. If spare ways are not available a new consumer unit shall be installed with an adequate number of ways for the existing and new installations. If a new consumer unit is required the CA shall determine if any additional spare ways are required in addition to those needed for the new installation.

The new circuit requirements are;

Items Served	Heat Interface Unit – 80W, Heat Meter – <1W
Circuit Reference	HIU and Heat Meter
MCB Rating/ Type	16/C
Arc Fault Protection Device (AFDD)	Required
Cable Type	LSOH Twin and Earth Type 1.3
Cabe Size	2.5mm^2
Electrical Accessories	Dedicated Fused Connection Unit (as consumer unit manufacturer) for each HIU and Heat Meter.

Common Requirements

Cables & Containment
Refer to J6828-MXF-XX-XX-SH-J-43000 Cables Types and Containment Schedule.

Primary Electrical Distribution is to be Type 1.5 or 1.6 cables running in containment. Associated CPC's will generally use the cable armouring of their respective sub-main cables unless otherwise indicated; where separate CPC's are indicated the cable armour is still to be bonded.

Electrical wiring containment systems will be chosen for robustness and adaptability.

To allow for future expansion, all primary submain containment will be sized for **40% space factor and 25% spare capacity**. Generally submain cables are on tray, or fixed direct are to be spaced by a minimum of one cable diameter apart.

Secondary Distribution Cables & Containment
Final circuit cabling shall be run in containment which will run at high level and should generally be accessible to facilitate future expansion and/or rewiring.

All final circuit containment (secondary containment) is to be designed by the Electrical Subcontractor with **40% fill and at completion be no more than 60% full**. An allowance has been made within the design for coordination purposes; the contractor is to review this at the earliest opportunity to provide comment. Provide containment for all electrical systems, including but not limited to:

- LV distribution
- LV lighting power and associated control
- Emergency lighting power
- Access Control Systems
- Security System
- Fire Alarm system
- Earthing & Bonding
- BMS

Provide separate trunking for Submains, LV Distribution, Fire Alarm and controls cabling.

Cables of Fire Resisting Construction
Fire rated cable shall consist of armoured multicore cables of fire resisting construction running in covered trunking, services risers or services ducts.

Power Supplies for Specialist Systems:
Provide dedicated power supplies for all specialist systems, including but not limited to those listed below:

- Fused connection units for fan coil units/heaters
- Ventilation System Fans. Fused connection units for local supply/extract fans
- Access Control Systems
- Fire Alarm system
- BMS

PVC sheathed cables and flat twin and earth cable are not acceptable.

All cables to be BASEC approved and CLEARLY Marked.

The Contractor shall remove and replace any cables found not compliant with the cables specified in the cable schedule not displaying the BASEC marking or not LPCB compliant at the MEP Contractors own cost, including any incurred costs from attendances by others and making good of affected building fabric, structures, client fit out items and the like.

Cables Buried in Ducting
All cables which run below areas of hard landscaping are to be installed in ducting. The ducting type, depth, route, bedding and backfilling requirements to be as indicated on the drawings. Generally, ducts will comprise of RIGIDUCT polyethylene ducts from Polypipe.

Underground low voltage cables must be installed deep enough. For this project all cabling will be installed in accordance with NJUG guidance.

Service/ Utility	**NJUG Guidance** **Recommended minimum depths from surface level to the crown of the apparatus**			
	Footpaths mm	Carriageway mm	Grassed Areas mm	Planting Areas mm
HV Electricity Cable	450-1200	750-1200	750-1200	1200
LV Electricity Cable	450	600	450	No specific NJUG requirement. 750mm
Telecoms Cable	250 - 350	450-600	350	No specific NJUG requirement 750mm

Cables are to be installed in a trench prepared by the Contractor. The bottom of the trench should be free from stones and a bedding of sand installed onto which the cable duct is levelled and laid. The duct is then to be surrounded and then backfilled with sand to give a compacted cover of not less than 150mm thickness above

the crown of the duct. Only then should the tiles or plastic marking tape be placed centrally over the ducts. The tiles or tape should be laid such that future excavation work will expose it.

The next layer of backfill should be placed manually and compacted with hand tools until a thickness of 150mm over the tiles or marker tape has been reached. The remaining back filling and compacting can be undertaken using mechanical equipment but consolidation should be obtained by compaction in layers of no greater than 150mm thickness.

Agree all bedding and backfill with the Structural / Civil Engineer prior to commencing works.

It is essential that required duct spacings (250mm) are maintained when there is more than one duct running in the same trench.

The trench may only be backfilled by the Contractor provided the following inspections and checks have been made:

- the ducting has a satisfactory bedding
- the spacing is correct where there is more than one cable in the trench
- warning tiles or tape are installed above the duct
- draw ropes have been installed and are free to move
- the duct is not blocked

Back-fill materials should not include items likely to damage the cable such as large pieces of rock, rubble or hardcore.

All marking tapes to be yellow with a black legend.

Cables Buried Direct in the Ground
All cables which run below areas of soft landscaping shall be installed directly in the ground. The depth, route, bedding and backfilling requirements to be as indicated on the drawings.

Underground low voltage cables must be installed deep enough. For this project all cabling will be installed in accordance with NJUG guidance.

Cables are to be installed in a trench prepared by the Contractor. The bottom of the trench should be free from stones and a bedding of sand installed onto which the cable is laid. The duct is then to be surrounded and then backfilled with sand to give a compacted cover of not less than 100mm thickness above the crown of the cable. Only then should the tiles or plastic marking tape be placed centrally over the ducts. The tiles or tape should be laid such that future excavation work will expose it.

Soft Fine fill Material
Soft fine fill material shall be of consistent composition under all conditions of humidity and temperature and shall not contain any readily visible foreign matter such as pieces of clay or organic detritus. The material shall not contain any sharp stones or flints.

Selected sand backfill
Selected sand backfill shall be of consistent composition and shall not contain any readily visible foreign matter such as pieces of clay or organic detritus. Not less than 95% by weight of the material shall pass through a British Standard 5mm sieve. The material shall not contain any sharp stones or flints.

The dry relative density of the selected sand backfill shall not be less than 1.6 when determined in accordance with Appendix A of EATS 97-1.

The next layer of backfill should be placed manually and compacted with hand tools until a thickness of 150mm over the tiles or marker tape has been reached. The remaining back filling and compacting can be undertaken

using mechanical equipment but consolidation should be obtained by compaction in layers of no greater than 150mm thickness.

It is essential that required cable spacings are maintained when there is more than one cable running in the same trench. These spacings are indicated on the drawings.

The trench may only be backfilled by the Trade Contractor after the following inspections and checks have been made by the electrical installer and the consultant:

- the cable has a satisfactory bedding
- the spacing is correct where there is more than one cable in the trench
- cables at duct mouths are suitably protected
- pulling equipment, if used has been removed
- the cables are free from obvious damage caused by installation (e.g. damage to insulation, sheathing or 'bird caging' of the steel wire armour)
- warning tiles or tape are installed above the cable

Back-fill materials should not include items likely to damage the cable such as large pieces of rock or hardcore.

Marking tape should be yellow with a black legend.

Agree all bedding and backfill with the Structural Engineer and his Resident Engineer prior to commencing works.

Precautions in Cold Weather
To avoid damage to the insulation and/or oversheath of cables, Low Voltage cables shall be maintained above 0°C.

Fire and Acoustic Stopping of Services Penetrations

- All penetrations through walls and floors are to be fire stopped and acoustically stopped to maintain the fire/acoustic integrity of the building elements.
- Unless otherwise specified, cable penetrations for all walls are to be made with using the "Hilti" Firestop Sleeve Range.
- Refer to the fire strategy drawings for information on fire separation requirements.
- Refer to the Acousticians information for acoustic requirements.

Electromagnetic Separation
The design aims to achieve suitable electromagnetic separation and screening through the use of separate containment, screened SWA submain cabling and screened Data cabling, refer to Earthing, Bonding, EMC & Surge Protection sections for details.

Labelling and Identification
Supply and install labels to all primary LV distribution cables at their origin, destination and at regular intervals (every 12m) between in accordance with the requirements of the IEE Wiring Regulations BS7671. Label all switchgear, isolating switches and plant/equipment. Label with engraved Traffolyte labels to indicate function and reference of each respective item of plant/equipment securely fixed to all devices with not less than 2 screws and glued. All labelling must coordinate with the record drawings so that the location, function of each item of plant can be determined.

CONTROL REQUIREMENTS

No specific control requirements.

SYSTEM DRAWINGS / SCHEMATICS

- J6828-MXF-XX-ZZ-DR-P-50211 and 50212 water distribution schematics
- J6828-MXF-XX-ZZ-DR-M-15211 and 15212 district heating distribution schematic
- J6828-MXF-XX-ZZ-DR-M-15218 typical dwelling HIU and services schematic
- J6828-MXF-XX-ZZ-DR-J-30210 heat metering schematic
- J6828-MXF-ZZ-ZZ-DR-M-15101 to 15106 typical accommodation layouts

REFERENCE SPECIFICATION CLAUSES

Also see the following Reference Specification SPEC-300 clauses for further details of Workmanship, materials standards, builders work standards, testing/ commissioning, and identification:

- PR_65_70_11_00 CONDUIT AND CABLE TRUNKING
- PR_65_70_36/48_00 HV/LV CABLES AND WIRING
- PR_65_70_11_00 SUPPORT COMPONENTS - CABLES
- PR_60_70_48_00 LV SWITCHGEAR AND DISTRIBUTION BOARDS
- PR_70_70_48_00 LUMINAIRES AND LAMPS
- PR_65_72_00_00 ACCESSORIES FOR ELECTRICAL SERVICES
- SS_70_30_25_25 EARTHING AND BONDING OF EXTRANEOUS METAL
- AC_70_65_00_00 TESTING AND COMMISSIONING OF ELECTRICAL SERVICES
- PR_40_10_57_24 IDENTIFICATION - ELECTRICAL
- PR_20_29_00_00 FIXING TO BUILDING FABRIC
- PR_35_31_68_72 PAINTING AND ANTI-CORROSION TREATMENTS

SS_70_30_80_00 SMALL POWER SYSTEMS

PERFORMANCE OBJECTIVES

Provide everything as necessary to form a COMPLETE electrical final distribution system to:

- provide electrical accessories and small power to fixed equipment and socket outlets as required within the heat network and water plantrooms, flats and communal risers.
- provide suitable power supplies to all electrically operated mechanical plant, equipment and specialist systems in accordance with manufacturer's and specialist installer's requirements.
- achieve high standards of electromagnetic compatibility and power quality to ensure that there is no disruption to ELV installations.
- minimise system harmonics and leakage currents in phases, neutral and earth conductors.
- balance the electrical loads equally across all three phases, as far as is practicable.
- provide a safe and reliable LV power distribution system for the building, satisfying all regulations & statutory requirements.
- be safe and reliable in use.
- comply with the Design Parameters

DESIGN PARAMETERS

The electrical contractor must be an NICEIC Approved Contractor.

Industry Standards

Statutory Acts	The Building Regulations (England & Wales) The Electricity at Work Regulations 1989
Building Control / Local Authority requirements	The Building Regulations Approved Documents Non-Domestic Building Services Compliance Guide The Memorandum of guidance on the Electricity at Work Regulations 1989 (the Memorandum)
Industry standards	Chartered Institute of Building Services Engineers (CIBSE) • CIBSE K guide • CIBSE TM39: Building Energy Metering Building Services Research and Information Association (BSRIA) • BSRIA Power quality guide (AG 2/2000) • Design Checks for Electrical Services - A quality control framework for electrical engineers (BG 3/2006) Health and Safety Executive • HSG85 Electricity at work: Safe working practices

	NICEIC • Technical Guidance		
British Standards	BS 7430	2011	Code of practice for protective earthing of electrical installations
	BS 7671	2018	Requirements for Electrical Installations. IET Wiring Regulations
	BS EN 50085-1	2005	Cable trunking systems and cable ducting systems for electrical installations. General requirements +A1:2013
	BS EN 50085-2-1	2006	Cable trunking systems and cable ducting systems for electrical installations. Cable trunking systems and cable ducting systems intended for mounting on walls and ceilings+A1:2011

SYSTEM DESCRIPTION

The contractor is to design, supply, install, test, clean, commission, demonstrate and set to work a complete Low Voltage (LV) General Power Distribution systems.

All cable and equipment shall be installed in a neat and workmanlike manner. All methods of construction not specifically described or indicated in the contract documents shall be subject to the control and approval of the consultant and client. Equipment and materials shall be of the quality and manufacture indicated.

The installers shall adhere to all Manufacturers', IET guidance and regulatory recommended installation practices when installing cabling and equipment unless specified otherwise by the authority having jurisdiction.

The general small power installation is to include:

- Socket outlets within the heat network plantroom for all temporary/portable/non-fixed electrical appliances and needs, including small power, cleaning requirements, maintenance etc. Circuits serving socket outlets are to be run as radial circuits.

- Socket outlets within the water services plantroom, Tower 1 for all temporary/portable/non-fixed electrical appliances and needs, including small power, cleaning requirements, maintenance etc. Circuits serving socket outlets are to be run as radial circuits.

- Socket outlets within the water services plantroom, Tower 2 for all temporary/portable/non-fixed electrical appliances and needs, including small power, cleaning requirements, maintenance etc. Circuits serving socket outlets are to be run as radial circuits.

- Fused connection units within flats and communal risers for heat interface units and heat meters.

- Small power to all equipment as required in connection with the specialist systems within the building as described within this information, including the fire alarm, communications and controls systems etc.

- Power to all items of plant and equipment that are not powered by mechanical control panels.

- All necessary containment systems, including conduit, trunking, flexible conduit, back boxes, etc.

Refer to specification section LV Distribution for general electrical distribution and infrastructure requirements.

General Electrical Accessories – heat network plantroom and risers
Generally electrical accessories are to be:

- Surface mounted metal-clad accessories

General Electrical Accessories – Flats
Generally electrical accessories are to be:

- Flush mounted Logic Plus accessories

Secondary Distribution Cables & Containment
Refer to J6828-MXF-XX-XX-SH-E-43000 Schedule of Cables and Containment

Final circuit cabling shall be run in containment which will generally run at high level and should generally be accessible to facilitate future expansion and/or rewiring.

Final small power and lighting circuits within:

- **Heat network plantroom, water services plantroom Tower 1, water services plantroom Tower 2 and Risers** – Type 1.1 (Singles) within conduit or trunking
- **Flats** – Type 1.3 (Twin and Earth) within wall build up or trunking

All final circuit containment (secondary containment) is to be designed by the contractor with **40% fill and at completion be no more than 60% full**. An allowance has been made within the design for coordination purposes; the contractor is to review this at the earliest opportunity to provide comment. Provide containment for all electrical systems, including but not limited to:

- LV Distribution
- LV Lighting Power and Associated Control
- Emergency Lighting Power
- Fire Alarm System
- Earthing & Bonding
- BMS

Provide separate containment for Submains, LV Distribution, Fire Alarm and Controls containment.

Refer to J6828-MXF-XX-XX-SH-E-22001 Schedule of Cables and Containment.

Fire and Acoustic Stopping of Services Penetrations

- All penetrations through walls and floors are to be fire stopped and acoustically stopped to maintain the fire/acoustic integrity of the building elements.
- Unless otherwise specified, cable penetrations for all walls are to be made with using the “Hilti” Firestop Sleeve Range.
- Refer to the fire strategy drawings for information on fire separation requirements.
- Refer to the Acousticians information for acoustic requirements.

CONTROL REQUIREMENTS

Circuit Protection
Automatic disconnection times and discrimination are to be in accordance with the 18th edition of the IEE wiring regulations. Circuits protected with an RCD or RCBO MUST conform to the same earth fault loop requirements as a corresponding device with no RCD/RCBO. All circuits must be protected by the over current characteristic under earth fault conditions. High earth fault loop impedances on circuits protected by RCD/ RCBO's are not acceptable.

SYSTEM DRAWINGS / SCHEMATICS

- J6828-MXF-XX-ZZ-DR-P-50211 and 50212 water distribution schematics
- J6828-MXF-XX-ZZ-DR-M-15211 and 15212 district heating distribution schematic
- J6828-MXF-XX-ZZ-DR-M-15218 typical dwelling HIU and services schematic
- J6828-MXF-XX-ZZ-DR-J-30210 heat metering schematic
- J6828-MXF-ZZ-ZZ-DR-M-15101 to 15106 typical accommodation layouts

REFERENCE SPECIFICATION CLAUSES

Also see the following Reference Specification SPEC-300 clauses for further details of Workmanship, materials standards, builders work standards, testing/commissioning, and identification:

- PR_65_70_11_00 CONDUIT AND CABLE TRUNKING
- PR_65_70_36/48_00 HV/LV CABLES AND WIRING
- PR_65_70_11_00 SUPPORT COMPONENTS - CABLES
- PR_60_70_48_00 LV SWITCHGEAR AND DISTRIBUTION BOARDS
- PR_75_51_52_00 CONTACTORS AND STARTERS
- PR_65_72_00_00 ACCESSORIES FOR ELECTRICAL SERVICES
- SS_70_30_25_25 EARTHING AND BONDING OF EXTRANEOUS METAL
- AC_70_65_00_00 TESTING AND COMMISSIONING OF ELECTRICAL SERVICES
- PR_40_10_57_24 IDENTIFICATION - ELECTRICAL
- PR_20_29_00_00 FIXING TO BUILDING FABRIC
- PR_35_31_68_72 PAINTING AND ANTI-CORROSION TREATMENTS

SS_70_80_33_00 GENERAL AND EMERGENCY LIGHTING

PERFORMANCE OBJECTIVES

Provide everything as necessary to form a COMPLETE internal lighting system to:

- Provide artificial lighting for functional (general) and security purposes, achieving the light levels and uniformity specified to the Mayford Estate heat network plantroom, water services plantroom Tower 1, water services plantroom Tower 2 and the roof areas which facilitate pipework distribution.
- Provide artificial lighting for functional (general) purposes, achieving the Colour Temperature (K) specified.
- Ensure all lighting control gear and luminaires are compatible with all lighting control equipment
- Ensure the installed lighting has an average e initial (100 hour) lamp plus ballast efficacy (lamp lumens per circuit-Watt) not less than that required for the building or system type by the Building Regulations Approved Document L2A.

Provide a complete emergency lighting system to:

- Provide emergency escape lighting to assist the safe evacuation of the building in the event of a general or local circuit mains power failure, evacuation or fire alarm, achieving the light levels and uniformity in line with the relevant British Standards
- Be energy efficient in operation
- Provide a logical and intuitive means of control and testing
- Be safe, reliable and efficient in operation.
- Enable safe ongoing inspection and maintenance

DESIGN PARAMETERS

The electrical contractor must be an NICEIC Approved Contractor.

Statutory Acts	The Building Regulations (England & Wales) The Electricity at Work Regulations 1989 (EAW Regulations)
Building Control / Local Authority requirements	The Building Regulations Approved Documents Part M 2015 (Access to and use of buildings: Volume 2 Buildings other than dwellings Part L2A 2013 Conservation of fuel and power in new buildings other than dwellings Non-Domestic Building Services Compliance Guide
Industry standards	Chartered Institute of Building Services Engineers (CIBSE) CIBSE Guide F: Energy Efficiency in Buildings CIBSE Guide K: Electricity in Buildings CIBSE Commissioning Code L: Lighting CIBSE Lighting Guide 6 SLL Lighting Guides

	SLL Code for Lighting TM39 Building Energy Metering		
	ICEL 1004		
	ICEL 1009		
	Building Services Research and Information Association (BSRIA)		
	Design Checks for Electrical Services (BG3/2006) BSRIA Power Quality Guide (AG2/2000)		
	NIC/EIC		
	Technical Guidance		
British Standards	BS 7671	2018	Requirements for Electrical Installations. IET Wiring Regulations
	BS EN 60598-1	2015+A 1:2018	Luminaires. General requirements and tests
	BS 5266-1	2016	Code of practice for emergency lighting for premises
	BS EN 1838	2013	Lighting applications - Emergency lighting
	BS EN 60598-2-22	2014	Luminaires - Particular requirements - Luminaires for emergency lighting
	BS EN 50171	2001	Central Power Control Systems
	EN 62034	2012	Automated test systems for battery powered emergency escape lighting (IEC 62034)

SYSTEM DESCRIPTION

The contractor is to design, supply and install new general-use lighting systems comprising controls and light fittings to the Mayford Estate heat network plantroom, water services plantroom Tower 1 water services plantroom Tower 2 and the roofs used for the distribution of heating and water pipework, including luminaries, switching, cabling, contactors, controls, containment and anything else necessary to provide a full and complete installation in line with the specification.

The Contractor shall survey the existing roof lighting and determine if it is sufficient for night-time access and maintenance. If it is not a new lighting installation shall be designed and installed suitable for night-time access and maintenance of roof mounted services.

All cable and equipment shall be installed in a neat and workmanlike manner. All methods of construction not specifically described or indicated in the contract documents shall be subject to the control and approval of the consultant and client. Equipment and materials shall be of the quality and manufacture indicated.

The installers shall adhere to all Manufacturers', IET guidance and regulatory recommended installation practices when installing cabling and equipment unless specified otherwise by the authority having jurisdiction.

Ensure that all products are registered for manufacturers' guarantees and take responsibility for ensuring that faulty lights are replaced for the guaranteed life of the product.

All room control devices are to be robust, and samples of each device are to be provided for approval.

Provide sufficient spare fittings to ensure that the client can quickly replace any damaged lights without needing to wait for new orders – numbers are shown on the schedule.

Lighting shall be provided by high efficiency LED sources.

Design Requirements

Space	Average Lux Level on the working plane (lux) *	Max Glare Index	Minimum Local Uniformity** / Minimum Room Uniformity****	Min Colour Rendering	General Control
all plantrooms	200	25	0.4/0.4 (circulation space only)	60	Local ON/OFF switch. No central override off (for safety reasons)

* 'Average illuminance' is defined in the CIBSE code for lighting as: 'Illuminance averaged over the specified area' This is derived from an average of the Illuminance at a representative number of points on a calculation plan.
**Local Uniformity is defined as the minimum lux level divided by the average lux level over the 'task and immediate surrounding area'.
*** Measured 100mm above finished floor level
**** Room Uniformity is defined as the minimum lux level divided by the average lux level over the floor plate.

Lights to be installed aligned and level, all luminaires are to be cleaned prior to handover. Dirty fittings, lamps and reflectors will not be accepted, including dirty or greasy finger/hand prints.

Secondary Distribution Cables & Containment
Refer to J6828-MXF-XX-XX-SH-E-43000 Cables and Containment Schedule

Final circuit cabling shall be run in containment which will generally run at high level and should generally be accessible to facilitate future expansion and/or rewiring.

Final lighting circuits:

- Mayford Estate heat network plantroom – Type 1.1 (Singles) within conduit or trunking
- Mayford Estate water services plantroom Tower 1 – Type 1.1 (Singles) within conduit or trunking
- Mayford Estate water services plantroom Tower 2 – Type 1.1 (Singles) within conduit or trunking

Emergency Lighting
The new emergency escape lighting system is to be a maintained/non-maintained system, running at mains voltage using selected normal light fittings.

Each light fitting shall be verified and tested by the electrical sub-contractor as being compliant with the above and appropriate certification provided.

Emergency lighting is to be functionally switched with the general lighting within the same area, with automatic operation on circuit failure. Provide local test key switches adjacent to local light switch.

Emergency lighting shall be self-contained combined emergency fittings used as part of the normal lighting scheme with automatic changeover (on failure of the main supply) with integral battery packs.

All emergency lighting and battery capacities shall be sized for a period of operation in emergency mode not less than 3 hours.

Earthing & Bonding
All final circuits serving light fittings to comply with the requirements of HIGH INTEGRITY EARTHING. This will require the provision of an additional full size CPC to final lighting circuits and/or earth continuity assurance of all metal containment (metal conduit) to be adequate as a CPC. The contractor shall supply and install additional/secondary CPC's to all lighting circuits.

Plastic conduits must not be used.

Refer to Earthing and Bonding Section.

CONTROL REQUIREMENTS

Plantrooms
Plantroom are to be manually switched this is to allow for higher risk tasks to be carried out and lights fixed on in a controlled way.

SYSTEM DRAWINGS / SCHEMATICS

- J6828-MXF-ZZ-ZZ-DR-P-50131 proposed water distribution layout
- J6828-MXF-ZZ-ZZ-DR-M-15131 proposed heat network layout

REFERENCE SPECIFICATION CLAUSES

Also see the following Reference Specification SPEC-300 clauses for further details of Workmanship, materials standards, builders work standards, testing/ commissioning, and identification:

- PR_65_70_11_00 CONDUIT AND CABLE TRUNKING
- PR_65_70_36/48_00 HV/LV CABLES AND WIRING
- PR_65_70_11_00 SUPPORT COMPONENTS - CABLES
- PR_60_70_48_00 LV SWITCHGEAR AND DISTRIBUTION BOARDS
- PR_75_51_52_00 CONTACTORS AND STARTERS
- PR_70_70_48_00 LUMINAIRES AND LAMPS
- SS_70_30_25_25 EARTHING AND BONDING OF EXTRANEOUS METAL
- AC_70_65_00_00 TESTING AND COMMISSIONING OF ELECTRICAL SERVICES
- PR_40_10_57_24 IDENTIFICATION - ELECTRICAL
- PR_20_29_00_00 FIXING TO BUILDING FABRIC
- PR_35_31_68_72 PAINTING AND ANTI-CORROSION TREATMENTS

SS_75_50_28_29 FIRE DETECTION AND ALARM

PERFORMANCE OBJECTIVES

Provide everything as necessary to form COMPLETE systems to;

- Provide an automatic fire detection and alarm system throughout the Mayford Estate plantrooms (heat network, water) and distribution roofs in accordance with the project fire strategy
- automatically notify an Alarm Receiving Centre (ARC) in the event of a confirmed alarm via a REDCARE complete line (24-hour continuously monitored)
- be accurate, reliable and minimise the likelihood of false alarms as far as practicable
- provide 24/7 monitoring
- be extendable
- operate reliably and without interruption under mains power failure conditions
- minimise EMC interference between LV and ELV/audio-comms. installations
- be safe, reliable and efficient in operation
- enable safe ongoing inspection and maintenance
- comply with all statutory requirements and design criteria

DESIGN PARAMETERS

The electrical contractor must be an NICEIC Approved Contractor

Industry Standards

Statutory Acts	The Building Regulations (England & Wales)
	The Electricity at Work Regulations 1989
	Health and Safety at Work Act 1974
Building Control / Local Authority requirements	The Building Regulations Approved Documents (latest version)
	NHBC Requirements
Industry standards	Chartered Institute of Building Services Engineers (CIBSE)
	CIBSE K guide E
	Building Services Research and Information Association (BSRIA)
	BSRIA Power quality guide (AG 2/2000)
	Design Checks for Electrical Services - A quality control framework for electrical engineers (BG 3/2006)
	Health and Safety Executive
	HSG85 Electricity at work: Safe working practices
	NICEIC
	Technical Guidance

British Standards	BS7671	2018	The IET Wiring Regulations 18th Edition
	BS 5839-1	2017	Fire detection and fire alarm systems for buildings - Code of practice for the design, installation, commissioning and maintenance of systems in non-domestic premises
	BS9999	2017	Code of practice for fire safety in the design, management and use of buildings

Project Specific

Fire Strategy	Maiden Lane Fire Strategy
Fire Brigade	London Fire Brigade

SYSTEM DESCRIPTION

The Contractor shall survey the existing installation to determine the works required to ensure adequate fire detection and alarm in the plant areas included in these works (heat network plantroom, Tower 1 water services plantroom, Tower 2 water services plantroom, roofs supporting services distribution). The roofs shall have relayed fire alarm sounders to alert maintenance people to the requirement to evacuate the roof should there be a fire.

Design supply, install, test, clean, commission, demonstrate and set to work complete Fire Detection and Alarm system, for the Mayford Estate heat network plantroom, water services plantrooms and roof distribution areas as an extension to the existing fire alarm system.

Provide all equipment, components, devices, hardware, software, programming, cabling, electrical accessories, fixings, fittings, components, ancillary equipment, accessories, sundries etc. as necessary to form a COMPLETE system.

The automatic alarm and detection system shall be in accordance with BS5839, the following categories will apply to the following areas;

- Mayford Estate heat network plantroom – L1 (BS5839-1) (Confirm with the Fire Engineer)
- Mayford Estate Tower 1 water services plantroom – L1
- Mayford Estate Tower 2 water services plantroom – L1

An open protocol, fully addressable and programmable fire alarm and detection system shall be provided.

The fire alarm panel must provide full fire alarm features.

The system is to be monitored remotely by an alarm receiving centre who will contact the development manager should a fire alarm be activated.

Contractor to Appoint a Specialist
The contractor is to appoint a fire detection and alarm specialist to design, install, test, commission and set to work a complete fire detection and alarm system.

Fire Control Panels
The fire control panel is to be open protocol, fully addressable and programmable and certified to EN54 parts 2 & 4. The fire alarm panel is to include a backlit LCD display, keypad, batteries and charger, LED indicators for each zone, digital communicator and will have full display and control functions.

All necessary network cards and accessories are to be provided to connect the new fire alarm panel to the existing panels to form an integrated system.

The layout of control panels shall be arranged so that fire alarm controls cannot be confused with other controls.

The system is to be microprocessor based to give full monitoring of individual alarm devices and the interconnecting cabling.

The fire detection and alarm system is to be capable of being tested without actuating or shutting down ancillary plant including mechanical plant, gas valves and lifts. Provide a switch adjacent to the main fire alarm panels to enable this.

As control software is used the fire alarm sub-contractor must guarantee the continued software support for the expected life of the system or a minimum of 25 years.

The system must be capable of programming individual devices regardless of its physical position located on a loop into various fire detection zones.

Batteries and Chargers
24 volt batteries and chargers (to be compatible with the proposed fire alarm panels) are to be provided for all active equipment to maintain autonomous operation of the entire system in the event of a mains power failure.

Batteries can be in separate cubicles or as a part of a system control panels, with easy access for maintenance.

The battery will consist of sealed for life lead acid cells of sufficient capacity to maintain the system in full quiescent operation for a period of 24hrs and thereafter operate the system continuously in alarm mode for a period of half an hour.

The battery pack will take up the load immediately on mains power supply failure.

The battery pack will be constructed such that no potentially explosive gases are produced and given off to the atmosphere.

All items must be to the approved to EN54 part 4

Cables and Containment
Refer to J6749-MXF-XX-XX-SH-E-22001 Schedule of Cables and Containment

All services must be installed in a workmanlike manner in accordance with best practice and routed where possible in concealed voids, risers and service areas. Exposed services must be routed in defined zones and co-ordinated with the structure and with each other to provide a neat and clean appearance.

Cabling will generally run at high level in the plantrooms within surface mounted galvanised steel (GS) conduit.

The installation will be wired in;

- Type 2.3 Prysmian FP200 GOLD

with any interconnecting rings between master panels wired in;

- Type 2.4 Prysmian FP PLUS.

The fire rated cable system will include cable ties, tray, trunking, terminations, etc. and must maintain the same integrity as the cable. Spine containment is in GS cable trunking and tray. Cables must be clipped to GS tray with stainless steel clips or run in GS conduit. Cables must not be laid unprotected in floor voids. Nylon cable ties must not be used in any part of the installation.

Each wiring leg will be number identified to coordinate with the final installation drawings. The system wiring/loop arrangement will suit the building layout and use. Where interface connections are required to a third party the fire alarm sub-contractor will provide and terminate the necessary cabling links between interface units and volt free relay contacts of third party equipment.

Fire Detection/ indication devices
The fire detection and alarm system will comprise control and indicating equipment, detectors, manual call points, interface modules, sounders, visual alarm devices, evacuation lamps and all other associated equipment/devices to provide a complete system to the relevant Standards listed.

Automatic Fire and Smoke Detection provision will generally be as follows:

- Heat detectors with visual alarm device and sounders to be installed throughout the Mayford Estate heat network plantroom.
- Flashing visual alarm devices and high output sounders are to be used in the Mayford Estate plantrooms (heat network and water plantrooms) and other areas of high ambient noise.
- Manual call points with integral response indicators shall be located on escape routes and all storey exits and all exits to open air.

Manufacturer's identification on point detectors will not be permitted.

Break Glass Manual Call Points
Manual call points will be of the double alarm break-glass release type to EN54 Part 11 with a facility to operate the alarm for test or practice purposes without breaking the glass. Each break glass is to have transparent tamper cover and integral (LED) response indicator. Manual call points should be flush mounted, where possible. Each call point shall be coloured red and clearly labelled "FIRE BREAK GLASS". The call point must be able to isolate short circuits on the detection line bus to avoid system disruption.

Manufacturer's identification on call points **will not** be permitted.

Visual Alarm Device
The visual alarm units are to be addressable (loop powered) combined sounder beacon, complete with red lens. Alarm sounder beacon with 11 selectable tonalities, 2 activation levels programmable with sound intensity up to 103 dBA at 1m, adjustable on 3 levels.

Manufacturer's identification on visual alarms **will not** be permitted.

Addressable Interface Units
All interfaces and control systems will be compatible without the need for modifications or additional controls equipment. The interface units will be addressable and loop-mounted on the fire detection & alarm system. All interface units will be powered from the detection address loop.

If a third party device is not loop powered or cannot switch the desired load required, the fire alarm sub-contractor must provide a 24V power supply unit (PSU) with associated standby batteries and will provide all associated interface units to allow for full PSU/Battery monitoring at the control panel in accordance with BS 5839.

The interface unit will include full fault monitoring of all input/output circuits and the power supply status.

All interface units must incorporate a minimum of either 4 inputs or 4 outputs or a combination of both and capable of switching both 24Vdc and 230Vac.

Provide Fire Alarm Interfaces (FAI) to equipment and systems as required by BS 5839 and BS9991 BS 9999 and as identified on the layout drawings or elsewhere in this specification, including but not limited to:

- Mechanical Plant Systems Generally
- Emergency Gas Shut Off Systems
- Smoke And Fire Damper Control Panels
- Access Control Systems
- Door Hold-Open Devices
- Security System

Interfaces with BMS System
The fire alarm sub-contractor will be responsible for providing interface units between the fire detection and alarm system and the Building Management System.

The Fire Alarm Contractor will install a fire detection and alarm system which:

- sends control outputs from the fire alarm to signal the BMS control systems to shut down all general ventilation plant and mechanical plant when the control logic requires. All fire alarm connections to plant must actively kill the power to plant not just send a control signal.
- on reset of the fire alarm system, sends a control output to the BMS control system to reset at the same time.

It is the responsibility of the BMS Control Systems Contractor to provide a BMS control system which:

- provides fault status information from the BMS control system to the fire detection & alarm system. As a minimum, the following fault status information will be provided: system healthy, mains failure, battery failure, and actuator failure and circuit fault.
- respond to control inputs from the fire alarm system and provide status indication status of each system to the fire alarm system.
- All fire alarm connections to plant must actively kill the power to plant not just send a control signal.

The BMS Control Systems Contractor shall allow for external mounting to his panel (control side) any Fire Alarm interface units for ease of wiring between systems.

Unless otherwise indicated the BMS Control Systems Contractor are responsible for the supply, installation, termination and testing of the wiring tails from the interface units to the BMS Control Systems. All wiring between the interface units and the fire detection and alarm system is to be provided by the Fire Alarm Contractor

The BMS Control Systems Contractor is to confirm the number and location of interface units required from the fire alarm system.

Interfaces with Access Control
Any security doors forming part of the means of escape route should be linked with the smoke detection system to disengage the door.

The fire alarm sub-contractor will be responsible for providing interface units between the fire detection and alarm system and the Access Control System.

The Fire Alarm Contractor will install a fire detection and alarm system which:

- sends control outputs from the fire alarm to signal the access control systems to unlock doors
- on reset of the fire alarm system, sends a control output to the access control system to reset at the same time

Unless otherwise indicated the Access Control Systems Contractor is responsible for the supply, installation, termination and testing of the wiring tails from the interface units to the Access Control Systems.

All detector and alarm circuits shall be monitored.

All fire alarm devices shall be double-circuited and wired on a zoned basis.

System shall be zoned according to the layout drawings, with multiple device loops provided for both redundancy and capacity.

A common interface shall be provided to monitor each of the systems in a seamless and fully integrated manner, allowing zones to be alarmed, disabled and modified for all buildings from a single Graphic User Interface (GUI), operating at network level such that multiple user workstations may be licensed to make changes to the access permissions of the system.

Installation & Workmanship
Provide installation drawings as required by the Max Fordham LLP preliminaries specification. Refer also to the reference specification clauses.

CONTROL REQUIREMENTS

The fire detection and alarm specialist is to develop the cause and effect matrix s part of his design. This is to be submitted to the fire engineer for review during the design process.

The cause and effect within the fire alarm system should be programmable so that the client can develop and modify this to reflect the diverse usage anticipated for the building.

Fire zonal diagrams are to be provided adjacent to the main control panel clearly indicating the agreed zoning strategy for the building. The zoning strategy is to be developed by the fire alarm sub-contractor as part of the detailed design of the system. The fire alarm sub-contractor is to provide power supplies and interfaces required in order to provide a fully operational system in accordance with the Fire Strategy.

REFERENCE SPECIFICATION CLAUSES

Also see the following Reference Specification SPEC-300 clauses for further details of Workmanship, materials standards, builders work standards, testing/ commissioning, and identification:

- PR_65_70_11_00 CONDUIT AND CABLE TRUNKING
- PR_65_70_36/48_00 HV/LV CABLES AND WIRING
- PR_65_70_11_00 SUPPORT COMPONENTS - CABLES
- PR_75_51_52_00 CONTACTORS AND STARTERS
- AC_70_65_00_00 TESTING AND COMMISSIONING OF ELECTRICAL SERVICES
- PR_40_10_57_24 IDENTIFICATION - ELECTRICAL
- PR_20_29_00_00 FIXING TO BUILDING FABRIC
- PR_35_31_68_72 PAINTING AND ANTI-CORROSION TREATMENTS

SS_75_70_54_10 CENTRAL CONTROL/BUILDING MANAGEMENT

PERFORMANCE OBJECTIVES

The Contractor is to appoint a specialist to design, select equipment/devices, supply, install and commission a fully integrated and operational controls system.

To provide a fully automatic controls system (referred to in the specification as a BMS) to control the complete heat network and water services plant rooms and their associated internal, external and distribution plant and equipment. The control system is inclusive of control panels, control wiring, indicator panels, hardware and software engineering, including the power wiring to outstations and interface boxes, along with all power wiring from the control points to the equipment served.

The term 'controls' includes flow and pressure switches, relays, interlocks and control wiring.

The controls system shall automatically operate the LTHW system plant and the associated equipment within the heat net to a safe and the most energy efficient manner.

The controls shall include all the necessary safety interlocks to allow the central plant to operate.

The controls package shall include a head end user interface with all the necessary graphics (PC and printer) along with a remote web-based system which will allow system parameter adjustment and monitoring.

The controls package shall include remote metering and logging of energy consumptions to all the central plant include, water consumption, gas consumption, electricity consumption, along with heat production.

The monitoring system shall be capable of producing automatic graphs and data analysis of the following from all central and standalone plant:

- Energy use
- Heat production
- Plant operation
- Plant faults and alarms
- Maintenance regimes and logging
- System set points
- System temperatures and pressures

A new master BMS head end Trend IQvision control panel running on a new computer (Contractor supplied to Client's specification) shall be located on a desk (Client free issue) in the heat network plantroom. This control panel will serve the heat network plantroom and the two water services plantrooms.

DESIGN PARAMETERS

Industry Standards

Statutory Acts	The Building Regulations
	The Electricity at Work Regulations 1989

Industry standards	Chartered Institute of Building Services Engineers (CIBSE) • CIBSE F guide • CIBSE H guide • CIBSE K guide • CIBSE M guide • Commissioning Code C: Automatic Controls • TM39: Building Energy Metering • KS04: Understanding Controls Building Services Research and Information Association (BSRIA) • KS04: Understanding Controls Building control and indoor environmental quality - a best practice guide (TN 9/98) • Library of System Control Strategies (AG7/98) • Effective BMS – A guide to improving system performance (AG10/2001)		
British Standards	BS 7671	2008	Requirements for Electrical Installations. IET Wiring Regulations
	BS 9999	2017	Fire safety in the design, management and use of buildings. Code of practice
	BS EN 13321-1	2012	Open data communication in building automation, controls and building management. Home and building electronic system. Product and system requirements
	BS EN 13321-2	2012	Open Data Communication in Building Automation, Controls and Building Management. Home and Building Electronic Systems. KNXnet/IP Communication

GENERAL DUTIES

The Contractor is to design, supply, install, test and commission the new installation in line with the intent described in this specification, drawings, schematics and schedules. All design responsibility for the correct operation and compliance with the performance objectives and design parameters within the specification rest with the contractor. Within this work section the installation requires existing system modifications/recommissioning, the Contractor shall allow for this to make a complete working system.

Any information relating to the size and duty of equipment that has been included within the tender information, has been included to indicate the assumptions used to establish the space requirements and distribution routes, and should not be relied upon for the purposes of the Contractor's design. Refer to section 4 of SPEC-200 for further information.

The Contractor is responsible for all operation and maintenance of all systems for 24 months following practical completion; refer to the Max Fordham Spec 200 for further information.

Any information relating to the size and duty of equipment that has been included within the tender information, has been included to indicate the assumptions used to establish the space requirements and distribution routes, and should not be relied upon for the purposes of the Contractor's design.

Refer to Max Fordham Spec 200 Section 9.1 for design and coordination drawing responsibilities, in addition to

those required in Section 4.

The Contractor responsible for the works in this MEP employer's requirements specification is responsible for the design and coordination of the builderswork associated with the systems specified. Provide all builderswork information in relation the systems in this specification, to the main contractor, in a timely manner.

SYSTEM DESCRIPTION

General

Design, install, test and commission a control system implementing control strategies in line with the intent described within the system description in this work section and within each of the individual MEP work sections described in these Employers Requirements. Coordinate the controls design with the Contractor's MEP designer.

Store hourly date stamped logs for at least a continuous 12 months running history on accessible memory. At least 100 points shall be downloadable remotely over the internet. The log shall over write the earliest recorded data when it is full.

The BMS automatic controls system shall be linked to a local LAN and shall be connected to the internet via a mobile phone carrier telecoms link to allow web-based monitoring and user adjustment from a remote location.

Provide necessary user licences and multi-user access to a user-friendly, graphics- driven display web portal to allow the Client, Facility Engineer and Consulting Engineer to monitor and adjust the BMS.

This shall include a high-speed internet connection with a fixed IP address provided to the head-end equipment. These shall be fully operational at Handover.

Provide SMS and email alarm sending based on priority level and alarm/address schedule.

Provide all necessary control field & power wiring, sensors, isolators and accessories associated with the controls system.

The BMS control system shall integrate all elements of the heating plantroom and provide information (including fault) related to the 2no. packaged water booster set onboard controls.

A plan and a schematic of the LTHW system within the heat network plantroom shall be visible on the BMS control system head end.

Control panels shall include; front rotary hand/off/auto switches for all drives, arrange for auxiliary contacts to signal to BMS when in auto position. Provide front lamps for each drive for run (green) and trip/fault (red). Provide a panel live lamp (white) and live lamps (white) for packaged plant. Lamps to be extra low voltage with integral transformers, easily replaceable. A push to make lamp test button is to be provided on each panel to illuminate all lamps on being activated.

The BMS specialist is to prepare schematic, GA layout and wiring drawings and issue these to the electrical contractor and MFP for comment at least a month before manufacturing is required to start. The mechanical contractor is to forward all details of ordered plant drives as early as possible.

For the responsibly and requirements with the BMS interface and the fire alarm systems refer to work section Ss_75_50_28_29 Fire Detection and Alarm.

BMS Control Strategy Overview

The existing controls system shall be either extended, modified or replaced in order to allow the control of the additional plant installed in the Mayford Estate heat network plantroom and monitoring of the water services plantrooms. *The Contractor shall survey the existing system and present to the Client in a BMS report costed*

options for either extending, modifying or replacing it so that it performs as described in this specification, with a risk analysis of the options.

The BMS shall continue to monitor and report the existing plant connected to the existing mechanical control panels located in the heat network plantroom.

A new mechanical control panel will be provided with a Trend web based system with Trend IQVISION and control all new plant.

The existing BMS control system shall be extended and modified to control and monitor and alarm the following new mechanical control panel.

The following systems within the heat network plantroom shall be controlled by the new mechanical control panel.

- Pressurisation unit
- Control valves
- Pumps

The electrical works required with these modifications are described in work section Ss_70_30_45_45 LV Distribution.

CONTROL REQUIREMENTS

Thermal energy is to be distributed to the whole Mayford Estate from the heat network plantroom. The main heat interface assets will consist of the following:

2no. 1467 kW plate heat exchangers

During the works 1no. plate heat exchanger and associated plant and pipework is required to continue to operate in parallel with the new system. Depending on the Client's decision to either extend, modify or replace the existing and system following the Contractor's BMS report the Estate's parallel heat networks shall either:

- be controlled by two separate systems during the works so that a new and old systems run independently, then the old system decommissioned;
- be controlled by the extended or modified system during the works, then the original system decommissioned.

Each HIU will consist of manually set temperature control valves, limiting HIU output temperatures to each individual apartment for DHW and space heating to ensure both safety and comfort. The pressure drop across the DHW heat exchanger is likely to be (0.5 barg).

The DH pumps will be controlled to maintain a set differential pressure sufficient to ensure that there is enough pressure at the farthest HIU on the system.

<u>Normal operation</u>

Performance

The heat exchangers connected to the Somers Town heat network will be the sole source of heat for the Estate. (If the Somers Town heat network fails a temporary heat source will be attached to the Estate's network.)

Distribution

The generated thermal load will be distributed via main distribution pump to the whole Estate. The heat to all the HIU's on the system will be delivered via underground pipework and above ground riser and lateral pipework.

Consequently all the HIU's receive the minimum differential pressure and temperature needed to achieve the desired loads on the secondary side. The 2-port control valves and differential pressure control valves at the HIU control the flow in the circuit according to the apartment side heating & hot water demand.

All pump controls will be monitored by the BMS. Main distribution pump set operates in a duty/assist/assist/standby arrangement (quantity of pumps shall be selected to meet performance requirements) with the minimum flow of the pump set to match the minimum building demand or 5% of the system peak load (whichever is smaller).

LTHW District Heating Pumps and Distribution Pressure and Flow

The main LTHW district heating pumps are to be duty/assist/assist/standby with speed control and changeovers based on the differential pressure readings from the circuit and on fault basis (based on pump/inverter general fault or lack of flow). Use proprietary staging and speed control matched with the pumps and inverters.

Each pump set is to be fitted with a differential pressure switch across the suction and discharge ports. Under normal operation, when the pumps are energised and water begins to flow through the pump, the DP switch will register a change in pressure and a "flow proven" signal will be generated by the BMS. If no change in pressure is sensed by the DP sensor upon energising, then the system will generate an alarm. The 'operating' pump will be disabled and the standby pump enabled by the BMS.

Fault will be indicated by;

a) Differential pressure switch not sensing a change in pressure across pump suction/discharge during operation or on timed basis during start-up and pump switch over, therefore not sensing any flow through the pump. Fault will indicate alarm and switch on the standby pump.
b) Inverter fault detected.

A pressure switch will be installed after the main distribution pump that will directly (in BMS panel) back off the main district heating pump if the pressure exceeds the pre-set value to protect the underground pipework, where the maximum allowable combined static and dynamic pressure is TBC by the Contractor.

LTHW Pump Sequencing

The LTHW circulating pumps will be controlled by differential pressure sensor located at the extremities of the system wired back to the BMS.

The differential pressure across these will be monitored and the pump speed and number of pumps operating changed to maintain a constant differential pressure.

Remote differential pressure shall reset the pump differential pressure on a periodic basis based on remote differential pressure readings in order to sustain a minimum remote differential pressure at a set point (x kPa, TBC). Refer to the heat network schematic for the location of the differential pressure sensors.

Evaluate the pressure signal received from these sensors and use the greater value to control the pump speed. Should one sensor not function of go out of range the other will be used to control the pump speed. The onboard pump controller shall fine tune the pump speed and the number of pumps in operation to achieve the most efficient pumping arrangement.

The pumps are to be interlocked (power or enable) to prevent all pumps operating at the same time.

<u>LTHW Minimum Flow</u>

Main distribution LTHW Pump Bypass

The BMS will monitor the speed of the main distribution LTHW pumps. When one pump is running and the flow rate drops below (pump min flow rate TBC by Contactor) litres per second (to be adjustable), the site demand is

less than the pump minimum flow rate, therefore the BMS will open control valve across the pumping set to ensure circulation is maintained through the pump bypass. A DPCV will ensure the pressure differential across this control valve remains consistent with the LTHW differential pressure set point so as not to cause unnecessary pump speed increase. As the site load increases and the LTHW flow and return differential pressure drops, this minimum pump flow bypass will be closed by the BMS.

Side Stream Filtration

The existing side stream filter shall be located across the main LTHW district heating pumps. A differential pressure control valve keeps the flow through the filter constant. A differential pressure sensor across the side stream filter monitors the pressure drop through it. The BMS will send a filter dirty signal when the pressure drop increases above a set level.

Close Valve Pressure

Primary LTHW pressure circuit

If at any point the system pressure at the sensor across the side stream filtration (TBC) bar (to be adjustable), representing a closed valve condition, the BMS will shut down the circulating pumps. The pumps are to be re-enabled when the pressure drops below (TBC) bar.

Pressurisation and Expansion

A pressurisation unit will be required to satisfy the main district heating distribution system. The initial filling of the LTHW circuits will be via a temporary fill connection. The maintenance of system pressures and the accommodation of system volume expansion will be done by self-controlling pressurisation system with appropriately sized expansion vessels. This unit will interlink with the BMS for enable and monitoring.

An additional pressurisation unit shall be installed as a duty/standby arrangement with an auto changeover panel.

The pressurisation unit will form part of the pressure control in terms of preventing over pressure due to fill and expansion and will also monitor and maintain the system set pressure. The LTHW pump discharge pressures will also be monitored to prevent excessive pressure in the system. All boilers are fitted with appropriately sized safety valves.

Plate heat exchanger safety features are in accordance with BS6644 & BSEN12828.

Pressurisation Unit

The unit will be sized and installed to maintain an operating pressure of around 2.5 bar (TBC) so as not to compromise the maximum pressure of the underground DH pipework.

A make-up water meter with electronic logging and automatic electronic alarm in the event of a sustained make up flow or leak.

The unit will be supplied with electronic level control; feed pumps will be duty/standby with pressure switches and electronic controller. The control will include hard wired pressure switches for alarm indication including a low pressure alarm to ensure unit is not constantly pumping water into a leaking system.

The unit will have a suitably sized expansion/control vessel to limit during normal operation pressure changes.

The pressurisation unit will be self-controlling to maintain the pressure within the system, indicating by volt free signal for fault conditions back to the BMS.

Heating Distribution Pipe Network

A leak detection system shall be installed to the new below ground pipe work and alarm as appropriate and raise alarm at the BMS.

Water Treatment

1No. vacuum degasser is to be fitted within the district heating plantroom, located on the common return of the primary LTHW circuit, prior to the plate heat exchangers. The unit will generate a fault signal output to the BMS.

1 No. dirt separator is to be fitted within the district heating plantroom, located on the common return of the primary LTHW circuit, prior to the plate heat exchangers. The unit will be of the demountable type for easy maintenance.

1No. automatic chemical dosing unit is to be fitted to automatically dose the system with corrosion inhibitor and biocide.

Cold water supply, storage and boosting (Including bin store supplies)

The new cold water storage tanks and booster pumps in Tower 1 and Tower 2 water services plant rooms shall be monitored by the BMS.

Provide temperature sensors and high and low level within the cold water storage tanks and monitor on the BMS.

Raise an alarm on high or low water level and on high temperature. Low level alarm to be hard wired to cut off to booster set.

Booster sets to include own integral control. Provide power to booster sets from separate control panels. Provide permanent live power supply from control panel with suitably rated MCB's. Control system is to provide healthy, fault and run status monitoring. Provide enabled and common fault lamps on front of BMS control panel.

Provide time schedule control. Initially set to run 24 hours.

Metering/Monitoring

The BMS shall NOT be used for energy monitoring, logging, calculations or analytics. This shall be provided by a separate meter monitoring platform and head end data storage and software. Refer to work section Ss_75_70_54_20.

Electric Meter

An electricity meter will monitor the electrical consumption of all items of plant installed from the BMS Control Panel.

Frost Protection

Provide plant and building frost protection. The BMS will monitor frost protection systems across the site for faults.

Plant Start Up

Once the system has been commissioned it will be available for operation. If the system is healthy (see monitoring below) all plant with onboard controlled will be enabled and will operate under their own controls.

Operation

Under normal operation the BMS will provide enable/fault signals to/from:

- LTHW distribution district heating pumps
- Pressurisation units

- Vacuum degasser
- Side stream filtration unit
- District heating leak detection system
- Domestic water packaged booster-sets

Under normal operation the BMS will control:

- LTHW main pump speed
- Minimum flow bypass valve

Under normal operation the BMS will rotate:

- Primary plate heat exchanger
- Ventilation fans

Under normal operation the BMS will monitor pressures and temperatures as follows at minimum:

- External ambient temperature
- Internal ambient temperature
- LTHW system primary flow temperature (Somers Town district heating incoming)
- LTHW system primary return temperature (Somers Town district heating outgoing)
- LTHW system secondary flow temperature (Mayford Estate side district heating)
- LTHW system secondary return temperature (Mayford Estate side district heating)
- Primary heating plant flow temperature
- LTHW circuits differential pressures
- LTHW pump differential pressure

Shut Down

The BMS will not shut down any systems under normal operating conditions expect controlled shutdown.

In a controlled shut down for the district heating system, the pump will be set to minimum speed and after a short delay the pump will be disabled.

All plant enabled from the BMS can by shut down manually from the panel.

BMS System Monitoring & Logging

The BMS shall automatically record data logged in the controllers on the IQ system at specified intervals (typically 15 minutes).

A twin data outlet with broadband enabled / static IP address will be installed adjacent to the BMS panel by others for remote monitoring of the BMS control panel.

Primary LTHW Temperature

The primary LTHW flow temperature is monitored by a temperature sensor prior to main distribution pumps. Should this reach a pre-set high temperature the primary heat network connection shall be shut down and an internal alarm will be generated within the controller. This will auto-reset if temperature drops.

Ambient Temperature

An outside ambient temperature sensor is to be located externally and recorded by the BMS panel.

Internal Temperatures

Internal heat network plantroom temperatures are monitored at different areas and a mean temperature will be recorded. If the temperature exceeds a set value a low priority alarm will be generated.

Static Pressure

Pressure monitoring at the neutral point will be carried out. If it this reaches a pre-set high level it will send an alarm system to the BMS.

System Pressure

System pressure monitoring will be carried out. If this reaches a pre-set high level an alarm will be sent to the BMS. Operation will resume when the pressure drops below the high-limit.

A pressure sensor across the pump will directly (in BMS panel) disable the main LTHW district heating pumps. This will indicate an alarm but not require manual reset.

Remote Monitoring

The BMS head-end is to be connected to a router to enable remote monitoring and control of the BMS. It is of paramount importance that full remote monitoring of the heat pump plant is provided, including the replication of specific fault codes.

SYSTEM DRAWINGS / SCHEMATICS

- J6828-MXF-ZZ-ZZ-DR-M-15217 Plant Room LTHW Integration Schematic
- J6828-MXF-XX-ZZ-DR-M-15211 to 15213 District Heating Distribution Schematic

REFERENCE SPECIFICATION CLAUSES

Also see the following Reference Specification SPEC-300 clauses for further details of Workmanship, materials standards, builders work standards, testing/ commissioning, and identification:

- PR_65_70_11_00 CONDUIT AND CABLE TRUNKING
- PR_65_70_36/48_00 HV/LV CABLES AND WIRING
- PR_60_70_48_06 BUSBAR TRUNKING
- PR_65_70_11_00 SUPPORT COMPONENTS - CABLES
- PR_60_70_48_00 LV SWITCHGEAR AND DISTRIBUTION BOARDS
- PR_75_51_52_00 CONTACTORS AND STARTERS
- PR_70_70_48_00 LUMINAIRES AND LAMPS
- PR_65_72_00_00 ACCESSORIES FOR ELECTRICAL SERVICES
- SS_70_30_25_25 EARTHING AND BONDING OF EXTRANEOUS METAL
- AC_70_65_00_00 TESTING AND COMMISSIONING OF ELECTRICAL SERVICES
- PR_40_10_57_24 IDENTIFICATION - ELECTRICAL
- PR_20_29_00_00 FIXING TO BUILDING FABRIC
- PR_35_31_68_72 PAINTING AND ANTI-CORROSION TREATMENTS

SS_75_70_54_20 HEAT METERING AND MONITORING

Read this section of the specification alongside the Camden Heat Metering Specification and it's appendices, "the Camden Specification". The information given here is intended to complement the Camden Specification. Additional information is contained within the Camden specification. The Camden Specification is to be complied with in full, please ensure that you have a copy of the Camden Specification issued as part of your tender pack. If not this needs to requested from the CA.

PERFORMANCE OBJECTIVES

To provide the infrastructure necessary to individually meter each dwelling's use of heat, remotely monitor the readings, automatically process the meter reading data to the Camden heat billing team in the correct format.

Additionally provide a data storage and analytics platform allowing data to be view in real time and stored for future use.

The system shall also be extended to the various heat meters installed throughout the LTHW heating systems to assist in accurately monitoring the performance of the system.

To provide controls and infrastructure which deliver consistently low return water temperatures to the heat network plantroom regardless of the time of day/year and load being served.

To provide a monitoring heat end platform that allows the monitoring of all heat meters on the network, the network KPIs and energy balances.

To provide the infrastructure to remotely monitor the electronic heat interface units (HIU) and allow parameter adjustment through a head end platform.

To provide a system that is easily commissionable and maintainable in operation.

DESIGN PARAMETERS

Camden's Heat Metering Specification Version 3, March 2019 including 4 appendices:

- Heat Network Design Supplement
- Standards for Data Cabling
- Connectivity Specification
- Data Format Specification

Industry Standards

Statutory Acts	The Building Regulations (England & Wales) Heat Network (Metering and Billing) Regulations 2014
Building Control / Local Authority requirements	The Building Regulations Approved Documents • Domestic Building Services Compliance Guide • Non-Domestic Building Services Compliance Guide
Industry standards	Chartered Institute of Building Services Engineers (CIBSE) • CP1 Heat Networks Code of Practice (CP1.2 If available)

British Standards	BS EN 1434-6	2015	Heat meters Part 6: Installation, commissioning operational monitoring and maintenance
	BS 5422	2009	Thermal insulating materials for pipes, tanks, vessels, ductwork and equipment operating within the temperature range -40°C and 700°C

Manufactures Standards

- Altecnic SATK32 HIU Installation, Operation & Maintenance Instructions
- All available relevant manufactures commissioning and setup guides.

GENERAL DUTIES

The Contractor is to design, supply, install, test and commission the new installation in line with the intent described in this specification, drawings, schematics and schedules. All design responsibility for the correct operation and compliance with the performance objectives and design parameters within the specification rest with the contractor. Within this work section the installation requires existing system modifications and new connections to existing systems, the Contractor shall allow for the isolation, draining down, connection, and refilling to make a complete working system.

Any information relating to the size and duty of equipment that has been included within the tender information, has been included to indicate the assumptions used to establish the space requirements and distribution routes, and should not be relied upon for the purposes of the Contractor's design. Refer to section 4 of SPEC-200 for further information.

The Contractor is responsible for all operation and maintenance of all systems for 24 months following practical completion; refer to the Max Fordham Spec 200 for further information.

Any information relating to the size and duty of equipment that has been included within the tender information, has been included to indicate the assumptions used to establish the space requirements and distribution routes, and should not be relied upon for the purposes of the Contractor's design.

Refer to Max Fordham Spec 200 Section 9.1 for design and coordination drawing responsibilities, in addition to those required in section 4.

The Contractor responsible for the works in this MEP employer's requirements specification is responsible for the design and coordination of the builderswork associated with the systems specified. Provide all builderswork information in relation the systems in this specification, to the main contractor, in a timely manner.

SYSTEM DESCRIPTION

The Contractor shall provide a fully automatic heat metering system connecting the dwelling level meters, network meters and central plant meters back to a cabled network with internet access facility for the remote processing and distribution of metered data.

End User (Dwelling) Heat Metering

General

The HIUs shall be factory fitted with a heat meter.

Meters shall be hard wired to the end users electricity supply (from an un-switched fuse) with battery back-up. Meters will have threaded not flanged connections. Meters shall have isolation valves on either side to facilitate

removal/replacement.

Meters shall each have 2no. MBus communication modules/ output ports (one for connection to the hardwired MBus AMR network and the other to the integral HIU control module.

The integral HIU control module shall be connected to the HIU via Modbus. The Modbus network will allow HIU settings to be checked, set and changed remotely along with fault diagnosis.

Ultrasonic Metering Station (UMS)

The UMS shall be connected to a Kamstrup 603 meter within the HIU, which can connect to two ultrasonic flow pieces and 3 temperature probes.

The second flow piece shall be installed in the heating circuit return.

The UMS flow piece shall be manufactured in brass and approved according to MID and EN1434.

The calculator shall be capable of displaying and recording all data from the second flow piece. Including, flowrate, volume and error codes.

The third temperature probe shall be PT500 and installed with a strap on device to the heating return circuit.

The calculator shall be capable of displaying and recording all data from the third temperature probe.

All data from the calculator, including the two flow pieces and three temperature probes must be able to be extracted through the MBus telegram.

Heat Network Meters

In addition to the dwelling heat meters the heat network is to be provided with an array of additional meters. Additional meters are to be provided to the 2no. heat exchangers. A heat meter is to be provided after the main circulation pumps. A heat meters shall be provided at the beginning of each main Block heat network branch.

All heat meters shall be connected to the central dataloggers in the Mayford Estate heat network plantroom in order to facilitate automatic meter reading (AMR). The connection shall be by a hardwired MBus network within each block. Connections between each block and the heat network plantroom shall be by hardwired MBus cabling set within a dedicated underground communications duct. The communications duct shall follow the route of the heat network. 1no. additional empty duct shall be provided in addition to those used for the heat network (for future use).

The MBus AMR system must not be wired in a looped / daisy-chain arrangement.

The AMR datalogger shall be connected to the heat network plantroom broadband line, to facilitate remote collection of meter reads. The MBus AMR system must facilitate the meter reading requirements defined in the Camden Specification. The contractor will set up the AMR system so that it is clear which meter reading relates to each dwelling the numbering or naming convention and will be logical and easy to follow.

During commissioning it will be possible to set the AMR to read all meters at a 1minute resolution. The AMR will have the capability to read the full range of reading available at the meter.

Data transmission shall follow known standard open protocols and records information universal .csv data files. Refer to the Camden's Heat Metering Specification Appendix: Data Format Specification.

Refer to the Camden Fairheat specification for details on the extensive requirements for metering testing, commissioning and witnessing.

Heat Meter General

The energy heat meter must be approved according EN 1434 and MID class 2 and the M-Bus module according to EN 13757-2:2005 and EN 13757-3:2013.

The calculator must include an integrated M-Bus connection, with the option for 2 additional, communication module slots.

Communication modules shall be interchangeable to flexibility post-installation (e.g. change from wired to wireless M-Bus, pulse input/output, etc.)

Both flow sensors can be detached from the calculator allowing the flow piece to be changed independently of the calculator and vice versa.

To avoid faulty pulse value settings, e.g. when changing the flow sensor, the calculator should be able to recognise the flow sensor's size automatically (Auto Detect).

Battery and mains power supply shall be interchangeable.

If battery powered the energy meter shall have 16 years battery lifetime. Communication shall not reduce battery lifetime of the meter (intervals ≥ 10 seconds).

Energy meters shall include programmable datalogging of years, months, days, hours and minutes. It must be possible to read/export logger registers from the meter.

Protection class of calculator: IP65. Protection class of flow sensor: IP68.

For wired M-Bus, the calculator and the M-Bus module must be galvanic isolated.

Shall be capable of calculating the VWART (Volume Weighted Average Return Temperature) and VWAFT (Volume Weighted Average Flow Temperature) directly from the registers on the energy meter.

The energy meter shall be able to show the VWART and VWAFT for the year and month on the calculator display.

When metering a heat source, the energy meter shall be able to calculate the COP (coefficient of performance) based on a pulse input of the energy consumed.

The heat meter shall be mounted on the HIU in a position where it can be read by the end-user without the need to open or remove the cover of the HIU.

The heat meter will be provided with two ultrasonic metering bodies.

Electronic HIU Monitoring

A Modbus network shall facilitate a communication protocol between the electronic HIU and the BMS, to allow the remote monitoring and parameter adjustment of the HIU.

The Modbus network shall be cabled to a series of Modbus repeaters and to a master Modbus modem connected to the IP network.

Energy Metering

Electric and water meters shall be connected to the BMS via a Modbus network. Refer to section Ss_75_70_54_10 for the energy metering and monitoring strategy.

Water Metering

A cumulative meter should be installed, positioned at the following points. The meters shall include an ModBus signal back to the monitoring platform.

- Mayford Estate district heating plantroom
- Both Mayford Estate water services plantrooms
- On each branch to the Mayford Estate blocks
- Each incoming water supply, located next to the utility water meter

Heat Network Monitoring

A heat network front end platform shall be provided as part of the heat metering and monitoring package. The platform shall be an internet based front end with remote login. The remote login shall be facilitated by the high-speed internet connection provided to the Mayford Estate district heating plantroom connected to the IP network.

The platform shall ultimately allow the heat network performance to be monitored and as a diagnostics tool.

The system shall collate the following data from the network:

- HIU heat meter readings (energy read, flow and return temperature, flow rate, instantaneous power, volume weighted return temperature)
- Electronic HIU (input/output to allow parameter adjustment)
- Network heat meters (power read, flow and return temperature, flow rate, instantaneous power)
- Central plant electricity meters (energy read)
- Trend BMS (energy read)

The monitoring platform must be capable of sending out fault alarms upon multiple instances such as high return temperatures from network level meters, faulty heat meters, faulty HIUs etc.

The monitoring platform is to allow an input/output gateway to the Modbus network to enable to the parameter adjustment of the electronic HIUs.

The following project KPIs shall be monitored and displayed on the front end platform, again with alerts and a traffic light alert system.

- Central plant operating efficiency
- Carbon footprint of heat network
- Carbon intensity of heat delivered
- Annual carbon intensity of heat delivered
- Flow and return deltaTs primary and network level
- Total demand
- Heat network distribution losses and efficiency
- External temperature

The monitoring platform shall be provided by VRM Technology.

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CONTROL REQUIREMENTS

Controls as section Ss_75_70_54_10 of this specification.

SYSTEM DRAWINGS / SCHEMATICS

- J6828-MXF-ZZ-ZZ-DR-M-15217 Plant Room LTHW Integration Schematic
- J6828-MXF-XX-ZZ-DR-M-15211 to 15213 District Heating Distribution Schematic
- J6828-MXF-XX-ZZ-DR-M-15218 Dwelling HIU and Services Schematic
- J6828-MXF-XX-ZZ-DR-J-30210 Heat metering schematic

TESTING & COMMISSIONING

Carry out testing and commissioning in line with SPHN-MFX-ALL-SL-SH-J-00001 – Testing and Commissioning Schedule.

APPENDIX A – MEP ENGINEERING SERVICES TENDER DOCUMENT LIST

Refer to Max Fordham document issue sheet.

APPENDIX B – CAMDEN HEATING NETWORKS DESIGN AND DELIVERY SUPPLEMENT