

**Daylight & Sunlight Assessments of Proposed Amendments to the
Development Permitted under WCC Reg. Ref.: 24/325
at Tinahask Upper, Money Big & Money Little, Arklow, Co. Wicklow.**

Applicant: Castlethorn

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1. Executive Summary

1.1 Introduction

The proposed development comprises amendments to the Large-scale Residential Development permitted under WCC Reg. Ref. 24/325 consisting 352no. residential units proposed in a mix of houses and apartment units comprising 334no. houses (44no. 2-bedroom, 241no. 3-bedroom and 49no. 4-bedroom) ranging from 2 to 3 storeys, 18no. apartments (6no. 1-bedroom and 12no. 2-bedroom) in 1no. 4 storey building, 1no. creche (c. 711 sqm) at ground floor of apartment Block A; and all associated and ancillary site development works including on site attenuation, hard and soft landscaping and boundary treatment works, including public open space; communal open space, public lighting; surface car parking; bicycle parking spaces/stores for houses and apartment units; 4no. ESB substations; bin stores; vehicular access via existing Northwood road and railway overbridge from Knockmore roundabout. The proposed development also includes road upgrade works to the existing railway overbridge and the western approach to same including the provision of a 2.5m footpath, 6m carriageway, safety barrier improvement works and other ancillary works required to facilitate these elements.

This report assesses the impact of the proposed development for daylight and sunlight on the neighbouring buildings and the quality of daylight and sunlight within the proposed development. This analysis is carried out based on the drawings of O'Mahony Pike Architects.

This report has been prepared by Ann Canning, an architect with a masters in energy retrofit technologies and a member of the Royal Institute of Architects of Ireland. Ann is an architect with in excess of 20 years experience, and a daylight and sunlight consultant for 7 years. She has worked on an extensive list of projects over the years varying in scale and location from restricted city sites to rural areas, throughout Ireland.

1.2 Assessment of Potential Impact to Daylight and Sunlight Availability on Neighbouring Properties

Analysis demonstrated in Section 4 shows that there will be a negligible reduction in daylight and sunlight in neighbouring properties.

The shadow study in Section 8 shows that there is no additional shading from the proposed development on the closest existing houses; those at Knockanrahan Lower.

The proposed development meets the recommendations of the BRE guidelines BR209:2022.

1.3 Assessment of the Quality of Daylight and Sunlight within the Proposed Development

The residential units were designed in line with the recommendations of the BRE guidelines BR209:2022. The guidelines clearly state that the targets are recommendations only and flexibility is required when setting and interpreting the targets.

The BRE guidelines BR209:2022 recommends assessment methods set out in BS EN 17037 for daylight provision. BS EN 17037 contains a National Annex which sets out minimum daylight levels to be achieved in the UK and channel Islands. Ireland has a similar latitude and climate to the UK. The UK annex to BS EN 17037 states that the target values set out in EN 17037 Table A1 may be hard to achieve in the UK, it sets alternative minimum values for rooms to dwellings. The minimum illuminance levels set out in BS EN17037:2018+A1:2021 are: Kitchens and living spaces containing a kitchen 200lux (1.3%DF). Living rooms 150lux (1%DF) and bedrooms 100lux (0.7%DF).

The levels set out in the UK annex are used in this assessment, as the primary results to be achieved, because these are referenced in the BRE guidelines BR209:2022, as recommended by the local authority. The BRE guidelines BR209:2022 deals with daylight and sunlight to neighbouring properties and defers to BS EN17037:2018+A1:2021 for daylight and sunlight within the proposed development and allows for a complete assessment of the proposed development and its surroundings. The BRE guidelines BR209:2022 presents a discussion on aspects of daylight and sunlight and interpreting the results of these assessments.

IS EN17037:2018 does not set out any guidance for assessing the impact to daylight and sunlight from a proposed development on neighbouring buildings nor is there any Irish governmental guidance on interpreting results and percentages of units to achieve the target results in multi unit developments. IS EN17037:2018 does not set out room use specific targets but instead designates a Minimum and Target lux level to be achieved in all rooms regardless of use. The function of a room historically has been the key factor in informing the design of a building and the window sizes to allow adequate daylight levels for the task typical to that room to be achieved. The lack of variance in target levels for the tasks typical to a room can lead to substantially oversized windows in rooms with a lower requirement for daylight levels, for example bedrooms. The aim to achieve the minimum target lux level to all rooms in a multi unit residential building is not practical and could lead to overheating of units that have greater access to the sky and sunlight. This could also lead to higher energy usage due to oversized windows and a balance needs to be met.

The results for the Minimum and Target levels set out in Table A1 in IS EN17037:2018 are presented in the assessment as supplementary for completeness, however, conclusions can not be made due to lack of clear guidance on interpenetration of results.

There are no existing mature trees within the vicinity of any of the proposed units that would influence the daylight levels and the assessment is carried out without any trees.

1.3.1 Assessment of Daylight in Accordance with BR209:2022 and BS EN 17037:2018+A1:2021

100% of the habitable rooms within the proposed development achieve the target values set out in BS EN 17037:2018+A1:2021 Table NA1. These are the minimum values, per specified use, to be achieved in habitable rooms and meets the recommendations of the BRE guidelines BR209:2022.

1.3.2 Sunlight within the Proposed Development

This scheme is well designed for sunlight. In the houses 100% will achieve the minimum target sunlight hours to a room. In the apartment units 94.4% meet the minimum recommended 1.5 direct sunlight hours. This exceeds the BRE guideline example for an apartment layout where 4 in 5 (circa 80%) achieves the target sunlight hours.

All proposed public and communal amenity spaces achieve sunlight levels that exceed two hours sunlight over 50% of the required amenity space on the 21st March.

The proposed development meets the recommendations for sunlight in the BRE guidelines BR209:2022.

1.4 Supplementary Information - Assessment of Daylight in Accordance with IS EN 17037:2018+A1:2021

To date there is no guidance from governmental bodies on the use or interpretation of IS EN 17037:2018+A1:2021. National policy documents and local authorities guidelines refer to the BRE guidelines BR209 2022, which in turn references BS EN 17037.

BS EN 17037:2018 is the same as IS EN 17037:2018; the difference is in the annex. The UK annex gives room specific values for dwellings. The assessment against IS EN 17037:2018+A1:2021 is included as supplementary information only; the levels are for any type of building; they do not take into account room use or make allowance for rooms that have a lesser requirement for daylight. Due to this limitation, it is considered the recommendations made in the BRE guidelines BR209:2022 and are more appropriate.

IS EN 17037:2018+A1:2021 sets out values for target illuminance, minimum target illuminance and fractions of reference plane to be achieved. The results of this assessment indicate a high level of daylight provision, with 100% of rooms achieving Minimum Illuminance and 100% achieving Target Illuminance.

1.5 Conclusions

Overall the design team worked in response to the context to ensure the proposed development performs with regards to achieving the best possible daylight and sunlight quality. All habitable rooms in the apartment units meet the minimum standard for daylight provision as per BS EN 17037:2018+A1:2021 as referred to in the BRE guidelines BR209:2022.

In the assessment of daylight in accordance with IS EN 17037:2018+A1:2021, shown for supplementary information, all habitable rooms in the apartment units achieve daylight provision as set out in IS EN 17037:2018+A1:2021

It is our opinion that all habitable rooms within the proposed development achieve the minimum target daylight levels set out in BS EN 17037:2018+A1:2021, as referred to in the BRE guidelines BR209:2022 and no compensatory measures are required.

2. Methodology

2.1 Standards and Guidelines

Ministerial guidance is provided in Sustainable Residential Development and Compact Settlements: Guidelines for Planning Authorities (2024) Section 5.3.7(b).

“In cases where a technical assessment of daylight performance is considered by the planning authority to be necessary regard should be had to quantitative performance approaches to daylight provision outlined in guides like A New European Standard for Daylighting in Buildings IS EN17037:2018, UK National Annex BS EN17037:2019 and the associated BRE Guide 209 2022 Edition (June 2022), or any relevant future standards or guidance specific to the Irish context.”

The Daylight and Sunlight assessments included in this report demonstrates the level of compliance with these three documents:

- BR209:2022 Site Layout Planning for Daylight and Sunlight (third edition), also referred to as the BRE guidelines.
- BS EN 17037:2018+A1:2021 Daylight in Buildings, also referred to as the UK Annex.
- IS EN 17037:2018+A1:2021 Daylight in Buildings.

2.2 BRE Guidance Document BR209:2022 Site Layout Planning for Daylight and Sunlight (third edition)

In its opening summary, the BRE guidelines BR209:2022 states that the report *“is purely advisory and the numerical target values within it may be varied to meet the needs of the development and its location.”* The recommendations of the BRE guidelines BR209:2022 are not suitable for rigid application to all developments in all contexts. This is of particular importance in the context of national and local policies for the consolidation and densification of urban areas.

The BRE guidelines BR209:2022 sets out the assessment metrics to be applied when assessing the potential impact of a development on the daylight and sunlight of neighbouring properties. The metrics for assessing impact to neighbouring buildings for Daylight is the Vertical Sky Component (VSC) and Sunlight is the Annual Probable Sunlight Hours (APSH). Sunlight to neighbouring amenity space is assessed through the measurement of sunlight availability on the 21st March and the plotting of shadow diagrams.

When assessing the quality of interior spaces in proposed developments, the BRE guidelines BR209:2022 Appendix C states; *“The guidance contained in this publication is intended to be used with BS EN 17037 and its UK National Annex.”* The BRE guidelines BR209:2022 also states in Section 1.7 that *“The guidance here is intended for use in the United Kingdom and in the Republic of Ireland, though recommendations in the Irish Standard IS EN 17037 may vary from those in BS EN17037.”*

2.3 Daylight in Buildings EN 17037:2018

EN 17037 is a unified daylighting standard published by the European Committee for Standardization in 2018. It is applicable across all countries within the EU. The EN17037:2018 standard deals exclusively with new developments and does not give guidance or metrics on loss of light or sunlight to existing properties. The Irish edition is IS EN17037:2018+A1:2021.

The standard is enacted in Britain under BS EN 17037:2018+A1:2021 with a UK National Annex for regional assessments. The daylight and sunlight assessment methods for internal daylight and sunlight provision are common to both the Irish standard and the UK version. The UK National Annex (NA) provides further recommendations for daylight provision in the UK and Channel Islands. The annex states that the daylight target levels in EN 17037:2018 Clause A.2 may be hard to achieve in buildings in the UK, in particular dwellings in urban areas with significant obstructions or tall trees outside. The UK annex sets out minimum daylight provision to be achieved in UK dwellings. Table NA.1 sets out room specific minimum values to be achieved in the UK and Channel Islands. These are Daylight Factor in Bedrooms (0.7% DF), Living Rooms (1% DF) and Kitchens and Living Spaces containing a Kitchen (1.3% DF). The Daylight Factor percentage values are derived from minimum room specific illuminance levels set out in NA+1 and the Median External Diffuse Illuminance ($E_{v,d,med}$) for Dublin from Table A.3 EN17037:2018. The illuminance levels and corresponding DF% are given in Table M5 below.

2.4 Daylight to Existing Buildings

BRE guidelines BR209:2022 Section 2.2.2 sets out which rooms need to be assessed for daylight.

“The guidelines here are intended for use for rooms in adjoining dwellings where daylight is required, including living rooms, kitchens and bedrooms. Windows to bathrooms, toilets, storerooms, circulation areas and garages need not be analysed. The guidelines may also be applied to any existing non-domestic building where the occupants have a reasonable expectation of daylight; this would normally include schools, hospitals, hotels and hostels, small workshops and some offices.”

A proposed development could potentially have a negative effect on the level of daylight that a neighbouring property receives, if the obstructing building is large in relation to its distance from the existing dwelling. BRE guidelines BR209:2022 Section 2.2.4 states that *“Loss of light to existing windows need not be assessed if the distance of each part of the new development from the existing window is three or more times its height above the centre of the existing window.”* In this report, we refer to this as the ‘zone of influence’.

BRE guidelines BR209:2022 Section 2.2.23 states; *“If any part of a new building or extension, measured in a vertical section perpendicular to a main window wall of an existing building, from the centre of the lowest window, subtends an angle of more than 25° to the horizontal, then the diffuse daylighting of the existing building may be adversely affected.”*

If a window falls within a 45° angle both in plan and elevation with a new development in place, the window may be affected and should be assessed.

For loss of daylight the BRE guidelines BR209:2022 recommends calculation of the Vertical Sky Component. VSC can be defined as the amount of skylight that falls on a vertical window. It is the ratio of direct sky illuminance falling on the outside window, to the simultaneous horizontal illuminance under an unobstructed sky. The standard CIE Overcast Sky is used; the ratio is usually expressed as a percentage. The maximum value is just under 40% for a completely unobstructed vertical wall. The VSC of a window is a good measure of the amount of daylight entering it.

The BRE guidelines BR209:2022 recommend one of two criteria is met when assessing for the Vertical Sky Component;

a) Where the Vertical Sky Component at the centre of the existing window exceeds 27% with the new development in place then enough sky light should still be reached by the existing window.

b) Where the Vertical Sky Component with the new development in place is both less than 27% and less than 0.8 times its former value, then the area lit by the window is likely to appear more gloomy, and electric light will be needed more of the time.

The BRE guidelines BR209:2022 state that if the VSC is:

- At least 27%, then conventional window design will usually give reasonable results;
- Between 15% and 27%, then special measures (larger windows, changes to room layout) are usually needed to provide adequate daylight;
- Between 5% and 15%, then it is very difficult to prove adequate daylight unless very large windows are used;
- Less than 5%, then it is often impossible to achieve reasonable daylight, even if the whole window wall is glazed

This report assesses the percentage of direct sky illuminance that falls on the centre point of neighbouring windows that could be affected by the proposed development through the Vertical Sky Component (VSC) as per the methodologies contained in the BRE guidelines BR209:2022.

2.5 Sunlight to Existing Buildings

The BRE guidelines BR209:2022 recommend assessing the main living rooms and conservatories if they have a window wall facing within 90° of due south. Kitchens and bedrooms are less important but care should be taken not to block too much sun. If the proposed development is fully north of the existing window then sunlight need not be assessed.

The Annual Probable Sunlight Hours (APSH) is used to assess the quantity of sunlight for a given location. This is the total amount of sunshine for a given location on an unobstructed horizontal surface taking cloud cover into account. Statistical data from the Irish Meteorological Service is used to assess the APSH and the Winter Probable Sunlight Hours (taken to fall between the 21st of September and the 21st of March).

Table M1 below shows the average sunlight hours for each month and the maximum possible without any cloud cover. This gives the factor of possible sunlight hours for each month.

Met Éireann Sunlight Hours Data Set 1991-2020													
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Average Sunlight Hours/ Day	1:54	2:54	3:42	5:24	6:24	6:00	5:17	5:00	4:24	3:24	2:24	1:42	
Average Sunlight Hours/ Month	58:54	81:12	114:42	162:00	198:24	180:00	163:47	155:00	132:00	105:24	72:00	52:42	1449.1
Total Available Sunlight Hours	252	265	358	412	483	485	496	451	375	320	250	236	4383
Probable Sunlight Hours Ratio	23.4%	30.6%	32.9%	39.3%	41.1%	37.1%	33.0%	34.4%	35.2%	32.9%	16.8%	22.3%	33.1%

Table M1: Average monthly sunlight hours recorded at Dublin Airport - Data set 1991-2020

The BRE guidelines BR209:2022 recommend that the centre of a window or 1.6m above ground for a door be assessed and it should receive at least 25% of the APSH and it should receive at least 5% WPSH. If the available APSH is less than this, then it should not be reduced below 0.8 times its former value or noticeable loss of sunlight may occur.

2.6 Sunlight to Gardens and Open Spaces

For calculations of sunlight analysis it is general practice to use March 21st. The BRE guidelines BR209:2022 states:

“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 21 March. If as a result of new development an existing garden or amenity area does not meet the above, and the area which can receive two hours of sun on 21 March is less than 0.8 times its former value, then the loss of sunlight is likely to be noticeable. If a detailed calculation cannot be carried out, it is recommended that the centre of the area should receive at least two hours of sunlight on 21 March.”

2.7 BRE guidelines BR209:2022 Appendix G: Calculations of Trees & Hedges

Trees are not usually included in the assessments of impact on neighbouring properties, unless specified otherwise. In relation to the effects of trees and hedges the BRE guidelines BR209:2022 Section G1.2 states;

"It is generally more difficult to calculate the effects of trees on daylight because of their irregular shape and because some light will generally penetrate through the crown. Where the effects of a new building on existing buildings nearby is being analysed, it is usual to ignore the effects of existing trees. This is because daylight is at its scarcest and most valuable in winter when most trees will not be in leaf."

The BRE guidelines BR209:2022 recommends that sometimes trees should be taken into account for the proposed development where the new development is proposed near large existing trees. This needs to be done by modelling a representative of the existing trees. Reflectance and transparency should be taken into account. Table G1 in BR209:2022 gives values for transparencies of tree crowns in summer and winter for deciduous trees, dense evergreen can be assessed as opaque. Table G2 gives general reflectance values for shades of trees.

2.8 BRE guidelines BR209:2022 Appendix H: Environmental Impact Assessment

The BRE guidelines sets out criteria for classification for assessment of impact where a new development affects a number of existing buildings or open spaces in relation to an Environmental Impact Assessment. The guide does not give a specific range or percentages but sets out parameters as set out below.

"Where the loss of skylight or sunlight fully meets the guidelines in this book, the impact is assessed as negligible or minor adverse. Where the loss of light is well within the guidelines, or only a small number of windows or limited area of open space lose light (within the guidelines), a classification of negligible impact is more appropriate. Where the loss of light is only just within the guidelines, and a larger number of windows or open space area are affected, a minor adverse impact would be more appropriate, especially if there is a particularly strong requirement for daylight and sunlight in the affected building or open space."

Where the loss of skylight or sunlight does not meet the guidelines in this book, the impact is assessed as minor, moderate or major adverse. Factors tending towards a minor adverse impact include:

- *only a small number of windows or limited area of open space are affected*
- *the loss of light is only marginally outside the guidelines*
- *an affected room has other sources of skylight or sunlight*
- *the affected building or open space only has a low level requirement for skylight or sunlight*
- *there are particular reasons why an alternative, less stringent, guideline should be applied.*

Factors tending towards a major adverse impact include:

- *a large number of windows or large area of open space are affected*
- *the loss of light is substantially outside the guidelines*
- *all the windows in a particular property are affected*
- *the affected indoor or outdoor spaces have a particularly strong requirement for skylight or sunlight, e.g. a living room in a dwelling or a children's playground.*

Beneficial impacts occur when there is a significant increase in the amount of skylight and sunlight reaching an existing building where it is required, or in the amount of sunlight reaching an open space. Beneficial impacts should be worked out using the same principles as adverse impacts. Thus a tiny increase in light would be classified as a negligible impact, not a minor beneficial impact."

The BRE guidelines does not set out a specific value range for the different classification of impact level of Minor, Moderate and Major to each window. For the purpose of this report one of five classification levels will be applied:

Imperceptible:	There is no reduction in the VSC levels or where the levels are 95% of the existing value.
Negligible:	A reduction in the VSC level but it retains a VSC >27% or <27% but >80% of the existing value.
Minor reduction:	VSC below 27% but greater than 20%, or ratio greater than 65% of the existing value.
Moderate reduction:	VSC below 20% but greater than 10%, or ratio greater than 50% of the existing value.
Major reduction:	VSC below 10% or ratio less than 50% of the existing value.

A flexible approach should be taken when assessing the impact with daylight and sunlight being one of many factors that influence the environment when planning a new development. The evaluation of the impact should be considered in conjunction with other factors when determining the overall impact level to a property.

2.9 Assessment Model Parameters

The BRE guidelines BR209:2022 recommends surface reflectances should represent real conditions and where reflectance values have not been measured or specified default values are set out in Table C4 of the guidance document. The surface reflectances have been specified and are set out in Table M2 below. This table also shows the input values for material used and additional assessment model input parameters.

Input Values for Assessment Model			
Surface Reflectance			
Element	Reflectance	Transmittance	Material Description
Internal walls	80%	0%	White Painted Walls
Internal ceiling	80%	0%	White Painted Ceiling
Floor - light wood	40%	0%	Light wood Flooring
External walls - proposed development	50%	0%	Brick
External walls - outside site	50%	0%	CIBSE
External ground	20%	0%	CIBSE
Glass		68%	Triple glazed clear glass
Maintenance Factor for Glass		Assessment Plane	
Suburban Vertical no overhang	0.96	Sensor Grid spacing	0.3m
Suburban Vertical sheltered by balcony or overhang	0.88	Sensor grid inset	0.35m
Framing Factor: Patio Doors	0.77	Minimum inset	0.3m
		Work plane offset	0.85m

Table M2 : Surface reflectance parameters and input values for model calculations

2.10 Daylight in the Proposed Development.

The BRE guidelines BR209:2022 Appendix C sets out interior daylight recommendations, it states; “BS EN 17037 supersedes BS8206 Part 2 ‘Code of practice for daylighting’.

BS EN 17037 sets out two methods for assessing daylight provision in proposed buildings. One method is called the **Illuminance method**. This is based on Target illuminances for daylight to be achieved across specified fractions of a reference plane at working plane height (0.85m) for half the daylight hours in a year. The Illuminance Method requires the use of a suitable weather file with local climate conditions and takes into account the orientation of the space.

The alternative method is called the **Daylight Factor Method**. This method is based on calculating the daylight factors achieved over specific fractions of a reference plane. The Daylight factor is the illuminance at a point on a reference plane in a space, divided by the illuminance on an unobstructed horizontal surface outdoors. This method uses an overcast sky for calculation and the assessment of the space is orientation independent. BS EN 17037 gives the Median External Diffuse Illuminance ($E_{v,d,med}$) for the capital cities throughout Europe to account for external local illuminance levels.

The UK committee formed the opinion that the Target Illuminance recommendations in Clause A.2 of BS EN 17037 may not be achievable for some buildings, particularly dwellings. The UK committee believes this could be the case for dwellings with basement rooms or those with significant external obstructions. In BS EN 17037:2018+A1:2021, the UK National Annex (NA) sets out additional minimum room specific Target Daylight Factor values for the UK. Clause NA.2 sets out illuminance values to be exceeded over at least 50% of the points on a reference plane 0.85m above the floor for at least half the daylight hours.

EN 17037:2018 sets out values for Minimum and Target levels to be achieved with a minimum, medium and high compliance level for each. The guideline recommends that the minimum level should be achieved for both target levels but it does not give guidance on the number of units or fraction within a multiple residential unit development that should achieve these values. Additionally it does not differentiate between room use and weighted targets for rooms which would have a lesser requirement. The UK annex sets out factors for UK specific settings where it is difficult to achieve natural daylighting.

The compliance calculation is based on an annual, climate-based simulation of interior illuminance distributions. The BRE guidelines BR209:2022 refers to this method as the Illuminance Method. For each hour of the year, the percentage of the floor area achieving minimum and target illuminance thresholds are measured on a room-by-room basis. Two target types are set with the following criteria:

- Target Illuminance: 300 lux over 50% of floor area for at least 50% of daylight hours.
- Minimum Illuminance: 100 lux over 95% of floor area for at least 50% of daylight hours.

BS EN 17037 gives three levels of recommendation for daylight provision in an interior space: Minimum, Medium and High. The BRE guidelines BR209:2022 (C3) recommends for compliance with the standard, a space should achieve the Minimum level.

Daylight hours are defined as the 4380 hours with the most diffuse horizontal illuminance in the weather file. In addition to this baseline (Minimum) requirement, rooms can achieve Medium and High levels of compliance by meeting higher illuminance thresholds, as outlined in the table below:

Target Illuminance Over At Least Half The Daylight Hours		
Level of recommendation	Target illuminance $E_T(lx)$ for half of the assessment grid	Minimum illuminance $E_{TM}(lx)$ for 95% of the assessment grid
Minimum	300 lux	100 lux
Medium	500 lux	300 lux
High	750 lux	500 lux

Table M3 : EN 17037:2018 (both IS & BS) Target Illuminance over at least half the daylight hours

Target Daylight Factor for Dublin*		
Level of recommendation	Target daylight factor D for half of the assessment grid	Minimum daylight factor D for 95% of the assessment grid
Minimum	2%	0.7%
Medium	3.5%	2%
High	5%	3.5%

Table M4 : EN 17037:2018 (both IS & BS) Target Daylight Factor (D) for Dublin

Target Minimum Daylight Factor for Dublin* based on UK National Annex		
Room Type	Target illuminance $E_T(lx)$ for half of the assessment grid	Target daylight factor D from Table A.3 EN17037 $E_{v,d,med}$ for Dublin -14,900
Bedroom	100 lux	0.7%
Living Room	150 lux	1%
Kitchen	200 lux	1.3%

* EN17037 uses the latitude of the capital city of each European country to set individual values for daylight and sunlight metrics for use in setting the target levels to be achieved in a particular country

Table M5 : BS EN 17037:2018+A1:2021 Target Illuminance levels and Daylight Factor for Dublin

2.11 Sunlight within Proposed Developments

The BRE guidelines BR209:2022 Section 3.1.7 states:

“that for large residential developments the overall sunlight potential can be initially assessed by counting the number of windows facing south, east and west and the aim should be to minimise the number of living rooms facing solely north, north-east or north-west unless there is some compensating factor such as an appealing view to the north.”

The BRE guidelines BR209:2022 acknowledges that it may not be possible to have every living room facing within 90° of south in large developments, however, it recommends maximising the number of units with a southerly aspect.

The BRE guidelines BR209:2022 recommends that BS EN 17037 should be used to assess for interior access to direct sunlight. BS EN 17037 Table A.6 sets recommendations for access to sunlight and notes three levels of achievement; Minimum, Medium and High. In dwellings at least one habitable room, preferably a living room, should achieve the Minimum of 1.5 direct hours on a specified date between 1st February and 21st March, with a cloudless sky. This assessment uses the 21st March. The guidelines recommend a time step of 5 minutes or less for the assessment interval. The Minimum level to achieve is 1.5, the Medium level is 3 hours and the High level is 4 hours direct sunlight.

3. Site & Project Overview

3.1 Site Overview

The site of the proposed development is located in the townlands of Tinahask Upper, Money Big & Money Little, Arklow, Co. Wicklow. It is bound by a railway line to the west and greenfields on all other boundaries; the sole exception of this along the northern boundary, where there is a small housing development of 6 no. houses at Knockanrahan Lower.



Figure 1: Indicative view of the north western section of the site, taken from Google Maps. Please refer to architectural drawings for statutory boundaries.



3.2 Proposed Amendments to Permitted Development

There is a permitted development on this site, under WCC Reg. Ref.: 24/325, of which areas to the east and south will not be amended. This is a predominantly low rise development; in this proposed amendment application there are 334 no. houses and a single four storey apartment building of 18 no. units with a creche on the ground floor.

4. Daylight & Sunlight in Neighbouring Properties

4.1 Preliminary Assessment of Neighbouring Buildings

There is relevant statutory guidance relating to housing estates provided in Sustainable Residential Development and Compact Settlements: Guidelines for Planning Authorities (2024) Section 5.3.7.

(a) The potential for poor daylight performance in a proposed development or for a material impact on neighbouring properties will generally arise in cases where the buildings are close together, where higher buildings are involved, or where there are other obstructions to daylight. Planning authorities do not need to undertake a detailed technical assessment in relation to daylight performance in all cases. It should be clear from the assessment of architectural drawings (including sections) in the case of low-rise housing with good separation from existing and proposed buildings that undue impact would not arise, and planning authorities may apply a level of discretion in this regard.

There are good separation distances between the existing houses in Knockanrahan and the proposed houses. Any potential on their daylight and sunlight is unlikely to be significant. A potential impact on daylight and sunlight relates to proximity. If the closest building meets the recommendations of the BRE guidelines, then buildings further away, will experience an equal or lesser impact. For completeness the closest house in Knockanrahan has been selected for sectional analysis.

4.2 Sectional Analysis Assessment of Daylight and Internal Sunlight

The BRE guidelines gives guidance on sectional analysis, stating that if part of a new building measured in a vertical section perpendicular to the main window wall of an existing building, from the centre of the lowest window, subtends an angle of more than 25° to the horizontal, then the diffuse light of the existing building may be adversely affected. If a window falls within a 45° angle both in plan and elevation with a new development in place then the window may be affected and should be assessed.

The closest dwelling shown at location A in Figure 2 below. Figure 3 shows a section through the rear ground floor window.



Figure 2: Detail of proposed site plan noting the aspect of windows in the closest existing dwelling

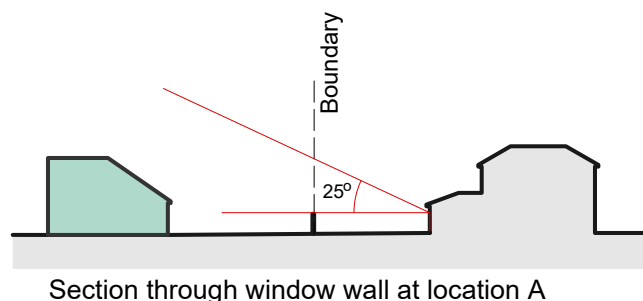


Figure 3: Section perpendicular to the window wall as located in Figure 2

4.3 Conclusion to Assessment of Daylight and Internal Sunlight in Neighbouring Buildings

Location A through No.4 Knockanrahan Lower: The 25° line would not be subtended by the proposed development, indicating any reduction in available daylight or sunlight is likely to be negligible. No detailed assessment of daylight or sunlight is required. The proposed development meets the recommendations of the BRE guidelines BR209:2022

4.4 Guidance on Sunlight to Amenity Spaces

The BRE guidelines BR209:2022 indicates that for an amenity area to have good quality sunlight throughout the year, 50% of the space should receive in excess of two hours sunlight on the 21st March. It also states that front gardens need not be assessed for sunlight. Amenity spaces which are entirely south of the proposed development will not perceive any reduction in sunlight.

4.5 Amenity Space to Neighbouring Properties

The shadow diagrams in Section 8 indicate that the shadows caused by the proposed development do not extend to any private garden or amenity space on the 21st march and no detailed assessment is required.

There will be no reduction in sunlight to any of the neighbouring amenity spaces. The proposed development meets the recommendations for sunlight in the BRE guidelines BR209:2022.

5. Daylight within the Proposed Development

All habitable rooms within the apartment units were assessed for daylight provision by illuminance method. The Illuminance method assesses the daylight levels over at least 50% daylight hours in the year and uses a weather file data set. These methods take into account the orientation of the space. They provide an accurate representation of the daylight provision to a specific room in the context of the proposed environment.

Compliance is demonstrated by a calculation of Daylight Provision with the illuminance method under BS EN 17037:2018+A1:2021. A summary of the results are presented in Table 2 below and a complete set of room results are shown in Appendix A.

For supplementary information, an assessment of Daylight Provision with the illuminance method under IS /BS EN 17037:2018 is undertaken. A summary of the results are presented in Table 3 below and a complete set of room results are shown in Appendix B.

5.1 Assessment for Daylight Provision BS EN 17037:2018+A1:2021

The UK National Annex (A1) contains minimum room specific target values for dwellings in the UK. Ireland has a similar latitude and climate to the UK. The minimum illuminance levels are kitchens and living spaces containing a kitchen 200lux, living rooms 150lux and bedrooms 100lux. It is recommended that these target illuminance values are exceeded over at least 50% of the points on a reference plane 0.85m above the floor, for at least half of the daylight hours.

The UK committee supports the recommendations of EN17037:2018 but considers the target daylight levels may be hard to achieve in UK dwellings, in particular in urban areas and areas with mature trees. The Target and Minimum levels set out in IS / BS EN17037:2018 does not take into account room use or make allowance for room that have a lesser requirement for daylight.

Minimum Daylight Provision UK NA.1 - BS EN 17037:2018+A1:2021					
	Room Use	Number of rooms	Target illuminance $E_T(lx)$ for half of the assessment grid	Number of rooms to achieve target lux over 50% of the assessment grid	Percentage of rooms achieving target lux
Apartments	LKD	18	200	18	100.0%
	Bedrooms	30	100	30	100.0%
Total		48		48	100.0%

Table 1: Summary of room for Target Illuminance compliance with BS EN 17037:2018+A1:2021. Individual room results can be viewed in Appendix A.

5.2 Conclusion

BR209:2022 recommends assessment methods set out in BS EN 17037 for daylight provision. 100% of the habitable rooms achieve the target values set out in BS EN 17037:2018+A1:2021 section NA1. These are the minimum values, per specified use, to be achieved in habitable rooms.

5.3 Supplementary Information - Assessment for Daylight Provision IS EN 17037:2018+A1:2021

A summary of Minimum and Target Illuminance levels under IS EN 17037:2018+A1:2021 Annex A Table A1 are set out in the table below.

Daylight Provision Illuminance Method IS EN 17037:2018+A1:2021						
		Below Target	Minimum	Medium	High	Percentage of rooms achieving target
Overall total	Target Illuminance	0.0%	0.0%	39.6%	60.4%	100.0%
	Minimum Illuminance	0.0%	0.0%	50.0%	50.0%	100.0%

Table 2: Percentage of rooms at each level to IS EN 17037:2018+A1:2021. Individual room results can be viewed in Appendix B.

The results indicate a high level of daylight provision, with 100% of rooms achieving Minimum Illuminance and 100% achieving Target Illuminance. The rooms will be bright and pleasant spaces.

The recommendations for Daylight provision in Table A1 are not specific for dwellings and do not make allowance for room use. BS EN 17037:2018+A1:2021 address this with the National Annex setting out room specific targets for dwellings; compliance for daylight within the development is presented in Section 5.2 above.

6. Sunlight within the Proposed Development

6.1 Sunlight Hours

The BRE guidelines BR209:2022 and EN 17037 (both IS & BS), set out recommendations for sunlight hours to be achieved. It states that; *“For dwellings, at least one habitable room, preferably a main living room, should meet at least the minimum criterion.”* The guidelines recommend the sunlight hours should be assessed preferably on the 21st March over the course of the day. The guidelines set three levels of achievement. Minimum 1.5h, Medium 3h and High 4h. The guideline does not set the percentage of units that need to achieve the recommendations but they do give an example of a well designed floor layout in the figure below where 4 out of 5 units in an apartment building would achieve the target sunlight.

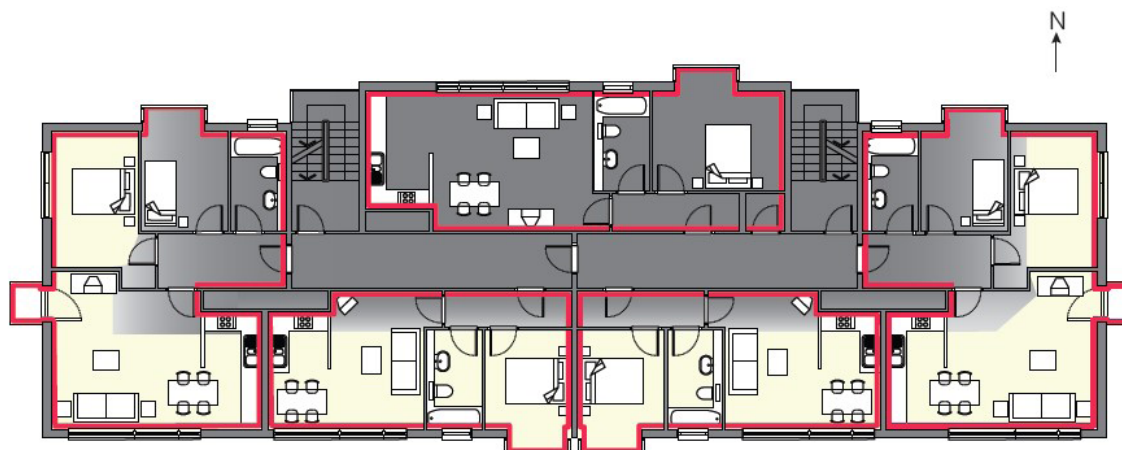


Figure 26: Careful layout design means that four out of the five flats shown have a south-facing living room

Figure 4: Extract from BR209:2022 Section 3 Sun-lighting: Diagram indicating sample floor plan to maximise units with a main living space facing south.

All the houses have a window wall within 90° due south and will achieve the minimum target sunlight hours to a room. The apartments are assessed for sunlight, in accordance with EN 17037 (both IS & BS). In the test, preference is given to living spaces, and to southerly facing rooms. However the recommendations of the BRE guidelines are met if minimum sunlight hours are achieved in any habitable room within a dwelling.

Detailed results are presented in Appendix C. It indicates if the relevant habitable room has a south facing window, together with the number of hours it receives sunlight, on the 21st March. A summary of these results are displayed in the table below.

Sunlight Hours Summary Table								
Apartments Units	Total Units	Habitable room with a window within 90° south		Below recommendation <1.5 hours	Minimum >1.5 hours	Medium >3 Hours	High >4 Hours	Number meets criteria
		No.	Ratio					
Habitable Rm	18	12	66.7%	1	5	0	12	17
								94.4%

Table 3: Summary of Results of Assessment of Sunlight Hours

6.2 Comment on EN 17037 Sunlight Hours

The BRE guidelines BR209:2022 recommend maximising the amount of units that have a window within 90° due south but does not have set targets. The guidelines acknowledge that for large developments with site constraints its not possible to achieve south facing windows to all main living spaces and that achieving sunlight hours in another habitable room meets the criteria. Windows with an aspect of greater than 90° due south, to the north west or north east, will still receive sunlight, but it is likely to be lesser amounts especially in the winter period. In this development with 18 no. apartment units 94.4% have a habitable room which achieves the minimum recommended 1.5 direct sunlight hours.

6.3 Conclusion

This scheme is well designed for sunlight. All houses have a window wall within 90° due south and will achieve the minimum target sunlight hours to a room. In the apartment units 94.4% meet the minimum recommended 1.5 direct sunlight hours. This exceeds the BRE guideline example for an apartment layout where 4 in 5 (circa 80%) achieves the target sunlight hours.

7. Sunlight to Amenity within the Proposed Development

The BRE guidelines BR209:2022 indicate that for an amenity area to have good quality sunlight throughout the year, 50% of the ground, should receive in excess of two hours sunlight on the 21st of March. It also states that front gardens need not be assessed for sunlight.

7.1 Sunlight to Amenity within the Proposed Development

The amenity areas within this proposal have been assessed with a calculation of Sun on the Ground on the 21st March. The permitted and cumulative development to the south have been included in the model, for completeness. Generated analysis is shown in Figure 5 and the results are set out in Table 5 below.

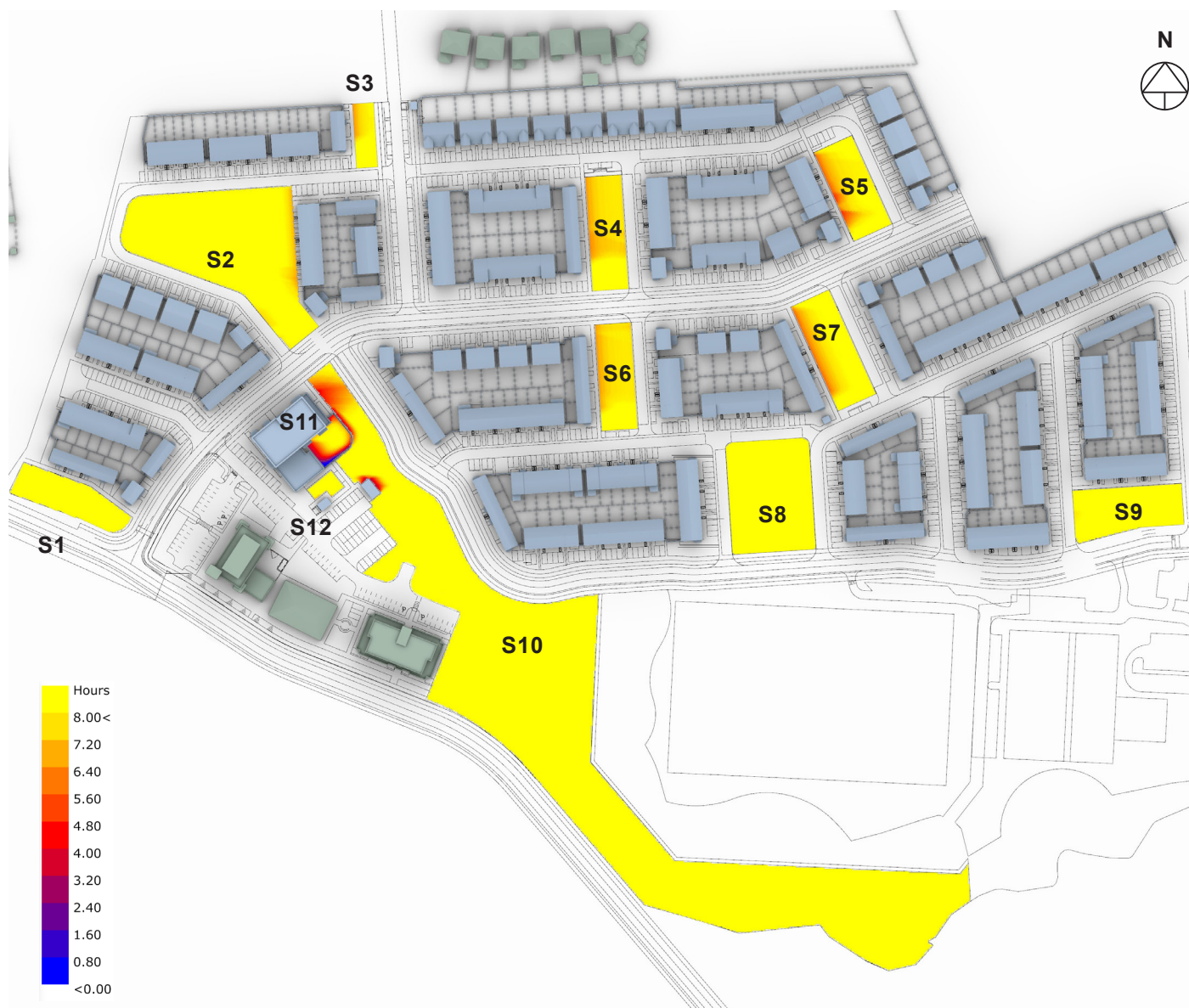


Figure 5: Radiation map of amenity within the proposed development, showing available sunlight on 21st March. The scale represents the sunlight received from 0 - 8 hours.

Sunlight on the Ground - Public & Communal Amenity			
ID No.	Details	% Area receiving 2 hours sunlight on 21st March	Meets criteria if >50% area receiving 2 hours sunlight on 21st March
S1	Public Open Space 1	100.0%	Y
S2	Public Open Space 2	100.0%	Y
S3	Public Open Space 3	100.0%	Y
S4	Public Open Space 4	100.0%	Y
S5	Public Open Space 5	100.0%	Y
S6	Public Open Space 6	100.0%	Y
S7	Public Open Space 7	100.0%	Y
S8	Public Open Space 8	100.0%	Y
S9	Public Open Space 9	100.0%	Y
S10	Public Open Space 10	100.0%	Y
S11	Creche	94.1%	Y
S12	Communal Open Space Block A	100.0%	Y

Table 4: Calculation of Sun on the Ground to Amenity Areas within the Proposed Development

7.2 Conclusion

All the public and communal amenity spaces are well oriented for sunlight. All achieve two hours sunlight on the 21st March over in excess of 50% of the area. The proposed development meets the recommendations for sunlight in the BRE guidelines BR209:2022.

8. Shadow Study

8.1 BRE Guidance on Shadow Studies

The BRE guidelines recommend using the March Equinox due to the equal length of the day and night time. It states:

“If a space is used all year round, the equinox (21 March) is the best date for which to prepare shadow plots as it gives an average level of shadowing. Lengths of shadows at the autumn equinox (21 September) will be the same as those for 21 March, so a separate set of plots for September is not required.”

June 21st and December 21st are provided below for information but it should be noted that the summer solstice is the best case scenario with shadows at their shortest. The summer solstice diagrams are included here with the Daylight Saving Time (UTC+1) applied. In Winter even low buildings will cast long shadows, when sun barely rises above an altitude of 10° during the course of the day. It is common for large areas of the ground to be in shadow throughout the day, especially in a built-up area. The guidelines recommend that sunlight at an altitude of 10° or less does not count. Below are the times for the Equinox and Solstice, when the sun is above 10° altitude, rounded to the nearest half hour.

Equinox: between 8:30 and 17:30

Summer Solstice: Between 6:30 and 20:00

Winter Solstice: Between 10:30 and 14:00

Section 8.2 shows the shadow plots for the Equinox on the 21st March at 2 hourly intervals between 09:00 and 17:00.

Section 8.3 shows the shadow plots for the Summer Solstice on the 21st June at 2 hourly intervals between 09:00 and 19:00.

Section 8.4 shows the shadow plots for the Winter Solstice on the 21st December at 2 hourly intervals between 09:00 and 15:00.

Each set of shadow plots shows the existing condition in contrast with the proposed development and the permitted / cumulative development to the south. Existing structures are shown in green, the proposed development are shown in light blue and the permitted / cumulative developments in dark blue.

8.2 Comment on the Shadow Study

The site is a greenfield site, there is no shadow cast from any structures in the existing condition. Shadow diagrams are a visual aid to understand where possible shading may occur. The use of shadow diagrams as an assessment method should be taken over the course of the day and not a specific time due to the transient nature of the sun and the shade caused by obstructions.

The shadow study on the 21st of March is examined, as per the recommendations of the BRE guidelines. It shows that there is no additional shading from the proposed development on the closest existing houses; those at Knockanrahan Lower.

8.2 Shadow Casting diagrams March Equinox



Figure 6: Shadow diagrams 21 March 09:00 UTC



Figure 7: Shadow diagrams 21 March 11:00 UTC



Figure 8: Shadow diagrams 21 March 13:00 UTC



Figure 9: Shadow diagrams 21 March 15:00 UTC



Figure 10: Shadow diagrams 21 March 17:00 UTC

8.3 Shadow Casting diagrams June Solstice



Figure 11: Shadow diagrams 21 June 09.00 UTC +1



Figure 12: Shadow diagrams 21 June 11:00 UTC +1



Figure 13: Shadow diagrams 21 June 13:00 UTC +1



Figure 14: Shadow diagrams 21 June 15:00 UTC +1



Figure 15: Shadow diagrams 21 June 17:00 UTC +1



Figure 16: Shadow diagrams 21 June 19:00 UTC +1

8.4 Shadow Casting diagrams December Solstice



Figure 17: Shadow diagrams 21 December 09:00 UTC



Figure 18: Shadow diagrams 21 December 11:00 UTC



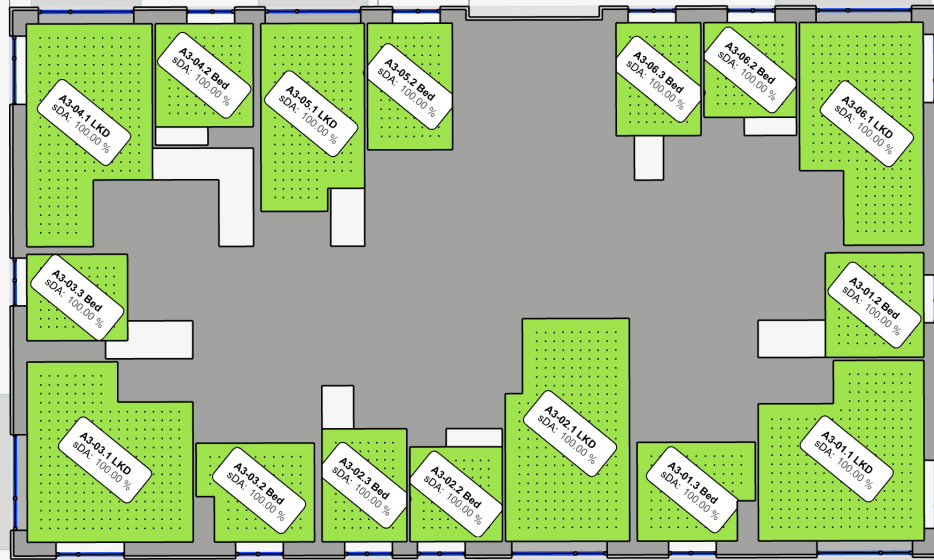
Figure 19: Shadow diagrams 21 December 13:00 UTC



Figure 20: Shadow diagrams 21 December 15:00 UTC

Appendix A - BS EN17037:2018+A1:2021 Minimum Room Specific Daylight Provision in Accordance with UK National Annex Table NA.1.

Third Floor



Second Floor



First Floor



Figure 21: Block A - Floor plans indicating Daylight Provision to BS EN17037:2018+A1:2021

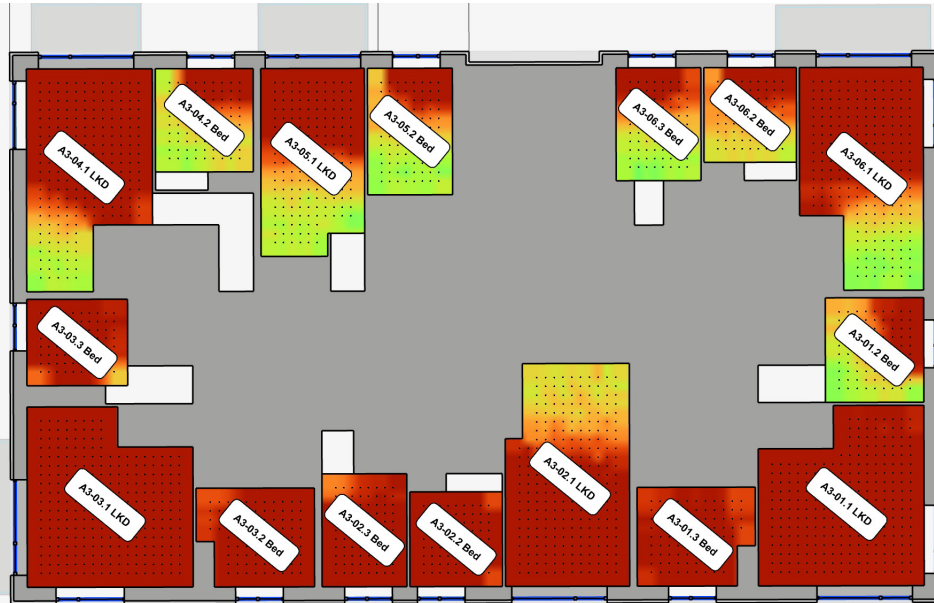
Minimum Illuminance Levels to BS EN17037:2018+A1:2021 - Table NA.1

Space ID	Use	Area m2	Sensor Count	Target Lux	Mean Lux	% of grid target exceeded	Minimum 50% of Grid	Meets Criteria
A1-01.1	LKD	29.0	262	200	1788	100.0%	Y	Y
A1-01.2	Bed	11.2	90	100	897	100.0%	Y	Y
A1-01.3	Bed	11.9	90	100	1632	100.0%	Y	Y
A1-02.1	LKD	28.7	260	200	1266	100.0%	Y	Y
A1-02.2	Bed	9.5	81	100	2056	100.0%	Y	Y
A1-02.3	Bed	10.4	88	100	2031	100.0%	Y	Y
A1-03.1	LKD	29.3	270	200	2458	100.0%	Y	Y
A1-03.2	Bed	11.8	89	100	2002	100.0%	Y	Y
A1-03.3	Bed	9.5	80	100	1664	100.0%	Y	Y
A1-04.1	LKD	26.2	227	200	1650	100.0%	Y	Y
A1-04.2	Bed	11.0	90	100	690	100.0%	Y	Y
A1-05.1	LKD	20.3	178	200	747	100.0%	Y	Y
A1-05.2	Bed	11.7	96	100	663	100.0%	Y	Y
A1-06.1	LKD	26.5	236	200	1179	100.0%	Y	Y
A1-06.2	Bed	9.5	81	100	779	100.0%	Y	Y
A1-06.3	Bed	10.4	88	100	723	100.0%	Y	Y
A2-01.1	LKD	29.0	262	200	1799	100.0%	Y	Y
A2-01.2	Bed	11.2	90	100	877	100.0%	Y	Y
A2-01.3	Bed	11.9	90	100	1670	100.0%	Y	Y
A2-02.1	LKD	28.7	260	200	1310	100.0%	Y	Y
A2-02.2	Bed	9.5	81	100	2026	100.0%	Y	Y
A2-02.3	Bed	10.4	88	100	1963	100.0%	Y	Y
A2-03.1	LKD	29.3	270	200	2421	100.0%	Y	Y
A2-03.2	Bed	11.8	89	100	1935	100.0%	Y	Y
A2-03.3	Bed	9.5	80	100	1683	100.0%	Y	Y
A2-04.1	LKD	26.2	227	200	1706	100.0%	Y	Y
A2-04.2	Bed	11.0	90	100	746	100.0%	Y	Y
A2-05.1	LKD	20.3	178	200	816	100.0%	Y	Y
A2-05.2	Bed	11.7	96	100	723	100.0%	Y	Y
A2-06.1	LKD	26.5	236	200	1195	100.0%	Y	Y
A2-06.2	Bed	9.5	81	100	827	100.0%	Y	Y
A2-06.3	Bed	10.4	88	100	776	100.0%	Y	Y
A3-01.1	LKD	29.0	262	200	2403	100.0%	Y	Y
A3-01.2	Bed	11.2	90	100	861	100.0%	Y	Y
A3-01.3	Bed	11.9	90	100	1747	100.0%	Y	Y
A3-02.1	LKD	28.7	260	200	1894	100.0%	Y	Y
A3-02.2	Bed	9.5	81	100	1995	100.0%	Y	Y
A3-02.3	Bed	10.4	88	100	1910	100.0%	Y	Y
A3-03.1	LKD	29.3	270	200	2926	100.0%	Y	Y
A3-03.2	Bed	11.8	89	100	1853	100.0%	Y	Y
A3-03.3	Bed	9.5	80	100	1693	100.0%	Y	Y
A3-04.1	LKD	26.2	227	200	1928	100.0%	Y	Y
A3-04.2	Bed	11.0	90	100	808	100.0%	Y	Y
A3-05.1	LKD	20.3	178	200	1105	100.0%	Y	Y
A3-05.2	Bed	11.7	96	100	775	100.0%	Y	Y
A3-06.1	LKD	26.5	236	200	1421	100.0%	Y	Y
A3-06.2	Bed	9.5	81	100	883	100.0%	Y	Y
A3-06.3	Bed	10.4	88	100	799	100.0%	Y	Y

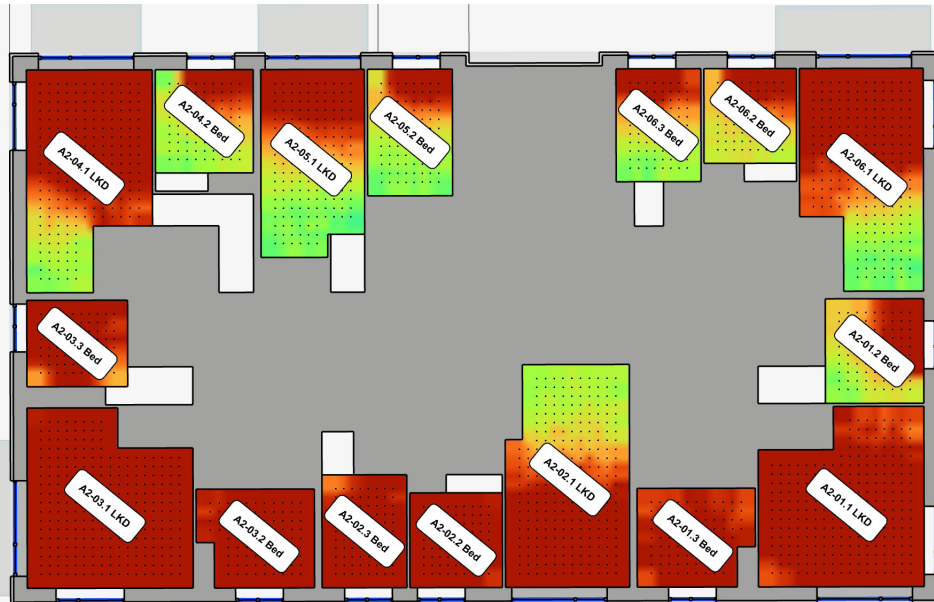
Table 5: Minimum daylight provision compliance for habitable rooms to BS EN17037:2018+A1:2021

Appendix B - Supplementary Information - Daylight Provision Room Results to IS EN 17037:2018+A1:2021

Third Floor



Second Floor



First Floor

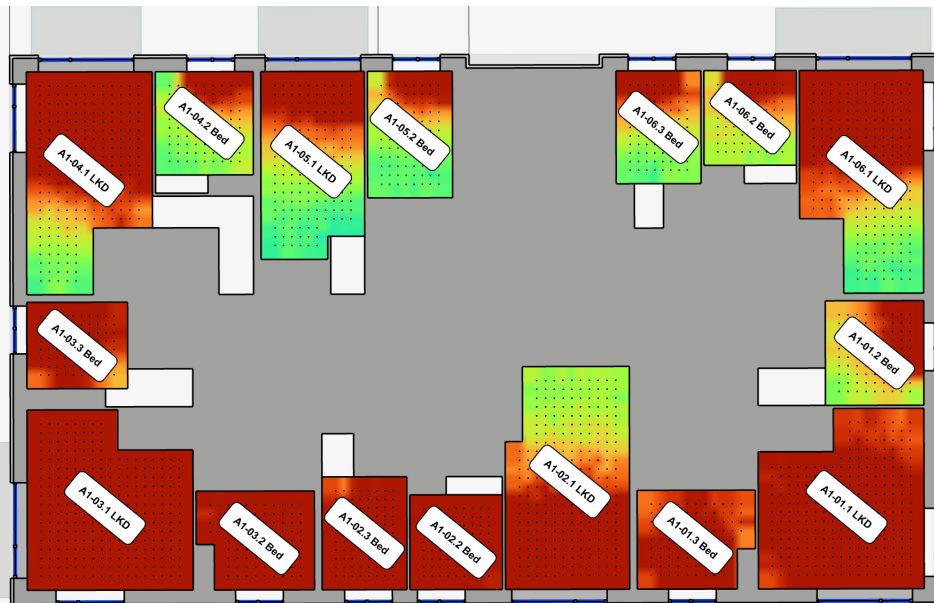


Figure 22: Block A - Daylight Provision and Annual Average Illuminance to all Habitable Rooms

IS EN 17037:2018+A1:2021 Daylight Provision Room Schedule

Space ID	Description	Area m2	Sensor Count	Target Illuminance	300lux_50	500lux_50	750lux_50	Minimum Target Illuminance	100lux_95	300lux_95	500lux_95
A1-01.1	LKD	29.0	262	High	80.1%	70.5%	60.6%	High	87.4%	74.4%	60.8%
A1-01.2	Bed	11.2	90	Medium	75.5%	60.8%	44.5%	Medium	85.9%	65.0%	44.6%
A1-01.3	Bed	11.9	90	High	74.7%	61.9%	50.1%	High	85.6%	68.7%	53.5%
A1-02.1	LKD	28.7	260	Medium	71.1%	58.0%	44.5%	Medium	80.2%	55.4%	36.6%
A1-02.2	Bed	9.5	81	High	78.2%	67.2%	56.5%	High	87.1%	73.4%	60.8%
A1-02.3	Bed	10.4	88	High	78.7%	68.3%	57.7%	High	86.7%	72.0%	58.4%
A1-03.1	LKD	29.3	270	High	82.4%	75.8%	66.4%	High	88.5%	78.1%	66.6%
A1-03.2	Bed	11.8	89	High	78.6%	68.7%	57.9%	High	87.4%	74.2%	60.8%
A1-03.3	Bed	9.5	80	High	76.3%	64.0%	52.8%	High	85.5%	67.6%	53.5%
A1-04.1	LKD	26.2	227	High	80.6%	71.5%	60.9%	Medium	81.6%	58.3%	40.9%
A1-04.2	Bed	11.0	90	Medium	70.0%	54.2%	35.3%	Medium	83.9%	59.7%	39.7%
A1-05.1	LKD	20.3	178	Medium	71.0%	55.8%	38.5%	Medium	80.8%	55.3%	31.7%
A1-05.2	Bed	11.7	96	Medium	68.8%	51.9%	32.1%	Medium	82.4%	57.0%	34.4%
A1-06.1	LKD	26.5	236	High	80.3%	71.3%	58.0%	Medium	82.3%	57.6%	37.6%
A1-06.2	Bed	9.5	81	Medium	74.1%	58.1%	42.0%	Medium	85.9%	65.1%	46.5%
A1-06.3	Bed	10.4	88	Medium	71.1%	55.2%	37.4%	Medium	83.9%	59.1%	38.9%
A2-01.1	LKD	29.0	262	High	80.2%	70.8%	61.1%	High	87.6%	74.7%	61.3%
A2-01.2	Bed	11.2	90	Medium	74.4%	59.8%	44.1%	Medium	85.1%	64.0%	45.4%
A2-01.3	Bed	11.9	90	High	76.0%	63.3%	51.8%	High	86.1%	70.4%	55.8%
A2-02.1	LKD	28.7	260	Medium	72.4%	59.8%	47.5%	Medium	80.9%	57.4%	39.7%
A2-02.2	Bed	9.5	81	High	79.0%	69.0%	58.6%	High	87.0%	73.4%	60.8%
A2-02.3	Bed	10.4	88	High	78.8%	68.5%	58.3%	High	86.7%	72.0%	58.7%
A2-03.1	LKD	29.3	270	High	82.2%	75.5%	66.1%	High	88.3%	77.6%	66.2%
A2-03.2	Bed	11.8	89	High	78.6%	68.4%	58.3%	High	87.1%	73.9%	60.6%
A2-03.3	Bed	9.5	80	High	76.3%	64.2%	52.9%	High	85.8%	68.3%	54.0%
A2-04.1	LKD	26.2	227	High	81.4%	73.0%	62.5%	Medium	83.7%	61.9%	46.4%
A2-04.2	Bed	11.0	90	Medium	72.9%	57.9%	41.5%	Medium	85.2%	63.4%	44.5%
A2-05.1	LKD	20.3	178	Medium	73.8%	59.0%	44.2%	Medium	83.6%	59.8%	40.6%
A2-05.2	Bed	11.7	96	Medium	71.4%	56.3%	37.9%	Medium	84.6%	61.5%	42.2%
A2-06.1	LKD	26.5	236	High	80.4%	71.5%	58.9%	Medium	84.1%	61.1%	42.6%
A2-06.2	Bed	9.5	81	Medium	75.4%	61.0%	45.7%	High	86.9%	68.5%	52.2%
A2-06.3	Bed	10.4	88	Medium	73.2%	57.6%	41.5%	Medium	84.8%	62.3%	43.4%
A3-01.1	LKD	29.0	262	High	82.4%	75.1%	65.8%	High	88.4%	76.9%	64.7%
A3-01.2	Bed	11.2	90	Medium	74.4%	59.9%	44.8%	Medium	85.3%	64.9%	46.9%
A3-01.3	Bed	11.9	90	High	76.8%	64.8%	53.7%	High	86.1%	70.6%	56.4%
A3-02.1	LKD	28.7	260	High	76.5%	64.2%	52.9%	Medium	82.5%	61.6%	45.5%
A3-02.2	Bed	9.5	81	High	78.7%	68.4%	57.8%	High	87.3%	74.4%	61.3%
A3-02.3	Bed	10.4	88	High	78.9%	68.4%	57.9%	High	85.9%	70.0%	56.7%
A3-03.1	LKD	29.3	270	High	83.3%	77.3%	68.3%	High	89.2%	79.2%	68.4%
A3-03.2	Bed	11.8	89	High	78.1%	67.3%	56.8%	High	86.6%	71.4%	57.9%
A3-03.3	Bed	9.5	80	High	76.7%	65.1%	53.9%	High	86.3%	69.4%	55.5%
A3-04.1	LKD	26.2	227	High	82.9%	76.2%	66.0%	High	85.1%	64.8%	50.0%
A3-04.2	Bed	11.0	90	Medium	74.3%	60.0%	44.5%	Medium	86.2%	66.4%	49.2%
A3-05.1	LKD	20.3	178	High	78.8%	67.7%	54.3%	Medium	86.2%	66.8%	49.6%
A3-05.2	Bed	11.7	96	Medium	73.2%	58.3%	42.6%	Medium	85.4%	63.9%	45.7%
A3-06.1	LKD	26.5	236	High	82.7%	75.3%	64.5%	Medium	85.6%	65.2%	47.2%
A3-06.2	Bed	9.5	81	Medium	77.3%	63.8%	49.6%	High	87.3%	70.5%	54.6%
A3-06.3	Bed	10.4	88	Medium	74.6%	59.7%	44.4%	Medium	85.5%	64.2%	46.1%

Table 6: Daylight provision individual values for all habitable rooms to IS EN 17037:2018+A1:2021

Appendix C - Sunlight Hours to Habitable Rooms Within the Apartments

Sunlight Hours Apartments				
Unit ID	Room Use	Habitable room window within 90° south	No. sunlight hours on 21st March	EN17037:2018 Level of exposure to sunlight
A1-01	LKD	Yes	4.6	High
A1-02	LKD	Yes	5.1	High
A1-03	LKD	Yes	7.4	High
A1-04	LKD	Yes	6.4	High
A1-05	LKD	No	1.1	Below criteria
A1-06	LKD	No	1.6	Minimum
A2-01	LKD	Yes	5.0	High
A2-02	LKD	Yes	5.2	High
A2-03	LKD	Yes	7.6	High
A2-04	LKD	Yes	6.8	High
A2-05	LKD	No	1.5	Minimum
A2-06	LKD	No	1.9	Minimum
A3-01	LKD	Yes	7.9	High
A3-02	LKD	Yes	7.9	High
A3-03	LKD	Yes	7.6	High
A3-04	LKD	Yes	6.9	High
A3-05	LKD	No	1.9	Minimum
A3-06	LKD	No	1.9	Minimum

Table 7: Sunlight Hours