CLARKE SERVICES GROUP

RIBA STAGE 2 REPORT
TO SUPPORT PLANNING APPLICATION
(INC VENTILATION STATEMENT & UTILITIES ESTIMATE)

52 AVENUE ROAD LTD

52 AVENUE ROAD, LONDON

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CONTENTS PAGE

1 PRELIMINARIES

1.1 Purpose of this document

This document has been prepared in support of a wider planning application by 52 Avenue Road Ltd to demolish an existing property and develop 12 new build, high quality townhouses at 52 Avenue Road, London NW8 6HP. The development will also be supplemented by a basement health and wellbeing facility.

The saliant objectives of this report is to provide a summary of the MEP building services, estimated utility loads and log the development of the design as it progresses through each of the RIBA stage of work phases.

1.2 Project description

The project involves the construction of 12 new build, high quality townhouses and associated health and wellbeing facility.

Each of the townhouses provides residential accommodation with basement, lower ground, ground, first and second floors with a total area of approx. 480sqm. The roof of each townhouse is proposed to be a private garden area.

The basement health and wellbeing centre (H&WBC) is proposed to incorporate a gym, swimming pool, spa, changing facilities, residents lounge and staff room with a total area of approx. 920sqm.

The overall aim of the project is to provide “best in class” accommodation and the specified building services systems are an important factor in meeting this brief.

A key requirement of the developer is to ensure the highest standards of sustainability within the design whilst providing an end product that surpasses expectations of similar developments.

The principal heating and cooling systems are to comprise of reversible heat pumps that harness the free energy from the ground to reduce reliance on fossil fuel usage. This will be supplemented with MVHR systems that will deliver tempered, filtered supply air to ensure indoor air quality is high.

All building services systems shall be of premium quality, incorporating the very latest technology and offering class leading efficiencies to reflect the overall nature of the development. This will enhance the end users experience of the property, providing optimum levels of comfort and surpassing the requirements of the Building Regulations and the Domestic Building Services Compliance Guide.

It is intended that all building services systems will be user friendly with full consideration given to access for maintenance of all items of plant. This will help to ensure that ongoing maintenance is correctly undertaken resulting in efficient operation and reliability.

Whilst the structure and building fabric are to be detailed by others these will also be of a premium quality with building fabric thermal transmittance values, glazing types and air permeabilities exceeding the requirements of the Building Regulations. This fastidious attention to detailing will help to reduce the building heating and cooling loads which will in turn prevent over specifying of plant and increase efficiency.

1.3 Project MEP team

The table below summarises the key personnel within CSG that will be involved in the project delivery and provides their contact details:

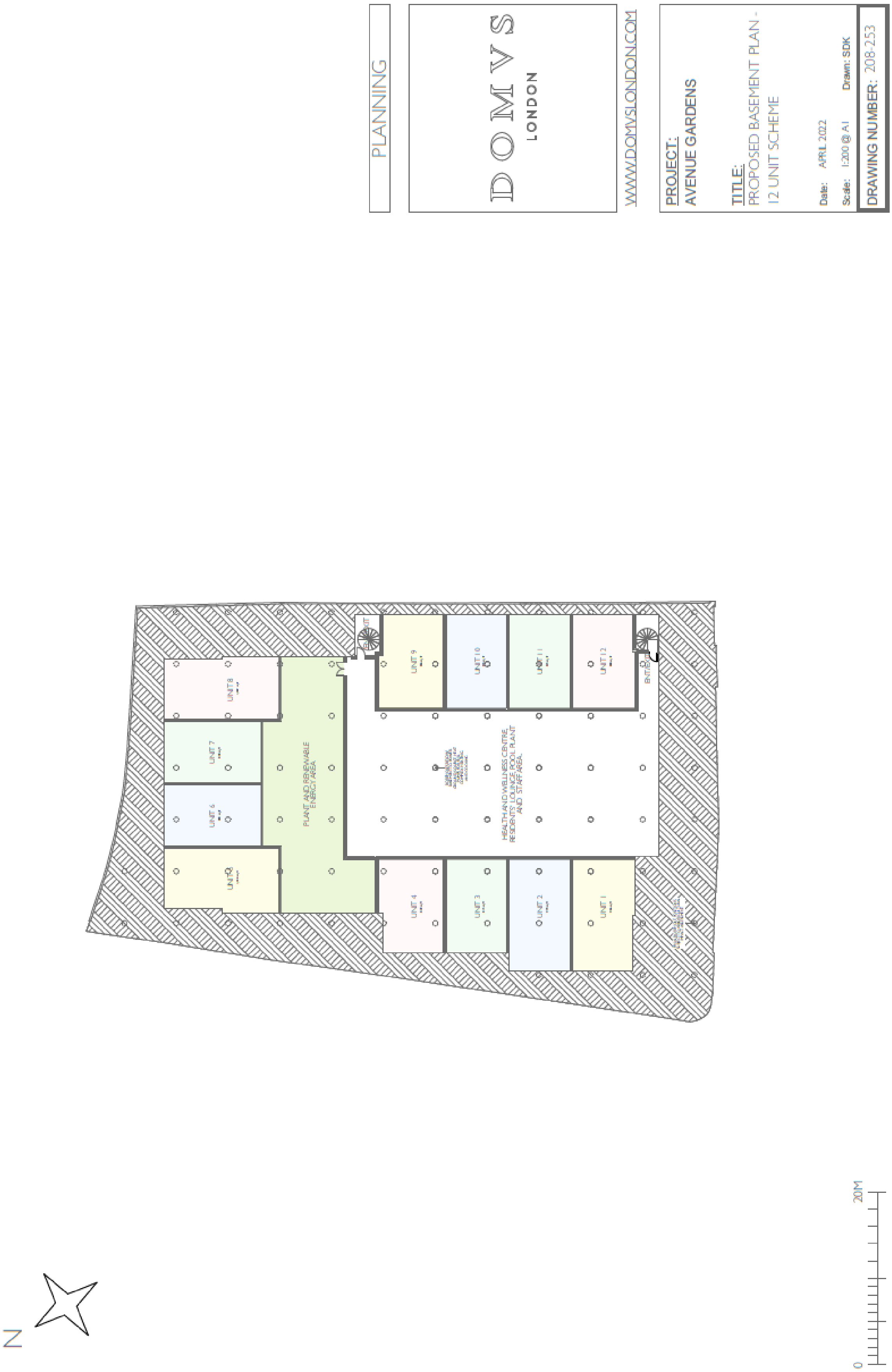
Name	Role	Telephone	Email
Simon Clarke	Managing Director	07747 854 805	simon@clarkeservicesgroup.co.uk
Lee Lindop	Associate Director	07503 097 001	lee@csgdesign.co.uk
Shoaib Maqsood	Sen. Elec. Engineer	07729 718 831	shoaib@csgdesign.co.uk
Rachael Lawton	CAD Technician	0161 300 9691	rachael@csgdesign.co.uk
Daniel Pratley	CSGA Director	07880 209 590	dan@csgacoustics.co.uk
Jessica Pointing	CSGU Director	07766 110 414	jessica@csgutilities.co.uk
Susma Chand	PA to Directors	0161 300 9691	susma@clarkeservicesgroup.co.uk

1.4 Design development

The building services strategies, loadings and details noted within this document are subject to change with design development and specialist input.

1.5 Proposed layouts

The layout of the building is being developed and is subject to change. At time of writing the proposed layouts for each individual townhouse and the health and wellbeing centre (H&WBC) are as follows: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DOMVS
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WWW.DOMVSLONDON.COM
PROJECT:
AVENUE GARDENS
TITLE:
PROPOSED BASEMENT PLAN -
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Date: APRIL 2022
Scale: 1:200 @ A1
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DRAWING NUMBER: 208-253
UNIT 1
UNIT 2
UNIT 3
UNIT 4
UNIT 6
UNIT 7
UNIT 8
UNIT 9
UNIT 10
UNIT 11
UNIT 12
PLANT AND RENEWABLE ENERGY AREA
HEALTH AND WELLNESS CENTRE
RESIDENTS' LOUNGE, POOL PLANT
AND STAFF AREA
ENTRANCE
EXIT
N
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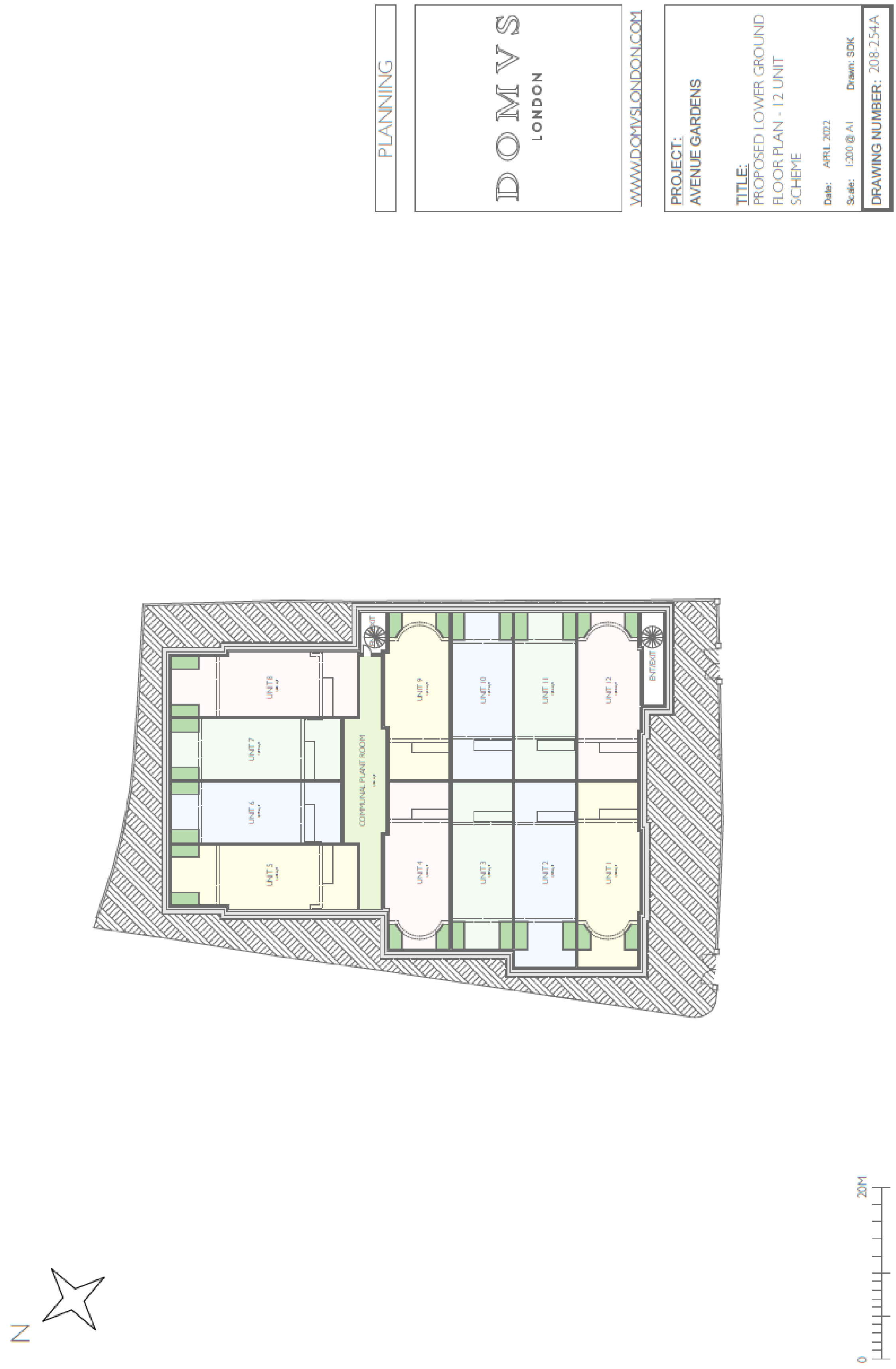
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TITLE:
PROPOSED LOWER GROUND FLOOR PLAN - 12 UNIT SCHEME
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UNIT 2
UNIT 3
UNIT 4
UNIT 5
UNIT 6
UNIT 7
UNIT 8
UNIT 9
UNIT 10
UNIT 11
UNIT 12
COMMUNAL PLANT ROOM
ENT/EXIT
N
0
20M


PLANNING
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PROJECT:
AVENUE GARDENS
TITLE:
PROPOSED GROUND FLOOR PLAN
Date: APRIL 2022
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Drawn: SDK
DRAWING NUMBER: 208-255
AVENUE ROAD
ELSWORTHY ROAD
50
56
70
N
COMMUNAL GARDEN
COMMUNAL GARDEN
UNIT 1
UNIT 2
UNIT 3
UNIT 4
UNIT 5
UNIT 6
UNIT 7
UNIT 8
UNIT 9
UNIT 10
UNIT 11
UNIT 12
0
20M


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PROJECT:
AVENUE GARDENS
TITLE:
PROPOSED FIRST FLOOR
PLAN - 12 UNIT SCHEME
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Scale: 1:200 @ A1
Drawn: SDK
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AVENUE ROAD
ELSWORTHY ROAD
50
56
70
N
20M
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CSG
design


PLANNING
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WWW.DOMVSLONDON.COM
PROJECT:
AVENUE GARDENS
TITLE:
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PLAN - 12 UNIT SCHEME
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UNIT 1
UNIT 2
UNIT 3
UNIT 4
UNIT 5
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UNIT 8
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UNIT 11
UNIT 12
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20M


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56
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0
20M

2 BASE MEP LOADS & UTILITY ESTIMATE

2.1 General

This section of the document defines the loads that have been used when considering various MEP plant configurations. These base loads have also informed the estimated capacity of the water and electric utilities required.

All loads at this stage are estimated and are subject to change with further detailed design.

2.2 Building fabric

The specification of the building fabric is key to ensuring the effective operation of modern building services systems.

Approved Document Part L Volume 1 as published by HM Government outlines the minimum accepted standards for the performance of building fabric within newly constructed dwellings. These requirements are summarised in the table below and we will look to improve upon them with the new townhouses.

Limiting U Values for new dwellings	
Element	**Maximum U Value W/(m2K)**
All Roof Types	0.16
Wall	0.26
Floor	0.18
Party Wall	0.20
Window	1.6
Rooflight	2.2
Doors	1.6

Approved Document Part L Volume 2 as published by HM Government outlines the minimum accepted standards for the performance of building fabric within newly constructed buildings other than dwellings. These requirements are summarised in the table below and we will look to improve upon them with the new H&WBC.

Limiting U Values for new buildings other than dwellings	
Element	**Maximum U Value W/(m2K)**
Flat Roof	0.18
Wall	0.26
Floor	0.18
Window	1.6
Rooflight	1.6
Doors	1.6

The heat loss and heat gain loads that we have calculated are based on a minimum of 25% betterment on these limiting values. This aligns with the aim to reduce heating / cooling loads and reflects the “best in class” nature of the development.

2.3 Estimated heat losses (heating loads)

The table below details how the loads for the space heating have been estimated for RIBA Stage 2 level of detail.

Estimated space heating losses			
Building	**Heat loss rate (W/sqm)**	**Building internal area (Sqm)**	**Estimated heat loss (KW)**
Individual Townhouse	45	480	21.6
Health & Wellbeing	45	920	41.4

2.4 Estimated heating gains (cooling loads)

The table below details how the loads for the space cooling have been estimated for RIBA Stage 2 level of detail.

Estimated space heating gains			
Building	**Heat gain rate (W/sqm)**	**Building internal area (Sqm)***	**Estimated heat loss (KW)**
Individual Townhouse	70	336	23.5
Health & Wellbeing	70	644	46.5

*Note that the cooling loads for each building type are based upon a reduced internal floor area as certain rooms (bathrooms, WC's, back of house for example) will not have cooling provided. For ease of calculation, the floor areas used in the cooling loads are based on a weighting factor of 70% of the building internal area.

2.5 Estimated domestic hot water loads

For each of the townhouses we have estimated that a maximum of 400 litres of hot water would be required in a one-hour period. This estimate is based upon a maximum of 3 showers and 2 baths being used – along with domestic kitchen usage - in any single hour.

Based on storing 400 litres of hot water with a reheat period of 1 hour we have estimated that the minimum domestic hot water load would be in the region of 24kW.

For the health and wellbeing centre we have estimated that a maximum of 600 litres of hot water would be required in a one-hour period. This estimate is based upon a maximum of 10 showers and 30 wash hand basins being used in any single hour.

Based on storing 600 litres of hot water with a reheat period of 1 hour we have estimated that the minimum domestic hot water load would be in the region of 35kW.

2.6 Estimated domestic cold-water loads

For each of the townhouses we have estimated a peak cold water flow rate as summarized in the table below:

Summary of water fittings – individual dwelling					
Outlet type	LU cold	LU hot	Overall quantity	Sub total LU cold	Sub total LU hot
Wash hand basin	1	1	10	10	10
WC	1	0	7	7	0
Sink	2	2	2	4	4
Washing machine	2	0	1	2	0
Dish washing machine	2	0	1	2	0
Shower	2	2	4	8	8
Bath	4	4	2	8	8
Total loading units				41	30
Converted to flow rate l/s				0.90	0.80
Total Unit flow rate l/s				1.70	

For the health and wellbeing centre we have estimated a peak cold water flow rate as summarized in the table below:

Summary of water fittings – health and wellbeing centre					
Outlet type	LU cold	LU hot	Overall quantity	Sub total LU cold	Sub total LU hot
Wash hand basin	1	1	10	10	10
WC	1	0	10	10	0
Sink	2	2	2	4	4
Shower	2	2	10	20	20
Total loading units				44	34
Converted to flow rate l/s				0.95	0.85
Total Unit flow rate l/s				1.80	

2.7 Estimated electrical loads

The table below details how the electrical loads for the have been calculated for RIBA Stage 2 level of detail.

Estimated electrical loads		
Building	**Electrical load (kVA)**	**Electrical supply size (A)**
Individual Dwelling	57	100 TPN
Health & Wellbeing	130	200 TPN

*Note that the electrical loads include assumptions for electric catering apparatus, electrical usage by GSHP & pool installations. A full breakdown of these assumptions can be provided by request.

3 TOWNHOUSE PROPOSED MEP SERVICES

3.1 General

This section of the document details the proposed MEP building services strategies and their integration into the townhouses taking into consideration the client's requirements.

Note that all MEP strategies are subject to further detailed design and verification of suitability as the design progresses.

3.2 Client's brief / thoughts

The client has requested that a ground source heat pump system be used. This decision is in part due to The Future Homes Standard preventing the installation of gas fired boiler in new properties from 2025 and the ability of GSHP technology to provide heating and cooling in a more sustainable manner to that of fossil fuel using systems.

If necessary, the Engineer can consider an air source heat pump system to supplement the ground source heat pump approach, however this is strictly a backup option following detailed design as there are various aesthetic and acoustic constraints to consider.

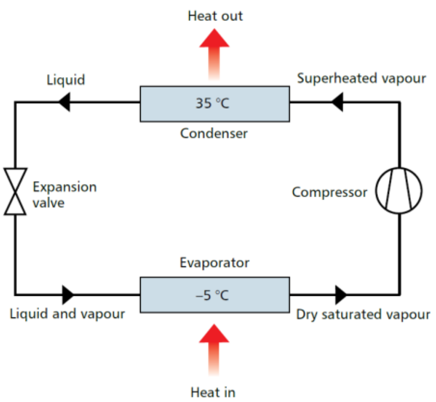
3.3 Heating and cooling plant

3.3.1 Ground source heat pump (GSHP)

GSHP systems are subject to specialist design input with regards to their general suitability and the design of the ground loop which is intrinsically linked to the existing ground conditions. We are still in discussions with various GSHP specialists to determine the system suitability, configuration and layout so this section is subject to change.

A GSHP extracts heating energy from the ground and delivers this heating energy to water that can be used to heat a building. The most widely adopted type of GSHP uses the vapour compression cycle with electrically powered compressors. The vapour compression cycle is one of the most commonly used methods of raising the temperature of low-grade heat to a level where it becomes useful.

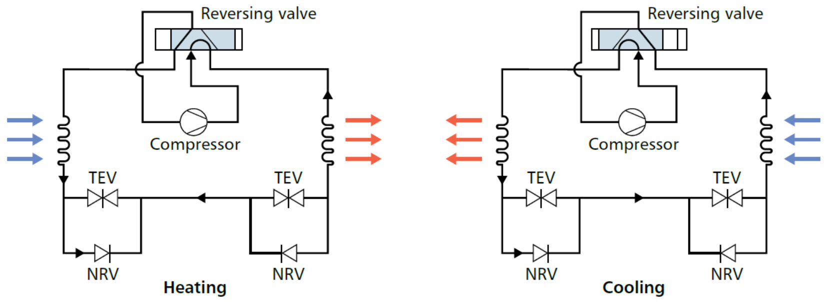
Vapour compression cycle diagram



During the vapour compression cycle low grade heat is put into a lower temperature refrigerant liquid which makes it vapourise. This vapour is then mechanically compressed to a higher pressure which increases its temperature. The hot vapour refrigerant enters a condenser where it surrenders its latent heating energy and turns back into a liquid. The liquid then expands through a valve causing a drop in pressure and partial vapourisation before re-entering the evaporator where the cycle starts again.

The vapour compression cycle can be reversed to provide cooling instead of heating. This is typically achieved with a reversing valve as shown in the diagrams below:

GSHP operation in heating and cooling mode

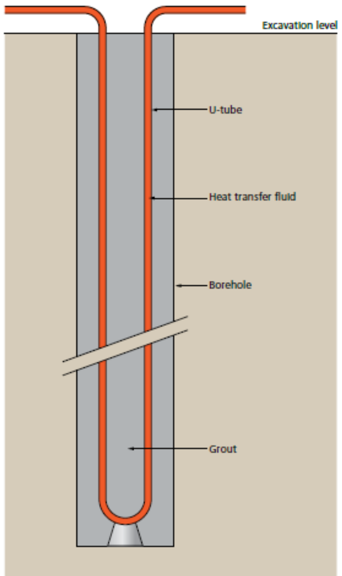


It is proposed that reversible GSHP plant with an output in the region of 25 - 35KW would be installed within the basement plant room of each townhouse. The GSHP would get its primary energy source from a series of boreholes that are drilled vertically in the ground (it is anticipated that horizontal loop arrays would not be feasible).

Solar energy is stored in surface soil and dissipates through rock layers in the ground forming a heat source that is relatively stable irrespective of the time of year or weather conditions.

Boreholes are drilled using specialist drilling rigs to a depth of around 100m to 150m. Each borehole is 150mm and requires minimum separation from any adjacent borehole of 5m. A u-shaped HDPE pipe is inserted into the borehole and connected via a trench and manifold assembly located externally to the GSHP plant located in the townhouse plant room. The area between the borehole and the u-pipe is filled with a specialist grout that enhances the thermal conductivity between the ground/rock and the u-pipe.

Typical u-pipe in vertical borehole



The GSHP plant circulates a brine fluid through the borehole pipework. This cold brine fluid absorbs the low-grade heating energy within the ground/rock and delivers it to the GSHP. Once the brine fluid surrenders its energy it is returned to the borehole to start the process again. Note that in certain applications boreholes can be built over.

Inside the GSHP plant this low-grade heating energy is compressed into high grade heating energy which can be used to serve the heating buildings system using the vapour compression cycle explained previously.

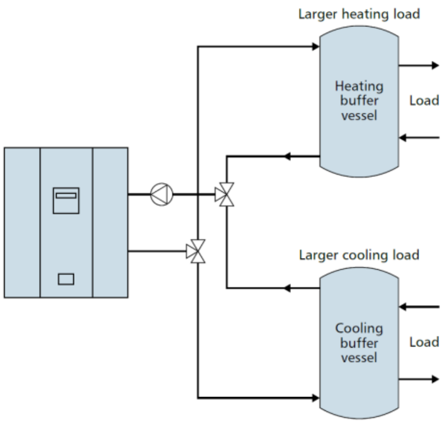
Based on our 25kW to 35kW peak capacity we would estimate that the following number of boreholes would be required per townhouse:

- 25kW system requires 5 vertical bore holes at a depth of 100m each (approx. 50W per meter of borehole TBC with detailed design / geothermal survey).

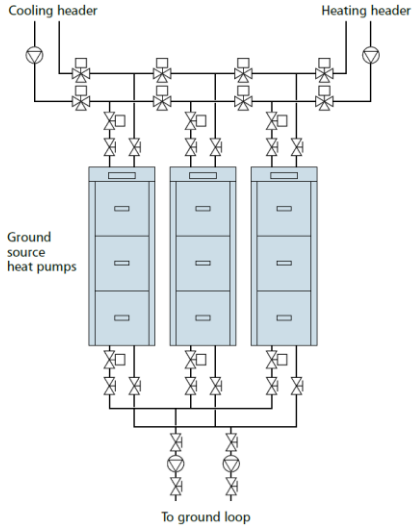
- 35kW system requires 7 vertical bore holes at a depth of 100m each (approx. 50W per meter of borehole TBC with detailed design / geothermal survey).

The schematics below shows a single reversible GSHP providing heating and chilled water via dedicated buffer vessels and multiple reversible GSHP providing heating and chilled water via a header configuration:

Single reversible GSHP schematic (buffer vessel solution)

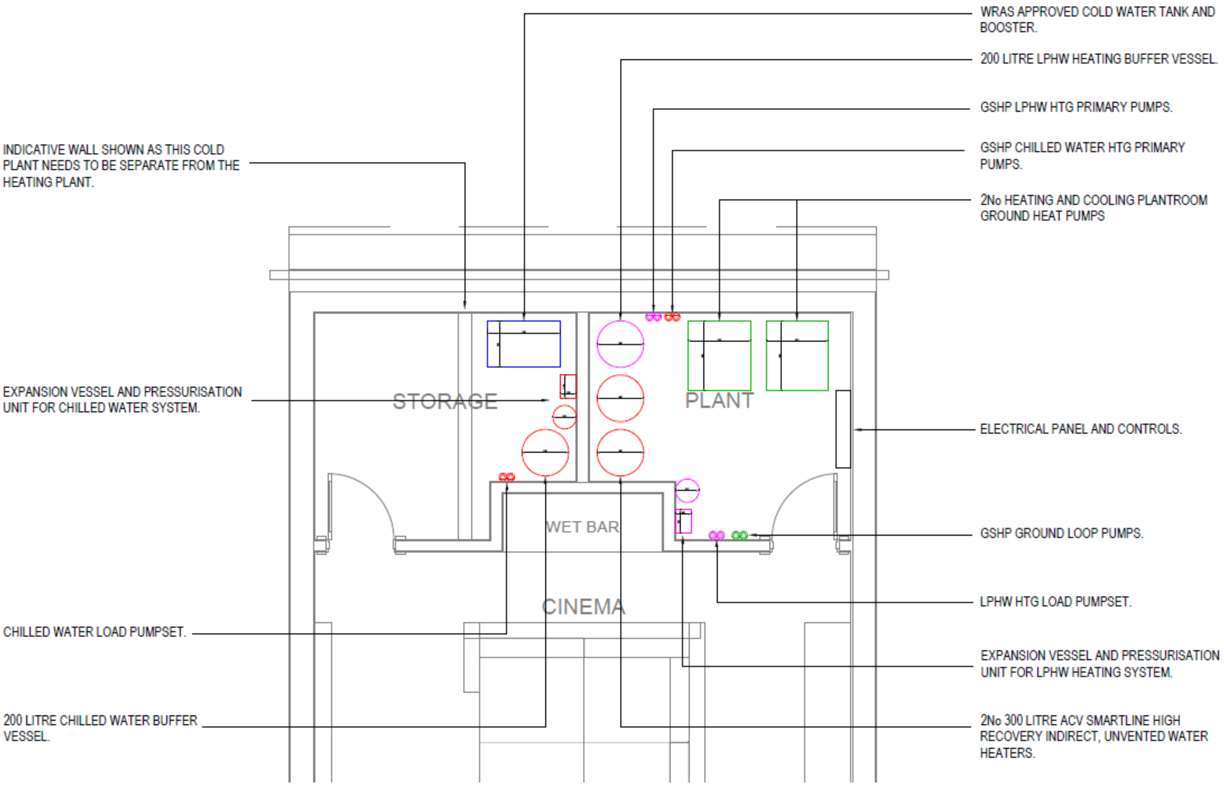


Multiple reversible GSHP schematic (header solution)



If reversible GSHP technology is considered fully suitable for the scheme, it is anticipated that each townhouse plant room layout would be as follows:

Indicative basement plant room layout (townhouse)



The efficiency criteria of GSHP plant are given as a coefficient of performance (COP). Put simply, the COP is the ratio of the GSHP output against the amount of electrical power required to run. Typical reversible GSHP COP can be as high as 5.0.

This means that a GSHP will have an output five times greater than the electrical input e.g., a 35kW output GSHP will require 7kW electrical input. These figures will be updated with plant proposals.

3.3.2 Space heating

The key to maximizing efficiency from GSHP systems is to keep the distribution temperature as low as possible. Due to this, standard radiators are not recommended as they do not provide a large enough surface area to compensate for the lower flow temperature provided by the GSHP.

As a rule of thumb, GSHP will operate efficiently with a distribution temperature of 40ºC flow and 35ºC return, which is perfect for wet under floor heating systems.

All habitable rooms in each dwelling will be provided with a wet UFH system. The exact nature of the UFH system will be confirmed with the floor build up detail but it is anticipated to comprise of:

1. Sub floor construction TBC,
2. PEX / MLCP UFH heating pipework to be installed in castellated panel with 10mm pre bonded EPS insulation (spacings to not exceed 150mm in any instance),
3. Screed to accept final floor finish (floor finish to be a mixture of timber and stone TBC by Architect),
4. Fully pumped manifolds complete with 3 port-controlled mixing valve and zone valve actuators (manifolds to be concealed in joinery / cupboards etc.),
5. Temperature control to each zone via Heatmiser floor and air sensors with temperature controls for the manifold and 230v actuators

Electric underfloor heating shall be provided to all wet rooms and similar. This will allow the wet rooms to be adequately heated during the summer period when the main heating plant may be off.

3.4 Domestic water services

3.4.1 Domestic cold water

A metered, mains incoming cold-water supply will be provided to each townhouse from Thames Water infrastructure. This supply will terminate in a WRAS approved, combined booster & storage tank. The combined booster and tank shall be provided within the basement plant room and located separately to heat generating equipment to prevent the growth of legionella.

This piece of equipment will be responsible for the storage and pressure boosting of the cold-water service within each townhouse.

Combined pressure booster and cold-water storage tank

Cold water to all outlets excluding the kitchen shall be softened to prevent limescale build up. The water softening apparatus shall be located within the plant room and be of a salt tablet type.

Cold water will be distributed throughout the townhouse using concealed, copper pipework that is complete with thermal insulation.

Specialist irrigation supplies are to be confirmed by others. At this stage it is assumed that each townhouse will be provided with a garden tap complete with backflow category 3 backflow protection.

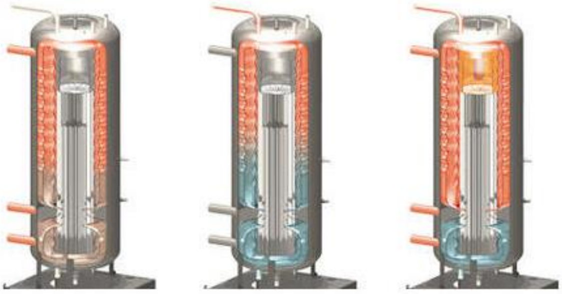
Details of the proposed sanitaryware are to be confirmed by others.

3.4.2 Domestic hot water

2No high recovery hot water heaters shall be installed within the plant room sized at 50% of the load to offer redundancy. These shall be provided with primary heating from the GSHP plant described previously.

We would recommend the use of “tank in tank” primary technology due to its faster recovery rate compared to traditional counterparts that are fitted with a heating coil at the bottom. The diagram below shows the principles of a high recovery, tank in tank” cylinder.

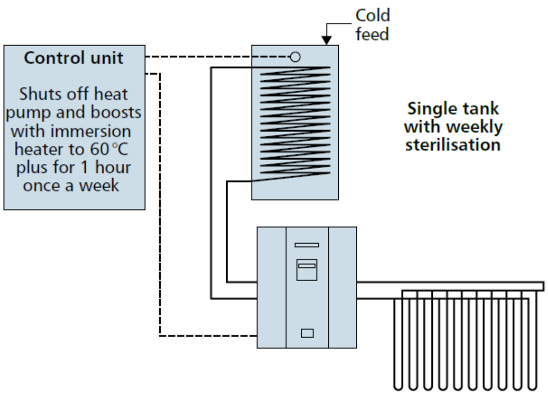
High recovery tank in tank hot water heater



The key to maximizing efficiency from GSHP systems is to keep the distribution temperature as low as possible. This goes against the requirement for domestic hot water to be stored above 60ºC to control legionella growth. To combat this, the GSHP will be able to periodically to run in high temperature mode resulting in a distribution temperature to the hot water heaters between 55ºC and 60ºC. Whilst running in high temperature mode the efficiency of the GSHP will drop.

The hot water heaters will be equipped with electric immersion heaters that shall be used to pasteurise the water contents on a weekly basis or in the case of GSHP maintenance. It is suggested that this pasteurisation process is carried out weekly for one hour.

Weekly hot water pasteurization cycle



The hot water system shall be equipped with a pumped secondary return to ensure that the system extremities are up to a safe temperature and provide quick draw off of hot water.

Hot water will be distributed throughout the townhouse using concealed, copper pipework that is complete with thermal insulation.

Thermostatic mixing valves, as required to satisfy the requirements of the building regulations will be provided.

Details of the proposed sanitaryware are to be confirmed by others.

3.5 Space cooling

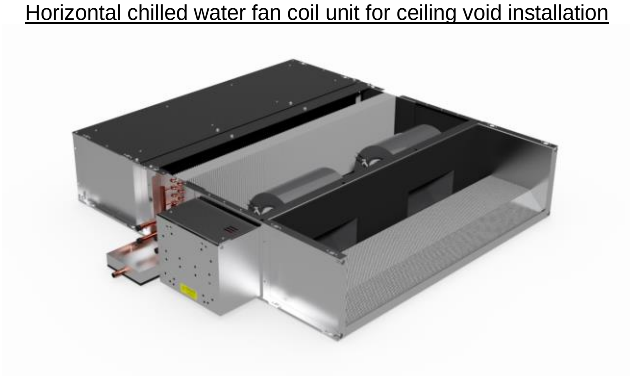
It is anticipated that a 2-pipe (cooling only) fan coil unit system will be installed to provide cooling to the main habitable spaces within each townhouse.

The reversible GSHP system will provide a chilled water primary circuit that serves all of the fan coil units. It is anticipated that this chilled water system will operate at an 8ºC flow and 14ºC return to maximise the efficiency of the GSHP system.

A chilled water fan coil unit (FCU) works by transferring heat from the air passing over the FCU heat exchanger (coil) to the chilled water passing within. Chilled water is supplied by the reversible GSHP and water within the distribution network is cooled to 8ºC.

Fans in the FCU recirculate room air over the exchanger containing the cold water, cooling the air, which is delivered into the space by discrete ductwork and grilles.

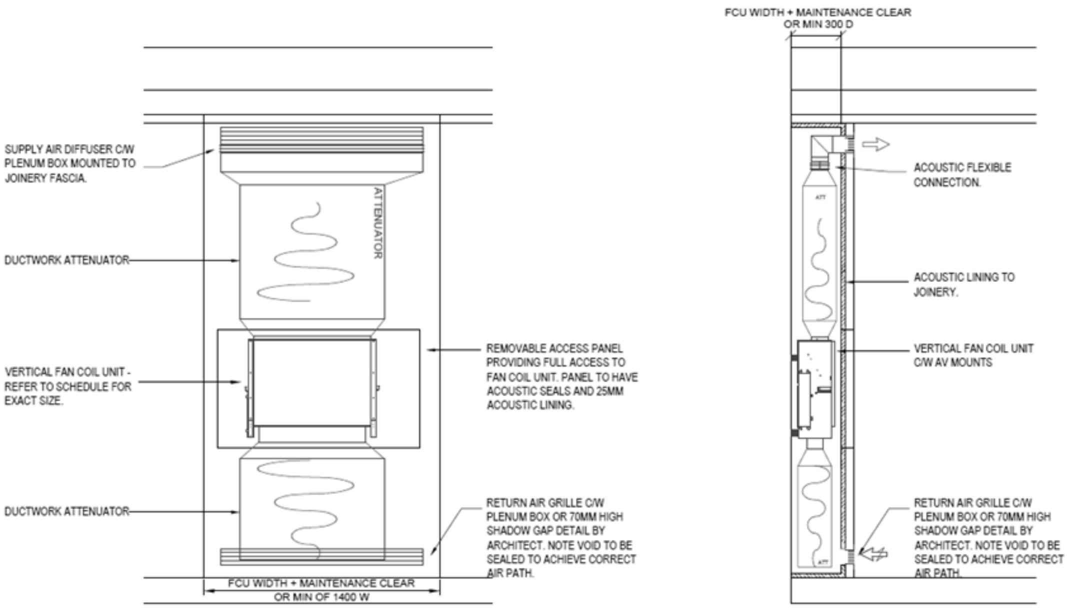
Horizontal chilled water fan coil unit for ceiling void installation



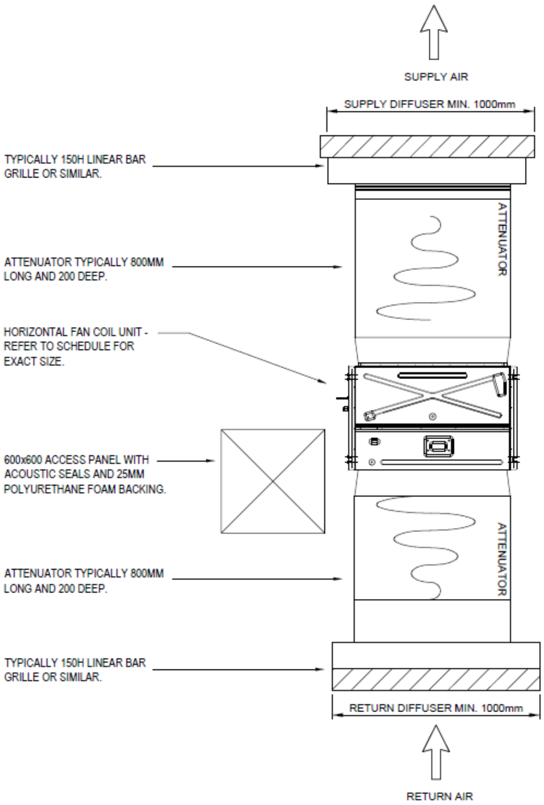
The exact positioning of the fan coil units is to be agreed as the room layouts progress but common solutions include vertical chassis units which can be concealed within a fixed piece of joinery or horizontal chassis units that can be concealed within ceiling voids.

In either instance it is important that attenuation is considered, particularly in bedrooms to deliver a high-quality end product.

Vertical chassis FCU concealed in fixed joinery



Horizontal chassis FCU concealed in ceiling void



3.6 Natural gas

No natural gas services are proposed. Kitchen appliances shall be electric and any fireplaces will need to be bioethanol or similar.

3.7 Mechanical ventilation

3.7.1 General supply and extract ventilation

It is proposed that each townhouse with be provided with continuous mechanical supply and extract with heat recovery (MVHR) as defined in Part F of the Building Regulations (system 4).

Filtration will be included within the MVHR unit and this is anticipated to be of F7 grade to provide a high level of indoor air quality.

The MVHR system will be installed in a cupboard or similar and arranged to operate continuously to supply fresh air and extract stale moisture laden air. The supply air temperature will be tempered by transferring the heating energy present in the extracted air via the MVHR units heat exchanger maximizing overall system efficiency.

It is anticipated that an MVHR system will be provided to serve the basement and lower ground floor. A separate MVHR system will be provided to serve the ground floor, first floor and second floor.

Intake and exhaust louvres will be required on the external façade of each townhouse and are anticipated to be cast iron air bricks or similar. Where possible, these will be located away from the principal façade. Alternatively, a false chimney may be used subject to further design.

Generally, air will be supplied into each habitable space and extracted from the bathrooms via a network of PVC flat profile ducting with the air terminals comprising of linear diffusers & grilles or similar.

Ductwork and grille velocities shall be kept low in order to reduce airborne noise and provide a high-quality installation.

The MVHR systems will be designed to satisfy the volumetric air flow rates as detailed in Part F of the building regulations with the calculated static resistance being subject to a 20% uplift to allow for the deterioration of filters.

Detailed calculations are to be completed however it is anticipated that the MVHR units within each dwelling will be as follows:

- MVHR unit 01 – flow rate of approx. 70 L/S @ 100pa external static
- MVHR unit 02 – flow rate of approx. 80 L/S @100pa external static

Purge ventilation will be detailed by others but is anticipated to consist of openable windows and doors.

To assist with adequate air transfer through the dwellings all doors shall be undercut to the requirements of Part F of the Building Regulations.

Typical domestic MVHR system

3.7.2 Kitchen ventilation

The kitchen ventilation will form part of the kitchen designers' package and will either be of a high-level canopy or downdraught specification.

In either case, it is anticipated that the kitchen ventilation will be of an extraction type and not recirculation with ductwork being provided to suit. The minimum extraction rate of the system shall be 30 L/S.

Filtration will be built into kitchen extract unit.

The kitchen extract system will have local manual control and be intermittently operated by the end user.

3.7.3 Ventilation attenuation

The general ventilation within each of the townhouses will be provided attenuation. This is anticipated to comprise of an acoustic top box for the MVHR unit and inline attenuation to room and atmosphere ducts.

The cupboard / enclosure housing the MVHR unit will also be provided with insulation to reduce noise break out through the MVHR unit case.

These measures will help to ensure that the end result is of high quality to the end users.

3.7.4 Fire & smoke ventilation

The fire and smoke ventilation systems are to be developed by Atelier Ten who have been appointed separately.

It is understood that the individual townhouses will not be provided with any dedicated fire and smoke ventilation with openable windows acting as the means of purge ventilation.

Further details of the proposed system should be obtained from their documentation.

3.8 Above ground drainage

A network of new above ground foul water drainage pipework shall be provided to serve the various areas of the townhouses including kitchens, bathrooms, plant rooms and fan coil unit condensate.

The above ground foul water drainage system shall be based upon a primary ventilated system configuration as described in BS EN 12056 part 2.

Generally, pipework will be Terrain DB12 acoustic which offers superior noise attenuation over traditional alternatives. We would also recommend that when passing through noise sensitive rooms the pipework is acoustically insulated.

Connections to below ground drainage shall be as detailed by the project civils engineer.

3.9 Electrical services

3.9.1 Lighting

A range of high efficiency LED light fittings shall be provided throughout the property to the lighting designers requirements.

It is assumed that the lighting will consist of recessed LED downlights with intelligent lighting control including scene selection – details TBC by AV / lighting company.

3.9.2 AV system

It is anticipated that an AV system will be installed to ensure maximum operational efficiency– exact details TBC by AV company.

It is anticipated that the heating and cooling controls will be integrated with the AV system to provide a single user interface – TBC by AV company.

3.9.3 Security & CCTV

To include for front and rear CCTV supplemented by an intruder system capturing PIR detection, window vibration detection with a monitored line.

The MEP provision will consist of all necessary power supplies and containment.

3.9.4 Fire alarm

A fire alarm system shall be provided comprising of automatic detection and sounders to meet the requirements of the project fire officer. It is anticipated that the level of cover required will be to LD1.

3.9.5 Small power and distribution

A new small power and electrical distribution system shall be provided comprising of consumer units with RCBO protection, flush twin and earth wiring and recessed, wall mounted electrical outlets. Finish of all visible wall outlets to be confirmed by the client.

3.9.6 Access control

To include for video entry call point at the main entrance with videophone receivers at each floor.

The MEP provision will consist of all necessary power supplies and containment.

3.9.7 Electric car chargers

The development will provide 2 disabled spaces with commensurate electric car charging.

4 HEALTH & WELLBEING CENTRE PROPOSED MEP SERVICES

4.1 General

This section of the document details the proposed MEP building services strategies and their integration into the health and wellbeing centre taking into consideration the client's requirements.

Note that all MEP strategies are subject to further detailed design and verification of suitability as the design progresses.

4.2 Client's brief / thoughts

The client has requested a ground source heat pump approach to ensure the most efficient sustainable use of energy throughout the development.

If necessary, the Engineer can consider an air source heat pump system to supplement the ground source heat pump approach, however this is strictly a backup option following detailed design as there are various aesthetic and acoustic constraints to consider.

4.3 Heating and cooling plant

4.3.1 Ground source heat pump (GSHP)

GSHP systems are subject to specialist design input with regards to their general suitability and the design of the ground loop which is intrinsically linked to the existing ground conditions. We are still in discussions with various GSHP specialists to determine the system suitability, configuration and layout so this section is subject to change.

The GSHP system proposed is intended to be similar in operation to that described for the individual dwellings but it will be scaled up to suit the differing loads of the building. To recap, the estimated loads for the H&WBC are:

- 41.4kW space heating,
- 35kW heating for domestic hot water production,
- 30kW heating allowance for specialist pool equipment (TBC by others),
- 46.5kW cooling

It is proposed that reversible GSHP plant with an output in the region of 75 - 100KW would be installed within the basement plant room.

Based on our 75kW to 100kW peak capacity estimate we would estimate that the following number of boreholes would be required:

- 75kW system requires 15 vertical bore holes at a depth of 100m each (approx. 50W per meter of borehole TBC with detailed design / geothermal survey).

- 100kW system requires 20 vertical bore holes at a depth of 100m each (approx. 50W per meter of borehole TBC with detailed design / geothermal survey).

The efficiency criteria of GSHP plant are given as a coefficient of performance (COP). Put simply, the COP is the ratio of the GSHP output against the amount of electrical power required to run. Typical reversible GSHP COP can be as high as 5.0.

This means that a GSHP will have an output five times greater than the electrical input e.g., a 100kW output GSHP will require 20kW electrical input. These figures will be updated with plant proposals.

4.3.2 Space heating

The key to maximizing efficiency from GSHP systems is to keep the distribution temperature as low as possible. Due to this, standard radiators are not recommended as they do not provide a large enough surface area to compensate for the lower flow temperature provided by the GSHP.

As a rule of thumb, GSHP will operate efficiently with a distribution temperature of 40ºC flow and 35ºC return which is perfect for wet under floor heating systems.

All habitable rooms in the H&WBC will be provided with a wet UFH system. The exact nature of the UFH system will be confirmed with the floor build up detail but it is anticipated to comprise of:

1. Sub floor construction TBC,
2. PEX / MLCP UFH heating pipework to be installed in castellated panel with 10mm pre bonded EPS insulation (spacings to not exceed 150mm in any instance),
3. Screed to accept final floor finish (floor finish to be a mixture of timber and stone TBC by Architect),
4. Fully pumped manifolds complete with 3 port-controlled mixing valve and zone valve actuators (manifolds to be concealed in joinery / cupboards etc.),
5. Temperature control to each zone via Heatmiser floor and air sensors with temperature controls for the manifold and 230v actuators

Electric underfloor heating shall be provided to all wet rooms and similar. This will allow the wet rooms to be adequately heated during the summer period when the main heating plant may be off.

Electric panel heaters shall be provided to back of house areas not benefitting from wet UFH.

4.4 Domestic water services

4.4.1 Domestic cold water

A metered, mains incoming cold-water supply will be provided to the H&WBC from Thames Water Infrastructure. This supply will terminate in a WRAS approved, combined booster & storage tank. The combined booster and tank shall be provided within the basement plant room and located separately to heat generating equipment to prevent the growth of legionella.

This piece of equipment will be responsible for the storage and pressure boosting of the cold-water service throughout the H&WBC.

Combined pressure booster and cold-water storage tank

Cold water to all outlets excluding the kitchen shall be softened to prevent limescale build up. The water softening apparatus shall be located within the plant room and be of a salt tablet type.

Cold water will be distributed throughout the H&WBC using concealed, copper pipework that is complete with thermal insulation.

The pool and associated spa will be subject to detailed design by a specialist. It is anticipated that the pool will be filled prior to occupation / out of hours so no cold-water loading has been taken into consideration. Details of the pool plant are to be provided when available.

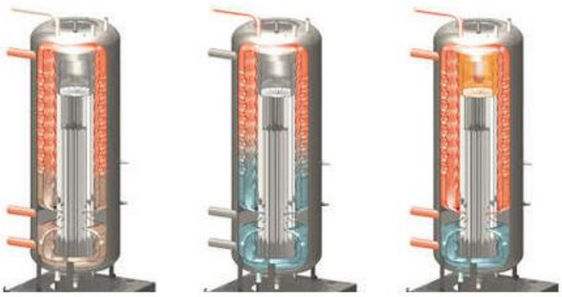
Details of the proposed sanitaryware are to be confirmed by others.

4.4.2 Domestic hot water

2No high recovery hot water heaters shall be installed within the plant room sized at 50% of the load to offer redundancy. These shall be provided with primary heating from the GSHP plant described previously.

We would recommend the use of "tank in tank" primary technology due to its faster recovery rate compared to traditional counterparts that are fitted with a heating coil at the bottom. The diagram below shows the principles of a high recovery, tank in tank" cylinder.

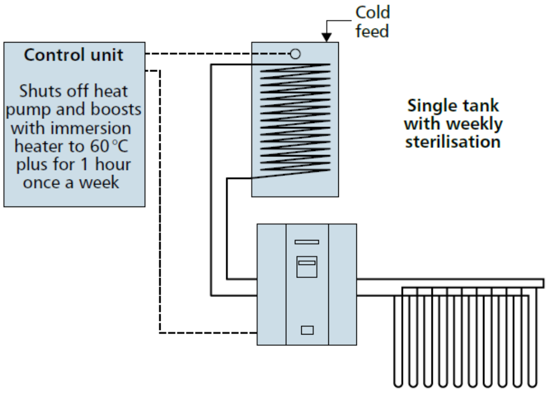
High recovery hot water heater



The key to maximizing efficiency from GSHP systems is to keep the distribution temperature as low as possible. This goes against the requirement for hot water to be stored above 60ºC to control legionella growth. To combat this, the GSHP will be able periodically to run in high temperature mode resulting in a distribution temperature to the hot water heaters between 55ºC and 60ºC. Whilst running in high temperature mode the efficiency of the GSHP will drop.

The hot water heaters will be equipped with electric immersion heaters that shall be used to pasteurise the water contents on a weekly basis or in the case of GSHP maintenance. It is suggested that this pasteurisation process is carried out weekly for one hour.

Weekly hot water pasteurization cycle



The hot water system shall be equipped with a pumped secondary return to ensure that the system extremities are up to a safe temperature and provide quick draw off of hot water.

Hot water will be distributed throughout the H&WBC using concealed, copper pipework that is complete with thermal insulation.

Thermostatic mixing valves, as required to satisfy the requirements of the building regulations will be provided.

Details of the proposed sanitaryware are to be confirmed by others.

4.5 Space cooling

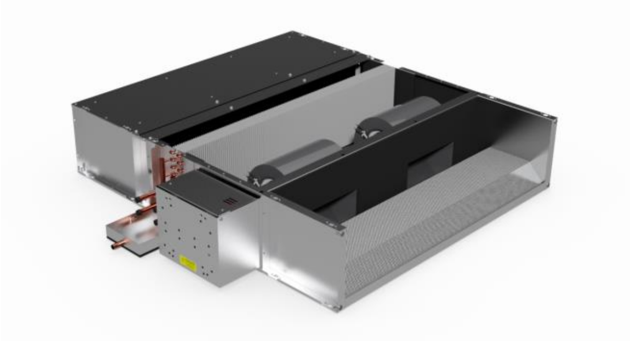
It is anticipated that a 2-pipe (cooling only) fan coil unit system will be installed to provide cooling to the selected rooms in the H&WBC.

The reversible GSHP system will provide a chilled water primary circuit that serves all of the fan coil units. It is anticipated that this chilled water system will operate at an 8ºC flow and 14ºC return to maximise the efficiency of the GSHP system.

A chilled water fan coil unit (FCU) works by transferring heat from the air passing over the FCU heat exchanger (coil) to the chilled water passing within. Chilled water is supplied by the reversible GSHP and water within the distribution network is cooled to 8ºC.

Fans in the FCU recirculate room air over the exchanger containing the cold water, cooling the air, which is delivered into the space by discrete ductwork and grilles.

Horizontal chilled water fan coil unit for ceiling void installation



The exact positioning of the fan coil units is to be agreed as the room layouts progress but the most common solution for commercial developments is to use horizontal chassis units that can be concealed within ceiling voids.

In either instance it is important that attenuation is considered, particularly in relaxation zones to deliver a high-quality end product.

4.6 Natural gas

No natural gas services are proposed. Kitchen appliances shall be electric.

4.7 Mechanical ventilation

4.7.1 General ventilation

It is proposed that the health and wellbeing facility will be provided with continuous mechanical supply and extract with heat recovery (MVHR) that will be time clock controlled to suit the opening hours of the facility.

Filtration will be included within the MVHR unit and this is anticipated to be of F7 grade to provide a high level of indoor air quality.

The MVHR system will be installed in the plant room and arranged to operate continuously to supply fresh tempered air and extract stale moisture laden air. The supply air temperature will be tempered by transferring the heating energy present in the extracted air over the MVHR units heat exchanger maximizing overall system efficiency.

General supply and extract will be provided to serve the gym, changing rooms, residential lounge and associated areas.

Generally, air will be supplied and extracted from each space via a network of galvanized rectangular ducting with the air terminals comprising of linear diffuser / grilles or similar.

Intake and exhaust louvres will be required and the positions of these are to be determined as the design develops.

Ductwork and grille velocities shall be kept low in order to reduce airborne noise and provide a high-quality installation.

The MVHR systems will be designed to achieve a maximum flow rate of 10 litres per second per person in general spaces such as the gym and to CIBSE recommendations of 10ACH in toilets / changing rooms etc. The calculated static resistance shall be subject to a 20% uplift to allow for the deterioration of filters.

Detailed calculations are to be completed however it is anticipated that the MVHR unit within the health and wellbeing will be as follows

- MVHR unit 01 – flow rate of approx. 700 L/S @ 200pa external static.

Typical commercial MVHR unit

4.7.2 Staff kitchenette ventilation

The staff kitchenette ventilation will form part of the kitchen designers' package and will either be of a high-level canopy or downdraught specification.

In either case, it is anticipated that the kitchen ventilation will be of an extraction type and not recirculation with ductwork being provided to suit. The minimum extraction rate of the system shall be 30 L/S.

Filtration will be built into kitchen extract unit.

The kitchen extract system will have local manual control and be intermittently operated by the end user.

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4.7.3 Pool ventilation

The provision of the pool plant including air handling apparatus will be via the project's pool specialist / supplier.

It is anticipated that a Calorex type air handling unit will be installed in the plant room which will control the temperature, humidly and provide mechanical supply & extraction to the pool.

Heating connections shall be provided to the pool air handling unit from the main heating plant serving the health and wellbeing area. An estimated load of 30kW has been allowed.

Ductwork will be of galvanized rectangular construction with a protective coating to prevent deterioration from the pool chlorine.

Ductwork and grille velocities shall be kept low in order to reduce airborne noise and provide a high-quality installation.

Typical Calorex Pool AHU

4.7.4 Fire & smoke ventilation

The fire and smoke ventilation systems are to be developed by Atelier Ten who have been appointed separately.

It is understood that Atelier Ten are reviewing the potential to use natural ventilation to drive the smoke ventilation. Further details of the proposed system should be obtained from their documentation.

4.7.5 Above ground drainage

A network of new above ground foul water drainage pipework shall be provided to serve the various areas of the H&WBC including kitchen, changing rooms, plant rooms and fan coil unit condensate.

The above ground foul water drainage system shall be based upon a primary ventilated system configuration as described in BS EN 12056 part 2.

Generally, pipework will be Terrain DB12 acoustic which offers superior noise attenuation over regular alternatives. We would also recommend that when passing through noise sensitive rooms the pipework is acoustically insulated.

Connections to below ground drainage shall be as detailed by the project civils engineer.

4.8 Electrical services

4.8.1 Lighting

A range of high efficiency LED light fittings shall be provided throughout the property to the lighting designers requirements.

It is assumed that the lighting will consist of recessed LED downlights with intelligent lighting control including scene selection – details TBC by AV / lighting company.

4.8.2 AV system

It is anticipated that an AV system will be installed – exact details TBC by AV company.

4.8.3 Security & CCTV

To include for front and rear CCTV supplemented by an intruder system capturing PIR detection, window vibration detection with a monitored line.

The MEP provision will consist of all necessary power supplies and containment.

4.8.4 Fire alarm

A fire alarm system shall be provided comprising of automatic detection and sounders to meet the requirements of the project fire officer.

4.8.5 Small power and distribution

A new small power and electrical distribution system shall be provided comprising of distribution boards with RCBO protection, singles in conduit wiring and recessed, wall mounted electrical outlets. Finish of all visible wall outlets to be confirmed by the client.

4.8.6 Access control

To include for video entry call point at the main entrance with videophone receivers at each floor.

The MEP provision will consist of all necessary power supplies and containment.

4.8.7 BMS System

A BMS system will be provided to automate, control and provide power the main heating, cooling, domestics and ventilation plant in the H&WBC.

It is anticipated that a wall mounted control panel will be provided in the plant room with a touch screen system offering user adjustment of the various system parameters.

There will also be the facility to remotely log into the system.