ONE Creative environments

Energy Statement Report

Nuffield Tees Hospital

WCSNTT-ONE-ZZ-XX-RP-J-1000 P03

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1. Project Details

This report refers to the new extension being installed onto Nuffield Tees Hospital. The new extension consists of 2 operating theatres all fitted with their own anaesthetic; scrub; and dirty utility rooms.

The purpose of this report is to explore and determine the reductions in carbon emissions brought about by improvements made towards fabric u-values.

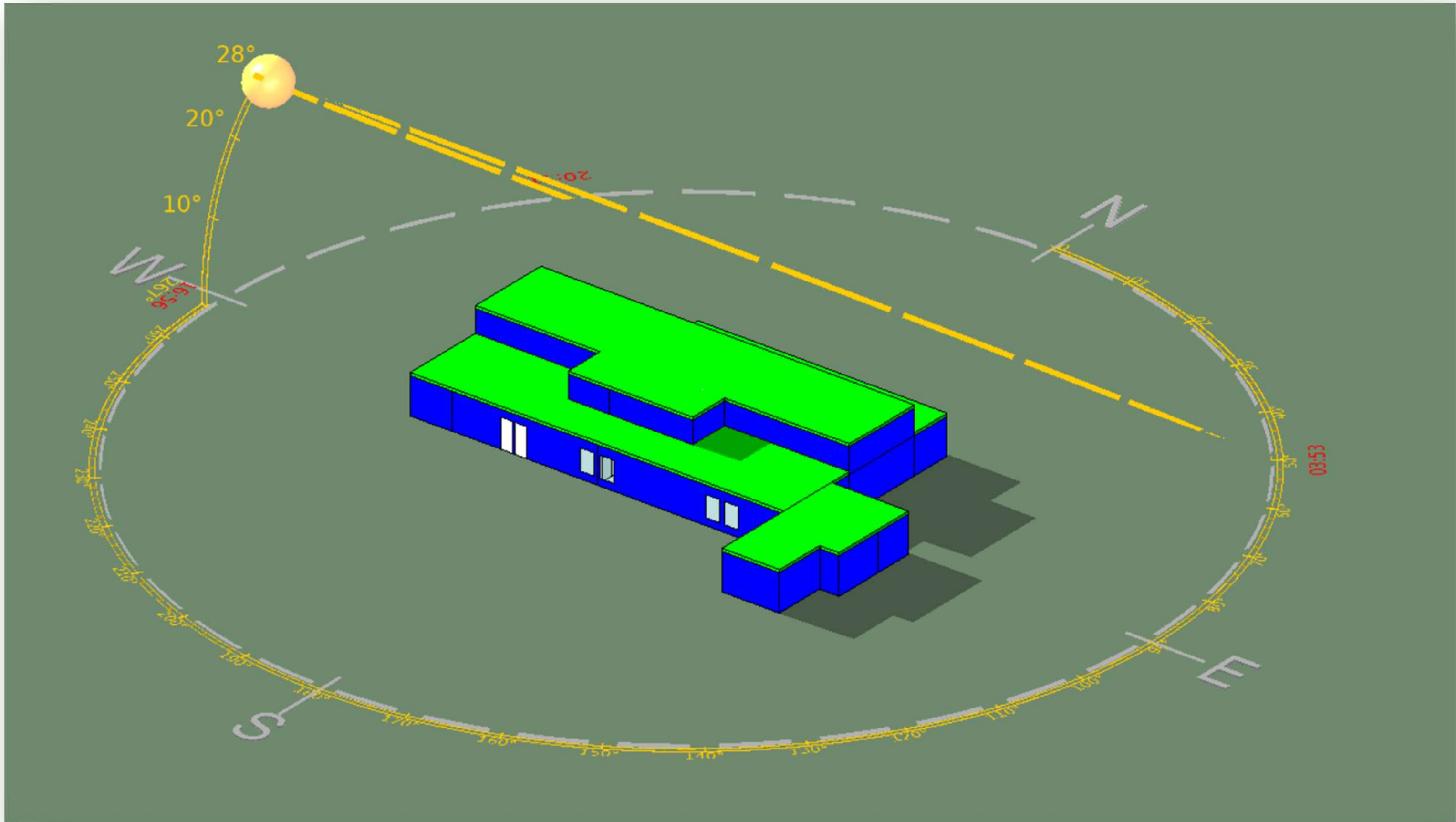


Figure 1 – Axonometric view of Nuffield Tee

2. Introduction

One Creative Environments have been appointed to provide a report on the thermal performance of Nuffield Tees Hospital. The aim of the thermal simulation is to determine how much of an effect the improvements in the U-Values of the building fabric has towards the carbon output of the building.

The development as briefly stated above consists of a pair or the following rooms: Anaesthetic; Operating theatre; Scrub, Prep room which form the bulk of the extension. The energy benchmarks and conversion factors used within this report have been established using NCM guidelines and energy modelling has been carried out using IES VE Compliance software.

The purpose of this document is to demonstrate how the proposed extension performs under 2 different scenarios. The first scenario which adopts a fabric approach which matches the U-Values stated in Part L Building Regs whilst the second scenario demonstrates an improvement upon these figures.

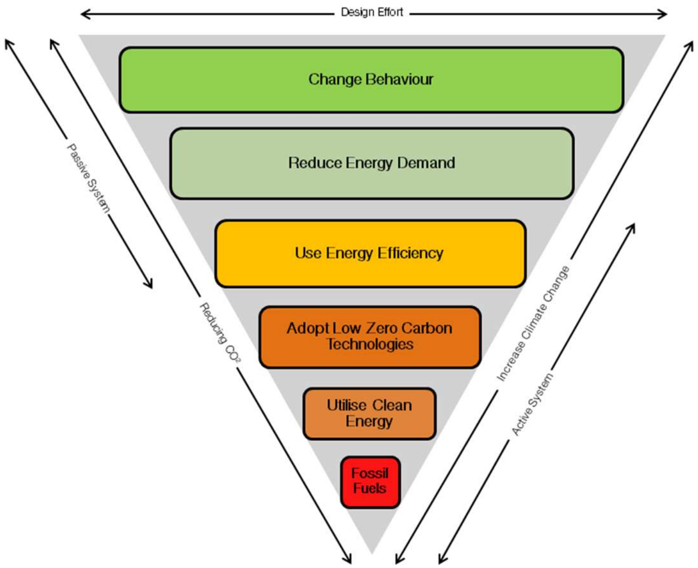
When preparing this document specific regard has been given to:

- The Energy Performance of Buildings Directive (EPBD)
- National Calculation Methodology (NCM) guidelines

2.1. Design Intent:

The development shall benefit from heating via an ASHP which utilises highly efficient heat recovery ventilation alongside high efficiency low energy LED lighting with intelligent lighting controls to conserve energy. There are 3 different systems used throughout the proposed extension – Link corridor connecting the existing hospital to the extension to be served via a DX-Split system, the operating theatre to be treated by an ASHP/AHU with the remaining corridors and electrical switch rooms to be heated via electric panel rads and ventilated via direct extract ventilation.

The performance of the building fabric will be optimised to reduce carbon emissions related to heat losses and solar heat gains. Highly efficient insulation and high-performance glazing shall be considered during the design development to further optimise building performance.



In undertaking this review, it is our intention to influence the design development as far as is possible on a limited site to:

- Ensure the orientation of the building is optimised, from a day lighting, natural ventilation, solar gain and air/acoustic quality perspective.
- Ensure that the overall carbon footprint of the building is optimised to deliver a building that meets the needs of the present without compromising the ability of future generations to meet their own needs and in accordance with planning policy.
- Ensure that the proposals meet the needs and aspirations of the client both commercially and operationally, without which the project will not progress.
- Ensure that the building treads lightly on the existing environment in respect of the local air quality, acoustic environment, and water cycle.

The building is to be assessed under Approved Document L2A of the Building Regulations (Conservation of Fuel & Power) for non-dwellings.

A simulation of the building using VE IES Thermal Modelling software has been used to establish the below target emission rate.

3. Construction Details

For the purpose of this report, we have performed 2 simulations to demonstrate the effects improvements on U-Values have towards the outputs of the BRULK. The 2 simulations use different U-Values to generate the proceeding BRUKL outputs.

3.1. U Values:

Building element	Baseline values	Proposed values
External Wall	0.18 W/m^{2}K	0.15 W/m^{2}K
Floor	0.18 W/m^{2}K	0.18 W/m^{2}K
Roof	0.15 W/m^{2}K	0.1 W/m^{2}K
Windows	1.08 W/m^{2}K	1.08 W/m^{2}K
Air Permeability	2.5 m^3/hr/m^2 @ 50Pa	2.5 m^3/hr/m^2 @ 50Pa

3.2. Mechanical Systems

As mentioned in 2.1 Introduction, there are 3 different mechanical approaches being adopted to treat the rooms. The efficiencies of these systems are imperative as they dictate the outputs of the BRUKL.

(1) Electric Panel and Extract Vent: Cleaners Cupboard; Accessible WC; Elec. Main; Electrical Switch Room; Dirty Corridor; Pharmaceutical Store; Corridor, IT Hub

(2) AHU/ASHP: Operating Theatre(s); Scrub; Dirty Utility(ies), Anaesthetic room(s); Prep room(s);

(3) DX Split System: Link Corridor; Cleaners Cupboard; Accessible WC

1- (1) Electric panel and Extract

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.65	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

2- (2) AHU/ASHP

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	6.5	12.3	-	1.6	1
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. ^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

3- (3) DX-Split System

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.8	5	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

4. Simulation results

The table below shows how the 2 simulations perform against target emission rates. It should be noted that whilst the proposed simulation does not adhere to the 10% decrease in emission and energy rates, it does however get very close to it with the proposed simulation reaching an 8.45% reduction in CO_2 emissions below Part L Building reg, BRUKL limits.

Carbon Dioxide (CO_2) Emissions and Primary Energy Rate		
CO_2 emission and primary energy rates of the building must not exceed targets (BER>TER)		
	<u>Baseline Simulation</u>	***<u>Proposed Simulation</u>***
Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	54.2	54.2
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	50.03	49.62
CO_2 Emission rate reduction (%)	**7.69**	**8.45**
Target primary energy rate (TPER) kWh/m^2.annum	553.49	553.49
Target primary energy rate (BPER) kWh/m^2.annum	522.09	517.91
Primary Energy Rate Reduction (%)	**5.67**	**6.42**

The U-Values shown above demonstrate the lowest U-Values that can be proposed at the current time. To lower the results further, it would be advised to look into alternative renewable solutions.

5. Conclusion

The original concept base design achieved a CO2 emission reduction of 7.69% below a BRUKL/Part L building regulation pass.

The subsequent planning requirements stated a requirement reduction of CO2 emissions by 10% below a BRUKL/Part L pass. We have been able to look at the services/building fabric proposed and been able to improve the CO2 emissions score by primarily reducing the building fabric 'U' value to achieve a CO2 emission reduction of 8.45% below a BRUKL/Part L building regulation pass. We are unable to commercially improve these fabric or services further without compromising the practical needs of a functional Theatre department.

By implementing these changes above, we have been able evidence that we are providing a highly sustainable building that benefits from a green approach by reducing the thermal fabric energy requirements and employing highly efficient ASHP/Electric heating. This will achieve a significantly lower CO2 emission than the governments CO2 targets for this type of building.

Approval Record

Revisions

Ref	Description	By	Date
P01	Initial Issue	IW	13/11/2023
P02	Initial Issue	GSB	15/11/2023
P03	Initial Issue	GSB	16/11/2023

Quality Control

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