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PRINTWORKS

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MCALEER & RUSHE

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## TABLE OF CONTENTS

|           |                                                      |           |
|-----------|------------------------------------------------------|-----------|
| <b>1</b>  | <b>GENERAL.....</b>                                  | <b>3</b>  |
| <b>2</b>  | <b>INTRODUCTION.....</b>                             | <b>3</b>  |
| <b>3</b>  | <b>GENERAL DESIGN STANDARDS .....</b>                | <b>4</b>  |
| <b>4</b>  | <b>MECHANICAL DESIGN CRITERIA .....</b>              | <b>5</b>  |
| <b>5</b>  | <b>ABOVE GROUND DRAINAGE .....</b>                   | <b>8</b>  |
| <b>6</b>  | <b>RAINWATER DRAINAGE .....</b>                      | <b>9</b>  |
| <b>7</b>  | <b>MAINS WATER SERVICES .....</b>                    | <b>10</b> |
| <b>8</b>  | <b>BOOSTED COLD WATER SERVICES.....</b>              | <b>10</b> |
| <b>9</b>  | <b>WATER TREATMENT .....</b>                         | <b>13</b> |
| 9.1       | Potable Water .....                                  | 13        |
| 9.2       | Closed Loop Systems.....                             | 13        |
| <b>10</b> | <b>DRY RISER.....</b>                                | <b>13</b> |
| <b>11</b> | <b>HEATING AND COOLING SYSTEM DRIVERS.....</b>       | <b>14</b> |
| 11.1      | ASHPs.....                                           | 14        |
| 11.1.1    | Ancillary Equipment.....                             | 14        |
| 11.1.2    | Execution and Testing Standards.....                 | 15        |
| 11.2      | Chillers.....                                        | 15        |
| 11.2.1    | Ancillary Equipment.....                             | 15        |
| 11.2.2    | Execution and Testing Standards.....                 | 16        |
| <b>12</b> | <b>HEATING AND COOLING SYSTEM DISTRIBUTION. ....</b> | <b>16</b> |
| 12.1      | Low-Temperature Hot Water (LTHW) Heating System..... | 16        |
| 12.2      | Chilled Water (CHW) Cooling System .....             | 17        |
| <b>13</b> | <b>VENTILATION SYSTEMS .....</b>                     | <b>18</b> |
| 13.1      | Dwelling Ventilation .....                           | 19        |
| 13.2      | Non-Domestic Ventilation .....                       | 20        |
| 13.3      | Laundry room ventilation .....                       | 20        |
| <b>14</b> | <b>BMS .....</b>                                     | <b>21</b> |
| <b>15</b> | <b>SPRINKLERS .....</b>                              | <b>21</b> |
| <b>16</b> | <b>SMOKE VENTILATION .....</b>                       | <b>21</b> |
| <b>17</b> | <b>APPENDIX.....</b>                                 | <b>22</b> |

## 1 GENERAL

This specification details the Particular Technical Requirements for Mechanical plant and equipment to be installed under the scope of the works.

The general technical requirements, whilst also forming part of the scope of works, are beyond the scope of this document. These can be found in the General Mechanical & Electrical Conditions Specification.

Specific plant and equipment details are provided in the Schedules of Technical Requirements included within Appendices to this Specification.

The contractor shall include for the installation and coordination of the site services element of the works in accordance with this specification and associated drawings. The design, installation and interaction with local authorities are all deemed to be part of the Contract Works

This specification must be read in conjunction with all other documents, Client ER's and all other documentation produced by the wider design team. Where referred to as 'the contractor' within this document refers to the Mechanical sub-contractor.

## 2 INTRODUCTION

The project comprises two adjacent purpose-built student accommodation (PBSA) developments: Tottenham Printworks and 807 High Road. Together, they provide 312 student bedspaces across multiple independent blocks, plus commercial floorspace (438 sqm GEA total). The sites are physically separate but share on-site management and life safety services.

Tottenham Printworks delivers 287 bedspaces: 276 in new Blocks A-C (222 clusters, 54 studios; no inter-block access) and 11 in existing High Road Apartments.

807 High Road, a four-storey building, adds 25 bedspaces (9 premium studios, 14 standard studios, 2 en-suites) in two linked blocks (A and B).

### 3 GENERAL DESIGN STANDARDS

Main sources of design data include the following:

- Building Regulation Approved Documents (parts B, F, G, H, J, L, P, M & Approved document 7)
- British Standards including BS EN and Codes of Practice
- BS 7671 Requirements for Electrical Installations (IET Wiring Regulations)
- BS ISO standards and documentation CIBSE Guides and Technical Memoranda
- BSRIA Guides
- BSRIA Technical Publications
- BSRIA Commissioning Codes
- ASHRAE Guides
- Local Authority (WCC) Requirements
- Utility Supply Authority Regulations and Guidelines
- IOP Guides
- Acoustic Criteria Report by others
- Building and Engineering Services Association (BESA) Technical Publications (Formally the Heating & Ventilation Contractors Association, HVCA)
- CDM Regulations
- CIBSE Design Guides
- CIBSE Commissioning Codes
- CIBSE Technical Memoranda
- CIBSE Building Energy Codes
- CIBSE Lighting Guides
- Domestic Building Services Compliance Guide
- European Directives including Eco Design European Directive (EU No 1253/2014)
- NHBC Standards
- Loss Prevention Council - Rules for Automatic Sprinkler Installations
- Pressure Equipment Directive

## 4 MECHANICAL DESIGN CRITERIA

**Table 1 External Design Conditions**

|                          | Winter °C         | Summer °C               |
|--------------------------|-------------------|-------------------------|
| Outdoor Design Condition | -4 °C / Saturated | 33 °C DB /<br>22.6°C WB |

**Table 2 Internal Design Conditions**

| Internal Design Condition | Summer °C DB | Winter °C DB | Heating and Cooling Method            |
|---------------------------|--------------|--------------|---------------------------------------|
| Lounges                   | 24° (+/- 2°) | 22° (+/- 2°) | Ceiling mounted FCU<br>LTHW / CHW     |
| Student Kitchens          | 24° (+/- 2°) | 22° (+/- 2°) | Ceiling mounted FCU<br>LTHW / CHW     |
| Bedrooms                  | 24° (+/- 2°) | 20° (+/- 2°) | Ceiling mounted FCU<br>LTHW / CHW     |
| Bathrooms                 | Uncontrolled | Uncontrolled | No Heating                            |
| Cluster Corridor          | Uncontrolled | Uncontrolled | No Heating                            |
| Common Rooms              | 23° (+/- 2°) | 21° (+/- 2°) | Ceiling Concealed<br>Ducted VRF units |
| Corridor                  | Uncontrolled | Uncontrolled | No Heating                            |
| Amenity Areas             | 24° (+/- 2°) | 21° (+/- 2°) | Ceiling mounted FCU<br>LTHW / CHW     |
| Plant Rooms               | Uncontrolled | Uncontrolled | No Heating                            |
| Bin Stores                | Uncontrolled | Uncontrolled | No Heating                            |
| Bike Sheds                | Uncontrolled | Uncontrolled | No Heating                            |

**Table 3 Ventilation Parameters**

| Area              | Supply/Extract                                                                            | Flow rate/ACH                                           | Notes                                              |
|-------------------|-------------------------------------------------------------------------------------------|---------------------------------------------------------|----------------------------------------------------|
| Lounges           | MVHR                                                                                      | 10 l/s per person                                       | Approved Document F                                |
| Kitchens          | Mechanical Extract (via MVHR) with make-up air from adjacent spaces                       | 13 l/s (Minimum)                                        | Approved Document F                                |
| Bedrooms          | MVHR                                                                                      | 8 l/s per person (Trickle)<br>15 l/s per person (Boost) | Approved Document F                                |
| Bathrooms         | Mechanical Extract (via MVHR) with make-up air through door undercut from adjacent spaces | 8 l/s (Trickle)<br>15 l/s (Boost)                       | Approved Document F                                |
| Cluster Corridors | MVHR                                                                                      | 1 ach                                                   | Corridors deemed as transient, non-occupied spaces |
| Management Suite  | MVHR                                                                                      | 10 l/s per person                                       | Approved Document F                                |
| Common Rooms      | MVHR                                                                                      | 10 l/s per person                                       | Approved Document F                                |
| Corridors         | Naturally Ventilated                                                                      | N/A                                                     | Corridors deemed as transient, non-occupied spaces |
| Ancillary Areas   | MVHR                                                                                      | 10 l/s per person                                       | Approved Document F                                |
| Plant Rooms       | Mechanical Extract                                                                        | 2 ach                                                   | Via plant room louvres                             |
| Bin Stores        | Mechanical Extract                                                                        | 10 ach                                                  | Via bin store louvres                              |

Note: Occupancy and fresh air rate as per Approved Document F & CIBSE guides recommendations.

**Table 4 Maximum Duct Velocities Room Side**

| Ductwork Section    | Design Velocity                |
|---------------------|--------------------------------|
| Risers              | 5.0 to 6.0 m/s (1 Pa/m)        |
| Ductwork to Louvers | 3.5 to 4.5 m/s                 |
| Main Branch         | 3.0 to 3.5 m/s (1 Pa/m)        |
| Sub Branch          | 2.0 to 3.0 m/s (1 Pa/m)        |
| Terminal Branch     | 1.5 to 2.0 m/s (1 Pa/m)        |
| Kitchen Extract     | 7.0-10.0 m/s                   |
| External Louvres    | 1.5 to 2.5 m/s (face velocity) |
| Extract Bellmouths  | 1.5 to 2.0 m/s (face velocity) |

**Table 5 Public Health Design Criteria**

| Design Parameter             | Design Criteria  | Notes                                                           |
|------------------------------|------------------|-----------------------------------------------------------------|
| CWS Storage                  | Typically, <20°C | Dependent on incoming supply temperature and ambient conditions |
| HWS to Basin                 | 43°C             | (Minimum with TMV)                                              |
| HWS to Sink                  | 50°C             |                                                                 |
| HWS to Shower                | 43°C             | (Minimum with TMV)                                              |
| Cold water demand per person | 100 l/person     | Based on IOP PES design guide                                   |

**Table 6 Mechanical Plant Life Expectancy**

| Plant                                | Life Expectancy          | Frequency of Maintenance |
|--------------------------------------|--------------------------|--------------------------|
| Exhaust/Extract fan                  | 15 years (approx.)       | 6 months                 |
| Supply Air fan                       | 15 years (approx.)       | 6 months                 |
| Heat Recovery Ventilation Unit       | 15 years (approx.)       | 6 months                 |
| Kitchen Extract fan                  | 15 years (approx.)       | 6 months                 |
| VRF/VRV system                       | 15 to 20 years (approx.) | 6 months                 |
| HWS / Heating Pump                   | 15 to 20 years (approx.) | 6 months                 |
| Pressurisation Unit & Expansion Tank | 15 to 20 years (approx.) | 6 months                 |
| Packaged Boosted Cold Water Pump     | 15 years (approx.)       | 6 months                 |
| Potable Water Tank                   | 15 to 30 years (approx.) | 6 months                 |
| BMS & Control Panels                 | 10 to 15 years (approx.) | 6 months                 |
| Sprinkler Pump                       | 15 to 20 years (approx.) | TBC by Specialist        |
| Sprinkler Tank                       | 15 to 20 years (approx.) | TBC by Specialist        |

Note: The data has been referenced from CIBSE Guide B.

## 5 ABOVE GROUND DRAINAGE

The mechanical Contractor shall design, supply, install, test, commission and set to work a complete soil and waste above ground drainage system serving all sanitary, ventilation and kitchen equipment, etc. The system shall be designed in compliance with Building Regulation Part H and BS EN 12056-2. Above ground foul water drainage installation to conform to the following:

- A system of above ground pipework to convey all soil and waste from new fittings to connect into the below ground drainage installation.
- Foul drainage connections to be provided to all FCU and MVHRs, The contractor is to allow for the installation of condensate lift pumps where deemed necessary.
- All works required to make a complete and working installation.
- Access to stacks for rodding purposes at every floor level, at each branch connection into the stack and at the foot of each stack for testing purposes.
- Rodding access points to each branch from the stacks.
- All drainage pipework, both foul and surface water, penetrating the façade must be constructed of non-combustible material.
- Liaison with the Building Control Officer to arrange site visits to confirm that the installation is in accordance with the Building Regulations.
- Air or water tests to the above ground drainage installation to be witnessed and passed by the design engineers.
- All drainage piping, storm and foul shall be insulated for noise. Acoustic performance shall meet or exceed criteria outlines in acousticians report. This is to be achieved by muftilag of density 5Kg/m2 or better. It should be noted that non-noise-sensitive areas such as Cycle and Refuse stores do not need to be insulated.
- Allow for adequate thermal expansion of pipework at dedicated points on each stack at each floor.
- There shall also be a retention of a 25mm water seal in every trap and no air should be blown through the trap when the performance is tested and witnessed.
- The contractor shall ensure sufficient access for testing purposes.

Where pipework passes through fire rated walls or through intermediate floors, fire stopping compound to suit the diameter of the pipe are to be installed in accordance with the manufacturer's instructions, requirements, and recommendations. Brackets shall be provided to meet the requirements of British Standard BS EN 12056: Part 2. Brackets shall be selected from the pipe manufacturer's standard range with anchor brackets and restraints as directed to limit thermal movement under operating conditions.

Although best endeavours have been made to detail all interfaces, the mechanical subcontractor shall liaise fully with all other contractors and specialists and ensure all interface requirements are provided whether or not these are detailed within the specifications or on the drawings.

A primary ventilated soil and waste pipework system will be provided to collect the discharge from the foul and waste fixtures within the building above ground floor level and will discharge to the local sewer via multiple civil connections at ground level. All soil and waste stacks serving all blocks will be discharged to the below ground civils network via gravity. All ground floor tank rooms, plant rooms, cycle stores and bin stores will discharge via gullies to the gravity foul drainage system

All vertical stacks will be installed using HDPE pipework with electrofusion welded joint supplied by Geberit (or similar approved). Branch pipework will generally be uPVC. Fire stopping achieved by compound and wraps fitted to stacks and vent pipes to maintain the integrity of each fire compartment. Where pipework is installed to run horizontally through ceiling voids of occupied spaces it will be insulated to prevent noise break-out. Thickness of insulation is to meet performance criteria set out in the project acoustic

report.

## 6 RAINWATER DRAINAGE

All roofs across the development will include the provision for surface water drainage. These will be provided to collect the runoff from all roofs, sub roof between cores, and canopies / building overhangs, external walkways and balconies. The architect is responsible for the overall rainwater drainage strategy, therefore rainwater outlet positions shown on architectural GAs should take precedence.

All external rainwater stacks will be installed in cast iron with welded joints. All internal rainwater pipes shall be routed to avoid though ancillary areas where possible to any acoustic implications.

The rainwater has been calculated to BS 12056 – 3 in accordance with Building Regulations Part H. The roof has been designed with a 1:40 fall towards rainwater outlets under category 1. A baseline rainfall intensity of 1 in 500-year storm has been selected as the minimum design figure across all roofs on this scheme. However, to future proof the system, a 40% global warning factor has been applied to all rainfall intensities. Adequate fire stopping will be provided where pipe work penetrates fire rated walls and slabs to maintain the integrity of each fire cell. Internal rainwater pipework to be installed in HDPE and electrofusion welded.

The mechanical Contractor shall design, supply, install, test, commission and set to work a complete above ground surface water drainage system serving all rainwater outlets across the site. The Above ground surface water drainage system to conform to and includes the following:

- A system of above ground pipework to convey all surface water from gullies and blue roofs to connect into the below ground drainage installation.
- All works required to make a complete and working installation.
- All final connections to gullies / connection boxes / hoppers.
- Access to stacks for rodding purposes at the foot of each stack.
- Liaison with the Building Control Officer to arrange site visits to confirm that the installation is in accordance with Building Regulations.
- Air or water tests to the above ground surface water installation to be witnessed and passed by the design engineers.
- Associated support steelwork
- Testing of the installation should be carried out on a section-by-section basis as the works proceed and subsequently, upon completion performance test the installation according to BS.12056. Building control shall be advised of testing dates for witnessing and signing-off.
- All drainage piping, storm and foul shall be insulated for noise. Acoustic performance shall meet or exceed criteria outlines in acousticians report. This is to be achieved by muftilag of density 5Kg/m2 or better. It should be noted that non-noise-sensitive areas such as Cycle and Refuse stores do not need to be insulated.

## 7 MAINS WATER SERVICES

Mains water will be supplied to the site via a single metered Thames water 125ø mm bulk supply main which enters from the Northwest boundary. MDPE pipe connections will feed the potable cold water storage tank for boosted cold-water, residential sprinklers & CAT V supplies across the site. All water meters are to be pulsed output with connection to the building management system for monitoring water consumption. Please refer to EDCs BCWS schematic for further details of water meters regarding the location and quantity of revenue meters and submeters. The MWS supply into the tank has been sized to achieve a 36-hour refill for each tank from completely empty. All Class E commercial units will be provided with a single 25mm mains water supply from below ground via cast in ducts.

The mains water entries to commercial units will be equipped with BREEAM leak detection as per Wat 03. This will be achieved with 2 pulsed output water meters the mains water supply. The first water meter will be located directly after the utility companies' chamber, with the second located within the demise of the building in order to maximise the area covered. The leak detection system shall have either an in-built diagnostic procedure or means of alerting building management of the presence of a leak. This is to also dial out to the building management's system. The system shall identify differential flow rates and therefore leakage rates, be it continuous, high or low level over set time periods and will be programmable to suit the owner/occupiers' water consumption criteria.

The system is to be activated when the flow passing through the water meter is at a flow rate above a preset maximum for a present period but will also be designed to avoid false alarms caused by the operation of plant and equipment with large water consumption. Any areas of the development that are likely to 10% or more of the relevant buildings total annual water demand will be additionally metered.

The contractor is to also allow for samples of mains water quality to be taken and assessed in order to confirm if an electromagnetic water conditioner is required in addition to the chlorine dioxide dosing unit.

## 8 BOOSTED COLD WATER SERVICES

Sectional, internally flanged base, twin compartment, GRP tanks will be provided for potable cold-water storage in each residential tank room. The tanks will have encapsulated thermal insulation and be provided with access manholes, overflow and warning pipes – incorporating insect screens – to comply with British Standards and Water Byelaws. The tanks have been sized and diversified in accordance with CIBSE Guide G for a tank turnover of at least 12 hours and will be kept the minimum feasible size. In order to satisfy both the sprinkler demand and residential domestic cold water demand, a 35,00L totally internally flanged tank has been selected. The twin compartment cold water storage tanks will comply with the local water regulations and shall be provided complete with overflows / warning pipes and air vents. A single boosted cold-water network will be present across the development to serve each of the blocks. The tank room, and associated booster sets for which will be housed in the Tankroom of Printworks and distribute Building 807 via a dedicated service trench. Booster pumps across the development have been selected to meet the residential domestic water demand. The contractor is responsible for the proper installation of all cold- water storage tanks and associated pump sets satisfying any manufacturer requirements. Should any equipment be disassembled during installation for any reason such as installation or plant replacement, manufacturers should be consulted for guidance and/or inspection of said equipment to ensure proper reassembly has been carried out and no warranties or guarantees are voided as a result.

Fluid category 5 (CAT V) Water supplies have been allowed for in each bin and cycle store, and at dedicated points for both plantroom washdown and irrigation of ground floor areas and podium level.

The system which supplies this water is fed from a main CAT V break tank and booster located in the tankroom. All individual supplies are sub metered to ensure accurate metering across all different uses. Irrigation of external areas is controlled bib taps and follows a manual irrigation regime. This allows for flexible external irrigation schedules to be controlled and set by the developer as and when needed. The contractor is to allow for roof mounted external bibtaps to be mounted on a pedestal. Please refer to landscape architects information for further information and layouts of irrigation pipework.

Due to the number of connected apartments on the boosted network and the variance in simultaneous demand across the site it is recommended that all booster pumps on each network will be variable

speed, inverter driven all controlled via the main control panel supplied. The system will operate to achieve constant pressure and variable flow across the BCWS network. The main control panel is to come with a link output to the BMS system. The BMS system is not to control the pumps, only to interface and detect any fault outputs. The boosted supply from the tank room will distribute to all

buildings / cores across the site. BCWS pipework shall be installed in steel (Medium grade) to BS EN 10255 for primary routes and copper to BS EN 1057 for corridors and apartments. Pressure reduction will be achieved at each floor via PRVs located in each BCWS riser before the main manifold distributing to dwelling service cupboards. All water meters will be installed in service cupboards to meter each cluster in accordance to utility provider's recommendations.

Surge arresters and back flow protection on the network shall also be incorporated where required as per the EDC schematics. The water prior to entering the network shall be chemically dosed with chlorine dioxide.

All boosted cold-water pipework routed through or located in external areas such as external walkways or carparks will be trace heated in order protect against risk of freezing in cold weather. All mechanical pipework in external walkways will be A1 fire rated as per NHBC requirements. All external pipework to The works shall include the full installation, in accordance with the Local Water Authorities water byelaws and requirements, and provision of:

- Provision for connections to sectional GRP water storage tanks.
- Potable water booster pump sets.
- Pipework distribution systems to apartments.
- Thermal insulation on all cold-water pipework, finished in reinforced aluminum foil vapor barrier facing.
- All IV's NRV's PRV's, double check valves, strainers, priority demand valves and ancillaries.
- Associated support steelwork.
- Surge arresters fitted to the top of boosted risers.
- Chemical cleaning of all pipework, components and plant and for providing a chlorine injection tee on the incoming mains water supply.
- Testing, and commissioning.

The control of Legionella in water systems shall be carried out in accordance with CIBSE TM13:2013 and (UK) HSG:274. It is necessary for the building services management regime to form an integral part of the preventative measures for Legionella control. Refer to water treatment measures for further information.

All pipework carrying unwholesome water shall be readily distinguishable in accordance with BS1710 and separate from wholesome supply in accordance with WRAS water regulations code. Double-check valves shall be provided on permanently connected fixtures such as washing appliances, to prevent back siphonage in absence of an air gap to that appliance.

All quick fill loops shall not be permanent as per the EDC schematics.

## **9 WATER TREATMENT**

### **9.1 Potable Water**

The chlorine dosing unit shall be placed directly before the cold water storage tank in order to dose both sections and ensure all domestic hot water plates and the end point appliances in the apartments are fully protected.

### **9.2 Closed Loop Systems**

The mechanical contractor shall adhere to the requirements set out in BSRIA BG 29 for all pre-commissioning and the initial system fill. A combined side stream filtration unit and dosing pot shall be installed in the plant room of each building which will filter the total system volume every 24 hours. Additionally, strainers have been positioned on all major plant to aid in system cleaning.

To comply with the requirements in BSRIA BG 29 (Pre-Commissioning Cleaning of Pipework Systems) water sampling locations shall be installed throughout the development.

The mechanical contractor is to allow for the installation of these sampling points to the locations stated above. The mechanical contractor shall submit the sampling frequency to client in accordance with the construction program throughout the install.

## **10 DRY RISER**

The Contractor shall supply, install, test and commission a complete dry riser system in accordance with the drawings and specification and BS9990:2015.

The system shall comprise of:

- A recessed stainless-steel breeching inlet case to the ground floor brickwork
- Brass valves and drains
- Galvanised steel dry riser pipework
- Allow for flow testing of installed dry riser, prior to sign off.

In accordance with the latest fire strategy report, dry rising mains will be in each core across the development. Landing valves will be installed at each level. All breeching inlets shall be dual port and located at ground level on the façade of the building as identified by the project fire strategy. A landing valve shall also be provided at ground floor on the facade. Horizontal pipework will be laid to fall so it can be adequately and completely drained following testing.

## 11 HEATING AND COOLING SYSTEM DRIVERS.

### 11.1 ASHPs

The MEP Trade Contractor shall be responsible for the design, supply, installation, coordination, testing, and commissioning of the Air Source Heat Pump (ASHP) systems. These units are air-to-water heat pumps used to generate Low-Temperature Hot Water (LTHW).

- Location: The ASHPs are situated in a dedicated plant enclosure on the roof of Block C.
- The plant enclosure must provide adequate spacing for air movement and maintenance in accordance with the manufacturer's recommendations.
- Function: The ASHPs generate LTHW at 60°C flow temperature, which is then pumped to the energy centre located at ground floor level.
- Buffer Vessels: Thermal storage vessels shall be located in the energy centre to act as a buffer during periods of peak demand. This prevents short cycling of the ASHP during low load conditions.
- System Requirement: The Heat Interface Units (HIUs) connected to the heating network must be selected to return water to the ASHP at 30°C. This is crucial for the heat pumps to maintain the necessary 30°C temperature difference ( $\Delta T$ ) to operate at their maximum efficiency.
- Extension: The contractor shall extend the LTHW system to riser positions in all blocks for distribution. Valved and capped LTHW connections shall also be provided for future extension to 807 High Road.
- Metering: Heat meters shall be provided at each ASHP and at each commercial unit. All meters must be visible on the Building Monitoring and Management System (BMS) system.
- Type: High temperature air-to-water heat pumps with electrically driven compressors.
- Compressors: The electric compressors must be semi-hermetically sealed. They shall be inverter driven and of the reciprocating type. They must comply with BS EN 378-2:2016 and BS EN 378-3:2016+A1:2020.
- Refrigerant: The heat pumps shall use Carbon dioxide / R744 refrigerant. R744 is an environmentally benign refrigerant and must be contained within the heat pump.
- DELC: The heat pumps shall have a Drive Energy Label Classification (DELC) of  $\leq 1000 \text{ kgCO}_2\text{-eq/kW}$  heating capacity.
- Standards: Compliance is required for safety and environmental standards (BS EN 378-1, BS EN 378-2) and test requirements (BS EN 14511-1, BS EN 14511-2, BS EN 14511-3, and BS EN 14511-4).
- Fan: Axial type, direct drive, and vertical configuration.
- Electrical Supply: Three phase.
- Rating: The system shall be designed with PN16 rated equipment and pipework throughout the secondary system.
- Emitters: Within dwellings and amenity spaces, the CHW system will serve Fan Coil Units (FCUs) to provide cooling.

#### 11.1.1 Ancillary Equipment

- Pumps: Close-coupled in-line pumps shall be provided.
- Pipework: Copper refrigerant pipelines shall be used for the refrigerant lines.
- Control: Demand side management is recommended to be incorporated into the control system. This allows operation to maximize periods when electricity is cheap to charge the thermal stores and avoid running during peak demand periods.
- Supports: The heat pumps and associated equipment shall be installed on Roof Equipment Supports
- Labelling: Plant and equipment identification shall include Equipment labels and warning notices and Self-adhesive colour pipe bands.

### 11.1.2 Execution and Testing Standards

- Installation: Installation of heat pump systems must adhere to BS EN 378-2, BS EN 378-3, and BS EN 378-4. Equipment must be fixed securely on purpose-made bases or supports.
- External Units: External units must be located away from windows and adjacent buildings, protected from high winds, and engineered to prevent snow, leaves, and debris from blocking air flow.
- Refrigerant Lines: Must be kept short and straight.
- Condensate: Condensate must drain away rapidly, with no risk of freezing. Contractor to allow for an additional tee on all condensate drains in order to facilitate wet testing.
- Performance Testing: The contractor must demonstrate the performance of the installations, aiming for capacity equal to, or not less than, the design heat loss. Environmental tests may be required, simulating operating conditions using artificial loads if necessary.
- Design Standards: The design must be completed in accordance with BSRIA BG 7/2009 and BS EN 15450.

The ASHP installation must be robustly engineered to meet specific operational efficiency criteria, particularly maintaining a large temperature differential across the heating circuit (60°C flow / 30°C return) to maximize the energy performance of the heat pumps.

## 11.2 Chillers

The MEP Trade Contractor shall be responsible for the design, supply, installation, coordination, testing, and commissioning of the Chilled Water (CHW) cooling system.

- Cooling Source: The cooling source consists of Air-Cooled Chillers (ACC).
- Location: The ACC units are situated in a dedicated plant enclosure on the roof of Block C.
- The plant enclosure must provide adequate spacing for air movement and maintenance in accordance with the manufacturer's recommendations.
- Function: The ACC units are used to generate CHW. The CHW system serves the student accommodation, high road dwellings, amenity spaces, and commercial units.
- Distribution: The chilled water is pumped to the CHW plant room at the ground floor at a constant flowrate.
- Pumping: Within the CHW plant room, variable speed pumps control the cooling flow rate based on demand, and circulation pumps must be selected to operate at minimum flow conditions.
- Storage: A thermal storage vessel (Buffer vessel) shall be located in the CHW plantroom. This vessel acts as a buffer during periods of peak demand and serves to prevent the short cycling of the chillers during low load conditions.
- Extension: The contractor shall extend the CHW system to riser positions in all blocks for distribution. Valved and capped CHW connections shall also be provided for future extension to 807 High Road.
- Metering: Valved, capped, and metered CHW connections must be provided for all commercial areas. All meters associated with the CHW system shall be visible on the Building Monitoring and Management System (BMS) system.
- Rating: The system shall be designed with PN16 rated equipment and pipework throughout the secondary system.
- Emitters: Within dwellings and amenity spaces, the CHW system will serve Fan Coil Units (FCUs) to provide cooling.

### 11.2.1 Ancillary Equipment

- Pumps: Close-coupled in-line pumps shall be provided.
- Pipework: Copper refrigerant pipelines shall be used for the refrigerant lines.
- Control: Demand side management is recommended to be incorporated into the control system. This allows operation to maximize periods when electricity is cheap to charge the thermal stores and avoid running during peak demand periods.

- Supports: The heat pumps and associated equipment shall be installed on Roof Equipment Supports
- Labelling: Plant and equipment identification shall include Equipment labels and warning notices and Self-adhesive colour pipe bands.

### 11.2.2 Execution and Testing Standards

- Installation: Installation of heat pump systems must adhere to BS EN 378-2, BS EN 378-3, and BS EN 378-4. Equipment must be fixed securely on purpose-made bases or supports.
- External Units: External units must be located away from windows and adjacent buildings, protected from high winds, and engineered to prevent snow, leaves, and debris from blocking air flow.
- Refrigerant Lines: Must be kept short and straight.
- Condensate: Condensate must drain away rapidly, with no risk of freezing.
- Performance Testing: The contractor must demonstrate the performance of the installations, aiming for capacity equal to, or not less than, the design heat loss. Environmental tests may be required, simulating operating conditions using artificial loads if necessary.
- Design Standards: The design must be completed in accordance with BSRIA BG 7/2009 and BS EN 15450.

## 12 HEATING AND COOLING SYSTEM DISTRIBUTION.

The Mechanical, Electrical, and Plumbing (MEP) Trade Contractor shall be responsible for the design, supply, installation, coordination, testing, and commissioning of all pipework systems, adhering strictly to the specifications herein and current standards.

- Design Standards: All pipework installations, including Low-Temperature Hot Water (LTHW), Chilled Water (CHW), and Cold Water (CW) services, shall comply with relevant British Standards (BS) and industry guidance, including the BESA Technical Report TR/20 series (covering LTHW heating, Hot Water Service, Cold Water Service, and Chilled Water).
- Pressure Rating: The LTHW and CHW secondary systems shall be designed with PN16 rated equipment and pipework throughout.
- Fire Stopping: Fire stopping measures must be applied using an approved specialist detail where systems penetrate a fire barrier, ensuring the performance of the barrier is maintained.
- Thermal Insulation: Where required (e.g., for CW pipework in unconditioned spaces, LTHW, or CHW), insulation shall generally consist of Phenolic foam (Kingspan Kooltherm) or Nitrile rubber insulation, finished in reinforced aluminum foil vapor barrier facing.

### 12.1 Low-Temperature Hot Water (LTHW) Heating System

The LTHW system shall operate as a two-pipe, variable flow distribution system.

- Operating Parameters: The LTHW is generated at 60°C flow temperature. The system must be designed to achieve a 30°C temperature difference (30°C return temperature) across the primary heating circuit to ensure the Air Source Heat Pumps (ASHP) operate at maximum efficiency.
- System Reach: The LTHW supply shall be extended from the energy centre to riser positions in all blocks to facilitate distribution to student accommodation, high road dwellings, amenity spaces, and commercial units.
- Metering: Heat meters shall be provided at each ASHP and at each commercial unit.

All pipework distribution for closed loop heating systems shall be as per the below.

| Location                           | Material                           | Standard / Specification                                                                                                                        |
|------------------------------------|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| Plantrooms, Risers, Primary Routes | Heavyweight Carbon Steel (BS 1387) | Pipework greater than 50mm to be Victaulic grooved or equivalent; Pipework 50mm and below to be Victaulic grooved or heavy grade steel screwed. |
| Dwellings & Common Corridors       | Copper Pipe (to BS EN 1057)        | Plastic pipes (PP, PEX, or multi-layer plastic composites) may be submitted as a Value Engineering (VE) proposal subject to developer approval. |

## 12.2 Chilled Water (CHW) Cooling System

The CHW system operates as a two-pipe arrangement, utilizing a constant flow primary circuit and a variable flow secondary circuit.

- Operating Parameters: Chilled Water (CHW) shall be generated at 7°C flow temperature with a 5°C temperature difference (12°C return).
- System Reach: The system shall extend to riser positions in all blocks to serve Fan Coil Units (FCUs) in student accommodation, dwellings, and amenity spaces, as well as providing connections to commercial units.
- Metering: Valved, capped, and metered CHW connections shall be provided for all commercial areas. All CHW system meters shall be visible on the Building Management System (BMS).

All pipework distribution for closed loop cooling systems shall be as per the below.

| Location                           | Material                                           | Standard / Specification                                                                                                    |
|------------------------------------|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| Plantrooms, Risers, Primary Routes | Heavyweight Carbon Steel (BS 1387)                 | Joining methods match LTHW: Victaulic grooved or screwed based on diameter.                                                 |
| Dwellings & Common Corridors       | Copper Pipe (to BS EN 1057)                        | Plastic pipes (PP, PEX, or multi-layer plastic composites) may be submitted as a VE proposal subject to developer approval. |
| Condensate Pipework                | Unplasticized polyvinyl chloride (PVC-U) pipelines | Required for removal of condensate from cooling coils and AC units.                                                         |

Minimum clearances must be maintained between insulated pipework and surrounding structure/services:

- Wall finish: 25mm
- Ceiling finish or soffit: 100mm
- Floor: 150mm
- Electrical services: 150mm
- Adjacent services: 100mm
- Another insulated pipeline: 25mm

### *Steel Pipework Execution (LTHW/CHW)*

- Jointing: Accessible joints shall be screwed (up to and including 50 mm) or mechanical grooved (50-300 mm), while permanently concealed joints shall be welded.
- Welding: Welding shall be in accordance with BESA Technical Report TR/5, and completed welds must be wire brushed and protected from corrosion.

### *Copper Pipework Execution (LTHW/CHW/CW)*

- Brazed Joints: Preparation, marking, and sealing of brazed joints in copper and copper alloy pipes must be carried out in accordance with BS EN 14324.
- Anchors/Supports: Pipelines must be provided with anchors to resist axial stress. Loadbearing support for vertical pipes is required not less than at every storey level. Pipelines and valves must not be supported on coil connections.

## **13 VENTILATION SYSTEMS**

The mechanical contractor shall be responsible for install, commissioning and testing of all mechanical ventilation systems across the development and shall comply with the following criteria.

Ventilation system design and construction shall preserve the building's intended performance and quality, specifically complying with:

- Building Regulations Part L1 and L2A for conservation of fuel and power.
- BS EN ISO 52016-1 for comprehensive ventilation system design. All ductwork shall be fabricated and installed in full accordance with BESA DW/144 specifications for high-quality construction.
- Steel Ductwork systems shall conform to BESA DW/144 standards.
- During installation, all cut edges on ductwork, flanges, and supports shall be carefully smoothed and de-burred to ensure safety and integrity.
- Fire-rated ductwork, fittings, and fire dampers shall provide a minimum 4-hour fire resistance rating, unless alternative ratings are explicitly indicated on fire compartmentation drawings.
- Internal cleanliness of ductwork shall meet BESA TR/19 guidelines, achieving a Medium cleanliness quality class to maintain hygienic airflow.

Ductwork dimensions shall be calculated using velocity limits from CIBSE Guide B2 to optimize energy use and acoustic comfort. Maximum permitted air velocities are:

| Duct Classification | Maximum Air Velocity | Source Reference |
|---------------------|----------------------|------------------|
| Main ducts          | <6 m/s               | CIBSE Guide B2   |
| Branch ducts        | <4.5 m/s             | CIBSE Guide B2   |
| Run-outs            | <2.5 m/s             | CIBSE Guide B2   |

- It should be noted that where ductwork passes over dwellings, a maximum velocity of 2.5m/s is to be permitted in order to prevent excessive noise breakout from ductwork, even when these are considered to be branch or main ducts.

## 13.1 Dwelling Ventilation

Domestic ventilation will consist primarily of openable windows/doors for purge ventilation and general ventilation via a Mechanical Ventilation with Heat Recovery System. These systems will be installed to meet the requirements set down by Approved Document Part F. The units will be ceiling mounted in each Kitchen Dining and Living room (KDL) with the ductwork terminating to ceiling mounted air valves and wall mounted supply plenums. All dwelling windows shall be openable and have been sized by the architect in accordance with Part F to allow purge of the habitable rooms naturally. For all dwellings, supply plenums shall always ensure a dedicated fresh air supply to all rooms and as such shall not terminate at the rear of FCUs. Extract air shall be achieved by air valves from each bathroom POD, where the mechanical contractor is responsible for final connection into a spigot provided as part of the POD. POD doors shall be undercut to facilitate cross ventilation.

All internal doors shall be undercut to facilitate the transfer of air from habitable rooms to the air extraction points. Kitchen cooker hoods shall be extract with ductwork terminating at the closest façade.

The MVHR system will be controlled via boost duct mounted CO<sub>2</sub> sensors located on the extract duct adjacent to the MVHR. Each MVHR has been sized to enable boost operation that equated to 15L/s extracted from each room, with the same being supplied. Otherwise MVHRs operate to meet minimum criteria set out in part F at 8L/s from bathrooms and 13L/s from kitchens.

Due to the flow rates and duct routes of MVHR ductwork crossing fire compartments, all domestic ductwork shall be galvanised steel to DW 144 to facilitate adequate sizing and the addition of fire dampers C/W fusible links where shown on drawings. Each damper fusible is to maintain the integrity of the associated fire compartment wall.

All terminations will have a free area in compliance with the domestic ventilation compliance guide. Termination details have been coordinated with the project architect and shown on architectural information. The mechanical contractor is responsible for the installation of ductwork up to this detail where the facade contractor is to install external elements. Please refer to both the architectural details as well as EDC apartment layouts and schematics for this demarcation.

Fresh air in dwellings shall not be combined with or terminate at the rear of FCUs. MVHR ductwork has been designed such that fresh air is always supplied / extracted from the dwelling regardless of whether FCUs are operating as required in Approved Document Part F. All internal ductwork on the atmospheric side of the each MVHR will be fully insulated to prevent condensation risk. Attenuation has been provided as per the EDC layouts in each apartment off the MVHR on both the room and atmospheric side of ductwork. Where MVHR and FCU supply grilles share a single supply grille, separate plenums shall be installed in order to prevent the higher pressure from FCUs causing back draft into the MVHR ductwork.

Residential Fan Coil Units (FCUs) will be positioned within bulkheads to allow for the supply of conditioned air to all habitable rooms.

Access panels are to follow manufacturer guidance requiring 1 no 600mm x 600mm panel for each FCU. Panels to be positioned at the rear quarter to facilitate the replacement of filters and inspection and maintenance of CHW and LTHW valves. In the event of the failure of an FCU requiring a full replacement, access is to be destructive.

All FCUs are to be manufactured and supplied by Caice and all supply air plenums and linear grilles are to be supplied by Gilberts. In bedrooms, return air paths for FCU supply air are integrated with the supply air grilles.

It should be noted that the mechanical contractor is responsible for ensuring steel ductwork associated with MVHRs is installed on site prior to the installation of bathroom PODs. This involves liaising with the necessary parties, subcontractor and any other trade contractor packages to accommodate the design and coordination of ductwork which has had to pass over pods where coordination would not allow an alternative route to be taken.

### 13.2 Non-Domestic Ventilation

Protected lobbies across the development will be provided with natural permanent ventilation via fire rated ductwork as per the latest fire strategy. All cluster corridors shall also be mechanically ventilated with ductwork extending from the dedicated MVHR and terminating at Air Valves in the corridor. These have been sized to achieve 1 ACH / HR when in boost. Whilst it is not envisaged that LTHW pipework shall contribute to overheating in these corridors, they will be mechanically ventilated to promote overall indoor air quality.

All occupied communal areas primarily ground floor and shall be mechanically ventilated using MVHRs sized in accordance with CIBSE guidance supplying at least 10l/s per person. Communal sanitary accommodation shall be ventilated via ceiling-mounted concealed grilles and diffusers connected to ductwork discharging to atmosphere through external weatherproofed louvres and fitted with in-line attenuators to meet acoustic requirements.

Amenity area services shall be exposed and painted to suit interior design intent. It should therefore be noted that all ductwork, MVHRs and FCUs shall be assessed for its suitability to be painted. Whilst it is unlikely that cladding will be required for these services to suite specific RAL colours, the contractor is to allow for as many of these services to be painted as possible which equipment selections and materials to suit. The contractor is also to liaise with the project architect on this item.

The full ventilation network shall be designed to be commissionable, with any additional equipment required for commissioning to be identified and submitted to the MEP consultant for approval. All MVHR units shall include G3-grade filters as a minimum and be selected to comply with the acoustic performance criteria stated in the Acoustic Report and schedules. All fresh air terminations to the rear of FCUs shall terminate within 300mm of the FCU, or as close as practicable. Ductwork shall be installed in accordance with approved schematics and layouts, including all necessary bends and offsets, with the contractor responsible for coordination, detailing, and ensuring the system fits within the spatial allowances. Where ceiling grilles are not provided within plantrooms, bellmouth fittings complete with wire mesh shall be installed as close to the slab as practicable.

Residential and commercial bin Stores will also be mechanically ventilated to adequately disperse stagnant odour. Single in line extract fans will be used with attenuators and in line duct filters. Extract ductwork is to extend sufficiently far into bin stores to ensure each entire bin store is ventilated. A nominal air change rate of 10 ACH / HR has been targeted in order to ensure there is little to no risk of foul odours accumulating and reaching reception areas and corridors.

### 13.3 Laundry room ventilation

Laundry rooms shall be ventilated by dedicated extract systems provided by the specialist supplier, Circuit Laundry. Ventilation requirements have been fully coordinated with Circuit Laundry. The mechanical contractor shall connect galvanised steel ductwork to spigots provided on the laundry equipment and extend to external terminations. External weathered louvres and plenum boxes shall be provided and installed as detailed on EDC schematics and Circuit Laundry drawings.

## **14 BMS**

A BMS system will be installed to monitor and control all mechanical equipment across the development. The BMS will give a common fault, alarm, run, modulation, enable, speed, interface, temperature and pressure sensing, including the following, but not limited to:

- VRF
- Hot water Systems
- Ventilation Systems
- Fire Alarm
- Cold water tank room
- Smoke Extract System
- Commercial Sprinkler System
- Generator

A BMS specialist shall be appointed to design, supply and install the BMS, as indicated on the drawings and BMS Outline Specification.

The Contractor shall allow for the installation of all instrumentation on site and providing all attendances required by the BMS vendor.

All instrumentation shall be site calibrated to a national standard on mechanical completion.

See separate BMS specification for detailed requirements and control philosophy.

## **15 SPRINKLERS**

Sprinklers for this project shall be tendered separately. Please refer to the 179-EDC-B1-XX-RP-M-0001 for further details.

## **16 SMOKE VENTILATION**

Smoke ventilation for this project shall be tendered separately. Please refer to the 179-EDC-B1-XX-RP-M-0002 for further details.

## 17 APPENDIX

### Schedule of Equipment Spares

| System Group                                    | Equipment / Control Type                | Description / Function                                                         | Location                                                    |
|-------------------------------------------------|-----------------------------------------|--------------------------------------------------------------------------------|-------------------------------------------------------------|
| <b>Temperature &amp; Environmental Controls</b> | Room Thermostats                        | Provides individual control per habitable room (each room is a separate zone). | Wall-mounted within each apartment.                         |
|                                                 | CO <sub>2</sub> Sensors (MVHR in-duct)  | Monitors return air quality for demand-controlled ventilation.                 | Within MVHR return air duct (Printworks only).              |
|                                                 | Central BMS Controller                  | Interfaces with all FCUs, manages scheduling and temperature setbacks.         | Central BMS/server location.                                |
| <b>Utility &amp; Electrical Controllers</b>     | Heat Interface Unit (HIU)               | Provides instantaneous domestic hot water and space heating interface.         | Located in each apartment utility cupboard.                 |
|                                                 | Electrical Consumer Unit                | Distributes apartment electrical circuits, includes RCBOs, SPDs, and AFDDs.    | Utility cupboard.                                           |
|                                                 | Kitchen Grid Switch / Hob Switch        | Control for built-in appliances and hob.                                       | Kitchen grid switch, typically hidden in cabinet or island. |
|                                                 | Stop Cock (Wheelchair accessible units) | Water isolation device.                                                        | Utility cupboard (accessible height).                       |
|                                                 |                                         |                                                                                |                                                             |
| <b>Fire &amp; Safety Controllers</b>            | Fire Alarm Panel                        | Controls building-wide detection and alarm systems.                            | Near Main Entrance.                                         |
|                                                 | AOV Panel                               | Operates automatic opening vents.                                              | Adjacent to Fire Alarm Panel.                               |
|                                                 | Smoke Extract System Controls           | Manages floor-level smoke extract fans and pressure control.                   | Central plant area or riser panel.                          |
| <b>Central Plant Controllers</b>                | Mechanical Control Panels               | Includes boiler sequencing, pump changeover logics.                            | Basement Block A / Ground Floor Block B Plantrooms.         |

## Contractor Responsibility Schedule

| Specification Volume                      | Key Element                                              | Sub-Contract Package |            |            |            |
|-------------------------------------------|----------------------------------------------------------|----------------------|------------|------------|------------|
|                                           |                                                          | Electrical           | Mechanical | Smoke Vent | Sprinklers |
| <b>General Mechanical + Public Health</b> | Supports and fixings                                     | No                   | Yes        | No         | No         |
|                                           | Pipework expansion and contraction                       | No                   | Yes        | No         | No         |
|                                           | Automatic controls installation (in its entirety)        | Yes                  | Yes        | Yes        | No         |
| <b>General Fire Protection</b>            | Fire protection systems (in their entirety)              | No                   | No         | No         | Yes        |
| <b>Particular Mechanical</b>              | Secondary support steelwork and access platforms/ladders | No                   | Yes        | Yes        | No         |
|                                           | Basement smoke ventilation system                        | No                   | Yes        | Yes        | No         |
|                                           | Firefighting shaft smoke ventilation system              | No                   | No         | Yes        | No         |
|                                           | Refrigeration leak detection system                      | No                   | Yes        | No         | No         |
|                                           | Access platforms, ladders and step overs                 | No                   | Yes        | Yes        | No         |
| <b>Particular Public Health</b>           | Secondary support steelwork and access platforms/ladders | No                   | Yes        | No         | No         |
| <b>Particular Fire Protection</b>         | Fire protection systems (in their entirety)              | No                   | No         | No         | Yes        |
| <b>Particular BMS</b>                     | Building management system (in its entirety)             | No                   | Yes        | Yes        | No         |
| <b>Particular BEMS</b>                    | Building Energy management system (in its entirety)      | Yes                  | Yes        | No         | No         |



EDC