



153 Friar Street, Reading
Daylight and Sunlight
Assessment

For Vail Williams LLP

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153 Friar Street, Reading

1. INTRODUCTION

Hydrock Consultants has been appointed by Vail Williams to provide a daylight and sunlight assessment for the proposed refurbishment of 153 Friar Street, Reading.

1.1 Purpose of Report

This report provides the results of a daylight and sunlight assessment that has been undertaken for the proposed development.

The development has been assessed using the criteria set out in the Building Research Establishment's (BRE) 'Site layout planning for daylight and sunlight - a guide to good practice' (BR 209) (Littlefair, 2022), which provides the criteria and methodology for calculation in connection to daylight and sunlight. Whilst the guide itself states that its guidelines are not mandatory, its aim being to help rather than constrain the designer. Although it gives numerical guidelines, these should be interpreted flexibly and considered for which area is predominately referenced for daylight and sunlight standards in the UK.

1.2 Site and Location

- The site is located in Reading town centre, along Friar Street in between Queen Victoria Street and Cross Street.
- The site is centrally located within Reading, close to Reading train station.

1.3 Development Details

- The development application will be mixed-use, comprising of existing commercial on the ground floor and new flats on the first and second floors.

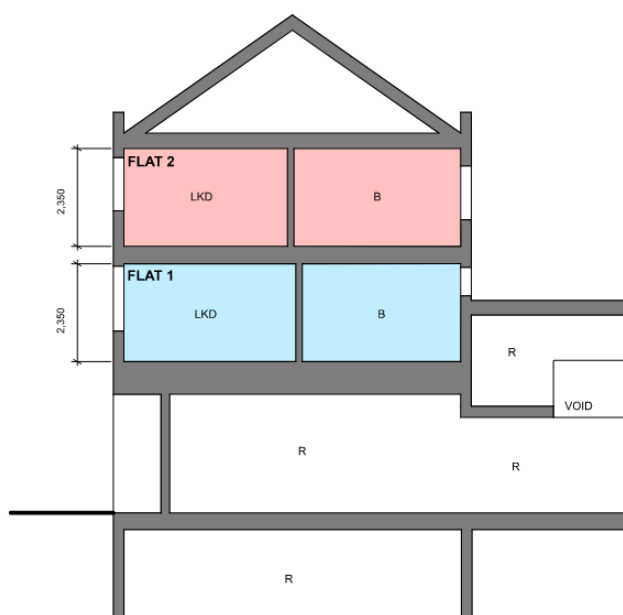


Figure 2: Diagrammatic Proposed Section

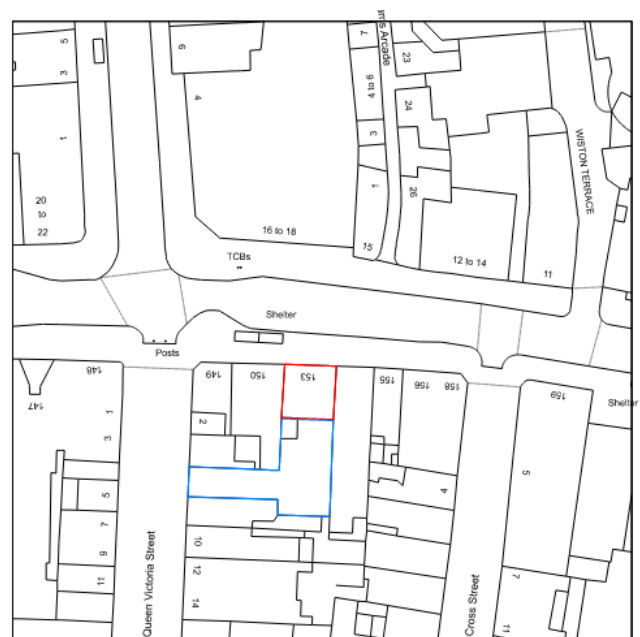


Figure 1: Site location

2. METHODOLOGY

This second section of the report discusses the relevant daylight and sunlight assessment methods for both the proposed new development, and impact assessment on existing buildings.

2.1 Background

Overshadowing occurs when buildings are in close proximity relative to their size. This results in reduced levels of daylight and sunlight in part, or all, of the affected buildings. Daylight refers to the level of diffuse natural light coming from the surrounding sky or reflected off adjacent surfaces, whereas sunlight refers to direct sunshine. A key difference between the two is that sunlight is highly dependent on orientation, whereas orientation has no effect on daylight.

The potential for daylight at a particular point may be quantified by assessing the proportion of the sky that is 'visible' from that point, i.e. not obscured by objects such as buildings. For points located on vertical surfaces such as walls, this proportion of visible sky is termed the 'vertical sky component' or VSC.

Further, climate-based modelling (CBM) techniques can be utilised to provide a more accurate assessment of predictive visual comfort within buildings. These techniques include spatial daylight autonomy (SDA), which considers percentage of time across a given year where appropriate illuminance levels are achieved, in addition to glare risk assessment.

These CBM techniques require more complex modelling and are more appropriate where the usage and task requirement of the space are known in more detail.

To achieve objectivity in quantifying daylight and sunlight, the guidelines laid down in the widely accepted BRE guidebook 'Site layout planning for daylight and sunlight: a guide for good practice', 2nd edition, 2022 by P J Littlefair are adhered to.

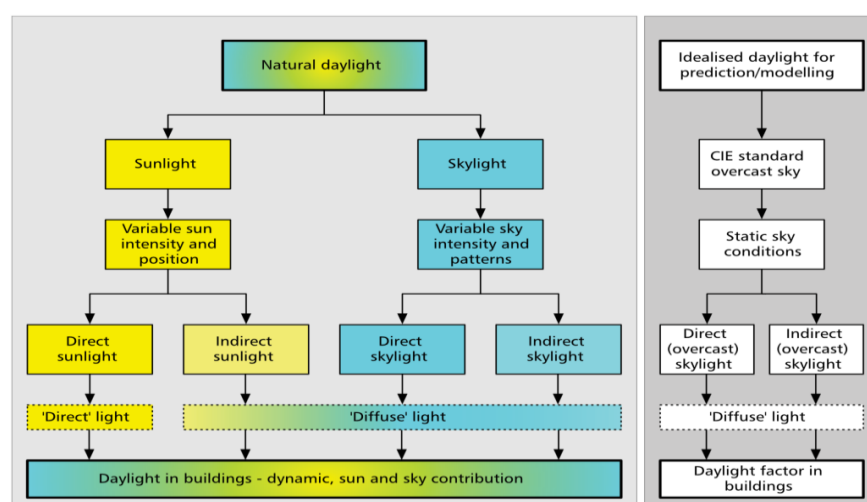


Figure 3: Natural daylight categories

2.2 Calculating Daylight in New Development

2.2.1 Recommendations for daylight provision in a space

The BRE guide cites the recommendations for daylight in BS EN 17037 - Daylight in buildings (the British Standard for Daylight), as the minimum values for target daylight factors (DT) and minimum target daylight factors (DTM) to be achieved, shown in Table 1. A margin of 0.5m should be applied to all walls, unless otherwise specified.

Table 1: BS recommended Daylight factors

	Daylight factor to exceed 100 lux (minimum target)	Daylight factor to exceed 300 lux (target)	Daylight factor to exceed 500 lux	Daylight factor to exceed 750 lux
London, UK	0.7 %	2.1 %	3.5 %	5.3 %

As a minimum, the daylight factor:

- for 300lux should be exceeded for more than half of the daylight hours, across 50% of the reference plane, and;
- for 100lux should be exceeded for almost all the space of the daylight hours, over 95% of the space.

2.2.2 Recommendations for view

BS EN 17037 - Daylight in buildings states that openings should provide a sufficient view from within the room, and gives recommendations for three levels of view out through vertical, inclined and horizontal openings. These levels depend on the horizontal sight angle, the distance to outside view, and the number of layers (content of the view).

Table 2: BS recommended assessment of the view outwards

Parameter			
Level of recommendation for view out	Horizontal sight angle	Outside distance of the view	Number of layers to be seen from at least 75 % of utilized area: Sky, landscape (urban and/or nature) or ground
Minimum	$\geq 14^\circ$	$\geq 6,0 \text{ m}$	At least landscape layer is included
Medium	$\geq 28^\circ$	$\geq 20,0 \text{ m}$	Landscape layer and one additional layer is included in the same view opening
High	$\geq 54^\circ$	$\geq 50,0 \text{ m}$	all layers are included in the same view opening

2.3 Sunlight for New Developments

2.3.1 Recommendation for exposure to sunlight

Window sunlight availability is assessed using sunlight exposure and the sun lighting of a dwelling may be adversely affected if centre of the window receives less than 1.5 hours of sunlight on March 21st.

Table 3: BS recommended daily sunlight exposure

Level of recommendation for exposure to sunlight	Sunlight exposure
Minimum	1.5 h
Medium	3.0 h
High	4.0 h

For amenity spaces it is recommended that for it to appear adequately sunlit throughout the year, at least half of a garden or amenity area should receive at least two hours of sunlight on 21st March.

3. DAYLIGHT AND SUNLIGHT MODEL

To carry out the daylight and sunlight assessment, a 3D computer model has been generated based on information.

3.1 Computer Simulation Details

3.1.1 Accuracy

It is important to note that with any modelling exercise there are assumptions and approximations made. While building performance modelling techniques include detailed hourly simulations, they are predictive methods only, and should not be relied upon as a measure of final building performance. The latter is subject to detailed design, installation, commissioning and operational profiles which are all subject to development. As far as possible, details of all assumptions and approximations used are supplied as part of the report. These should be read and considered carefully.

3.1.2 Software

The calculations have been carried out using IES Virtual Environment 2022, an accredited Building Performance Modelling (BPM) tool in accordance with CIBSE Guide AM11 (CIBSE, 2015).

IES uses a Radiance based calculation simulation for daylight. This predicts the transport of light in a virtual 3D scene using physically based models for the emission, transmission, reflection and scattering of light. The output, therefore, can inform on how the building might perform; for example, in terms of visual impression and predicted illuminance levels for particular sky conditions. Radiance is capable of producing highly accurate predictions, within 10% of measured illuminance values.

In practical terms however, there are a number of factors that will affect the accuracy and reliability of modelling predictions:

- Model geometry;
- Physical properties;
- Luminous environment;
- Sensor grid/points;
- Simulation parameters; and
- Data output.

3.1.3 Geometry

Three-dimensional numerical models suitable for daylight/sunlight analysis were constructed to represent the current site conditions and the proposed development. The models included a representation of buildings adjacent to the development site up to a distance judged to have an influence on the availability of natural light.

3.1.4 Weather

In accordance with BRE guidelines, the daylight factor has been assessed based on a uniform overcast sky with account for different climatic conditions at different locations.

Solar calculations, for the purpose of sunlight availability, have been carried out based on the most suitable local weather file at the development.

4. PROPOSED DEVELOPMENT DAYLIGHT ANALYSIS

This section of the report will provide an analysis of the proposed development daylight performance. This will be quantified in terms of daylight factor and view out. To carry out this assessment a representative sample of units have been tested to provide an overview of the building's daylight performance.

4.1 Daylight Factor

The daylight factor for each unit have been calculated and assessed against the BRE criteria. The results are as follows:

Table 4: Daylight results

Room	Target Daylight Factor across % of room	Minimum Daylight Factor across % of room
1F Flat LRD	50%	70%
1F Flat Bedroom	40%	60%
2F Flat LRD	52%	79%
2F Flat Bedroom	29%	49%

BS EN 17037 (the British Standard for Daylight) recommends that habitable rooms should achieve a daylight factor of 2.1% for at least 50% of the space, and 0.7% daylight factor (minimum) for at least 95% of the space.

Both living rooms (first floor and second floor flats) achieve sufficient daylight access, achieving the daylight factor across 50% of the room. However, both bedrooms in these flats do not achieve sufficient daylight across the spaces, achieving 40% and 29% respectively. Similarly, all the spaces do not achieve the minimum daylight level across 95% of the room, rather achieving in the region of 70-80% for the living rooms and 50-60% for the bedrooms. However, these levels of daylight are deemed acceptable in respect to their intended use and the nature of the refurbishment maintaining the existing window openings.

The building to the west of the proposed development causes a large amount of overshadowing to the bedrooms to the rear of the flats, these rooms are therefore expected to perform poorer in terms of daylight.

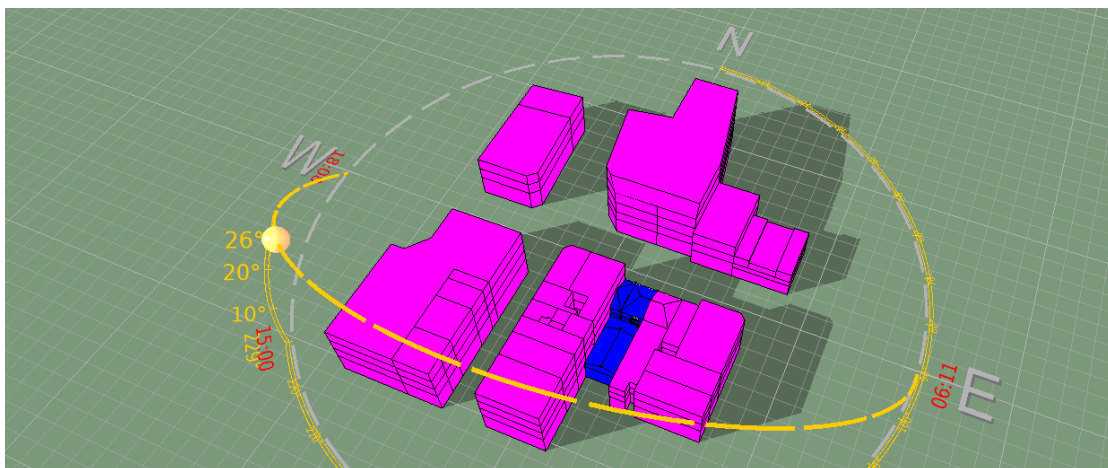


Figure 4: IES model showing sun path and overshadowing experienced on the proposed development (blue)

4.2 Sky view

The sky view factors for each unit have been calculated and assessed against the BRE criteria. The results are as follows:

Table 5: Sky view results

Room	Horizontal sight angle	Outside distance of the view	Number of layers (Sky View)
1F Flat LRD	18.75	19.1m	98%
1F Flat Bedroom	9.70		100%
2F Flat LRD	22.45	19.1m	100%
2F Flat Bedroom	19.80		96%

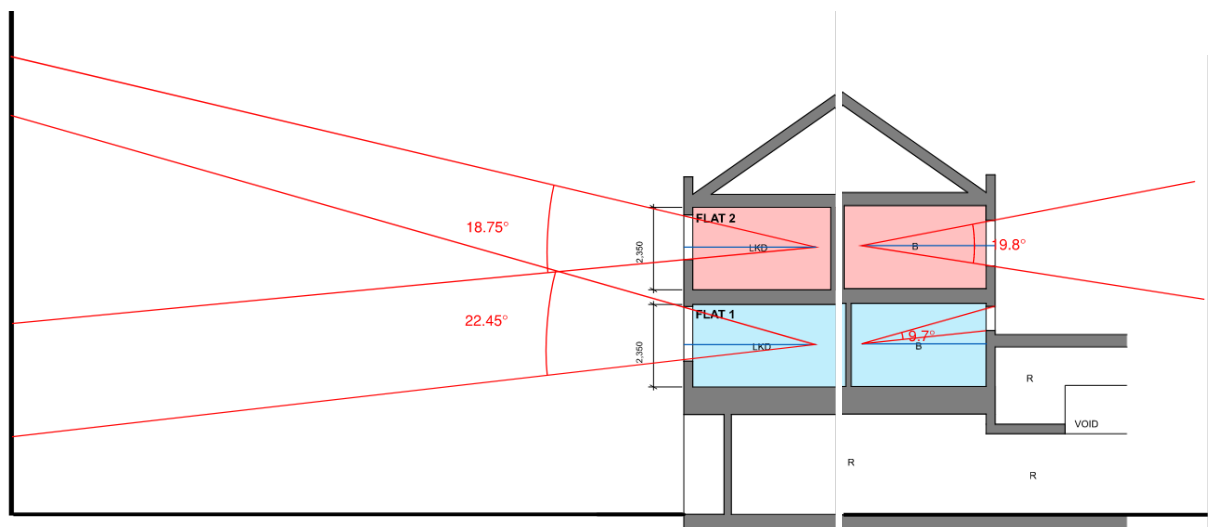


Figure 5: Horizontal sight angle calculation

BS EN 17037 (the British Standard for Daylight) recommends that habitable rooms should achieve a minimum horizontal sight angle, outside distance of the view and number of layers for at least 75% of the space.

Both living rooms (first floor and second floor flats) achieve sufficient views out, achieving a horizontal sight angle above 14°, outside distance of 19.1m and a sky view of 98% and 100% respectively. The second floor flat's bedroom achieves sufficient view out, achieving a horizontal sight angle of 19.8°, outside distance of 73.5m and a sky view of 96%, however the first floor flat's bedroom only achieves a horizontal sight angle of 9.7° due to the height of the existing window in the space. However, all the spaces are deemed acceptable in respect to their view, due the nature of the refurbishment maintaining the existing window openings.

5. PROPOSED DEVELOPMENT - SUNLIGHT ANALYSIS

This section of the report provides an analysis of the development performance in terms of access to sunlight. This will be quantified in terms of sunlight hours. As with the daylight assessment, a representative sample of dwellings have been assessed.

5.1 Window Sunlight Assessment

5.1.1 Sunlight Hours

BRE recommends that habitable rooms should be provided with:

- 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.

Both living rooms (first floor and second floor flats) do not achieve sufficient sunlight levels, achieving below 1.5 hours of sunlight on March 21st, due to the orientation of the façade. However, the bedrooms do achieve acceptable levels of sunlight, achieving above 1.5 hours on March 21st. However, all the spaces are deemed acceptable in respect to their sunlight, due the nature of the refurbishment maintaining the existing window openings and the existing orientation of the development.

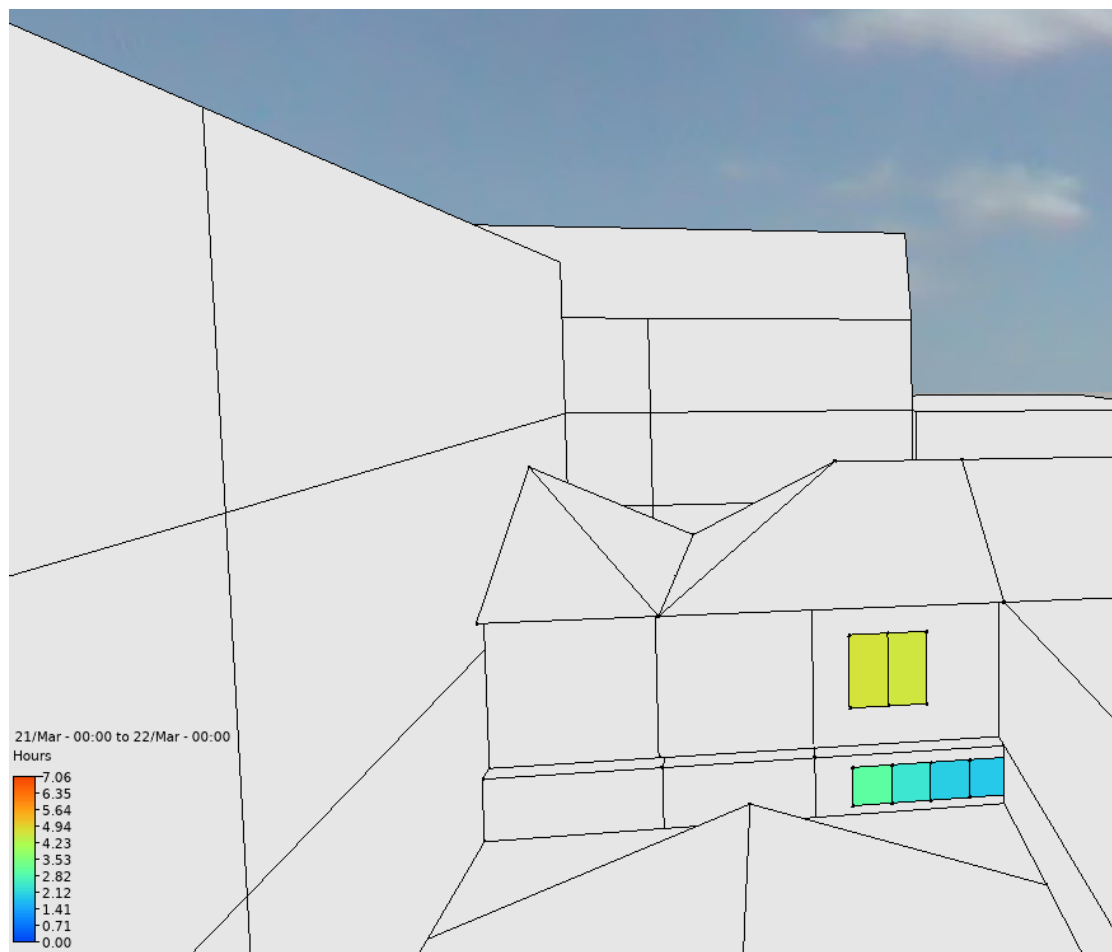


Figure 6: Sunlight hour levels on south facades (First and Second floor bedrooms)

6. CONCLUSIONS

The design team have carried out an assessment of site layout planning for daylight and sunlight. The team have sought to maximise opportunities for daylight access and sunlight availability in accordance with BRE good practice guidance whilst also taking into account other site requirements and objectives.

6.1 Summary

The development is generally performing well in terms of daylight and sunlight, with consideration to the existing context of the development.

6.2 Daylight

The daylight performance of the two dwellings have been assessed. The both of the living rooms contained within these dwellings are passing the BRE guidelines for daylight, while the bedrooms slightly under performance in terms of daylight and the first floor flat's bedroom in terms of view out, this is due to the existing windows opening being maintained during the refurbishment.

Whilst the site is performing relatively well, it should be noted that the BRE guidelines were designed to be used flexibly, allowing some degree of argument for daylight levels that do not meet the minimum requirements.

Based on the above the daylight performance is deemed to be acceptable, particularly in relation to other site design requirements, objectives and constraints such as:

- Proximity to proposed adjoining development and existing buildings;
- Internal layouts restricted by existing building layouts; and
- Balanced fabric design criteria to maximise daylight whilst limited winter heat loss and risk of summertime overheating.

6.3 Sunlight

Window sunlight has been assessed. Only windows on the south façade achieve above 1.5 hours on March 21st and are within the BRE guidelines. This is deemed acceptable within the existing constraints of the site.