



Bury Old Road Planning Stage Overheating Review and Strategy

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PROJECT:

Bury Old Road
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REPORT AMENDMENT RECORD SHEET

ISSUE	DATE	CLAUSE	REVISION
Preliminary	06/11/2023	First Issue	P1
Preliminary	10/11/2023	Second Issue following client comments	P2
Preliminary	23/11/2023	Third Issue following client comments	P3

Contents

1.0	General.....	5
2.0	Conclusions	5
3.0	Design Parameters.....	6
4.0	Table of results.....	7
5.0	Mechanical Ventilation Strategy Options.....	9
6.0	Overheating offset strategies	12

1.0 General

GLD Technical Consulting has been commissioned by Mayfair Estates to produce an overview report for planning that identifies the potential for overheating of the residential development at their Bury Old Road housing development. The report is to consider the areas where the potential for overheating is likely and to propose the outline strategy for offsetting the overheating identified.

A sample of the proposed residential (Terrace and Semi-detached) units representing a typical floor are assessed. The study has been undertaken with reference to CIBSE TM59 in order to identify the overheating risk.

2.0 Conclusions

The proposed ventilation strategy to meet the minimum building regulations requirements is either:

1. Continuous extract with occupancy boost and trickle vent supply air with trickle vents mounted within windows.
2. Intermittent extract with occupancy overrun and trickle vent supply air with trickle vents mounted within windows.

The proposed overheating offsetting strategy is to utilise openable windows to purge the heat build-up in the summer months and provide the additional ventilation required to prevent further heat gains.

However, this overview study has identified that this strategy will not be acceptable for the front and rear (only during night-time) of the buildings which face Bury Old Road. It has been shown that the windows cannot be opened due to “excessive internal noise levels” as described in the acoustics report from DBX, and the same applies to the Catherine Road buildings, during the night-time. Therefore, a mechanical ventilation strategy will be required to combat the overheating.

The calculations undertaken indicate that the rooms in which the windows can be opened during the day-time, will receive sufficient natural ventilation to offset heat gains; and therefore, a mechanical ventilation strategy would only be required during the night-time. These conclusions are based on the design parameters identified in this report and as taken from the CIBSE guidance.

The potential mechanical ventilation strategy options include using one of the following:

1. Purge ventilation via Mechanical extract such as an inline fan.
2. Mechanical ventilation heat recovery system (MVHR).
3. Variable Refrigerant Flow Comfort cooling.
4. A hybrid system of cooling and ventilation in which to comply with the requirements of Approved Document F (discussed within section 6).

3.0 Design Parameters

The design criteria below have been assumed to estimate the heat loss and heat gains for all areas:

External Summer Temperature °C	External Winter Temperature °C	Summer Control Temperature °C	Winter Control Temperature °C	Infiltration ac/h
28	- 4	25	21	0.25

(Table 3.1- Design Parameters)

Element(s)	U-value W/(m ² ·K)
External Walls	0.16
Floors	0.18
Roofs	0.16
Windows	1.6
Doors	1.6

(Table 3.2- U Values)

Accurate figures will need to be provided and confirmed by the architect at a later design stage to comply with latest Building regulations.

4.0 Table of results

The following tables show the room heat gains and equivalent ventilation rates required to offset those heat gains as calculated using MEPWORX calculation software for the heat gains.

Bury Old Road

Project Name			Bury Old Road				
Project Number		J358	Date		21.11.2023		
Heat Gains Results			Revision		P2		
Room Gains- Bury Old Road							
Terrace Ref.	Floor	Room Name	Sensible (kW)	Latent (kW)	Total Cooling Load (kW)	Equivalent (m³/s)	
Left Terrace	Ground	Living/Kitchen	1.42	0.44	1.86	0.193	17.7
		WC	0.02	0.02	0.04	0.002	1.5
		Circulation	0.37	0.15	0.52	0.051	4.4
		Dining	0.35	0.08	0.43	0.047	7.4
		Utility	0.03	0.01	0.04	0.004	2.9
	First	Bedroom 2	0.32	0.16	0.48	0.044	3.1
		J&J Bath	-0.01	0.05	0.04	0	0
		Circulation	0.39	0.13	0.52	0.054	5.4
		Bedroom 3	0.64	0.12	0.76	0.088	8.6
	Second	Bedroom 1	0.55	0.22	0.77	0.075	4
		En-suite	0.03	0.05	0.08	0.004	1.1
		Circulation	0.4	0.08	0.48	0.055	8.9
		Bedroom 4	0.67	0.12	0.79	0.091	8.9
Middle Terrace	Ground	Living/Kitchen	0.95	0.44	1.39	0.129	11
		WC	0.02	0.02	0.04	0.002	1.5
		Circulation	0.18	0.15	0.33	0.025	2.1
		Dining	0.35	0.08	0.43	0.047	7.4
		Utility	0.03	0.01	0.04	0.004	2.8
	First	Bedroom 2	0.3	0.16	0.46	0.042	3
		J&J Bath	-0.01	0.05	0.04	0	0
		Circulation	0.09	0.13	0.22	0.013	1.3
		Bedroom 3	0.65	0.12	0.77	0.089	8.7
	Second	Bedroom 1	0.52	0.22	0.74	0.071	3.8
		En-suite	0.03	0.05	0.08	0.004	1.1
		Circulation	0.08	0.08	0.16	0.011	1.8
		Bedroom 4	0.68	0.12	0.8	0.093	9.1
Right Terrace	Ground	Living/Kitchen	1.4	0.44	1.84	0.19	17.8
		WC	0.02	0.02	0.04	0.002	1.5
		Circulation	0.37	0.15	0.52	0.051	4.4
		Dining	0.35	0.08	0.43	0.047	7.4
		Utility	0.03	0.01	0.04	0.004	2.9
	First	Bedroom 2	0.32	0.16	0.48	0.044	3.1
		J&J Bath	-0.01	0.05	0.04	0	0
		Circulation	0.39	0.13	0.52	0.054	5.4
		Bedroom 3	0.64	0.12	0.76	0.088	8.6
	Second	Bedroom 1	0.55	0.22	0.77	0.075	4
		En-suite	0.03	0.05	0.08	0.004	1.1
		Circulation	0.4	0.08	0.48	0.055	8.9
		Bedroom 4	0.67	0.12	0.79	0.091	8.9

(Table 4.1- Heat Gains - Bury Old Road)

Catherine Road

Project Name			Bury Old Road				
Project Number			J358	Date		21.11.2023	
Heat Gains Results				Revision		P2	
Room Gains- Catherine Road							
House Ref.	Floor	Room Name	Sensible (kW)	Latent (kW)	Total Cooling Load (kW)	Equivalent (m³/s)	Equivalent (ac/h)
Left House	Ground	Living/Dining/Kitchen	0.59	0.34	0.93	0.081	3.8
		WC	0.04	0.03	0.07	0.006	3.5
		Laundry	0.02	0	0.02	0.002	3.5
		Stairwell	0.09	0.04	0.13	0.013	3.1
		Circulation	0.04	0.04	0.08	0.006	2.2
	First	Bedroom 4	0.15	0.05	0.2	0.02	4.6
		Bathroom	0.02	0.04	0.06	0.003	0.9
		Bedroom 3	0.13	0.08	0.21	0.018	2.5
		Bedroom 2	0.18	0.09	0.27	0.024	3.2
		Stairwell	0.09	0.04	0.13	0.013	3.1
		Circulation	0.13	0.05	0.18	0.018	4.9
		Bedroom 1	0.33	0.17	0.5	0.045	3.1
	Second	En-suite Bathroom	0.1	0.07	0.17	0.013	2.4
		Stairwell/ Circulation	0.13	0.05	0.18	0.018	4.9
Right House	Ground	Living/Dining/Kitchen	0.59	0.34	0.93	0.081	3.8
		WC	0.04	0.03	0.07	0.006	3.5
		Laundry	0.02	0	0.02	0.002	3.5
		Stairwell	0.08	0.04	0.12	0.011	2.7
		Circulation	0.04	0.04	0.08	0.006	2.2
	First	Bedroom 4	0.15	0.05	0.2	0.02	4.6
		Bathroom	0.02	0.04	0.06	0.003	0.9
		Bedroom 3	0.13	0.08	0.21	0.018	2.5
		Bedroom 2	0.18	0.09	0.27	0.024	3.2
		Stairwell	0.08	0.04	0.12	0.011	2.7
		Circulation	0.13	0.05	0.18	0.018	4.9
		Bedroom 1	0.33	0.17	0.5	0.045	3.1
	Second	En-suite Bathroom	0.09	0.07	0.16	0.013	2.4
		Stairwell/ Circulation	0.08	0.04	0.12	0.011	4.1

(Table 4.2- Heat Gains - Catherine Road)

5.0 Mechanical Ventilation Strategy Options

Decentralized Systems (Extract) –

We propose using decentralised extract systems for each dwelling to be in compliance with approved document F – Volume 1: dwellings. This requires separate extraction fans for each wet room within each dwelling. The reason as to why these fans are required is to protect the health of occupants of the building by providing adequate ventilation. Without adequate ventilation, mould and internal air pollution may become hazardous to health.

The extract fans can be operated in two ways:

- Continuous (operating constantly) with boost facility on occupancy.
- Intermittent (operating when room is occupied) with overrun.

Depending on which operation type will be utilised, the flow rate will differ which will be vital when selecting the extraction fans; these flow rates are the following:

- 8 L/s (Continuous).
- 15 L/s (Intermittent).



(Figure 5.1- Ceiling Mounted Extract Fan)

Trickle Ventilation (Supply) –

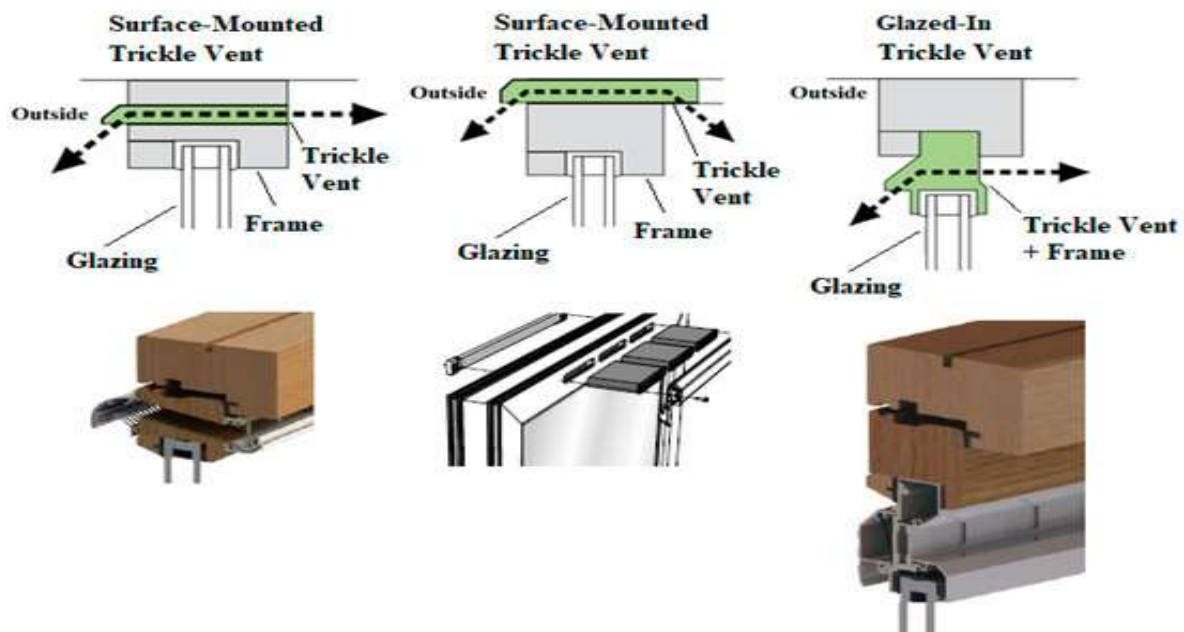
Supply: openable windows and trickle vents could be utilised to supply air into the room and offset overheating in the summer months.

We are proposing to use natural air supply systems for each dwelling to be in compliance with approved document F – Volume 1: dwellings. The airflow into the room must be refreshed with new air flow. Trickle vents are designed to provide continuous and discreet fresh air into the rooms at all times when left open. At the same time, they also maintain low noise levels,

which modern trickle ventilation products are capable of and should be selected to meet any acoustic requirements for the project.

For windows and doors, three distinct types of trickle vents are possible depending on the product, the installation, or the building:

- Fitted through the window frame itself or the opening sash.
- Located on a separate frame attached to the top of the window.
- Glass units with trickle vents mounted at the top.

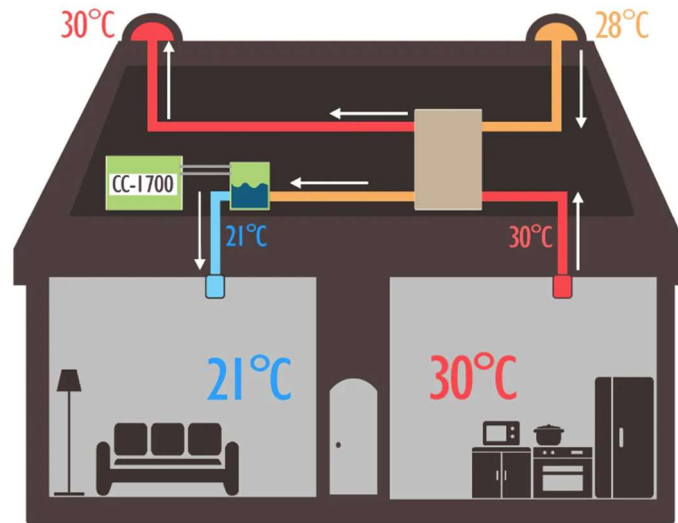


(Figure 5.2- Types of Trickle Vents)

Mechanical Ventilation Heat Recovery (Supply and Extract) –

MVHR provides filtered air into a building as well as transferring the heated (or cooled) air from a room via an internal exchanger. During the winter months, the heat exchanger within the unit transfers heat from the air leaving a room into the colder incoming air. During the summer months, the heat exchanger works in reverse; with cooler air being transferred from a room into the hotter incoming air (see figure 5.3). Ventilation ducts (rectangular or circular) are utilised to circulate air from the rooms through the heat exchanger within the MVHR unit.

Importantly, MVHR removes humid air from kitchens, bathrooms, utility rooms and other 'wet' rooms. Humid air leads to slower evaporation of body's perspiration when compared with a less humid air, even if both are the same temperature. By lowering the relative humidity, MVHR help the body to feel cooler. Also, by removing excess humidity, it ensures there is no mould build up in the wet rooms, which can have a negative effect on the occupant's health.



(Figure 5.3- MVHR Operation with Comfort Cooling- source: BPC UK)



(Figure 5.4- MVHR Operation- source: Airflow Understanding MVHR Cooling Article)

MVHR technology can help compliance with approved document F – Volume 1: dwellings when specified, designed, and installed correctly. According to this document, dwellings using mechanical ventilation with heat recovery, each habitable room should consist of mechanical supply ventilation. The total supply air flow should be distributed proportionately to the volume of each habitable room.

6.0 Overheating offset strategies

The following tables identify the rooms where the outline calculations have identified that overheating outside of the acceptable range as identified within TM59 will likely be experienced without additional measures.

Project Name		Bury Old Road												
Project No		J358								Date	21.11.2023			
										Revision	P3			
Natural Ventilation Calculation														
Terrace Ref.	Room Name	Dimensions of Room		Window Dimensions & Information							Ventilation Required to offset Solar Gains (L/s)	Area required to offset solar gains in summer season (m²)	Additional Ventilation to offset solar gains in summer season (L/s)	
		Width (m)	Depth (m)	Height of Opening (m)	Width of Opening (m)	Length of Restrictor (m)	Total Window Area (m²)	Quantity	Total Openable Window Area (m²)	Ventilation rate per m² (L/s)				Total Ventilation rate through Opening (L/s)
Left Terrace	Living / Kitchen	5.00	8.10	2.100	4.000	-	8.400	1	8.400	35.41	297	193	5.45	Through Windows
	Dining	Mechanical Ventilation												
	Bedroom 1	5	4.1	2.1	1.8	-	3.780	1	3.780	71.43	270	75	1.05	Through Windows
	Bedroom 2	5	4.1	2.1	1.8	-	3.780	1	3.780	72.13	273	44	0.61	Through Windows
	Bedroom 3	Mechanical Ventilation												
	Bedroom 4	Mechanical Ventilation												
Middle Terrace	Living / Kitchen	5.00	8.10	2.100	4.000	-	8.400	1	8.400	28.35	238	129	4.55	Through Windows
	Dining	Mechanical Ventilation												
	Bedroom 1	5	4.1	2.1	1.8	-	3.780	1	3.780	71.72	271	71	0.99	Through Windows
	Bedroom 2	5	4.1	2.1	1.8	-	3.780	1	3.780	71.19	269	42	0.59	Through Windows
	Bedroom 3	Mechanical Ventilation												
	Bedroom 4	Mechanical Ventilation												
Right Terrace	Living / Kitchen	5.00	8.10	2.100	4.000	-	8.400	1	8.400	35.25	296	190	5.39	Through Windows
	Dining	Mechanical Ventilation												
	Bedroom 1	5	4.1	2.1	1.8	-	3.780	1	3.780	71.43	270	75	1.05	Through Windows
	Bedroom 2	5	4.1	2.1	1.8	-	3.780	1	3.780	72.13	273	44	0.61	Through Windows
	Bedroom 3	Mechanical Ventilation												
	Bedroom 4	Mechanical Ventilation												

(Table 6.1- Natural Ventilation Calculation-Bury Old Rod)

Project Name		Bury Old Road (Catherine Road)													
Project No		J358												Date	21.11.2023
														Revision	P3
Natural Ventilation Calculation															
House Ref.	Room Name	Dimensions of Room		Window Dimensions & Information							Ventilation Required to offset Solar Gains (L/s)	Area required to offset solar gains in summer season (m²)	Additional Ventilation to offset solar gains in summer season (L/s)		
		Width (m)	Depth (m)	Height of Opening (m)	Width of Opening (m)	Length of Restrictor (m)	Total Window Area (m²)	Quantity	Total Openable Window Area (m²)	Ventilation rate per m² (L/s)				Total Ventilation rate through Opening (L/s)	
Left House	Living /Dining/ Kitchen	5.40	6.20	2.100	1.800		4.000	1	4.000	28.18	113	93	3.30	Through Windows	
Right House	Living /Dining/ Kitchen	5.40	6.20	2.100	1.800		4.000	1	4.000	28.18	113	93	3.30	Through Windows	

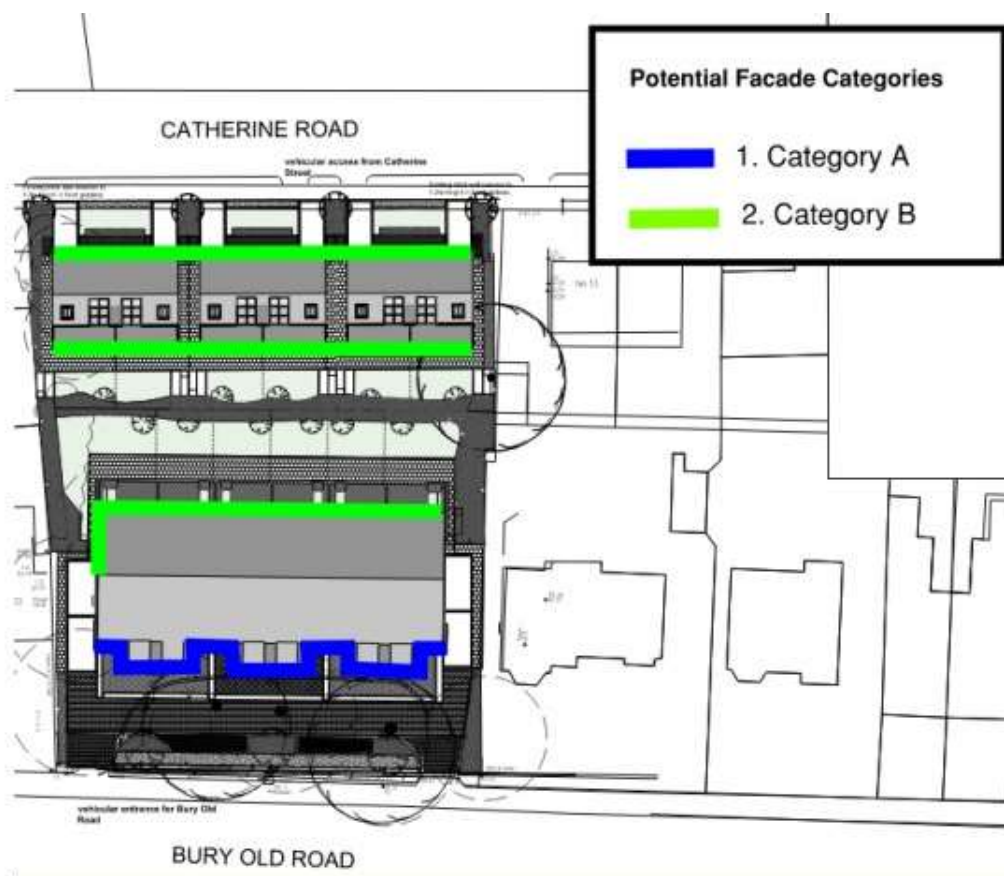
Table 6.2- Natural Ventilation Calculation-Catherine Road)

The tables within section 4 indicate the rooms within each building that experience high room temperatures during the summer month. These rooms will need to be addressed and resolved by either mechanical or natural means. Tables 6.1 & 6.2, indicate the amount of natural air that can be supplied via the openable window area which can be utilised to offset the overheating issues in bedroom 1 & 2 (for terraces), and living / kitchen (for both house types). If the current window design of the buildings is to be retained, sufficient natural air can be supplied into the rooms to offset the overheating in the summer months.

According to approved document F – Volume 1: dwellings, purge ventilation is separate to the main ventilation system and should be provided in each habitable room. Purge ventilation should be capable of extracting at least **four air changes per hour** per room directly to the outside. This is often achieved using either:

- Openable windows.
- Mechanical extract system.

The acoustic report developed by DBX, suggests that the windows cannot be opened at the front of the buildings which face Bury Old Road (coloured blue in figure 6.1) due to the elevated noise levels that are present, meaning that purge ventilation would only be possible through a mechanical extract system.



(Figure 6.1- Façade Categories. Source: DBX acoustic report)

The façade under consideration, consist of three different rooms: Dining Room, bedroom 3 and bedroom 4, all of which experience overheating during the summer months. Taking into consideration the statement above, there are mechanical options that can be discussed and reviewed to mitigate the higher heat gains within the rooms, which are as follows:

1. Mechanical Ventilation Heat Recovery and Comfort Cooling.
2. Mechanical Ventilation Heat Recovery and Mechanical Purge Ventilation.
3. Overall Larger Mechanical Ventilation Heat Recovery.

Figure 6.1 indicates the façades (category B) in which windows can be opened as part of the overheating mitigation strategy. However, Environmental Health suggests that it is only possible to keep the windows opened during the day-time as they need to be closed at night to meet the internal noise levels.

The results obtained indicate that overheating occurs during the day-time and night-time. Studies suggest the night-time temperature is a significant risk factor because higher night-time temperatures may increase the risk to health due to the inability to recover from daytime heat stress and the interruption to sleep.

CIBSE Guide A: Environmental Design (2015a) recommends that peak operative bedroom temperatures should not exceed an absolute threshold of 26°C from 10 pm to 7am in order to guarantee comfort during the sleeping hours.

If they cannot be opened during the night-time, then mechanical ventilation proposed on section 6 will be required to combat overheating.