EAL CONSULT BUILDING SUSTAINABILITY SINCE 2008

DAYLIGHT & SUNLIGHT ASSESSMENT

PROPERTY ADDRESS
No 21 Bath Street,
Huddersfield,
HD1 5BQ

DATE
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PREPARED BY
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EXECUTIVE SUMMARY

This daylight assessment has been prepared to determine whether the proposed dwelling at No 21 Bath Street, Huddersfield, HD1 8BQ will provide residential accommodation considered acceptable in terms of daylight and sunlight. A detailed assessment of daylight quantity and distribution, as well as sunlight availability, have been undertaken for the relevant habitable rooms. This assessment should be consulted in conjunction with the proposed drawings.

The main objective to carry out this Daylight assessment is to:

- Determine the daylight and sunlight levels in all habitable rooms for the proposed re-development, in order to provide high standards of living to its future occupants

The methodology set out in this report is in accordance with BRE's 'Site Layout Planning for Daylight and Sunlight' (BR209, 2022), which is accepted as good practice by Planning Authorities. In June 2022 a new version of the Guidelines was published, which changes the criteria and methodology to assess daylight and sunlight within newly proposed schemes. However, the aim of the new guidance is the same as the old one, which is "to help ensure good conditions in the local environment considered broadly, with enough sunlight and daylight on or between the buildings for good interior and exterior conditions", as stated in Paragraph 1.5 of the new guidance.

The following assessments were carried out:

Daylight Assessment

- **Proposed dwelling at Basement Level – Daylight and Sunlight into Proposed Windows and habitable rooms**
  An assessment of daylight & sunlight into rooms within the proposed development has been carried out. This is to ensure future residents will benefit from the well-being of adequately daylit rooms. This will include the calculations of:

  a. Target Daylight Factor Levels for each habitable room (kitchen, living room and bedrooms)

The assessment of daylight and sunlight to the proposed dwelling, indicates that the target daylight factor of the residential unit at basement level, meets the recommended values set by BRE for all habitable rooms.

The proposed drawings supplied by the architect were used for the purpose of modelling and for the calculations, including location, site plan and proposed floor plans.

Additional Notes:

In most urban areas it is important to recognise that the distribution of daylight within a room may be difficult to achieve, given the built-up nature of the environment. Consequently, most local authorities seek to ensure that there is sufficient daylight within the room as determined by the Target Daylight Factor calculation.

TERMS AND DEFINITIONS

Daylight Factor (D)
Ratio of total daylight illuminance at a reference point on the working plane within a space to outdoor illuminance on a horizontal plane due to an unobstructed CIE standard overcast sky. Thus a 1% D would mean that the indoor illuminance at that point in the space would be one hundredth the outdoor unobstructed horizontal illuminance.

Target Daylight Factor
Daylight factor value equivalent to the target illuminance to be exceeded for more than half of annual daylight hours over a specified fraction of the reference plane within a daylit space.

Minimum Target Daylight Factor
Daylight factor value equivalent to the minimum target illuminance to be exceeded for more than half of annual daylight hours over 95% of the reference plane within spaces with vertical and/or inclined daylight apertures.

CIE standard overcast sky
A completely overcast sky for which the ratio of its luminance Lγ at an angle of elevation γ above the horizontal to the luminance Lz at the zenith is given by: (1 + 2 sin γ) Lγ = Lz 3 A CIE standard overcast sky is darkest at the horizon and brightest at the zenith (vertically overhead).

Daylight, natural light
Combined skylight and sunlight.

No sky line
The outline on the working plane of the area from which no sky can be seen.

CURRENT POLICIES, REGULATIONS AND BENCHMARKS

People expect good natural lighting in their homes and in a wide range of non-domestic buildings. Daylight makes an interior look more attractive and interesting as well as providing light to work or read by. Access to skylight and sunlight helps make a building energy efficient; effective daylighting will reduce the need for electric light, while winter solar gain can meet some of the heating requirements.

The quality and quantity of natural light in an interior depend on two main factors. The design of the interior environment is important: the size and position of windows, the depth and shape of rooms, and the colours of internal surfaces. But the design of the external environment also plays a major role: e.g. if obstructing buildings are so tall that they make adequate daylighting impossible, or if they block sunlight for much of the year.

Obstructions can limit access to light from the sky. This can be checked at an early design stage by measuring or calculating the angle of visible sky θ, angle of obstruction or vertical sky component (VSC) at the centre of the lowest window where daylight is required. If VSC is:

- at least 27% (θ is greater than 65°, obstruction angle less than 25°) conventional window design will usually give reasonable results. - between 15% and 27% (θ is between 45° and 65°, obstruction angle between 25° and 45°) special measures (larger windows, changes to room layout) are usually needed to provide adequate daylight.
- between 5% and 15% (θ is between 25° and 45°, obstruction angle between 45° and 65°) it is very difficult to provide adequate daylight unless very large windows are used.
- less than 5% (θ less than 25°, obstruction angle more than 65°) it is often impossible to achieve reasonable daylight, even if the whole window wall is glazed.

In general a dwelling, or non-domestic building that has a particular requirement for sunlight, will appear reasonably sunlit provided:

- at least one main window wall faces within 90° of due south and
- a habitable room, preferably a main living room, can receive a total of at least 1.5 hours of sunlight on 21 March. This is assessed at the inside centre of the window(s); sunlight received by different windows can be added provided they occur at different times and sunlight hours are not double counted.

Where groups of dwellings are planned, site layout design should aim to maximise the number of dwellings with a main living room that meets the above recommendations.

If a living room of an existing dwelling has a main window facing within 90° of due south, and any part of a new development subtends an angle of more than 25° to the horizontal measured from the centre of the window in a vertical section perpendicular to the window, then the sun lighting of the existing dwelling may be adversely affected. This will be the case if the centre of the window:

receives less than 25% of annual probable sunlight hours and less than 0.80 times its former annual value; or less than 5% of annual probable sunlight hours between 21 September and 21 March and less than 0.80 times its former value during that period;

- and also has a reduction in sunlight received over the whole year greater than 4% of annual probable sunlight hours.

The British Standard "Daylight in buildings" (BS EN 17037) contains advice and guidance on interior daylighting. The guidance contained in this publication (BR 209) is intended to be used with BS EN 17037 and its UK National Annex[C1]. Other European countries have their own versions of EN17037, which do not include the UK National Annex.

BS EN 17037 supersedes BS 8206 Part 2 "Code of practice for daylighting"[C2], which contained a method of assessment based on Average Daylight Factor, which is now no longer recommended. For daylight provision in buildings, BS EN 17037 provides two methodologies. One is based on target illuminances from daylight to be achieved over specified fractions of the reference plane (a plane at table top height covering the room) for at least half of the daylight hours in a typical year. The other, alternative, method is based on calculating the daylight factors achieved over specified fractions of the reference plane.

BS EN 17037 gives three levels of recommendation for daylight provision in interior spaces: minimum, medium and high. For compliance with the standard, a daylit space should achieve the minimum level of recommendation.

Daylight factor method

The daylight factor is the illuminance at a point on the reference plane in a space, divided by the illuminance on an unobstructed horizontal surface outdoors. The CIE standard overcast sky[C3] is used, and the ratio is usually expressed as a percentage.

Table C2 gives the daylight factor targets for side lit rooms in London.

Table C2 – Target daylight factors (D) for London

Level of recommendation	Target daylight factor D for half of assessment grid	Target daylight factor D for 95% of assessment grid
Minimum	2.1%	0.7%
Medium	3.5%	2.1%
High	5.3%	3.5%

METHODOLOGY

Surface reflectance

Internal and exterior surfaces and obstructions need to be modelled including appropriate surface reflectances.

Surface reflectances should represent real conditions. Where reflectance values have not been measured or specified, default values to be used in the calculation are given in Table C4.

Table C4 – Recommended default surface reflectances	
Surface	**Default reflectance**
Interior walls	0.5
Ceilings	0.7
Floors	0.2
Exterior walls and obstructions	0.2
Exterior ground	0.2

Where surface finishes have been specified or measured on site, they can be used in the calculations with appropriate factors for maintenance and furniture. To allow for these factors, maximum reflectances for white painted surfaces in the calculations should not exceed 0.8 indoors, and 0.6 outdoors. Maximum reflectances for light pastel walls should not exceed 0.7 in the calculations, and maximum reflectances for light wood floors should not exceed 0.4. Surface reflectances used should be presented in the assessment, along with a specification of the materials if non-default reflectances are used.

Glazing transmission

Glazing transmission factors, including maintenance factors, need to be included in the simulation along with account for, or modelling of, window framing. Where window frames are not specifically included in the model, frame factors should be applied based on the ratio of glass to overall window aperture area for the type of window to be used; this will generally vary with window size and whether the windows have opening lights. Where window types have not been specified, results for the overall window aperture should be multiplied by a default framing factor as given in Table C5.

Table C5 – Recommended default framing factors	
Window type	**Default framing factor**
Windows with small panes	0.5
Normal windows with opening lights	0.6
Patio doors	0.7

SITE

The proposed site is located in a predominantly residential area.
Daylight studies was undertaken to ensure all habitable rooms will provide good natural light levels for its future occupants.

The proposal includes the refurbishment of the existing building, consisting of a 2 storey structure, to provide additional residential unit on basement level. A lightwell has been provided at basement level to allow natural light to reach the proposed habitable rooms.

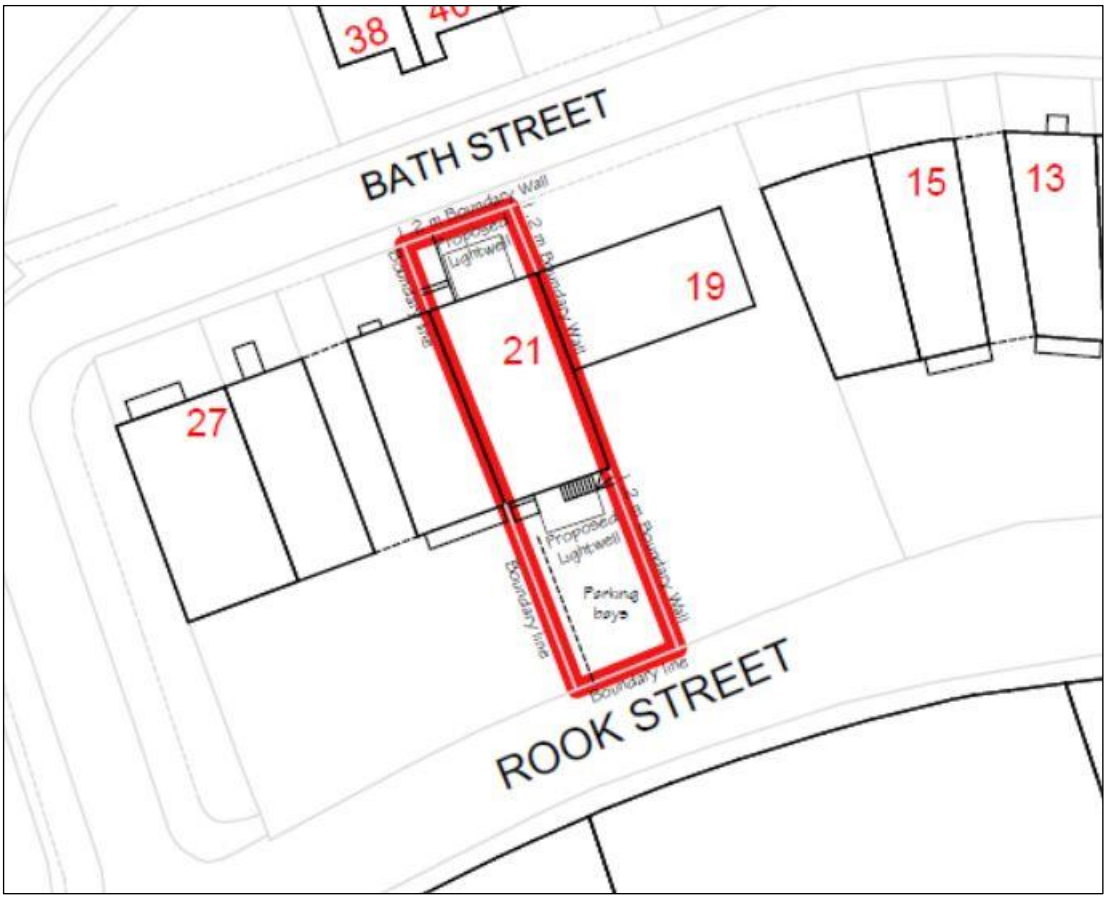


Figure 1 - Site Location

DAYLIGHT & SUNLIGHT ASSESSMENT: PROPOSED DWELLING – BASEMENT LEVEL

Daylight factor

The daylight factor is the illuminance at a point on the reference plane in a space, divided by the illuminance on an unobstructed horizontal surface outdoors. The CIE standard overcast sky[C3] is used, and the ratio is usually expressed as a percentage. The recommendations for side lit rooms are met if both target daylight factors (the median daylight factor over 50% of the reference plane, and the minimum daylight factor over 95% of the reference plane) are achieved.

The table below shows the minimum requirements that each habitable space needs to achieve.

Table C2 – Target daylight factors (D) for London		
Level of recommendation	Target daylight factor D for half of assessment grid	Target daylight factor D for 95% of assessment grid
Minimum	2.1%	0.7%
Medium	3.5%	2.1%
High	5.3%	3.5%

Sunlight: Annual and Winter Probable hours

BRE states: "in housing, the main requirement **for sunlight is in living rooms**, where it is valued at any time of the day, but especially in the afternoon. Sunlight is also required in conservatories. It is viewed as less important in bedrooms and in kitchens where people prefer it in the morning rather than the afternoon."

The BRE guide considers the critical aspects of orientation and overshadowing in determining the availability of sunlight at a proposed development site.

The guide proposes minimizing the number of dwellings whose living room face solely north unless there is some compensating factor. At the same time it acknowledges that the site's existing urban environment may impose orientation or overshadowing constraints which may not be possible to overcome.

"In general, a dwelling or non-domestic building which has a particular requirement for sunlight, will appear reasonably sunlit provided that:

- At least one main window faces within 90 degrees of due south, and
- The centre of at least one window to a main living room can receive 25% of annual probable sunlight hours, including at least 5% of annual probable sunlight hours in the winter months between 21 September and 21 March. "

In paragraph 3.1.11 the BRE guidance suggests that if a room faces significantly North of due East or West it is unlikely to meet the recommended levels proposed by the BS 8206-2. As such, it is clear that only windows facing within 90 degrees of due South can be assessed using this methodology.

Table 1 - Daylight & Sunlight Assessment

Unit	Room Type	TDF (%)[1]	Pass	Sunlight Assessment (probable sunlight hours)	
				Annual %	Winter %
Basement Dwelling	Kitchen/Living Room	2.7%	Yes	N/A	N/A
	Bedroom 1	2.1%	Yes	N/A	N/A
	Home Office	2.2%	Yes	N/A	N/A

Results:

A total of 3 rooms were assessed at No 21 Bath Street. Results demonstrate that 3/3 habitable spaces will meet the required minimum Target Daylight Factor.

The residential unit does not have a living room facing south and thus, the annual and winter probable hours have not been calculated.

Please note that the proposed scheme uses an existing building and therefore, the layout and arrangement of the proposed residential units had many design constraints.

[1] Target Daylight Factor

CONCLUSION

Daylight Assessment to Proposed Habitable rooms:

The Target Daylight Factors (TDFs) was assessed for all habitable rooms at No 21 Bath Street – Basement Level.

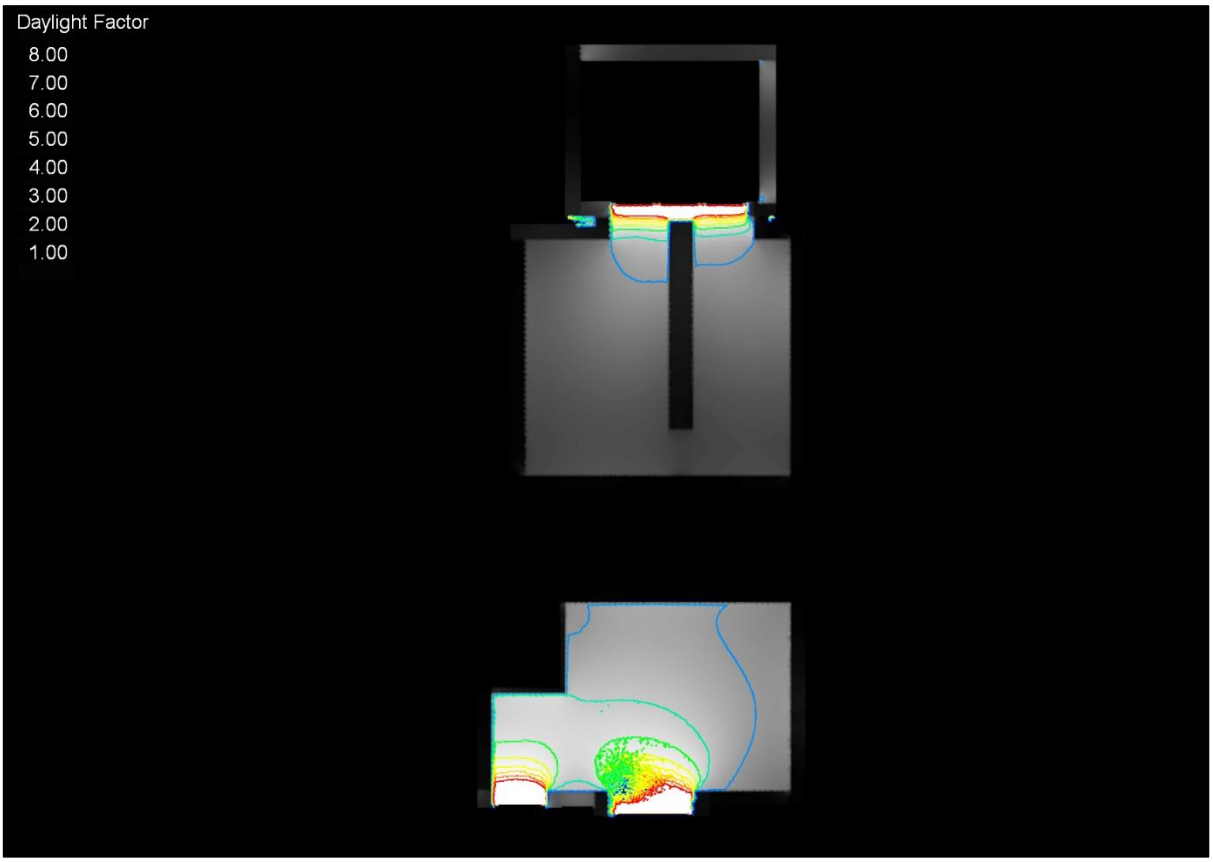
The results show that:

a. All proposed habitable rooms – kitchens/living room, bedroom, and study room – achieve the minimum target daylight levels. (3 out of 3 assessed rooms).

Overall, the design has sought to strike the best possible balance taking into account the site constraints and the existing building layout and location of windows.

It is worth noting that the daylight standards are for guidance and their purpose is to encourage good daylight levels within a dwelling. In this development the daylight & sunlight levels have not achieve the minimum requirement set by BRE, however, it is up to the Council to consider the proposed scheme acceptable due to site constraints.

APPENDIX A



Target Daylight Factor Results of each habitable space within the proposed development.

Basement Level