County Heritage Centre Tallaght,
Old Blessington Road,
Dublin 24.

Environmental Analysis Report

IN2 Project No. D2301

04/08/2023

REV01

Revision History

Date	Revision	Description
2023-08-04	00	Issued for Design Team Review
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1.0 Executive Summary

This report compiles the environmental analysis as undertaken by IN2 Engineering Design Partnership for the County Heritage Centre Development Tallaght at Old Blessington Road, Dublin 24.

Our analysis, as detailed within the report, demonstrates the County Heritage Centre will comply with all relevant, appropriate standards, with no significant negative impacts on the surrounding buildings or amenity spaces. The building will be a highly efficient and sustainable addition to the local environment.

The report has been prepared as a desktop exercise with 3D massing and survey information provided by others. No site visits took place as information provided included all relevant required information and our understanding is that any survey information or 3D models provided were carried out by relevant suitably qualified professionals.

Various software programs were utilised in the analysis of the proposed development. These included:

- Radiance Lighting Software
- TAS by EDSL
- iSBEM / DesignBuilder

Section 2.0 introduces the various Guidelines and Standards utilised throughout the Daylight / Sunlight analysis undertaken. Section 3.0 is a glossary of common terms found in the report. The specific methodology for each topic (as relevant) is detailed in the relevant section in the body of this report as identified below.

Analysis Type	Relevance	Assessment Methodology	Compliance Guidelines Targets	Reference section of this report
Daylight	Existing Neighbouring Buildings	Vertical Sky Component	BR 209 (2022 Edition)	Section 4.3
Sunlight	Existing Neighbouring Buildings	Annual Probable Sunlight Hours	BR 209 (2022 Edition)	Section 4.4
Sunlight	Existing Neighbouring Amenity Spaces	Sunlight Hours	BR 209 (2022 Edition)	Section 5.0
Daylight	Proposed Building	Medium Daylight	BR 209 (2022 Edition)	Section 7.0
Solar Gain	Proposed Building	Part L 2022 Solar Gain	Part L 2022 Solar Gain	Section 8.0
Energy and Carbon	Proposed Building	Part L 2022/ NZEB Compliance	Part L 2022/ NZEB Compliance	Section 9.0

Impact of the proposed development on the Neighbouring buildings is determined in Section 4.0. The results determined that due to the massing and placement of the proposed building there would be **no impact** on neighbouring office accommodation for daylight (VSC), Sunlight (APSH), nor sunlight to neighbouring the adjacent amenity space.

Section 5.0 outlines the results for the assessed amenity spaces in accordance with BR 209. The proposed amenity spaces are predicted to receive excellent overall sunlight availability as 84% of the overall amenity space is determined to receive at least 2 hours of sunlight on 21st March, which is well above the recommended 50%.

Internal daylight analysis, as detailed in section 6.0, has been undertaken for all occupied spaces throughout the proposed building as designed. Each space has been assessed based on BRE Guide requirement for the Spatial Daylight Autonomy. Each of the seven spaces assessed were found to comply, with each of the spaces at ground floor level achieving good daylight levels, whilst the upper spaces were predicted to achieve “Very Good” and “Excellent” daylight. The open nature of the internal layouts contributes to maximising daylight from the clerestory windows at first floor down to the ground floor Gallery spaces.

Shadow Diagrams have been included in Section 7.0. These diagrams illustrate the site shading for the equinox and both winter and summer solstice.

Building Regulations Part L 2022 requires limitation of solar gain through building fabric to minimise energy demand for comfort cooling. The analysis determined the building as designed to fully comply with the requirements, based on provision of glazing with performance (measured as Total heat Transmittance or g-value) for each space as indicated in Section 8.0 and Appendix A.

Section 9.0 outlines the methodology for Part L 2022 Energy and Carbon analysis. The analysis confirms full compliance with the energy reduction, carbon emissions reduction and renewable energy contributions requirements. Compliance has been predicted through a combination of Passive design features, Low-energy systems, supplemented by renewable technologies. Air Source Heat Pumps (ASHP's) for space heating is predicted to provide the renewable energy contribution equating to 24% exceeding the requirement.

An option that would utilise the nearby District Heating system in lieu of the proposed ASHP’s was found to be a viable alternative option predicted to fully comply with the Energy and Carbon performance targets.

In summary, this report confirms that best practice Sunlight and Daylight availability have been ensured for the proposed building as designed, with no impact on the existing neighbouring environment, with full compliance with the solar gain, energy, and carbon performance requirements.

2.0 Standards and Guidelines

The Building Research Establishment's (BRE) Site Layout Planning for Daylight and Sunlight: A guide to good practice (BRE 209) (2nd edition) (the "**BRE Guide 3nd Edition**").

has been consulted when compiling this report to ensure compliance with the various Daylight and Sunlight requirements as applicable and relevant.

The BRE Guide (2022 Edition)

The BRE Guide describes its purpose in the following terms in the "Summary" section (v):

> *"This guide gives advice on site layout planning to achieve good sunlighting and daylighting, both within buildings and in the open spaces between them. It is intended to be used in conjunction with the interior daylight recommendations for new buildings in the British Standard Daylight in buildings, BS EN 17037. It contains guidance on site layout to provide good natural lighting within a new development; safeguarding of daylight and sunlight within existing buildings nearby; and the protection of daylighting of adjoining land for future development."*

The BRE Guide also notes that:

> *"1.6 The guide is intended for building designers and their clients, consultants, and planning officials. The advice given here is not mandatory and the guide should not be seen as an instrument of planning policy; its aim is to help rather than constrain the designer. Although it gives numerical guidelines, these should be interpreted flexibly since natural lighting is only one of many factors in site layout design (see Section 5). In special circumstances the developer or planning authority may wish to use different target values. For example, in a historic city centre, or in an area with modern high-rise buildings, a higher degree of obstruction may be unavoidable if new developments are to match the height and proportions of existing buildings. Alternatively, where natural light is of special importance, less obstruction and hence more sunlight and daylight may be deemed necessary. The calculation methods in Appendices A and B are entirely flexible in this respect. Appendix F gives advice on how to develop a consistent set of target values for skylight under such circumstances."*

> *"1.7 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 EN 17037. Many of the principles outlined will apply to other temperate climates. More specific guidance for other locations and climate types is given in BRE Report Environmental site layout planning."*

The Guide does not impose absolute standards that must be achieved under all circumstances. In the context of this report, any deviations from the Guide's recommendations have therefore been identified, with an approach throughout to ensure that good quality daylight/sunlight in achieved through analysis and design improvements as far as practicable and viable as detailed in the report as relevant.

The main sections in the guide that the assessments within this report will reference (as applicable) are:

1.0 Light from the Sky (Daylight).

- 1.1 Existing Buildings – The guide sets a quantitative assessment method for determining the impact of new developments on light from the sky (VSC) on existing neighbouring buildings.

2.0 Standards and Guidelines (Cont'd)

1.2 New Development – Within Appendix C of the BRE Guide, the targets for internal daylight are provided for both optional methodologies, Climate Based Daylight Modelling (CBDM) with targets provided for Lux levels as determined through Spatial Daylight Autonomy (SDA), and Daylight Sky analysis with targets provided for Medium Daylight Factor (MDF), please refer to methodology section for detailed explanation of the methods utilised in this report.

2.0 Sunlighting – *Based on site location, longitude and latitude, and solar azimuths. i.e. buildings south of a site will not be impacted for sunlight in the northern hemisphere.*

2.1 New Development – The guide sets a quantitative method for determining sunlight to a habitable room within a building.

2.1 Existing Buildings – The guide sets a quantitative assessment method for determining the impact of new developments on sunlight, annual probable sunlight hours (APSH) and winter probable sunlight hours (WPSH), on existing neighbouring buildings.

2.2 Gardens and open spaces – The amenity criteria set out is used for both proposed new amenity and the impact on existing neighbouring amenities.

The specific methodology for each topic (as relevant) is detailed in the relevant section in the body of this report.

3.0 Glossary

Working Plane

The working plane is the notional plane where visual tasks, and on which predicted light levels would normally be undertaken. For a residential assessment, the working plane is defined by BR209 at 850mm above floor level.

Daylight Factor

The Daylight Factor (DF) is the ratio of the illuminance at a point on a working plane in a room, due to the combination of light received directly and indirectly from a sky, over the illuminance on an external horizontal plane based on an unobstructed sky. Daylight factor, as defined here, excludes the contribution of direct sunlight. The sky utilised for ADF and MDF assessments, as defined below, is the (theoretical) CIE Overcast Sky, which is unidirectional, therefore a north facing window is assumed to receive the same light as south etc.

Median Daylight Factors

Median daylight factor is the value of daylight achieved for 50% of the assessed space.

Probable Sunlight Hours

Annual probable sunlight hours and winter probable sunlight hours, also referred to as APSH and WPSH, are used for the assessment of impact on neighbouring buildings by a proposed development. APSH and WPSH are a measure of probable direct sunlight to a window or surface and therefore are only relevant to windows within 90 degrees of south for buildings in the northern hemisphere. Therefore, any window with a northerly aspect (i.e. orientated between North and East and North and West) is therefore not assessed within the methodology.

Vertical Sky Component

Vertical Sky Component, also referred to as VSC, is used for the assessment of impact on neighbouring buildings by a proposed development with respect to daylight availability. VSC is a measure of the percentage of illuminance that a point can receive from the CIE Overcast Sky as a percentage of that received at unobstructed horizontal locations. In simple terms, how much of the sky that can be seen for a given point. VSC assessments do not included reflected light. VSC is calculated for compliance with BR209 as detailed below.

Amenity Sunlight

Amenity sunlight is a measure of direct daylight received on an area over the duration of 21st March based on the sun's solar position for a geographical location. As the 21st March is the solar equinox, the sun is at its mid-point of travel position through the year, therefore representing an average condition throughout the year of how well sunlit an amenity space will be. It may be noted that in the Northern Hemisphere, the sun rises due east and sets due west. Amenity sunlight is calculated for compliance with BR209 as detailed below.

4.0 Impact on Neighbouring Building

4.1 Guidance

As set out within the introduction, the impact on existing buildings has been assessed utilising quantitative assessment method as detailed in the BRE publication “Site Layout Planning for Daylight and Sunlight – A guide to good Practice (2022 Edition)”.

BRE Guidelines state:

Light from the Sky

> *“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. This will be the case if either:*
>
> - *The VSC (Vertical Sky Component) measured at the centre of an existing main window is less than 27%, and less than 0.8 times its former value.”*

The analysis is based on measuring the VSC at the existing main windows. As per the BRE Guide, main windows included, living rooms, kitchens, and bedrooms. Existing windows with VSC above 27% after proposed development are considered to still receive good daylight availability and therefore not adversely affected.

Sunlighting

> *“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 sunlighting of the existing dwelling may be adversely affected. This will be the case if the centre of the window:*
>
> *Appendix A: receives less than 25% of annual probable sunlight hours, or less than 5% of annual probable sunlight hours between 21 September and 21 March and*
>
> *Appendix B: receives less than 0.8 times its former sunlight hours during either period and*
>
> *Appendix C: has a reduction in sunlight received over the whole year greater than 4% of annual probable sunlight hours.*

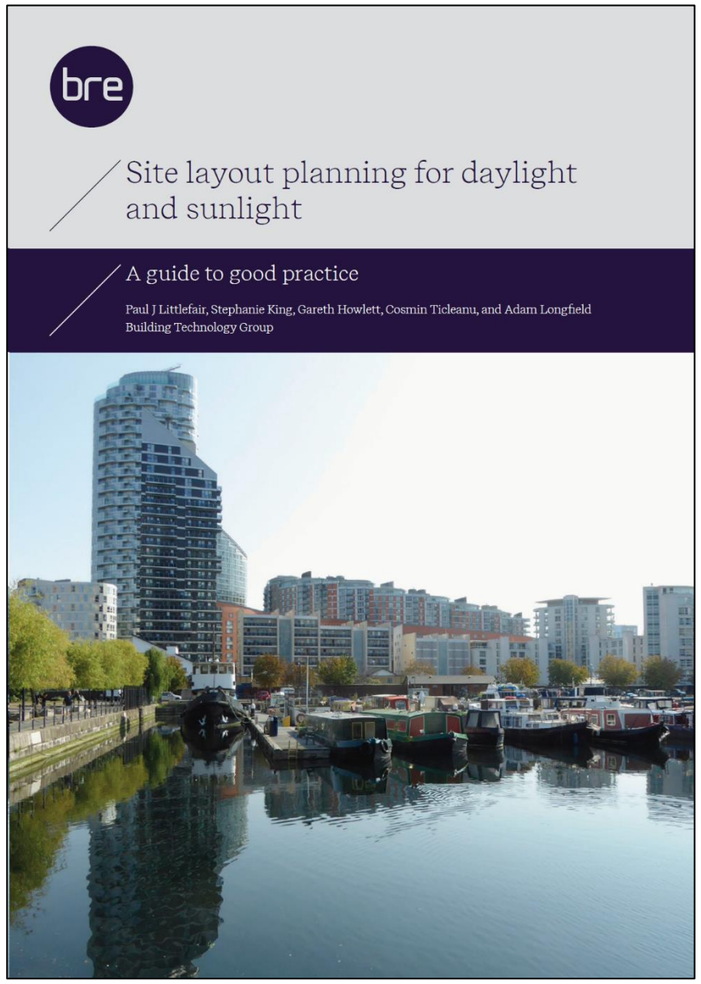


Fig 4.1.1 – BRE publication “Site Layout Planning for Daylight and Sunlight – A guide to good practice (Third Edition)

4.2 Methodology

Analysis was undertaken by calculating daylight and sunlight availability for the permitted vs. proposed extension development for indicative window locations on the façade of each neighbouring buildings which have the potential to be impacted as indicated in Figure 4.2.1 below.

The analysis assesses main windows. The analysis was carried out on existing neighbouring office buildings (highlighted in blue). Analysis was undertaken by calculating daylight and sunlight availability for permitted vs proposed scheme for indicative window locations on the façade of the building. It may be noted that Daylight availability (VSC) is applicable to all windows, regardless of orientation. Sunlight availability (APSH) is only applicable to windows facing within 90° of due south.

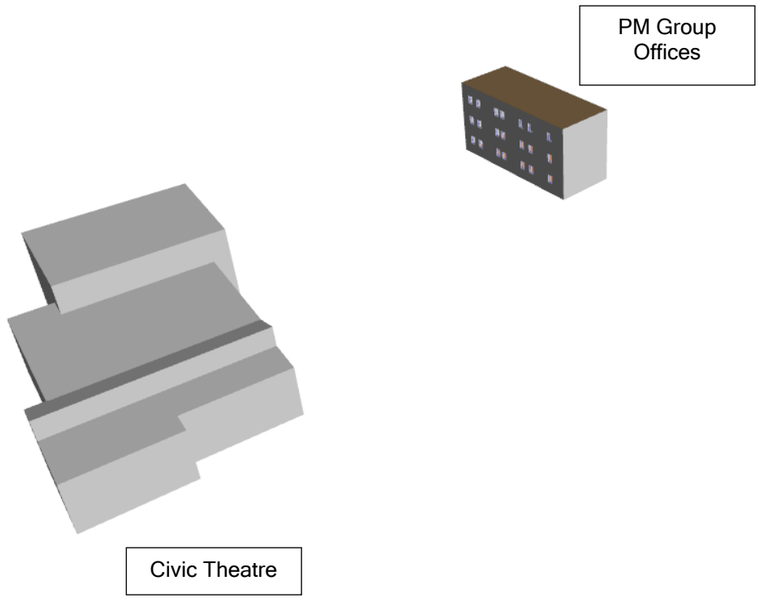
4.2.1 – Site Plan with Adjacent Neighbouring Buildings Identified

Methodology (Cont'd)

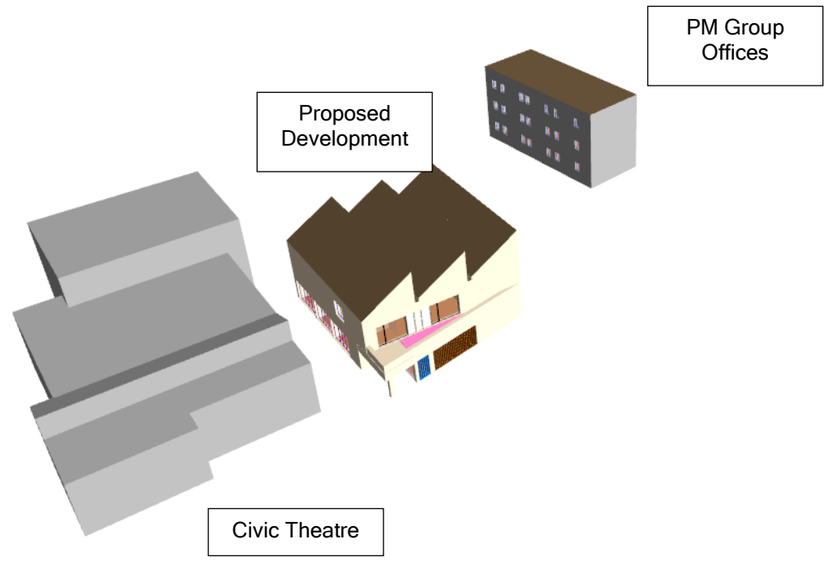
3D models of both the existing site and proposed development at Old Blessington Road were produced for VSC and APSH assessment. These models also include adjacent office buildings, and the windows to be analysed.

Fig 4.2.2 is a 3D model of the existing site. Fig 4.2.3 is a model of the proposed development, based on 3D modelling information as received from architects.

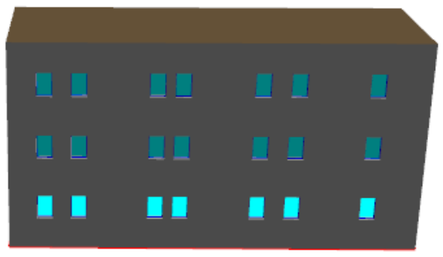
The permitted vs proposed developments were compared to assess potential sunlight (APSH) and daylight (VSC) impact by the proposed development. It was determined that the PM Group Office is the only building to be impacted as all other buildings are further away. Figure 4.2.4 shows the satellite image and the model of the building to be assessed.



4.2.2 – 3D Model of Existing Buildings and Adjacent Buildings



4.2.3 – 3D Model of Proposed Development and Adjacent Buildings



4.2.4 – Satellite image (left) and 3D Model (right) of Adjacent Buildings to be assessed.

4.3 Results – VSC Daylight

The below tables present the VSC results for the windows on the neighbouring buildings. This assessment determined that daylight (VSC) on all assessed windows on the existing neighbouring buildings will not be impacted. They are therefore determined to be compliant with BR 209 guidelines, as outlined in Section 4.2 above.

Room Ref	Window Ref Ex	VSC Existing (%)	VSC Proposed (%)	Proposed/ Existing		Criterion 1 VSC Proposed < 27%	Criterion 2 Ann or Win <80% of Baseline	**OVERALL COMPLIANCE**
PM Group	W185	9.5	8.4	0.89		No	Yes	**Pass**
PM Group	W186	9.7	9.0	0.93		No	Yes	**Pass**
PM Group	W187	10.0	9.7	0.98		No	Yes	**Pass**
PM Group	W188	9.4	8.4	0.90		No	Yes	**Pass**
PM Group	W189	9.7	9.0	0.93		No	Yes	**Pass**
PM Group	W190	10.0	9.7	0.98		No	Yes	**Pass**
PM Group	W191	9.5	8.3	0.88		No	Yes	**Pass**
PM Group	W192	9.7	8.9	0.92		No	Yes	**Pass**
PM Group	W193	10.0	9.6	0.97		No	Yes	**Pass**
PM Group	W194	9.5	8.1	0.86		No	Yes	**Pass**
PM Group	W195	9.7	8.8	0.91		No	Yes	**Pass**
PM Group	W196	10.0	9.6	0.97		No	Yes	**Pass**
PM Group	W197	9.5	8.1	0.86		No	Yes	**Pass**
PM Group	W198	9.7	8.7	0.90		No	Yes	**Pass**
PM Group	W199	10.0	9.6	0.97		No	Yes	**Pass**
PM Group	W200	9.5	8.0	0.85		No	Yes	**Pass**
PM Group	W201	9.7	8.7	0.90		No	Yes	**Pass**
PM Group	W202	10.0	9.6	0.97		No	Yes	**Pass**
PM Group	W203	9.5	8.0	0.84		No	Yes	**Pass**
PM Group	W204	9.7	8.6	0.89		No	Yes	**Pass**
PM Group	W205	10.0	9.6	0.96		No	Yes	**Pass**

4.3.1 – VSC Results

4.4 Results – Annual Probable Sunlight Hours

Similarly, analysis undertaken for sunlight availability of existing vs. proposed conditions determined no undue reduction in sunlight availability to the existing neighbouring buildings.

Room Ref	Annual Existing (%)	Annual Proposed (%)	Proposed/ Existing	Winter Existing (%)	Winter Proposed (%)	Winter Proposed/ Existing	Total Potential Annual Sunny Hours	Max Allowable Annual Reduction	Actual Annual Reduction	Compliant with Criterion 1 Ann < 25% or Win <5%	Criterion 2 Ann or Win <80% of Ex	Criterion 3 Ann reduction > 4%	**OVERALL COMPLIANCE**
PM Group	58	55	0.95	19	16	0.85	1277	51	38	Yes	Yes	Yes	**Pass**
PM Group	58	58	1.00	19	18	0.95	1277	51	0	Yes	Yes	Yes	**Pass**
PM Group	58	58	1.00	19	19	1.00	1277	51	0	Yes	Yes	Yes	**Pass**
PM Group	58	55	0.95	19	16	0.85	1277	51	38	Yes	Yes	Yes	**Pass**
PM Group	58	58	1.00	19	18	0.95	1277	51	0	Yes	Yes	Yes	**Pass**
PM Group	58	58	1.00	19	19	1.00	1277	51	0	Yes	Yes	Yes	**Pass**
PM Group	58	55	0.95	19	16	0.85	1277	51	38	Yes	Yes	Yes	**Pass**
PM Group	58	57	0.99	19	18	0.95	1277	51	13	Yes	Yes	Yes	**Pass**
PM Group	58	58	1.00	19	19	1.00	1277	51	0	Yes	Yes	Yes	**Pass**
PM Group	58	55	0.95	19	16	0.85	1277	51	38	Yes	Yes	Yes	**Pass**
PM Group	58	57	0.99	19	18	0.95	1277	51	13	Yes	Yes	Yes	**Pass**
PM Group	58	58	1.00	19	19	1.00	1277	51	0	Yes	Yes	Yes	**Pass**
PM Group	58	56	0.97	19	17	0.90	1277	51	26	Yes	Yes	Yes	**Pass**
PM Group	58	57	0.99	19	18	0.95	1277	51	13	Yes	Yes	Yes	**Pass**
PM Group	58	58	1.00	19	19	1.00	1277	51	0	Yes	Yes	Yes	**Pass**
PM Group	58	56	0.97	19	17	0.90	1277	51	26	Yes	Yes	Yes	**Pass**
PM Group	58	57	0.99	19	18	0.95	1277	51	13	Yes	Yes	Yes	**Pass**
PM Group	58	58	1.00	19	19	1.00	1277	51	0	Yes	Yes	Yes	**Pass**
PM Group	58	56	0.97	19	17	0.90	1277	51	26	Yes	Yes	Yes	**Pass**
PM Group	58	57	0.99	19	18	0.95	1277	51	13	Yes	Yes	Yes	**Pass**
PM Group	58	58	1.00	19	19	1.00	1277	51	0	Yes	Yes	Yes	**Pass**

4.4.1 – APSH Results

5.0 Amenity Sunlight

5.1 Methodology

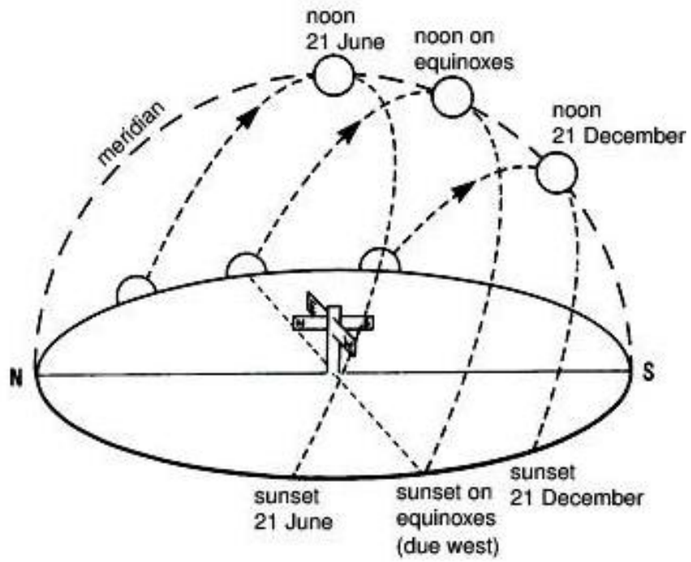
The BRE Site Layout Planning for Daylight and Sunlight Design Guide 209 provides guidance with regards to sunlighting and shading to external Amenity spaces within proposed developments.

The guidance recommends “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”.

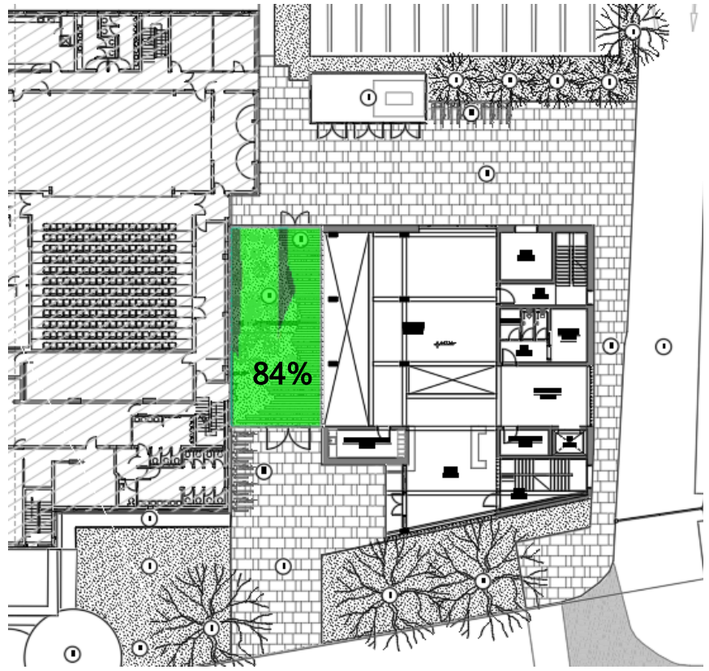
The methodology assesses sunlight performance at the Equinox, as this is the mid solar position throughout the year (as illustrated in Fig.4.1.1), with compliance indicative of spaces that will receive adequate sunlight and appealing useful spaces, including that the following attributes will be achieved as identified in BRE.209:

- Provide attractive sunlit views (all year)
- Make Outdoor Activities like sitting out and children’s play more pleasant (mainly warmer months).
- Encourage plant growth (mainly spring and summer).
- Dry out the ground, reducing moss and slime (mainly in colder months).

As shown in Figure 5.1.2 the amenity area is fully complaint with the guidelines, with well over 50% of the total area receiving more than 2 hours of sunlight on March 21st.



5.1.1 – Annual Solar Position



5.1.2 – Amenity Shading Analysis Results.

6.0 Daylight Analysis

6.1 Methodology

Daylighting analysis was undertaken for the proposed building using TAS software to determine Median Daylight Factors (MDF's) in accordance with BRE 209 3rd Edition.

MDF's were determined for a CIE Overcast Sky equivalent to providing an external, unobstructed ground illumination level of 10,000 Lux. CIE Overcast skies are theoretical sky models, with brightness highest at the zenith and reducing to the horizon, but also unidirectional (as illustrated in Figure 6.1.1); therefore MDF's do not differ for façade orientation, with North facing rooms achieving identical metric performance to South facing, (all else being equal), as results account for diffuse natural light only and exclude any direct sunlight effects.

The daylight analysis accounted for all aspects that can potentially restrict natural light availability including any adjacent / opposing buildings, along with explicitly modelling Building Details (as illustrated in Figure 6.1.2) such as balcony structures, window frames, reveal and cill depth etc. in accordance with the architectural design.

The daylighting models were calculated based on the following assumptions regarding transmittance and reflectance (based on values as identified in BRE 209 3rd edition):

- Glazing Transmission = 68% with maintenance factor of 96%
- Ceilings: 80% reflectance
- Walls: 70% reflectance
- Floors: 40% reflectance

Daylight Factors for each space were then calculated for a working plane height of 0.85m on a 0.25 x 0.25 m grid basis with 0.3m offset, to enable a detailed calculation within each room, the medium value of which was then determined to calculate MDF.

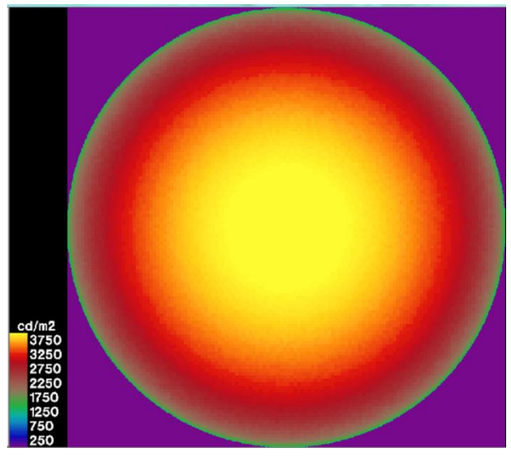


Fig 6.1.1 - CIE Overcast sky as viewed from below.

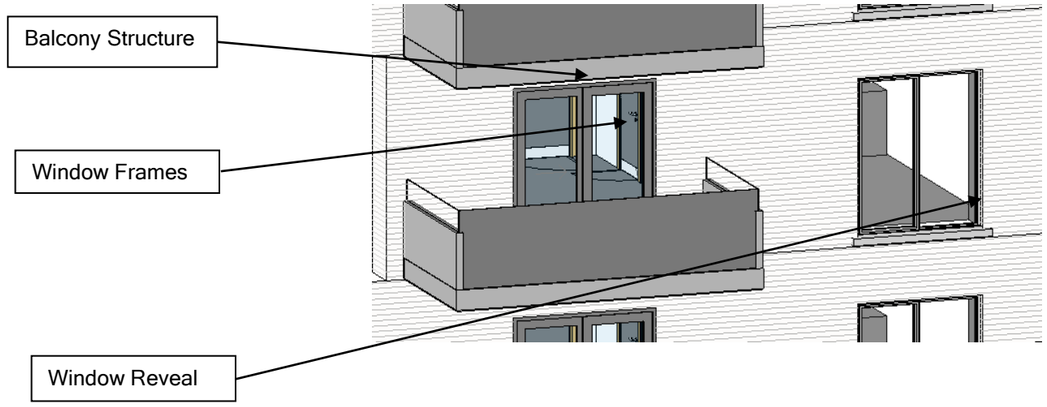


Fig 6.1.2 – Sample Building Details included within Daylight Analysis

Methodology (Cont'd)

For internal daylight assessments of commercial developments, BS EN 17037 gives three levels of recommendation for daylight provision: minimum, medium and high.

Since the daylight calculation uses an overcast sky model, the resulting daylight factors are independent of orientation and location. In order to account for different climatic conditions at different locations, BS EN 17037 gives equivalent daylight factor targets for each capital city in Europe. The values for Dublin are listed below:

Nation	**Capital** [a]	**Geographical latitude** φ [°]	**Median External Diffuse Illuminance** $E_{v,d,med}$	***D* to exceed 100 lx**	***D* to exceed 300 lx**	***D* to exceed 500 lx**	***D* to exceed 750 lx**
Ireland	Dublin	53,43	14 900	0,7 %	2,0 %	3,4 %	5,0 %

The relative level recommendations are met if both target daylight factors are achieved (the median daylight factor over 50% of the reference plane, and the minimum daylight factor over 95% of the reference plane) are achieved.

Level of recommendation	Target daylight factor D for half of assessment grid	Target daylight factor D for 95% of assessment grid
Good	2.0%	0.7%
Very Good	3.4%	2.2%
Excellent	5.0%	3.4%

We note the BRE guide should be seen as advisory only as the guide was developed for low density urban housing and was developed to inform design rather than to constrain it. Although the guide provides numerical guidelines, these should be interpreted flexibly since natural lighting is only one of many factors in site layout design.

6.2 Results - Ground Level

Daylighting Analysis as illustrated below, determined the following daylighting performance with associated Median Daylight Factors (MDF's). All occupied were determined to be compliant at a "Good" level of targeted illuminance.

Daylight Level - Median Daylight Factor (MDF)				
Required	**Poor**	**Good**	**Very Good**	**Excellent**
MDF	< 2.0%	2.0-3.4%	3.4-5.0%	5.0%+

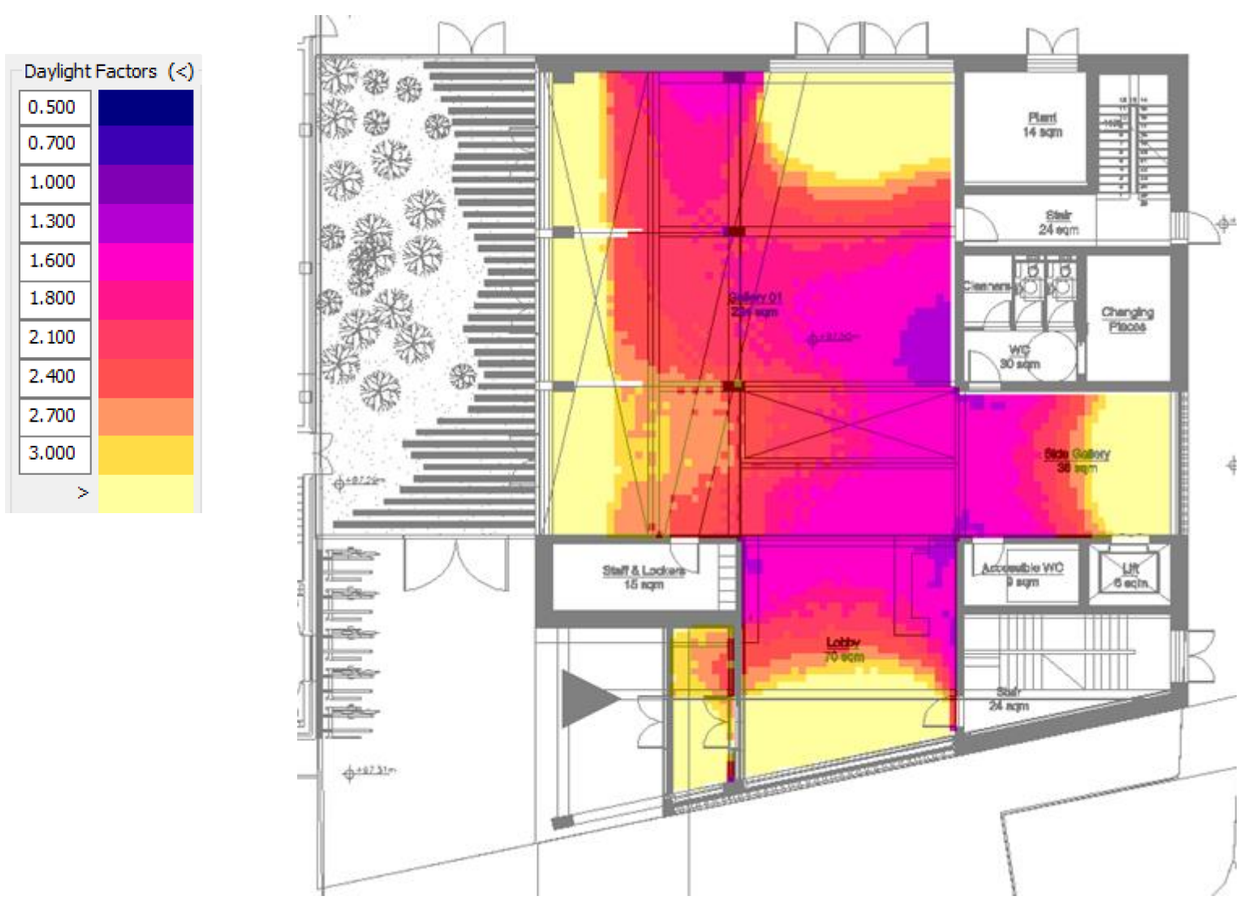


Fig 5.2.1 – Ground Level Daylighting Contours

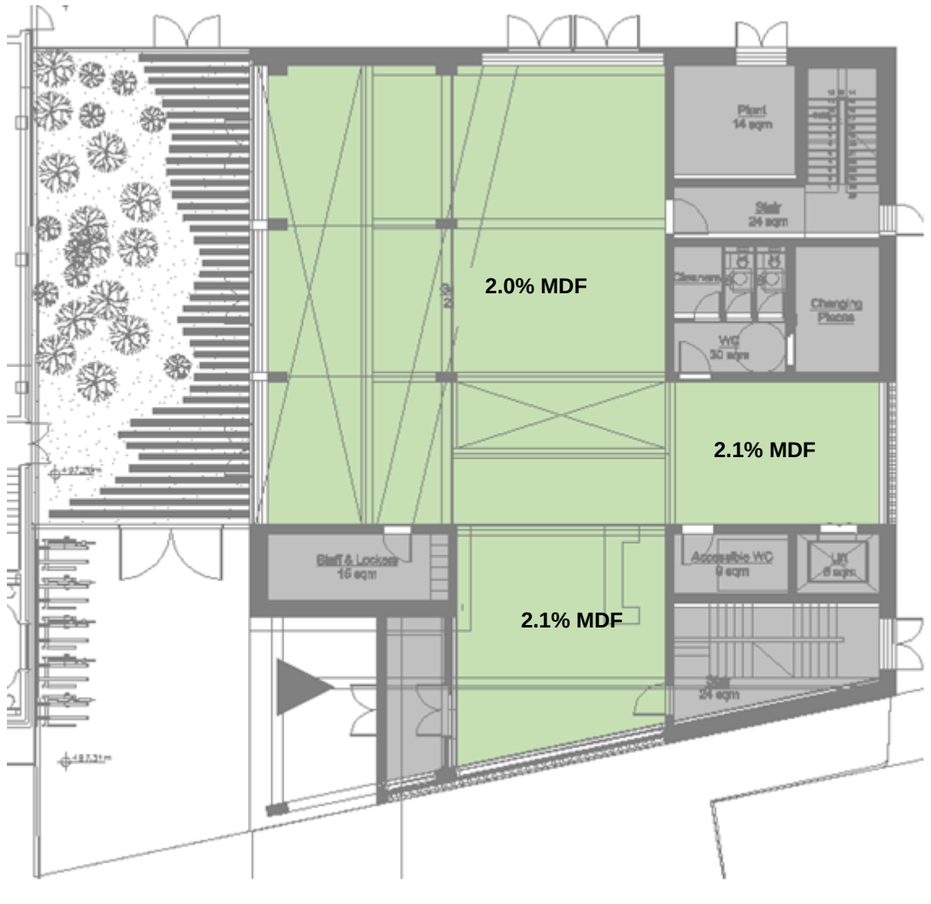


Fig 6.1.2 – Level 00 Daylighting Results

6.3 Results – 1st Floor Level

Daylighting Analysis as illustrated below, determined the following daylighting performance with associated Median Daylight Factors (MDF's). Two occupied spaces were determined to be compliant at "Excellent" level of targeted illuminance, with a "Very Good" level of compliance predicted for the remaining two spaces.

Daylight Level - Median Daylight Factor (MDF)				
Required	**Poor**	**Good**	**Very Good**	**Excellent**
MDF	< 2.0%	2.0-3.4%	3.4-5.0%	5.0%+

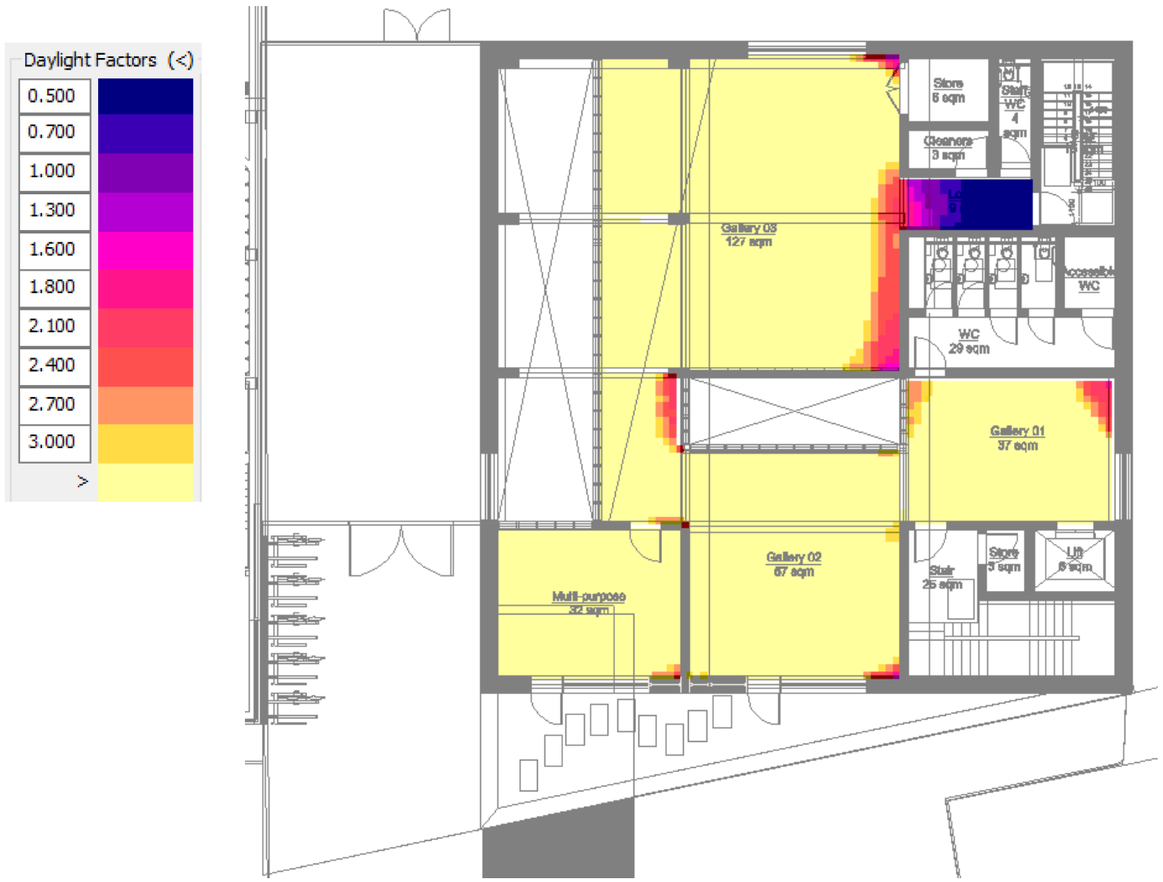


Fig 6.3.1 – Level 01 Daylighting Results

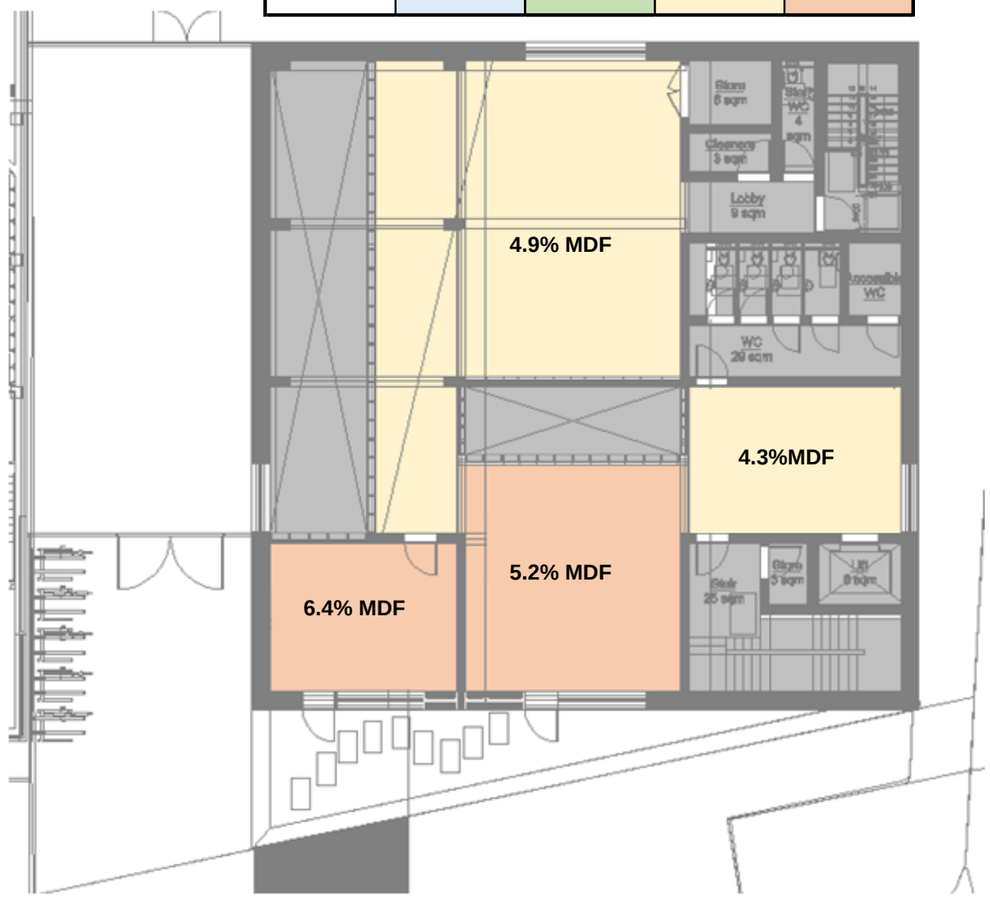
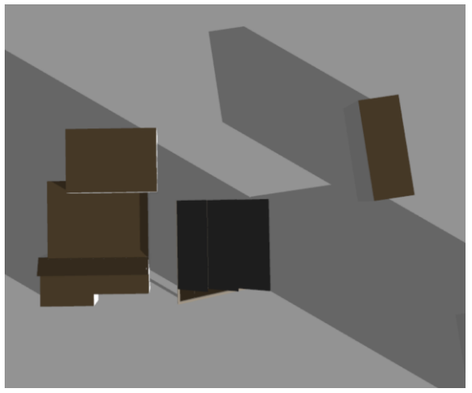
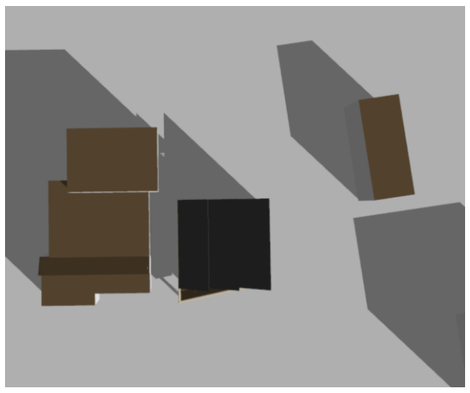
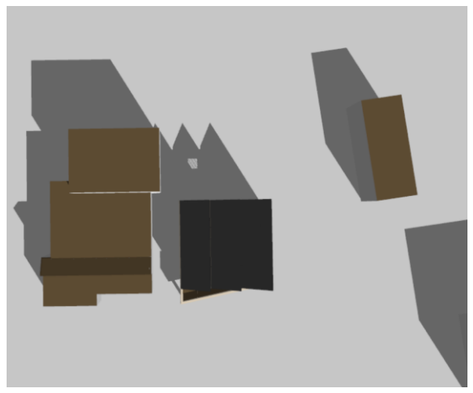
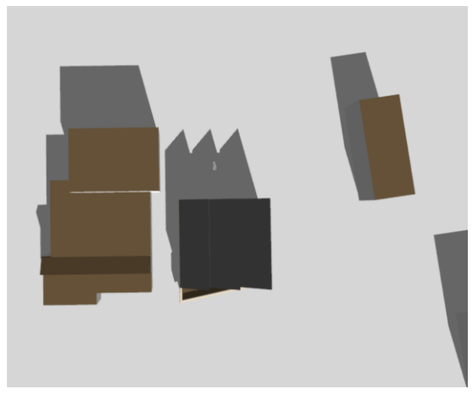
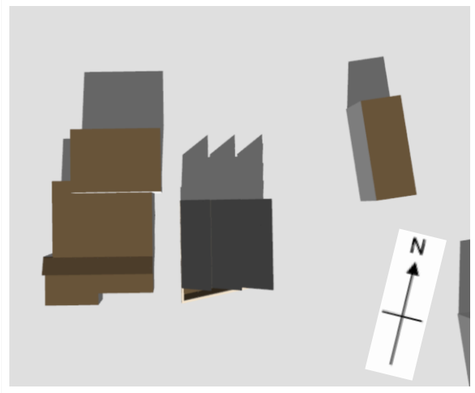


Fig 6.3.1– Level 01 Daylighting Contours

7.0 Site Shading Diagrams

Equinox March 21st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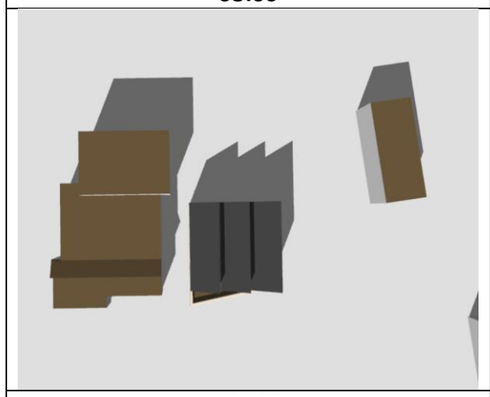
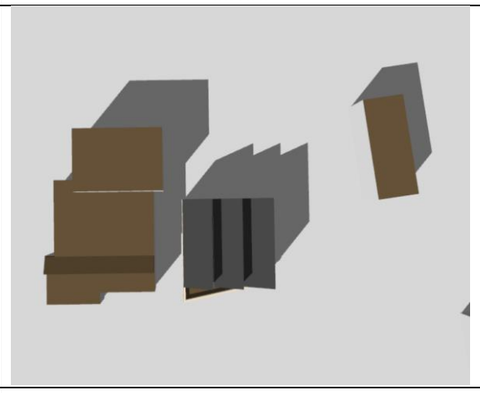
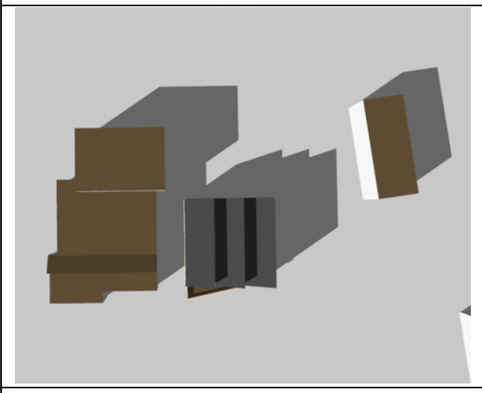
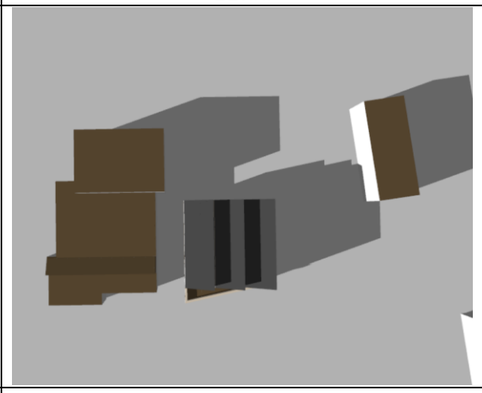
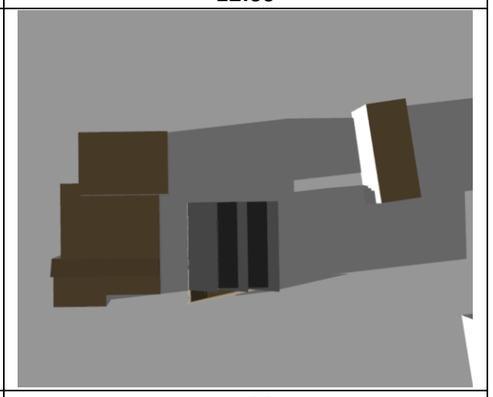
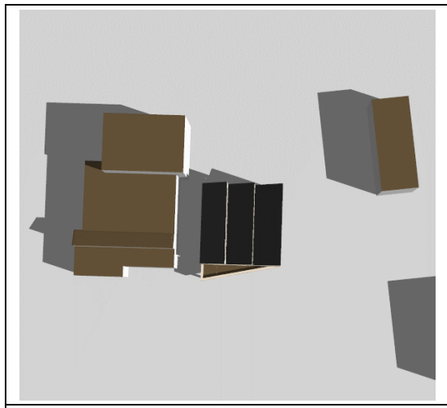
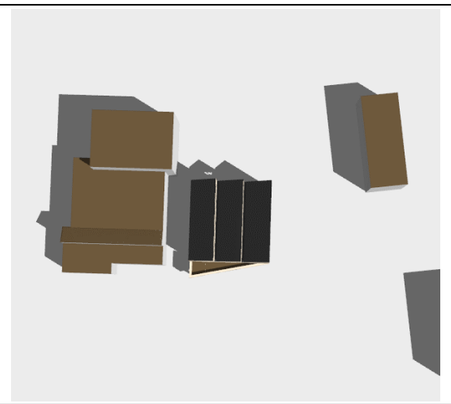
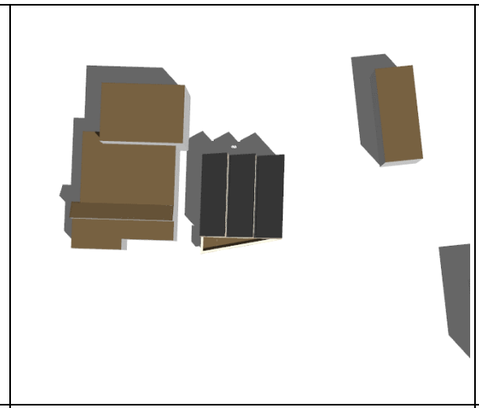
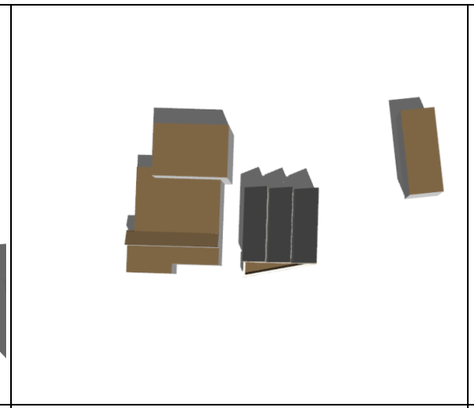
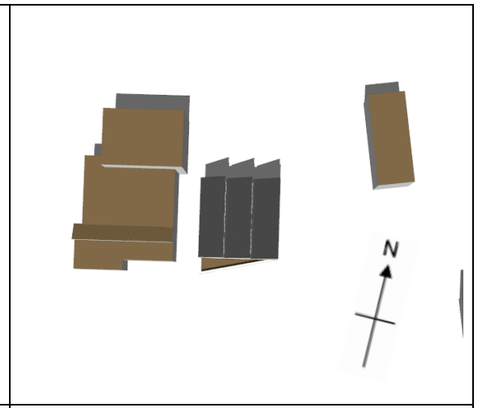
				
13:00	**14:00**	**15:00**	**16:00**	**17:00**

Fig 7.1.1 - Sunlight and Site Shading Diagrams - Equinox (March 21st): 08:00-17:00 hrs

The Site Shading diagrams in Fig 7.1.1 illustrate how the proposed development is not predicted to cause undue overshadowing on the neighbouring office building. All neighbouring office spaces are predicted to receive at least 2 hours of sunlight on 21st March and are therefore determined to receive adequate sunlight in the proposed condition.

Summer Solstice June 21st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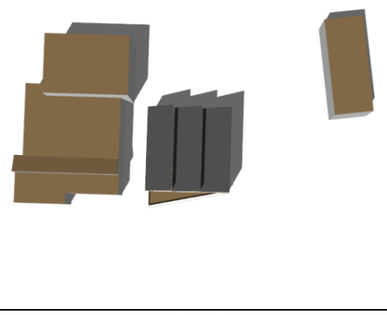	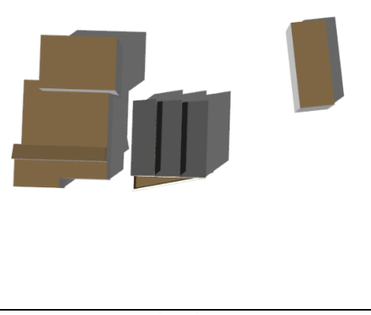	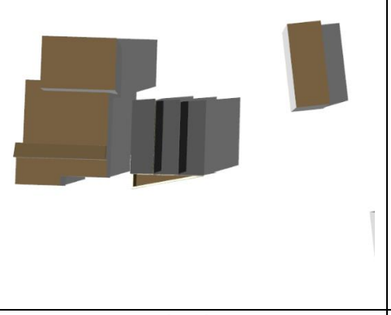	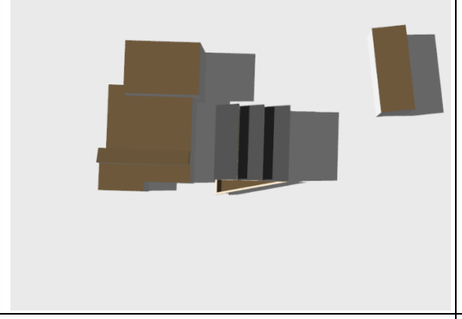	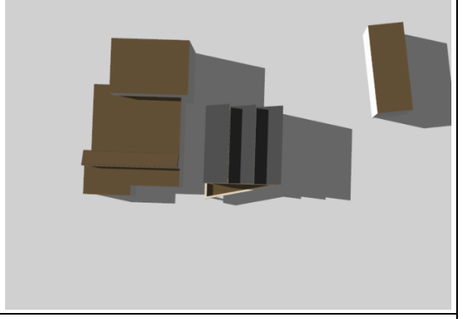
13:00 (IST)	**14:00 (IST)**	**15:00 (IST)**	**16:00 (IST)**	**17:00 (IST)**

Fig 7.1.2 - Sunlight and Site Shading Diagrams - Summer Solstice (June 21st): 08:00-17:00 hrs

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Winter Solstice December 21st

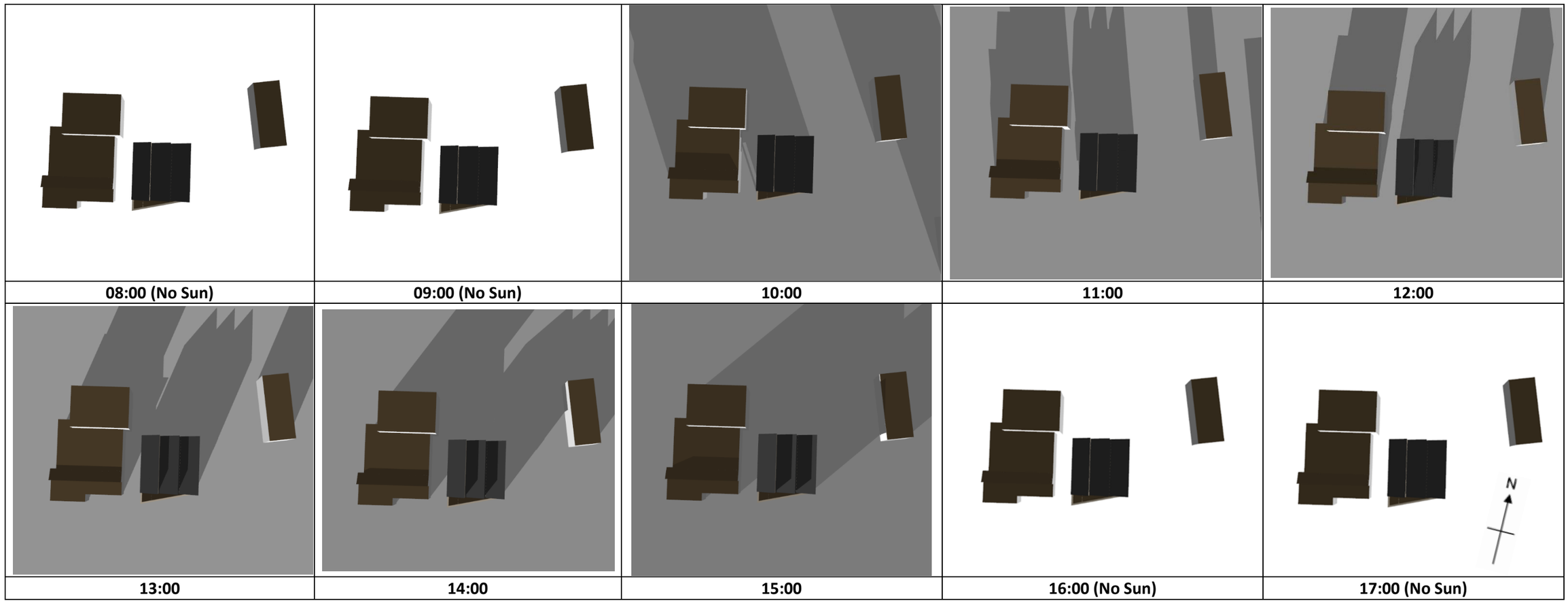


Fig 7.1.3 - Sunlight and Site Shading Diagrams - Winter Solstice (December 21st): 08:00-17:00 hrs

Whilst both winter and summer solstices have been included, it should be noted that the statistics of Met Eireann, the Irish Meteorological Service, indicate that the sunniest months in Ireland are May and June. During December, Dublin receives a mean daily duration of 1.7 hours of sunlight out of a potential 7.4 hours sunlight each day (i.e. only 22% of potential sunlight hours). This can be compared with a mean daily duration of 6.4 hours of sunlight our of a potential 16.7 hours each day received by Dublin during June (i.e. 38% of potential sunlight hours). Therefore, impacts caused by overshadowing are generally most noticeable during the summer months and least noticeable during the winter months. Due to the low angle of the sun in mid-winter, the shadow environment in all urban and suburban areas are generally dense tending to make the images confusing and superfluous.

8.0 Solar Gain

8.1 Methodology

Part L of the Building regulations requires limitation of solar gain through the building fabric to minimise energy required for cooling.

Thermal analysis was undertaken for all occupied perimeter zones areas of the building using Dynamic Simulation Modelling (TAS software). This involved creating a 3D representational model of the building including its form, materials, and constructions, glazing and shading, both local and from neighbouring buildings.

Using the model, the annual predicted solar gain was calculated for each occupied space within the building and the result compared with the maximum allowable target. Each space was assessed based on the assumed solar performance values as indicated in Figures 8.1.1 to 8.1.4.

8.2 Results

The results determined that all spaces meet the building regulation requirements based on provision of glazing with a Solar Control performance (g-Value) as indicated in Figures 8.1.1 to 8.1.4 and Table A1 in Appendix A.

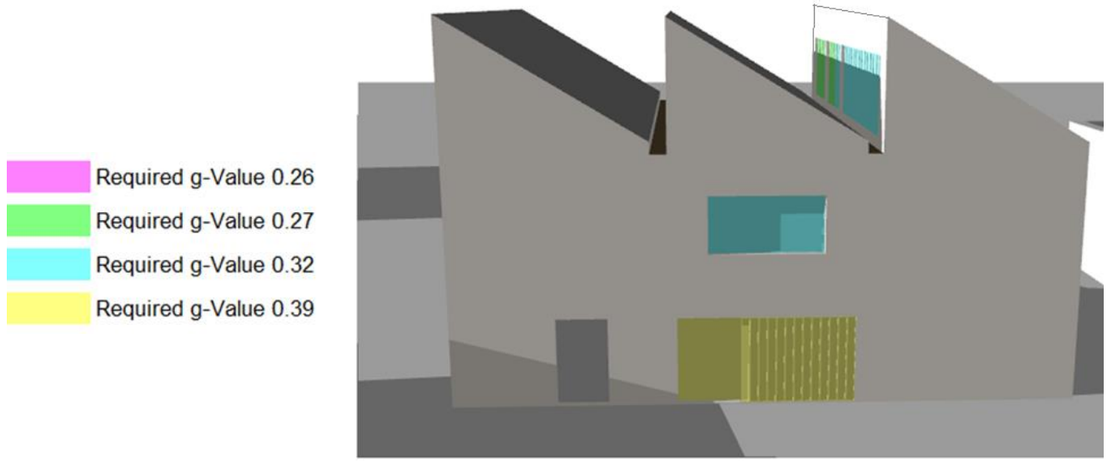


Fig 8.1.1 – North Elevation – Required Solar Performance for Glazing

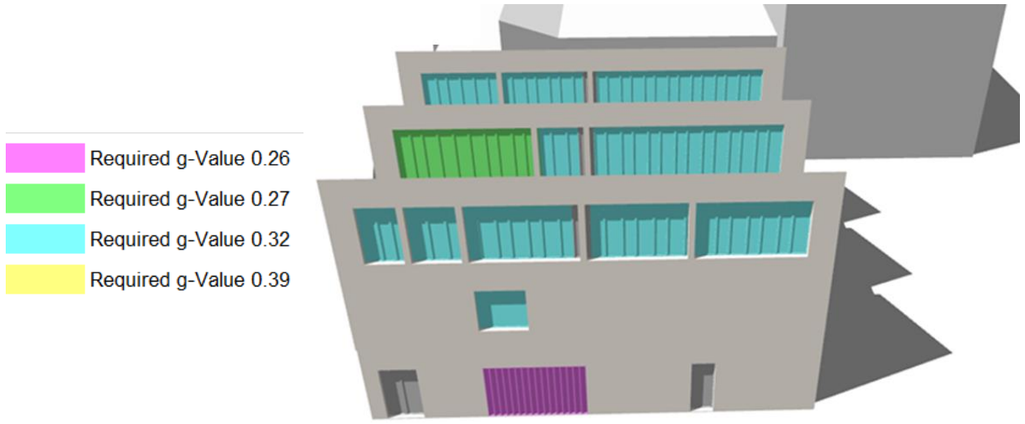


Fig 8.1.2 – East Elevation – Required Solar Performance for Glazing

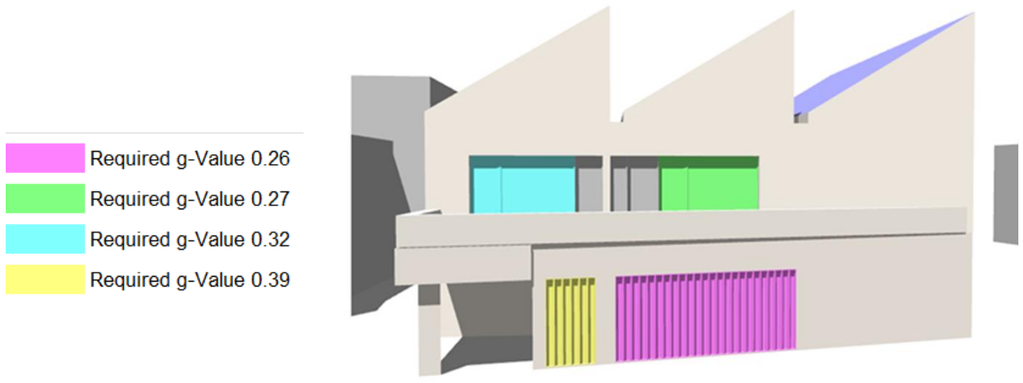


Fig 8.1.3 – South Elevation – Required Solar Performance for Glazing

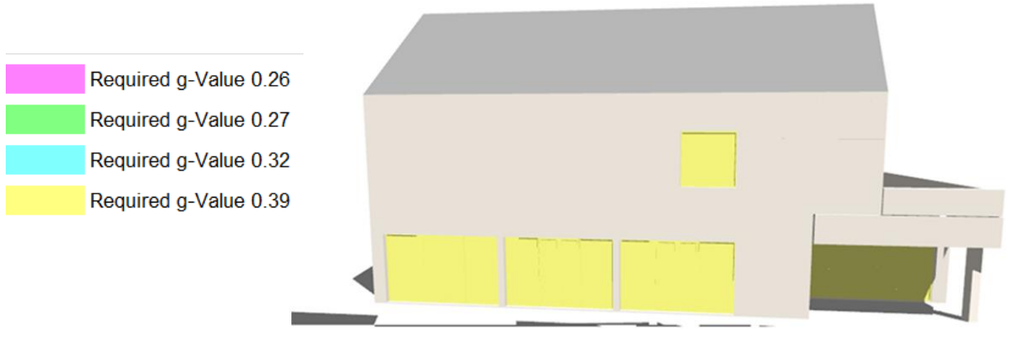


Fig 8.1.4 – West Elevation – Required Solar Performance for Glazing

9.0 Energy and Carbon Part L 2022 Compliance

The EU Energy Performance of Buildings Directive (EPBD) requires that all new developments be designed to be Near-Zero Energy Buildings (NZEB) from 2020.

This directive has been interpreted for Ireland as requiring both a substantial reduction in Primary Energy (of the order of 50-60% below the Part L 2008 benchmark), with significant proportion of that (10-20% of energy) being provided by Renewable Energy sources "either on-site or nearby (i.e., energy from PV panels, ASHP heating systems or district heating systems etc.)".

9.1 NZEB Methodology

The NZEB methodology involves comparing the "Actual Building" energy performance as proposed against a "Reference Building".

In order to demonstrate NZEB compliance, a representative model for the extension building was used to calculate the predicted Primary Energy usage for the "Actual" building as designed, based on the proposed fabric and HVAC service values as detailed in Table B1 of Appendix B.

The calculated primary energy consumption of the "Actual Building" is divided by that of the NZEB "Reference Building", the result being the Energy Performance Coefficient (EPC) of the "Actual Building".

The Renewable Energy Ratio (RER) is calculated by dividing the renewable energy contribution as a proportion of overall Primary Energy provided. To demonstrate that an acceptable Primary Energy consumption rate has been achieved, the calculated EPC of the building being assessed should be not greater than the Maximum Permitted Energy Performance Coefficient (MPEPC) as defined within Part L 2022.

9.2 NZEB / Part L 2022 Compliance Results

The proposed building was found to fully comply with the requirements of Part L 2022, 17% below the MPEPC energy target and 44% below the carbon target MPCPC. A renewable energy contribution RER of 24% is provided by the renewable contribution from the ASHP exceeding the 20% requirement for this building. An alternative Service Design Option was assessed that included connection to the local District Heating System for which full compliance with the requirements of Part L 2022 was determined.

Part L 2022 Target		Results	
MPEPC	< 1.0	0.83	Compliant
MPCPC	< 1.15	0.64	Compliant
RER	≥ 0.1[1]	0.24	Compliant

[1]10%-20% required for NZEB / Part L 2022

BRIRL Output Document

Compliance Assessment with the Building Regulations (Ireland) TGD-Part L 2022

This report demonstrates compliance with specific aspects of Part L of the Building Regulations. Compliance with all aspects of Part L is a legal requirement. Demonstration of how compliance with every aspect is achieved may be sought from the Building Control Authority.

County Heritage Centre Tallaght

Date: Thu Aug 03 18:11:07 2023

Administrative information

Building Details
Address: Town Centre Tallaght, Dublin 24, Dublin 24,

NEAP
Calculation engine: SBEMIE
Calculation engine version: v5.6.a.0
Interface to calculation engine: DesignBuilder SBEM
Interface to calculation engine version: v6.1.9
BRIRL compliance check version: v5.6.a.0

Client Details
Name:
Telephone number:
Address:

Energy Assessor Details
Name: Alex O' Toole
Telephone number: 01-4960900
Email: Alex.OToole@in2.ie
Address: Studio E&F Mount Pleasant Business Centre Ranelagh Dublin 6, Dublin 6, D06 P5N8

Primary Energy Consumption, CO2 Emissions, and Renewable Energy Ratio

The compliance criteria in the TGD-L have been met.

Calculated CO2 emission rate from Reference building	26.2 kgCO2/m2.annum
Calculated CO2 emission rate from Actual building	16.7 kgCO2/m2.annum
Carbon Performance Coefficient (CPC)	**0.64**
Maximum Permitted Carbon Performance Coefficient (MPCPC)	**1.15**
Calculated primary energy consumption rate from Reference building	158.2 kWh/m2.annum
Calculated primary energy consumption rate from Actual building	130.6 kWh/m2.annum
Energy Performance Coefficient (EPC)	**0.83**
Maximum Permitted Energy Performance Coefficient (MPEPC)	**1**
Renewable Energy Ratio (RER)	**0.24**
Minimum Renewable Energy Ratio	**0.1**

Figure 9.1.1 – Proposed County Heritage Centre Building Design - Part L 2022 BRIRL Compliance

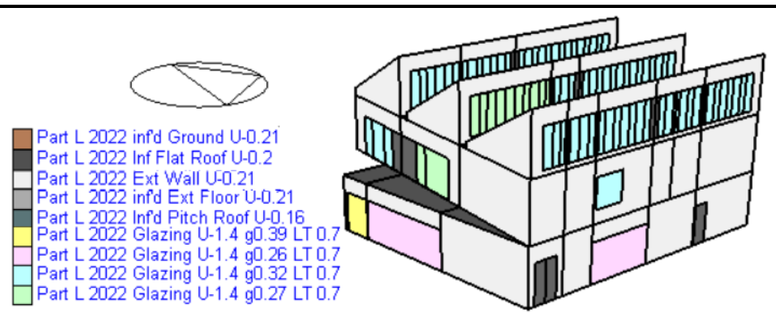
10.0 APPENDIX A

Table A1 – SOLAR GAIN RESULTS

Zone Name	Facade Length (m)	Floor Area (m²)	Actual Solar Gain (kWh)	Solar Gain Limit (kWh)	Solar Gain (%)	Required g-Value	Compliant
0nd z 02 Reception	7.5	55.7	1777	1813	-2%	0.26	Yes
0nd z 06 Side Gallery	5.1	37.3	1181	1217	-3%	0.26	Yes
0nd z 11 Gallery 01	31.9	226.4	7284	9523	-24%	0.39	Yes
1st z 01 Multipurpose	11.5	32.4	2565	2756	-7%	0.32	Yes
1st z 02 Gallery 02	7.3	57.2	2720	2930	-7%	0.27	Yes
1st z 06 Gallery 01	5.1	37.0	1836	1892	-3%	0.32	Yes
1st z 13 Gallery 03	10.4	111.6	5335	5694	-6%	0.32	Yes
a							

11.0 APPENDIX B

Table B1 – BUILDING FABRIC AND HVAC ASSUMPTIONS



Building Fabric -			
Element	U-Value W/m²K	General Fabric Details	
External Walls	0.21	Glazing Light Transmittance	70%
Pitched Roof	0.16	Glazing g-Value	Range 0.26 to 0.39 See Section 8.0
Ground Floor	0.21		
Exposed Floor	0.21		
Terrace/ Balcony	0.20	Air Permeability	m³/hr.m²@50Pa
Glazing (Centrepane)	1.40	New Building	5.0
Thermal Bridges			
Junction	Ψ Value W/m K	Junction	Ψ Value W/m K
Roof to Wall	0.180	Lintel above Window or Door	0.450
Wall – Ground Floor	0.240	Sill below Window	0.080
Wall – Wall (Corner)	0.140	Jamb at Window or Door	0.090
Wall – Floor (int not ground floor)	0.110		
Heating System - Heating- ASHP to all areas			
Fuel Type	Grid Electricity	ASHP Seasonal Efficiency	276%
Heating Water Pumps	Variable Speed	Distribution System Efficiency	95%
Hot Water System - HWS – ASHP District Heating to all areas			
Fuel Type	Grid Electricity	Direct Electric Localised Units Seasonal Efficiency	100%
Heating Water Pumps	N/A	Distribution System Efficiency	N/A
Cooling -			
Fuel Type	NA	Seasonal Efficiency	NA
Chilled Water Pumps	NA	Distribution System Efficiency	NA

HVAC System - Natural Ventilation - To Reception, Galleries, Multipurpose, Circulation and Plant		
Natural Ventilation	Supply Air Fan Specific Fan Power (W/l.s)	NA
	Extract Fan Specific Fan Power (W/l.s)	NA
	Heat Recovery Efficiency	NA
	CO2 Sensor	NA
Mechanical Ventilation with Heat Recovery - To Toilets, Stores, Staff Lockers and Changing Areas		
Mechanical Ventilation (MVHR)	Supply Air Fan Specific Fan Power (W/l.s)	0.9
	Extract Fan Specific Fan Power (W/l.s)	1.0
	Heat Recovery Efficiency	65%
	CO2 Sensor	NA

Lighting - Proposed

Space Type	Presence Detection Switching	Daylight Control	Lamp and ballast Efficacy (lumens/W)	Light Output ratio
Reception	Manual	Photocell / Dimming	85	0.06
Galleries	Manual	Photocell / Dimming	85	0.06
Multipurpose	Auto On/Off	Photocell / Dimming	85	0.06
Circulation	Auto On/Off	Manual	85	0.06
Plant	Auto On/Off	Manual	85	0.06
Toilets	Auto On/Off	Manual	85	0.06
Stores	Auto On/Off	Manual	85	0.06
Staff Lockers	Auto On/Off	Manual	85	0.06
Changing Area	Auto On/Off	Manual	85	0.06

Controls - Proposed	
Automatic monitoring and targeting with alarms for out-of-range values	Yes
Power factor correction to achieve a whole building power factor of at least	>95%

IN2 Engineering Design
Unit E&F
Mount Pleasant Business Park
Upper Mount Pleasant Avenue
Dublin 6
(01) 496 0900

info@in2.ie