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# 1 Summary of Changes to Mechanical Systems Following Planning Comments

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## 1.1 System Changes from the Planning Submittal

### 1.1.1 Planning Submittal System Type

The heating plant design submitted for the initial Planning application was for what is known as a “4-pipe” system.

A 4-pipe system incorporates an Air Source Heat Pump (ASHP) which either takes heat from the external (in heating mode) or rejects heat to the external air (in cooling mode) and produces both heating water (known as Low Temperature Hot Water – LTHW) and chilled water (CHW).

The LTHW and CHW is circulated around the building in two pairs of flow and return pipework (4 pipes in total).

The internal heat emitters, which are generally fancoil units (FCU), use this water to either heat or cool the air within the rooms.

The advantages of this 4-pipe solution include the following:

- Limited requirement for heating/cooling generation plant space outside of the main plantroom.
- Reduced maintenance within lettable spaces.
- No requirement for refrigerant pipework outside of the ASHP.

Following the Planning submission for the above 4 pipe ASHP arrangement, Mesh were asked to redesign the system for a much-reduced acoustic criteria and to assess the feasibility of changes to the building footprint and envelope. These changes were driven by an acoustic survey and comments from the neighbours. The neighbours had a perception that the 4-pipe ASHP plant was massing in one location on the boundary. The 4-pipe system was already pushing the available space in the 1950s extension to the limits in terms of the physical space required by the ASHP itself and the depth, height and surface areas of the intake and exhaust attenuators required.

### 1.1.2 Updated Proposal to Accommodate Change to Noise Requirement

Following engagement with equipment suppliers on reducing the ASHP size and noise, it was determined that the proposed 4-pipe ASHP or another 4-pipe ASHP could not satisfy the new design criteria. The change to the 2-pipe system was therefore selected.

Where the 4-pipe system distributes both LTHW and CHW around the building, the 2-pipe system has one pair of pipes (flow and return) which circulates water at approximately 20°C. This is why this type of system is also known as an “Ambient Loop”.

Within each tenanted area, internally located Variable Refrigerant Volume (VRV) heat pumps then use this ambient temperature water to both heat and cool the nearby spaces (by either taking heat from or rejecting heat to the loop).

The advantages of this 2-pipe solution include the following:

- Increased heat pump options, including modular units.
  - o Allows more flexibility in plantroom layout.
  - o Improves system redundancy.
  - o Potential to run fewer heat pump modules at part load.
  - o Potential to continue to serve the property during maintenance.
- Reduced noise levels from heat pump equipment.
  - o Reduced attenuator length.
- Reduced heat pump intake and exhaust air.
  - o Face area of attenuators can reduce.

The disadvantages compared to the 4-pipe solution include the following:

- There is a space requirement within the tenanted areas to locate the VRV heat pumps (requiring acoustic treatment).
- The total refrigerant capacity is higher due to the internal VRV units and distribution to the refrigerant based FCUs.

## **1.2 Changes to Egbert Street Plant Area**

Following the comments from neighbours on the inclusion of plant space on the Egbert Street boundary, alternative means of plant contingency have been selected. This now means that the large attenuators currently shown on the Egbert Street plant area can now be removed. The intention is to keep this area allocated as a back-up plant space, but for internally housed plant only with no need for access to air (pumps, buffer vessels, etc) therefore enabling the building to be acoustically sealed and insulated to ensure no noise impact to neighbours.

The existing Planning submission includes penthouse louvres to duct air to internally mounted VRV heat pumps to cool the Comms/Server rooms. The new contingency proposal is to allow for additional ducted VRV units to offset additional heating/cooling loads from the 2-pipe heat pump if required during later design stages.

To achieve this, three additional pairs of penthouse louvres (1 pair required by each VRV unit) have been proposed for the roof of the eastern wing of the site. The ambient loop selection currently allows for the base loads (and heat created by the internal units themselves). Further design stages will determine to what extent these additional penthouse louvres are required. Mesh Energy recommends they are included in the Planning submission.

## **1.3 Nighttime Equipment Frost Protection Duty**

Due to the more stringent noise criteria during nighttime, it is beneficial to run fewer heat pump units. During this time period, only heating will be provided to the buildings (other than for the Comms/Server rooms), this will also be during the heating setback period (reducing the internal temperature required from 21°C to 15°C).

Initial estimates indicate that only 2 of the 3 proposed heat pumps will be required to meet this lower duty, and therefore producing lower noise levels.

Confirmation of this would need to be determined in future detailed design stages. However, should it not be possible to meet the nighttime acoustic criteria even at reduced operation levels, an alternative frost protection option would be used instead to ensure maximum noise levels are observed, such as introducing an electric boiler (which operate more quietly than ASHP) for the coldest periods.