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Project Memo

Project Name:	Kabannas, St. Pancras Hostel, 79-81 Euston Road, London
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Kabannas, St. Pancras Hostel, London: Cooling Hierarchy Compliance Statement

This statement has been prepared in support of proposals for the installation of a new HVRF Air Conditioning System at 79-81 Euston Road, London, NW1 2QE.

The HVRF system is being proposed as part of the refurbishment works involving the replacement of an existing Versatemp air conditioning units which is currently redundant. The acoustic and indoor air quality requirements for this property does not allow for natural/ passive ventilation in meeting the cooling demands for the building.

1. Cooling Hierarchy

The cooling hierarchy as described in the London Plan requirements are expressed in this section below

1.1 London Plan

Policy SI4 – Managing Heat Risk

Development proposals should minimise adverse impacts on the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure.

Major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the following hierarchy;

Reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure.

Minimise internal heat generation through energy efficient design.

- *Manage the heat within the building through exposed internal thermal mass and high ceilings Provide passive ventilation.*
- *Provide mechanical ventilation.*
- *Provide active cooling systems.*

The policy requires that passive ventilation should be prioritised, taking into account external noise and air quality in determining the most appropriate solution. The increased use of air conditioning systems is not desirable as these have significant

energy requirements and, under conventional operation, expel hot air, thereby adding to the urban heat island effect. If active cooling systems, such as air conditioning systems, are unavoidable, these should be designed to reuse the waste heat they produce.

Camden Council

The Local Plan states that:

- Active cooling (air conditioning) will only be permitted where its need is demonstrated and the steps in the cooling hierarchy are followed (Local Plan policy CC2).
- Development is expected to reduce overheating risk through following the steps in the cooling hierarchy. All new development should submit a statement demonstrating how the cooling hierarchy has been followed (Local Plan policy CC2).
- All developments should seek opportunities to make a positive contribution to green space provision or greening.

Cooling hierarchy

All developments should follow the cooling hierarchy outlined below, to reduce the risk of overheating and subsequent reliance on active cooling:

1.0 Minimise internal heat generation through energy efficient design, considering the following:

- Layout and uses: locate any spaces that need to be kept cool or that generate heat on cooler sides of developments.
- Reducing heat gains e.g. including low energy lighting.
- Seal/ insulate heat generating processes.
- Reduce the distance heat needs to travel and insulate pipework.
- Design layouts to promote natural ventilation e.g. shallow floor plans and high floor to ceiling heights.
- Consider evaporation cooling which cools air through the evaporation of water.
- Consider ‘free cooling’ or ‘night cooling’, which uses the cooling capacity of ambient air to directly cool the space.

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2.0 Reduce the amount of heat entering a building in summer

- Consider the angle of the sun and optimum daylight and solar gain balance
- Orientate and recess windows and openings to avoid excessive solar gain.
- Consider low g-values and the proportion, size and location of windows
- Make use of showing from other buildings
- Include adequate insulation
- Design in shading: e.g. include internal courtyards, large shade providing trees and vegetation, balconies, louvres internal or external blinds, and shutters
- Make use of the albedo effect (use of light coloured or reflective materials to reflect the sun's rays)
- Include green infrastructure e.g. green wall, green/ blue roofs and landscaping, to regulate temperature
- Reduce the amount of heat entering a building in summer

3.0 Manage the heat within the building through exposed internal thermal mass and high ceiling

4.0 Passive Ventilation

- Natural Ventilation, openable windows, the stack effect system
- Design Layouts to promote natural ventilation e.g. shallow floor plans and high floor to ceiling heights
- Consider evaporation cooling which cools air through the evaporation of water
- Consider free cooling or night cooling which uses the cooling capacity of the ambient air to directly cool the space

5.0 Mechanical Ventilation

- Ensure the most efficient system is possible
- Consider mechanical ventilation with heat recovery

6.0 Active cooling:

- Ensuring they are the lowest carbon options
- Ground Source Heat Pumps and Air Source Heat Pumps can be used in reverse to provide cooling to buildings
- Water based cooling system also reduce the need for air conditioning by running cold water through pipes in the floor and/ or ceiling to cool the air

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79-81 Euston Road Design Compliance

The objective of this section is to demonstrate compliance with the proposed works for new plant equipment at Euston Road with the policies presented above. The work relates to the upgrade of the heating and cooling system via a HVRF Air Conditioning Solution.
The HVRF system consists of outdoor units located at roof level, which are connected by refrigeration pipes to a Hybrid Branch Controller (HBC). The indoor units are then connected to the HBC by water pipes. Heat exchange takes place between the water and refrigerant in the HBC, so that water can be used to heat and cool internal air as opposed to refrigerant. The system incorporates heat recovery during periods of simultaneous heating and cooling and smart control to facilitate high efficiencies through the use of variable water/ refrigerant temperatures

Improvements to the building fabric have also been carried out which have been detailed in the table below and will help to minimize the heat gain within the building.

Fabric Set			**Existing Building**	**Material Alteration**
BUILDING FABRIC				
Air Perm. @50Pa		**m3/h·m2**	10	8
External Wall	IES		3002 External Wall (0.70)	3002 External Wall (0.30)
	U-value	**W/m2·K**	0.7	0.3
Flat Roof	IES		3002 Flat Roof (0.35)	3002 Flat Roof (0.18)
	U-value	**W/m2·K**	0.35	0.18
Floors	IES		3002 Ground Floor (0.70)	3002 Ground Floor (0.70)
	U-value	**W/m2·K**	0.7	0.7
External Window	IES		3002 External Window (1.60)	3002 External Window (1.60)
	U-value	**W/m2·K**	1.6	1.6
Door	IES		3002 Door (1.60)	3002 Door (1.60)
	U-value	**W/m2·K**	1.6	1.6

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Cooling Hierarchy – Design Principles

The proposed works either adopts base build design principles or includes the proposed design that complies with the cooling hierarchy as summarised in the table below

Cooling Hierarchy	Base Build Design	Proposed Design
Energy Efficient Design	The base build design is the conversion from a hotel into a hostel. This has repurposed the space and saved significant embodied carbon in comparison with a new build, however, means that there wasn't an opportunity to alter massing or form to suit natural ventilation	Low Energy LED lighting will be used to reduce heat gains in the space. Improved fabric U-values will be used to reduce heat gains in the space. Rationalise routing of domestic hot water pipework to mitigate heat gains in the space
Summer Overheating	Building geometry provide self-shading to reduce solar gains.	Replacement windows specification to reduce solar heat gains and overheating risk within the building.
Thermal Mass	Building Construction in-situ reinforced concrete	Exposing elements to thermal mass reduces peak cooling load and improves thermal comfort
Passive Ventilation	Building Location in terms of noise and air quality means natural ventilation has not been included in the base build design	Passive ventilation not included in proposed design due to noise and air quality concerns
Mechanical Ventilation	The base build ventilation is provided with supply and extract Air Handling Unit with no heat recovery	Highly efficient air handling unit with heat recovery and low energy fans.
Active Cooling	The existing building cooling system is provided by Versatemp A/C system. This system is currently redundant.	Proposed design will use a highly efficient HVRF Air Conditioning System that incorporates heat recovery during periods of simultaneous heating and cooling and smart

		control to facilitate high efficiencies through the use of variable water/ refrigerant temperatures

Cooling Solution

As passive cooling wasn't found to be viable due to existing building form, acoustic and air quality concerns the proposed design is for cooling provided by a HVRF Air Conditioning system. The size of this system has been reduced due to the efficiency measure detailed in the cooling hierarchy response.

Energy Modelling

An energy model of the development was developed and used to analyse and optimise the base build design. The model has been developed to reflect the proposed layouts and M&E systems

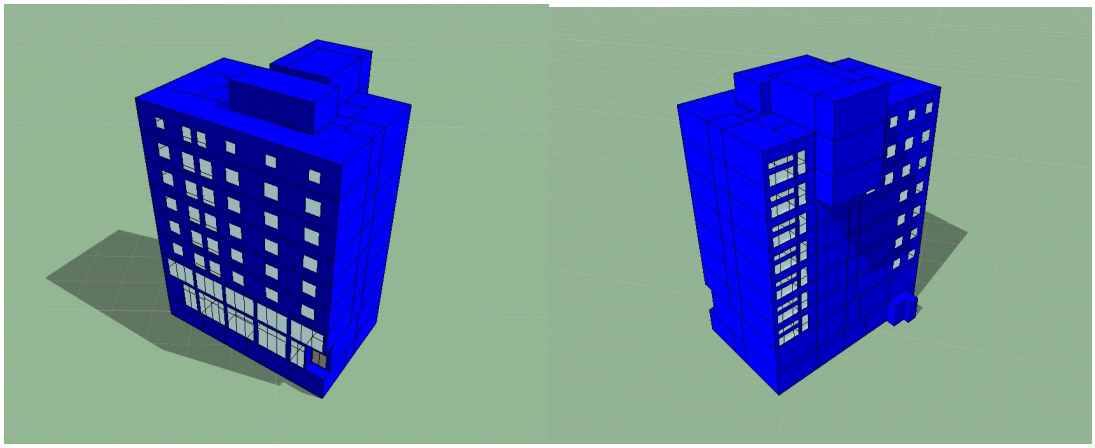

Figure 1: IES Model snapshot

The key energy modelling results are as follows;

- Existing Base Building System – 56.87 kgCO2/m²/yr
- Proposed Building System – 45.06 kgCO2/m²/yr

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Measure			Existing Building	Proposed Building
CARBON				
CO2e	Elec	tCO2/yr	24.44	17.98
	Gas	tCO2/yr	115.12	92.60
	Biomass	tCO2/yr	0.00	0.00
	TOTAL	tCO2/yr	139.56	110.59
CO2e Saving	Elec	tCO2/yr	N/A	6.46
	Gas	tCO2/yr	NA	22.52
	Biomass	tCO2/yr	NA	0.00
	TOTAL	tCO2/yr	N/A	28.98
		%	N/A	20.76%
CARBON INTENSITY				
CO2e Intensity	Elec	kgCO2/m2/yr	9.96	7.33
	Gas	kgCO2/m2/yr	46.91	37.73
	Biomass	kgCO2/m2/yr	0.00	0.00
	TOTAL	kgCO2/m2/yr	56.87	45.06
CO2e Intensity Svg	Elec	kgCO2/m2/yr	N/A	2.63
	Gas	kgCO2/m2/yr	NA	9.18
	Biomass	kgCO2/m2/yr	NA	0.00
	TOTAL	kgCO2/m2/yr	N/A	11.81
		%	N/A	20.76%

Compared to the existing base gas boiler and Versatemp air conditioning system the proposed HVRF air conditioning system provide a significant reduction in the Buildings CO_2 emission rate as detailed above.

Conclusion

The Cooling Hierarchy has been fully considered and where feasible appropriate passive measure have been implemented to reduce the cooling demand before consideration has been given to energy efficient air conditioning.

Given the location of the building and in order to maintain adequate comfort levels, acoustics and indoor air quality, all the spaces within the building are intended to be comforted cooled via the proposed HVRF air conditioning system.