TECHNICAL DESIGN NOTE

Hydrock

Project name	Sutton High Street		
Design note title	BREEAM Passive Design Report		
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Executive Summary

As part of the BREEAM New Construction 2014 assessment of the proposed Sutton High Street development this study examines the utilisation of passive design measures to reduce building carbon emissions.

This study serves as evidence towards achieving the credits of 'Ene 04 – Low Carbon Design: Passive Design' in BREEAM UK New Construction Non-Domestic Buildings (2018). The following credit has been achieved:

- One credit: Passive Design Analysis

The proposed development uses passive design measures to reduce the total heating, cooling, mechanical ventilation and lighting loads, and energy consumption. Dynamic thermal modelling shows that a tbc carbon reduction can be achieved through passive design alone.

At RIBA Stage 2, the project team carried out a passive design analysis of the proposed building to identify opportunities for the implementation of passive design solutions that reduce demands for energy consuming building services. The proposed design has maximised the use of passive design features, where possible, within the limitations of working within the constraints of the existing site.

The passive design features include:

- High standards of thermal insulation and fabric efficiency.
- The use of solar gains to reduce heating energy demands during wintertime.
- Solar shading in the form external walkways.
- All lighting is of low energy design (LED).
- Dual aspect retail unit where cross ventilation is possible.

The final design will depend on system design development, and must consider the requirements of local planning policy and Part L Compliance. The final design must also consider London Plan Policy 5.2 and Sutton Local Plan Policy 31 which require at least a 35% and 20% on site reduction in carbon emissions respectively. Commercial/retail units are to achieve BREEAM 'Excellent' (BREEAM Pre-assessment being provided by Energist UK).

1. INTRODUCTION

1.1 General

Hydrock has been instructed to carry out a Passive Design analysis for the proposed development at Sutton High Street in London (London Borough of Sutton).

This study serves as evidence towards achieving the credits of 'Ene 04 -Passive Design' in BREEAM 2018. The project shall reduce carbon emissions by X% through Passive Design.

This report investigates the following:

- Site location
- Site weather
- Microclimate
- Building layout
- Building orientation
- Building form
- Building fabric
- Thermal mass or other fabric thermal storage
- Building occupancy type
- Daylighting strategy
- Ventilation strategy
- Adaptation to climate change

In order to provide a relatively accurate prediction for the building energy demand, thermal performance modelling of the building geometry and fabric has been carried out using Integrated Environmental Solutions Virtual Environment (IESVE) 7.0.12.0 (2019) Compliance, an approved ADL2A modelling package.

Simulation results based on Part L2A 2016 have been carried out to determine the actual Building Emission Rate.

The report is for the exclusive use of the Client and should not be used in whole or in part by any third parties without the express permission from Hydrock in writing.

The report should not be relied upon exclusively by the Client for decision making purposes and should be read in conjunction with the architectural plans and reports.

1.2 Description of Development

The proposed Sutton High Street development consists of seven floors, with the ground floor being used as a retail space and the remaining floors containing one- and two-bedroom apartments.

Figure 1 - CGI of the proposed development

2. METHODOLOGY

Two separate dynamic thermal simulations were performed in order to determine the passive design demand reduction. Thermal modelling has been carried out based on the architect's general arrangement plans and elevations issued on 7th December 2020.

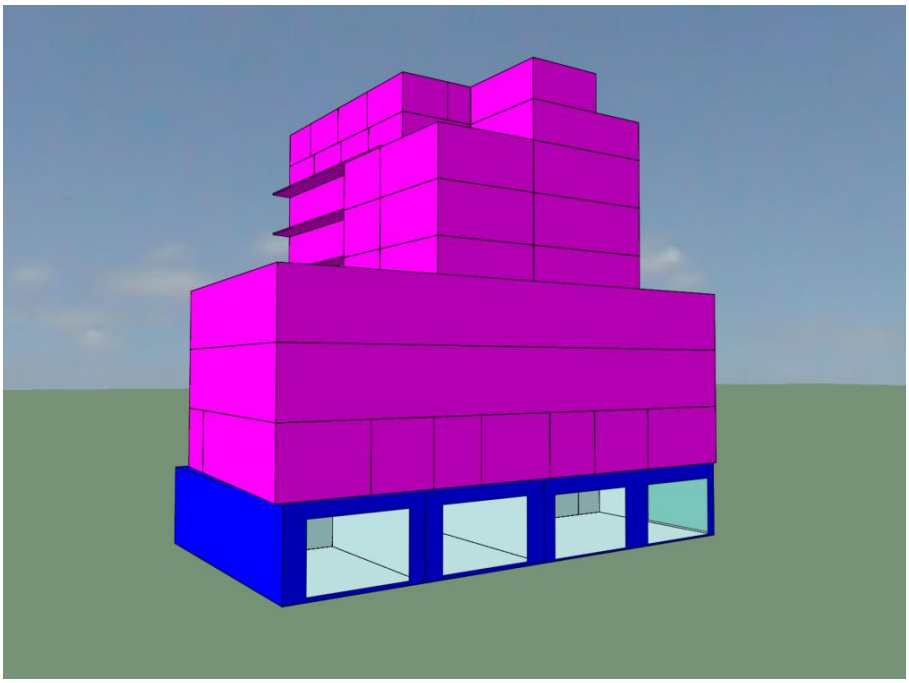

Figure 2 - IES model for the retail units

3. PASSIVE DESIGN SOLUTIONS

A summary of the potential passive design solutions that could be included within the scheme are shown in Figure 2.

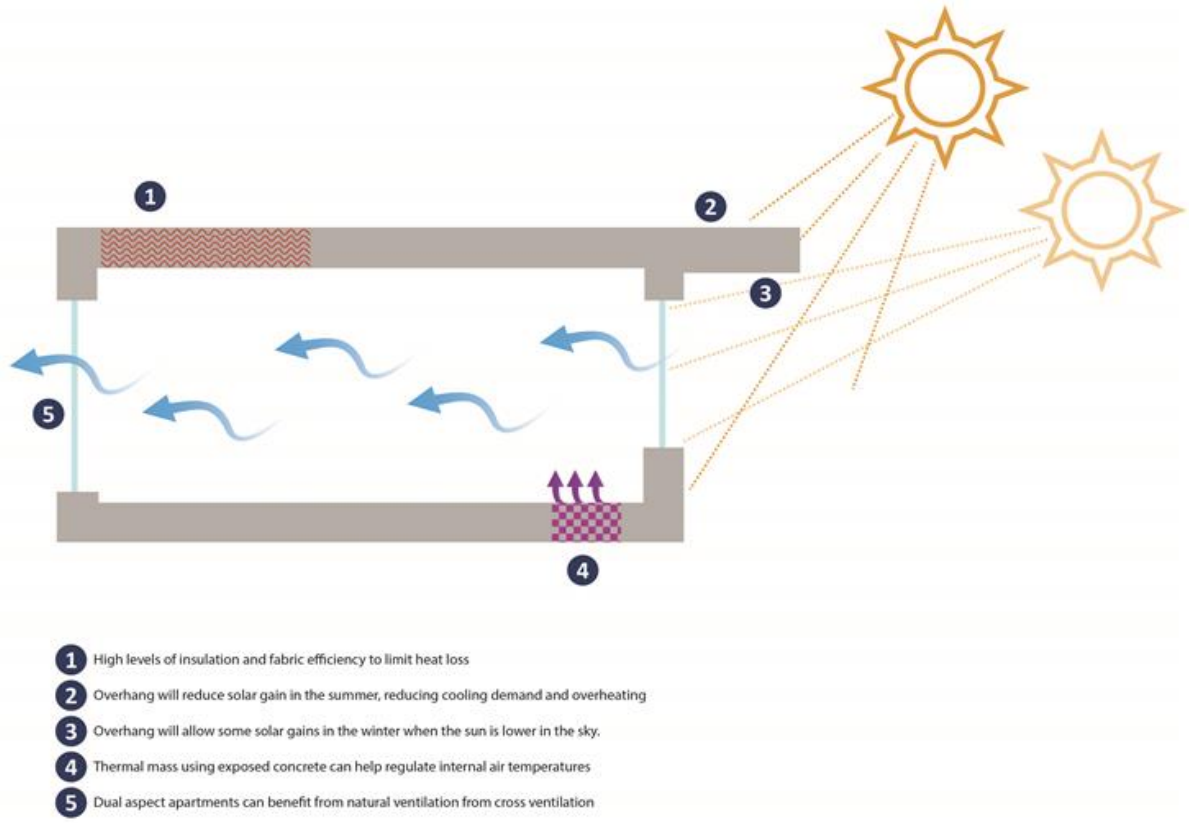

Figure 3 - Passive design options

3.1 Site location, orientation, layout and weather

The building is seven-storeys and located on Sutton High Street in the London Borough of Sutton. It is orientated north to south along the site. The retail units at ground level are east facing and will benefit from direct sunlight during the mornings.

The CIBSE (Test Reference Year) - weather file for London was used for the simulations. This approved weather data is the closest available for the site geographical location.

The IESVE Compliance software uses orientation, weather and location data to accurately model the solar gain to the building, and compares the solar gain in the occupied spaces to a benchmark value.

3.2 Building form and fabric

The building consists of a mixed-use development with retail A1/A3 use on the ground floor along with apartments on the upper floors. At ground level a reception for the building's residents and the site wide residents' facilities are included. Ab A1/A3 use is also included facing onto Sutton High Street.

External walkways have been explored to reduce overheating during the summer, while allowing solar gain during the winter. Overhangs could be considered on the south facing façade to mitigate the overheating risk.

The fenestration strategy has been designed to provide high levels of daylight and natural ventilation to provide a habitable space for the occupants in the residential areas of the building.

The building fabric is specified in excess of what is required under the Part L2A notional building, as shown in Table 1. The aim is to have an efficient building fabric, including low thermal transmittance building elements, to reduce heat loss from the building.

A maximum air permeability of 3 $m^3/h/m^2$ @ 50Pa. will be targeted in the building design. Post construction air leakage testing will be required to demonstrate that this figure has been achieved.

Table 1: Building element thermal properties

Building Element	U-Value
Roof	0.12 W/m^2k
Wall	0.18 W/m^2k
Floor	0.12 W/m^2k
Glazing	1.20 W/m^2k G-value 0.6
Air Permeability	3 $m^3/m^2/hr$ @ 50 Pa

The good levels of insulation and air tightness follow the energy hierarchy , designed to minimise the energy required to maintain an acceptable internal environment.

3.3 Ventilation

Natural ventilation, through trickle and purge ventilation, through openable windows has been explored and will be used in the residential spaces. All windows on the residential floors will be comprised of both fixed and operable windows, this will include trickle ventilation and openable windows to allow natural ventilation.

The A1/A3 retail unit is likely to be mechanically ventilated.

3.4 Daylight Access

The amount of glazing proposed has been influenced by the passive design goals of the project, with large areas of glazing provided in retail units, increasing the amount of natural daylight within each space and reducing the reliance on artificial lighting. Window reveals will provide some shading to reduce solar gains during the summer, whilst allowing solar gains in the winter when the sun is lower in the sky.

3.5 Thermal Mass

The reinforced concrete construction of the core and upper floors will provide some thermal mass. Materials with a high thermal mass (such as concrete) are able to absorb heat from the internal or external environment and release the heat slowly, helping to regulate internal temperature. To gain the maximum benefit from thermal mass the material needs to be exposed. The retail units may be furnished with exposed concrete soffits but due to the development being Shell & Core only this cannot be confirmed.

3.6 Adaptation to Climate Change

The passive design measures (detailed above) will help the building and its users adapt to future climate change.

The insulation and ventilation strategies will be adapted to prevent future overheating. Building materials will be selected to be durable to withstand changes in climate such as higher wind speeds and increased levels of precipitation.

4. CONCLUSIONS

This report has provided an overview of the potential passive design measures that could be included within the Sutton High Street development to reduce the overall energy demand and carbon emissions. The results of this passive design analysis are shown in the figure below.

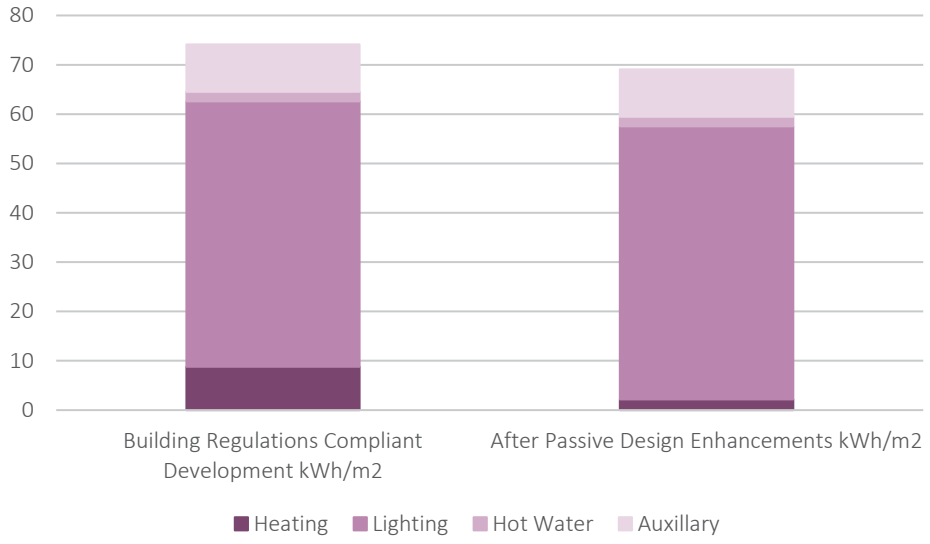

Figure 4 – Energy requirements before and after passive design

Table 1 - Carbon emissions summary

	Building Regulations Compliant Development $kgCO_2/m^2$	After Passive Design Enhancements $kgCO_2/m^2$
Heating	1.90	0.47
Lighting	28.62	27.80
Hot Water	0.42	0.42
Auxiliary	4.97	4.97
Total	35.91	33.67

The Sutton High St development will achieve a 6% reduction in carbon emissions through the specification of passive design solutions.