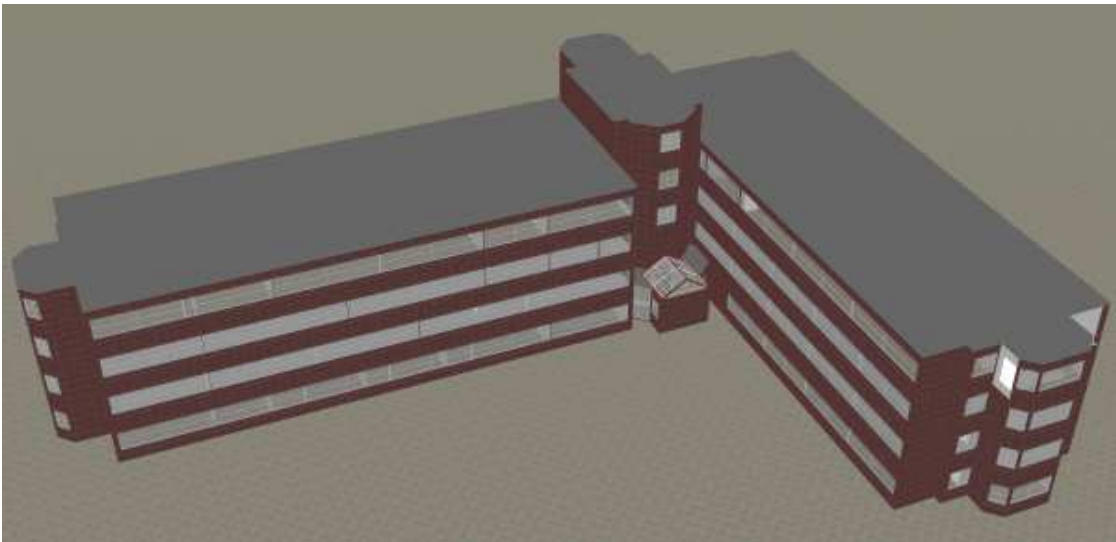


Energy Performance Certificate for a multi-storey office block

Introduction

The case study illustrates the use of DesignBuilder SBEM to produce an Energy Performance Certificate (EPC) and Recommendation Report for a level 4 office building. It demonstrates how a large building with a complex geometry can be quickly modelled using DesignBuilder SBEM and how the data inheritance tools within the software allow data to be quickly entered into the model. These tools greatly enhance the productivity of Energy Assessors using DesignBuilder SBEM providing them with a competitive advantage.

The Building



The owners of this 1979 four storey office block commissioned Safety Management and Monitoring Services Limited based at Huddersfield to prepare an Energy Performance Certificate (EPC) for their building. David Higham, the Energy Management Consultant assigned to the project has used **DesignBuilder SBEM** to produce the EPC.

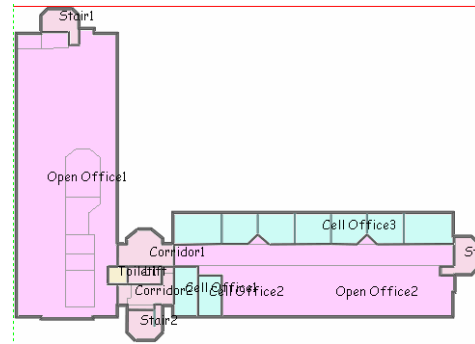
Building Geometry

The building consists of two office blocks arranged in an L shape and joined by a circulation area containing lifts, stairs and corridors with a plant room at the top level. There are further stair wells at each end of the office blocks as illustrated in the picture above. Modelling the building presented a

considerable challenge due to its shape and range of building services which required the full range of tools within DesignBuilder SBEM to be deployed.

The ground floor block was created by importing a DXF file and tracing around the outline. As the outline is the same for the three floors above these were created using the clone tool to make copies of the ground floor. The internal floor layouts were also imported in the DXF files for each floor. Parts of the internal layout such as the stairs and circulation area between the office blocks are the same on all floors and were copied from the ground floor layout thus saving further time.

A further simplification of the building model was achieved by using hanging partitions to create cellular offices as one zone. This is illustrated in the floor plan right where a number of cellular offices with the same building services are included as one zone



Entering Building Data

This is a relatively large building of nearly 4000m² with a considerable number of activity zones. It was therefore important to develop a strategy for loading the building data that exploits the data inheritance features of DesignBuilder in order to minimize the time and effort required.

Constructions and facades are common to the whole building which allowed these data to be entered at the building level and hence be inherited down to the surface level in each zone. Where a particular façade had no glazing or a different percentage of glazing the data was edited at surface level.

The lighting is mainly fluorescent tubes of varying ages and types. The strategy adopted was to count the number of tubes in each zone and to calculate the installed load including the ballast.

Heating is predominantly by room heaters of various types and efficiencies, while cassette units were installed in some meeting rooms and offices to provide local air conditioning. The strategy employed was to define an HVAC system for each system and assign it to the relevant blocks or zones.

Data was entered in each of the five tabs as described below.

Activities

The activities in the building are typical of those found in offices and include open and cellular offices, circulation areas, toilets, storage etc. They were assigned to each zone by selecting from the prescribed list of SBEM office activities

Constructions

This heavyweight poorly insulated building has a single external wall construction for all parts of the building. This allowed the external wall construction to be specified once at building level whereupon this construction was applied to all external walls in the building. Similarly for roofs and floors etc. This feature of DesignBuilder allows data to be entered much quicker than some other software tools such as iSBEM.

Openings

The building has a uniform pattern of glazing on most facades. The required information regarding glazing type and areas of glazing was entered at building level and hence applied initially to all facades of the building. The area of the glazing was set by moving the slider to specify the areas of glazing as percentage of the wall area. The glazing type was selecting from a drop down menu. In this building some facades have no glazing or reduced areas of glazing. These surfaces were simply selected from the navigation tree and the area of glazing adjusted using the slider.

Lighting

Electric lighting is predominantly supplied by fluorescent tubes some of which are the older halophosphate tubes with standard ballasts. In each zone the installed load was estimated by counting the fittings and multiplying by the wattage including that for the ballast. Design illuminance was assumed to be that recommended by CIBSE unless it was obviously higher or lower when estimated values were used. The estimated lighting load in W/m^2 and design illuminance were entered for each zone. Lighting control is manual throughout the building.

HVAC

Heating is predominantly by local room heaters of various ages and efficiencies. The most common type is other local room heaters - unfanned from the SBEM menu. A number of room heaters were defined with different Seasonal Energy Efficiency Ratios (SEER) and these were allocated at block and zone level as appropriate. The meeting rooms on the second floor have cassette units fitted as do a few offices. A further HVAC system was defined for these using the split and multi-split option in the SBEM menu. These few simple steps allowed the correct HVAC system to be applied throughout the building.

DHW

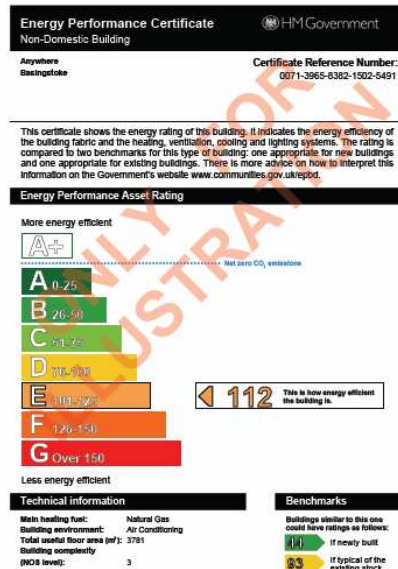
DHW is supplied by a stand alone water heater using grid electricity and incorporating a 227 litre storage vessel. Hot water is supplied to each floor by a secondary circulation loop using a 0.95 kW pump. In DesignBuilder the DHW generator is entered at building level so that it is automatically assigned to all the occupied zones as required for the SBEM calculation.

Comment by David Higham, Energy Assessor

“Our company produces EPCs for large buildings with complex shapes and building services. DesignBuilder has proved an invaluable tool to enable me to do this. The drawing tools and data inheritance have greatly reduced the time required to model the building and enter data”

The EPC

The EPC was produced by clicking on the calculate tab and selecting EPC England. As would be expected for this 1979 poorly insulated building the asset rating is a relatively poor 112 which puts the building in band E. Clearly there is considerable scope to improve the insulation and services in this building – see recommendations below.



Recommendations

The recommendations report has been reviewed by David Higham, the Energy Assessor for this project, who has removed some recommendations and added recommendations of his own.

Recommendations are grouped into short, medium and long payback with a further section ‘Other recommendations’ showing recommendation added by the Assessor. An example of the short payback recommendations is shown on the right.

3. Recommendations

The following sections list recommendations selected by the energy assessor for the improvement of the energy performance of the building. The recommendations are listed under four headings: short payback, medium payback, long payback, and other measures.

a) Recommendations with a short payback

This section lists recommendations with a payback of less than 3 years:

Recommendation	Potential impact
Replace 38mm diameter (T12) fluorescent tubes on failure with 26mm (T8) tubes.	MEDIUM
Consider replacing T8 lamps with retrofit T5 conversion kit.	LOW
Some spaces have a significant risk of overheating. Consider solar control measures such as the application of reflective coating or shading devices to windows.	MEDIUM
Introduce HF (high frequency) ballasts for fluorescent tubes: Reduced number of fittings required.	LOW
Add time control to heating system.	HIGH

More about DesignBuilder SBEM

More details about DesignBuilder SBEM and the training package available from DesignBuilder Certification can be found at www.dbcert.co.uk. Enquiries can be made to admin@dbcert.co.uk or by telephone on 01442 866378 or 07774 161708.