

Sunlight & Daylight Impact Assessment

Green Park Village School

On behalf of Berkeley Homes

Revision C

Date: 28th March 2018



REVISION HISTORY

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Calculations contained within this report have been produced based on information supplied by the Client and the design team.

Any alterations to the technical specification on which this report is based may invalidate its findings.

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1. EXECUTIVE SUMMARY

1.1 Purpose of the Sunlight Impact Assessment

This Sunlight Impact Assessment has been produced by Energist UK on behalf of Berkeley Homes Western ('the Applicant').

It reviews the expected access to natural light for the proposed school building on the Green Park Village development in Reading ('the Development') and also considers its impact on the availability of natural light for neighbouring properties.

It supports a planning application for Reading Borough Council.

This Strategy has been specifically designed to follow the best practice guidance as set out in the BRE publication 'Site Layout Planning for Daylight and Sunlight'.

This assessment demonstrates how the Applicant has integrated into the proposed design aspects to allow for:

- Good levels of natural daylight for the majority of teaching rooms of the proposed development.
- Sufficient space exists between the proposed development and the site boundary, so that future development on neighbouring land will not be restricted to limiting amounts of natural daylight because of this development.
- A design which benefits from access to natural daylight without an excess of solar gains. This can have the potential of creating overheating issues in summer months.
- The inclusion of outdoor space with sufficient levels of direct sunlight.
- A design that will not have a significant impact on the amount of direct sunlight received by public and open spaces of neighbouring developments.
- Passive design to use naturally occurring solar gains to the advantage of the occupiers

1.2 Summary of results – New Development

The following analysis has been completed for the new development at Green Park Village School.

Methodology	Conclusions
Average Daylight Factor (ADF)	Out of the 15 windows assessed the ADF is exceeded on 13 of them (86%). This means the rooms will have sufficient access to natural light without the requirement for additional lighting. The remaining windows are marginally short of the requirements (13%), however, the developer will incorporate into the design a suitable strategy for providing additional electric lighting with adequate controls to ensure that acceptable levels of light are experienced in the classrooms when required.
No Sky Line (NSL)	The NSL is 100% for all rooms with exception of the Nursery Room. This means all other assessed rooms have a direct sight of sky (at 85cm above ground level). Alternative designs for the nursery have been explored, but as a result of the educational requirement for a covered play space for this part of the building, the NSL recommendation is not practically achievable. The NSL result for the nursery room should be considered against the requirement to provide a covered educational space.
Vertical Sky Component (VSC)	The VSC is greater than 27% for 12 of the 15 assessed glazed areas. This will give reasonable levels of daylight. The remaining windows are again just short of the recommended target. Larger windows have been considered by the developer, however, this has not been deemed as a practical approach, as a result, careful room design and suitable lighting systems will be used to minimise the impact on the room occupants.
Single façade room depth	All of the assessed glazing relates to single façade rooms. The amount of available daylight to the upper floors is sufficient given the depth of the room. As covered by the previous ADF and VSC Calculations, the developer is aware that the amount of natural daylight in some areas must be compensated by ensuring lighting systems and internal design is sufficient to offset the amount of available natural light and has considered this as part of the current design.

Summer Overheating Analysis (SOA)	The solar gains analysis taken from the SBEM Calculations shows a consistent improvement over the Part L Target calculations. The Average Daylight Factor is less than 6.0 which means the habitable rooms are not expected to have excessive levels of direct sunlight. It is not expected that these rooms will experience uncomfortable levels of overheating from solar gains.
Annual Probable Sunlight Hours (APSH)	The analysis of Annual Probable Sunlight Hours has shown there is no obstruction to sunlight within the target depth.
Sun on the Ground (SotG)	The centre of the proposed Leisure Area is expected to receive 9 hours of direct sunlight. This far exceeds the minimum recommendation of two hours.
Solar Energy Overshadowing (SEO)	All but one of the classrooms has been designed in such a way that the glazing will receive at least three hours of sunlight on any clear day, at any point throughout the year. The Solar Energy Overshadowing calculation shows the Nursery Room falls short of this recommendation. As noted in previous conclusions the light levels for the Nursery Room will be compensated via electric lighting and a practical design to offset the inclusion of the covered play space which is a requirement for this building type.
Annual Sunlight Tracker	The analysis shows the window of the Nursery Room is not expected to receive full sunlight at any time through the year. The window is constantly partially shaded by the neighbouring Extra care home building and the covered play space situated directly adjacent to the building. Classroom 8 is shown to receive direct sunlight during the afternoon, but will be partially or completely shaded in the mornings, and all day in some winter months. Similarly, Classroom 9 does not receive direct sunlight early on, but will receive sunlight in the afternoons and evenings in the summer and spring months. All other rooms are considered to have suitable levels of natural light without the need for further analysis.

1.3 Final Conclusions

Based on the calculations completed we can conclude that all areas with exception of the Nursery will receive adequate levels of sunlight, in most cases, exceed the requirements.

Due to various factors including room sizes, glazing sizes and orientations we cannot foresee any issues from surrounding developments on the site, or hindrances from the proposed development.

The Nursery has been determined as the worst-case room for levels of both Daylight and Sunlight, this is partly due to the opposite Extra Care Home building but mostly as a result of the covered play space located on the Ground Floor.

This is an educational requirement and not for shading purposes, this has therefore been deemed as acceptable.

To summarise, the Green Park School Development has exceeded recommendations for both Sunlight and Daylight for a greater proportion of areas than those that do not pass. No further changes to Design are required at this stage in either layouts or glazed areas.

2. INTRODUCTION

2.1 Site description

This Sunlight Impact Assessment has been prepared for the new education building as part of the Green Park Village development. This falls within the jurisdiction of the Local Planning Authority at Reading Borough Council.

The Development consists of A New Two Form Entry School

The site is neighboured by a new 6 storey Extra care home, and there are concerns that this taller building will reduce the amount of natural light available for the school building.

The proposed works are to take place in a built-up area. This assessment will review the available light for the proposed works, as well as measuring the impact on light available for existing, neighbouring buildings.

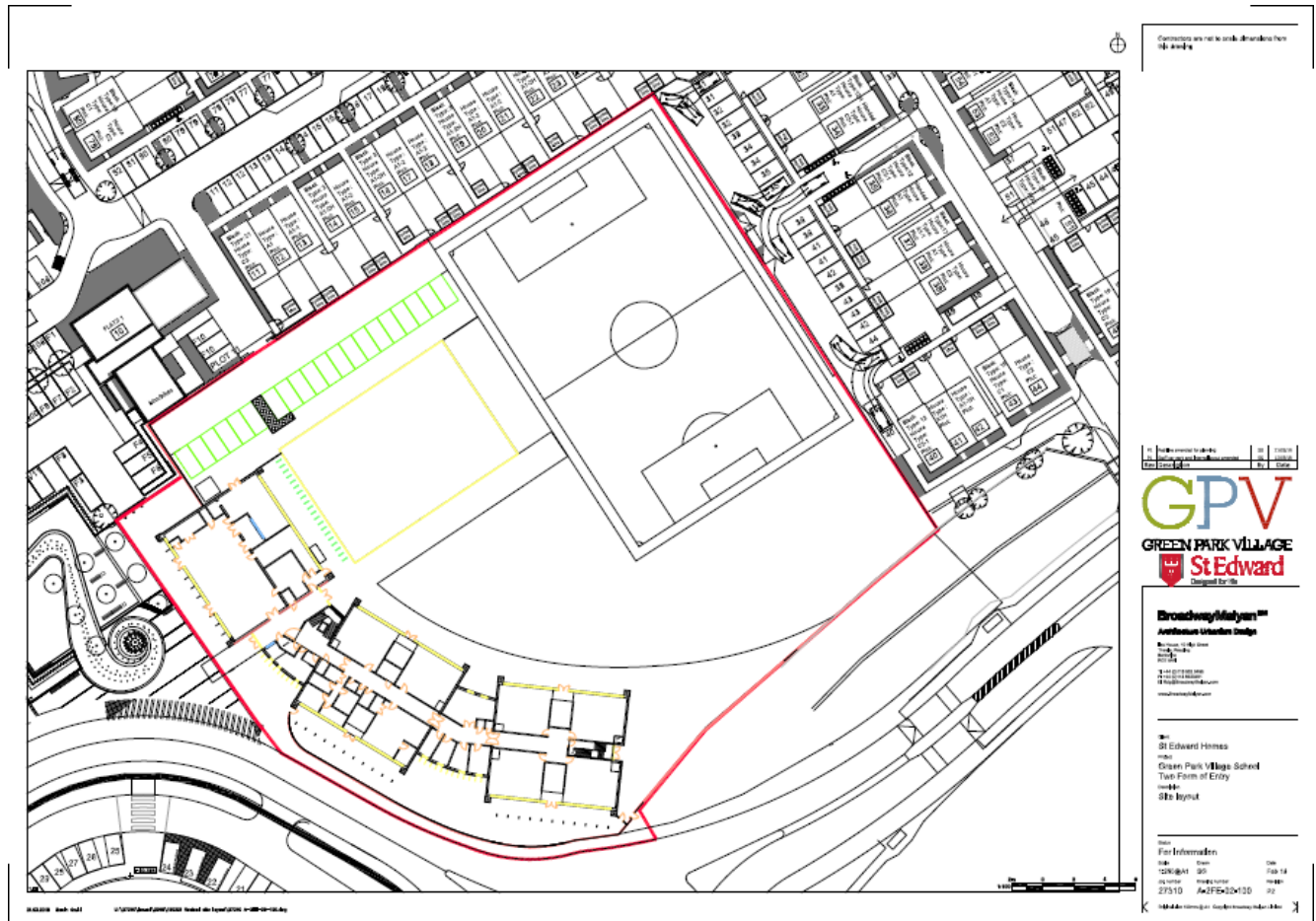


Image 1: Site location of Green Park Village School showing neighbouring properties

3. PROCESS

3.1 Background

This Assessment has been specifically designed to follow the best practice guidance as set out in the BRE publication '*Site Layout Planning for Daylight and Sunlight*'.

The BRE document offers good practice targets that Applicants are recommended to adhere to. There is no direct connection between the analysis in this report and any specific Building Regulations in England or Wales.

The conclusions and recommendations are presented for the Applicant to review with the Local Planning Authority as part of the decision process.

This Assessment uses 3D computer-drawn models to track the availability of sunlight over the course of the year. This gives a visual representation of any potential issues in relation to good levels of available daylight.

Examples of this 3D model are shown below:

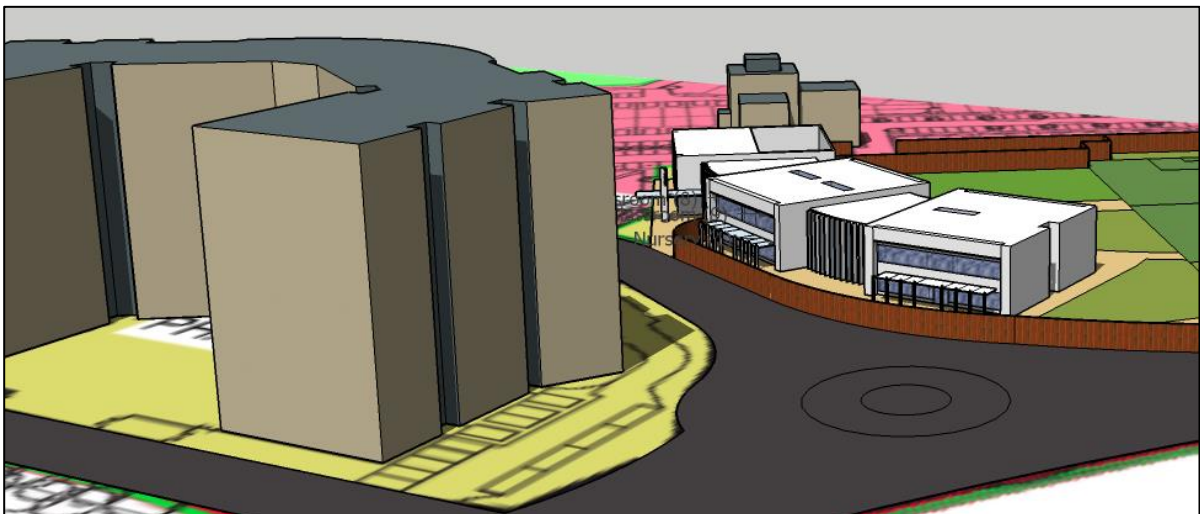


Image 2: 3D Model: Overhead view showing school (white; centre) and Extra care home (to the left).

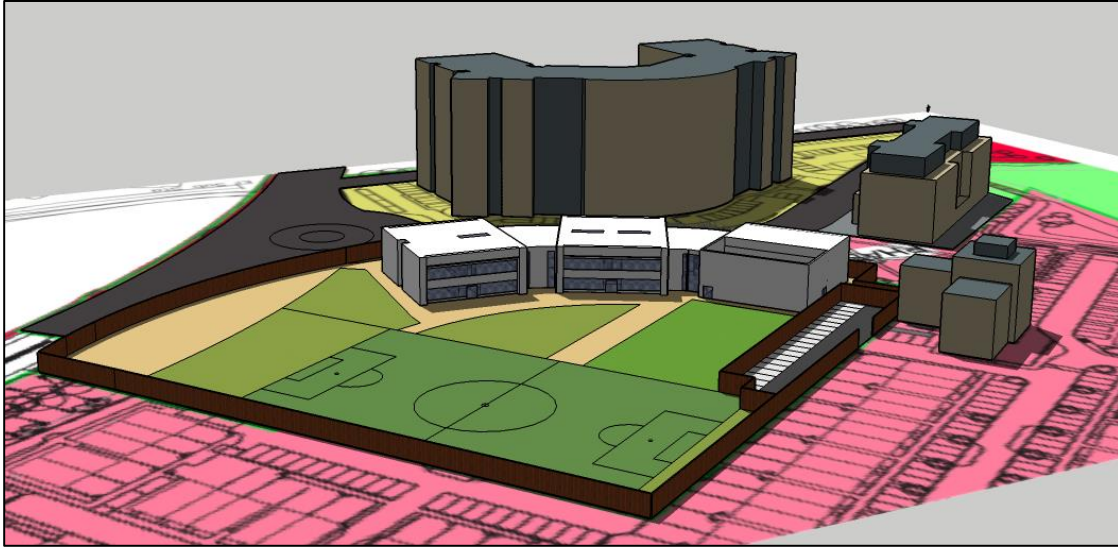


Image 3: 3D Model: View showing school building from the playground side. Shows Extra care home building in background. (Buildings which are not considered relevant to this assessment have been omitted).



Image 4: 3D Model: School building as viewed from the side of the Extra care home. External Fencing has no measured impact on the development. (Buildings which are not considered relevant to this assessment have been omitted).

3.2 Explanation of Methodologies Used

For ease of reference, this Assessment has been separated into two core sections:

- The Sunlight & Daylight Impact of the proposed development.
- The potential change in Sunlight & Daylight Impact on the proposed development from surrounding buildings.

This Assessment considers different methods to reach conclusions in line with the guidance of BRE. A summary of these methods, along with a brief description of the assessment process are listed below:

Methodology used on the proposed development only	Description of calculation
Average Daylight Factor (ADF)	The ADF assesses the amount of natural light which can enter a room. The calculation considers window sizes, internal room layouts and the height and distance of obstructions which may block light from entering the room.
No Sky Line (NSL)	The NSL assessment checks the percentage of a room which has a direct view of daylight at a height of 85cm above floor level. The calculation considers the dimensions of the room, window sizes and external obstructions to the window.
Vertical Sky Component (VSC)	The VSC measures the amount of skylight which falls on a vertical window. A lower VSC means less natural light will access a room. The 3D model of the Development is superimposed over a 'Skylight Indicator' template to show where shading is expected.
Single façade room depth	This check applies only to rooms lit by windows on a single façade to ensure the back of the room will not appear gloomy. The depth of the room should not exceed the limiting value given by:

	$\frac{L}{W} + \frac{L}{H} < \frac{2}{1-R_b}$ Where W is the room width, L is the room depth, H is the window head height and R_b is the average reflectance of surfaces.
Summer Overheating Analysis (SOA)	A Simplified Building Energy Model (SBEM) Calculation has been completed on the proposed school to provide an indication if the building may be prone to overheating in summer months. This calculation considers the thermal mass and U-Values of construction, orientation and size of windows, and build quality (predicted air permeability).
Annual Probable Sunlight Hours (APSH)	APSH analysis shows the amount of direct sunlight which is expected to reach a specific window throughout a typical, cloud free day. In line with BRE Guidance, the Sunpath used is based on March 21st – the Spring Equinox – as this is the average Sunpath throughout the year. The 3D model of the Development is superimposed over a 'Sunlight Availability Indicator' to show where the window will not receive sunlight due to obstructions. This is assessed at a height of 1.6 metres above ground level.
Sun on the Ground (SotG)	The SotG assesses the amount of sunlight expected at the centre-point of the developments external leisure areas, at a height of 1.5 metres. The 3D model of the Development is superimposed over a Sun-on-the-Ground Indicator template. The Sunpath used is based on March 21st – the Spring Equinox – as this is the average Sunpath throughout the year.
Solar Energy Overshadowing (SEO)	The SEO analysis has been carried out on a south facing window of a habitable room of the proposed development. The angle of obstruction is checked to see how much direct sunlight will be received. This check specifically looks at available sunlight in winter months.

Annual Sunlight Tracker	This applies to the three worst-case performing rooms in the school building. The Annual Sunlight Tracker is a visual representation which shows, throughout the course of a year, how much direct sunlight will be received by the glazed areas of the classrooms. The tracker shows, hour-by-hour, month-by-month when the window is expected to be in full sunlight, partially shaded and receiving no sunlight at all.
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Table 1: Summary of methodology to be used on the proposed development.

4. IMPACT FOR THE NEW DEVELOPMENT

THE QUANTITY AND QUALITY OF DAYLIGHT INSIDE A ROOM
WILL BE IMPAIRED IF OBSTRUCTING BUILDINGS ARE
LARGE IN RELATION TO THEIR DISTANCE AWAY.
THE DISTRIBUTION OF LIGHT IN THE ROOM WILL BE
AFFECTED AS WELL AS THE TOTAL AMOUNT RECEIVED.

Site Layout Planning for Daylight and Sunlight - BRE

4.1 Introduction

There are two stages when assessing the daylight and sunlight impact for a new development.

Firstly, the available light to specific windows is considered – this is known as 'Light from the Sky' calculations.

Next, general checks are completed on the proposed development to ensure good overall natural light levels.

Combined, these reviews consider the proximity and size of nearby obstacles in relation to the proposed development, as well as window sizes and internal room layouts.

To assess the Light from the Sky, there are three separate methods:

- The Average Daylight Factor (ADF)
- The Vertical Sky Component (VSC)
- No Sky Line assessment (NSL)

For the purposes of this calculation, not all windows need to be assessed. Only rooms considered as regularly occupied areas will be considered. In this case, classrooms and hall areas will be considered within the calculation. Corridors and store rooms will be omitted.

For the purposes of this calculation, the following windows have been assessed:



Image 5: Windows assessed under the Light from the Sky calculation for the school building at the Green Park Village development

- Window 01: Nursery 1
- Window 02: Classroom 2
- Window 03: Classroom 3
- Window 04: Classroom 4
- Window 05: Classroom 5
- Window 06: Classroom 6
- Window 07: Classroom 7
- Window 08: Classroom 8
- Window 09: Classroom 9
- Window 10: Classroom 10
- Window 11: Classroom 11
- Window 12: Classroom 12
- Window 13: Classroom 13
- Window 14: Classroom 14
- Window 15: Classroom 15

As well as the 15 assessments used to measure Light from The Sky on specific windows, the following, more general checks have also been completed.

- Single façade room depth
- Summer Overheating Analysis (SOA)
- Annual Probable Sunlight Hours (APSH)
- Sun on the Ground (SotG)
- Solar Energy Overshadowing (SEO)

Definitions of the various methods are listed in Section 3.

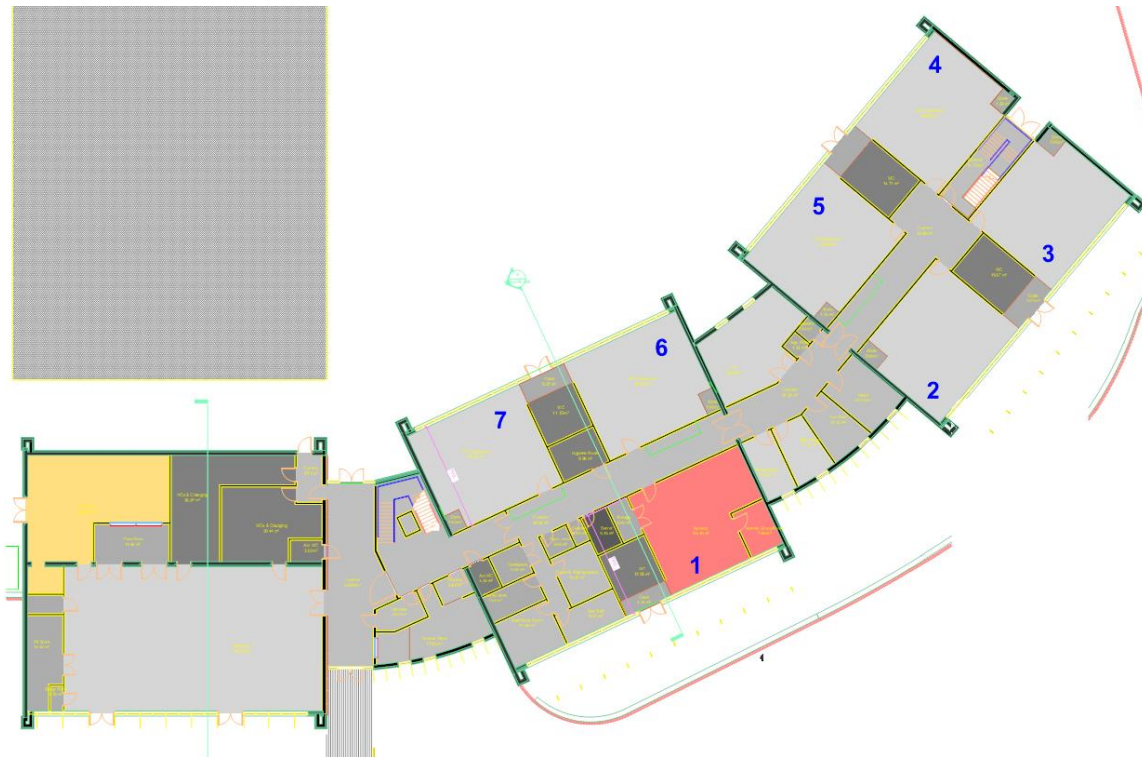


Image 6: Ground Floor Classrooms assessed for the school building at the Green Park Village development.

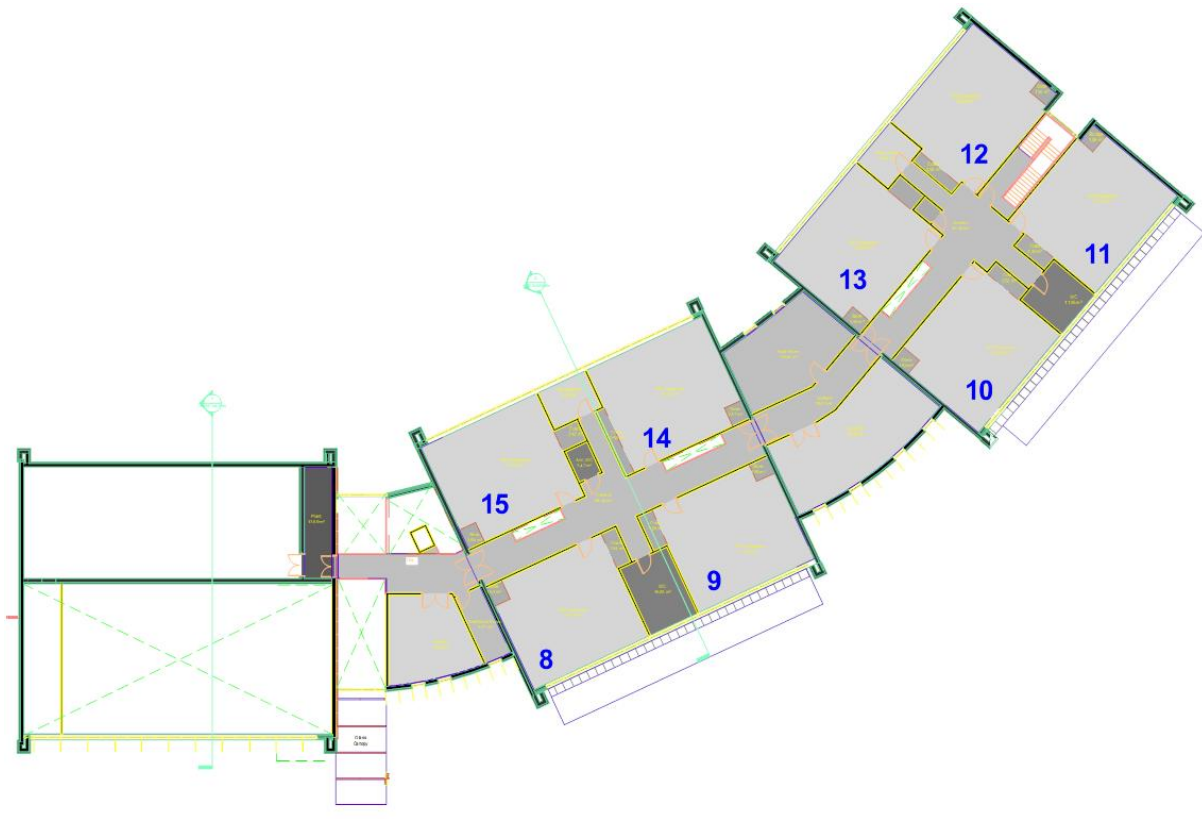


Image 6: First Floor Classrooms assessed for the school building at the Green Park Village development.

4.2 Average Daylight Factor

Guidance from BRE suggests rooms in a new non-residential building will have sufficient levels of natural light providing the ADF is better than:

- Up to 5.0% for rooms that require a well daylit space
- 2.0% - 4.0% for rooms which require good daylit spaces
- 2.0% for domestic spaces. A partly daylit space
- 1.0% for bedrooms / dormitories
- Other rooms do not need to be assessed

These are not specific targets that must be achieved in order to achieve compliance, although BS 8206-2 sets out a minimum ADF of 2.0% for domestic spaces. The recommended levels are to be used as a guide that can be compared to the calculated figure for the building.

ADF Calculations are shown in **Appendix 2**.

School	ADF (%)	Target (%)
Nursery 01	1.87	2.00
Classroom 02	3.40	2.00
Classroom 03	3.08	2.00
Classroom 04	1.87	2.00
Classroom 05	2.21	2.00
Classroom 06	2.28	2.00
Classroom 07	3.30	2.00
Classroom 08	2.32	2.00
Classroom 09	2.31	2.00
Classroom 10	3.61	2.00
Classroom 11	3.66	2.00
Classroom 12	3.32	2.00
Classroom 13	3.32	2.00
Classroom 14	3.34	2.00
Classroom 15	4.09	2.00

Table 2: ADF results for the proposed school building

4.3 No Sky Line

BRE recommends 80% of a room should have direct sight of natural light when measured at a height of 0.85 metres above floor level. If not, it is deemed that supplementary electric lighting will be required.

NSL Calculations are shown in **Appendix 2**.

School	NSL (%)	Target (%)
Nursery 01	46.7	80.0
Classroom 02	100.0	80.0
Classroom 03	100.0	80.0
Classroom 04	100.0	80.0
Classroom 05	100.0	80.0
Classroom 06	100.0	80.0
Classroom 07	100.0	80.0
Classroom 08	100.0	80.0
Classroom 09	100.0	80.0
Classroom 10	100.0	80.0
Classroom 11	100.0	80.0
Classroom 12	100.0	80.0
Classroom 13	100.0	80.0
Classroom 14	100.0	80.0
Classroom 15	100.0	80.0

Table 3: NSL results for the school building

4.4 Vertical Sky Component

BRE does not set out recommended VSC targets, however a room with a VSC greater than 27% will give reasonable amounts of daylight.

Anything less, and the Applicant may wish to consider larger windows, or changes to the room layout, to improve access to natural light.

The VSC is always calculated using the centre point of the lowest window of a habitable room (kitchen, living room or bedroom).

VSC Calculations are shown in **Appendix 2**.

School	VSC (%)	Target (%)
Nursery 01	15.0	27.0
Classroom 02	35.0	27.0
Classroom 03	35.0	27.0
Classroom 04	35.0	27.0
Classroom 05	35.0	27.0
Classroom 06	35.0	27.0
Classroom 07	35.0	27.0
Classroom 08	18.0	27.0
Classroom 09	18.0	27.0
Classroom 10	35.0	27.0
Classroom 11	35.0	27.0
Classroom 12	35.0	27.0
Classroom 13	35.0	27.0

Classroom 14	35.0	27.0
Classroom 15	35.0	27.0

Table 4: NSL results for the school building. Calculations are shown in **Appendix 2**.

4.5 Single Façade Room Depth

This check applies only to rooms lit by windows on a single façade. The depth of the room should not exceed the limiting value given by:

Plot 01	$(L/W) + (L/H)$	$2 / (1-R_b)$	Check
Nursery 01	4.49	4.00	Over
Classroom 02	4.40	4.00	Over
Classroom 03	4.41	4.00	Over
Classroom 04	4.51	4.00	Over
Classroom 05	4.45	4.00	Over
Classroom 06	4.59	4.00	Over
Classroom 07	4.59	4.00	Over
Classroom 08	2.45	4.00	OK
Classroom 09	2.45	4.00	OK
Classroom 10	2.48	4.00	OK
Classroom 11	2.44	4.00	OK
Classroom 12	2.29	4.00	OK

Classroom 13	2.29	4.00	OK
Classroom 14	2.35	4.00	OK
Classroom 15	2.35	4.00	OK

Table 5: Single façade room depth assessment for the school building.

4.6 Summer Overheating Analysis (SOA) – Solar Gains

So far, the focus of these assessments has been to consider how the design of the development will provide the occupiers with good levels of sunlight.

However, it is possible to have too much sunlight, which can lead to a risk of the development overheating.

This development has been designed with the following in mind:

- Approximately half of all teaching rooms in the development have a main window within 90 degrees of due south. This is the best orientation for receiving sunlight, and homes or developments without windows facing this orientation are perceived as insufficiently sunlit.
- As this is a large development, it is recommended that taller, more populated areas are positioned at the north of the site. Low-rise, larger buildings should be positioned in the south.
- In school buildings, access corridors should be positioned in the core of the building. This allows the teaching areas to benefit from greater glazed areas.
- As covered previously, the Average Daylight Factor for these classrooms range between 1.8 – 4. Any room with an ADF calculated above 6.0 is considered to have excessive levels of sunlight, and could be at risk from overheating in summer months.

An SBEM calculation has been completed on the school building. Part of this assessment measures the risk of overheating. Building with consistently high internal temperatures in summer months will be uncomfortable to work in.

The SBEM BRUKL report has concluded that no key rooms within the school are expected to be at risk of excessive solar gains.

The SBEM BRUKL document is included in **Appendix 5**.

4.7 Annual Probable Sunlight Hours (APSH)

Previous sections of this report have shown potential concerns regarding daylight availability for some of the classrooms within the school building due to the height and proximity of the Extra care home. To provide further clarity, analysis on the APSH has been completed.

To assess the APSH, a plan of the development is superimposed over a Sunlight Availability Indicator. This Indicator features 100 points, or nodes, of potential sunlight as measured on the Spring Equinox (March 21st).

In the case of new buildings, BRE recommends that:

- At least 25% of nodes in total are unobstructed
- And at least 5% of nodes under the equinox line are unobstructed

APSH Calculations are shown in **Appendix 4**.

GPV School	Unobstructed nodes	Recommendation
Nursery 1	No obstructed nodes	At least 25% At least 5%
Window 8	No obstructed nodes	At least 25% At least 5%
Window 9	No obstructed nodes	At least 25% At least 5%

Table 6: Summer Overheating results for Green Park Village School

4.8 Sun on the Ground (SotG)

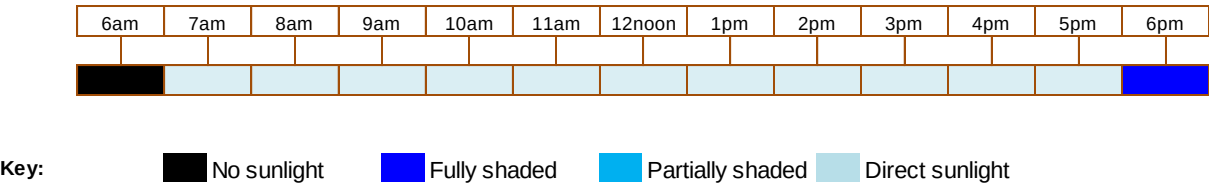
This section looks at the availability of natural light in open spaces. This may consider private gardens or communal outdoor spaces.

Sunlight in these outdoor areas is valuable for occupants, as it provides an attractive sunlit space for outdoor activities, encourages plant growth, dries out the ground and provides drying space for clothes.

The Applicant may wish to consider:

- North facing spaces are better suited for car parking.
- As this is a large development, it is recommended that taller, more populated areas are positioned at the north of the site. Low-rise, larger buildings should be positioned in the south.

Based on established criteria (as listed in Section 3), BRE recommends the assessment should so a minimum of two hours direct sunlight



	Calculated (Hours)	Recommended (Hours)
Playground of School	9.0 hours	2.0 hours

Table 7: Sun on the Ground summary

4.9 Solar Energy Overshadowing (SEO)

This section offers design recommendations for making the most of the sun's energy.

The Applicant may wish to consider:

- Using passive building designs to capture solar energy
- Make the most of solar gains by installing large levels of glazing to face within 30 degrees of due south
- Consider the installation of solar thermal or solar photovoltaic panels to use the sun's energy to provide hot water or energy for the building
- If possible, position the building so it is north / south facing.
- Consider the location of trees and other buildings to minimise the risk of overshadowing

To assess the risk of overshadowing on the building, an SEO calculation can be completed.

BRE recommends the window will receive at least three hours of direct sunlight around the middle of the day. This assessment does not take into account climatic conditions, and assumes clear skies at all times.

This calculation considers four stepped targets:

- At least three hours of sunlight all year
- At least three hours of sunlight from January to November
- At least three hours of sunlight from February to November
- At least three hours of sunlight from February to October

The winter months are gradually removed from the target, as the climate is less likely to provide decent levels of sunlight and warmth.

Nursery (1)	Calculated Hours	Days Achieved	Targeted Hours	Difference
Three hours (Jan-Dec)	0	0	3	Under
Three hours (Jan-Nov)	0	0	3	Under
Three hours (Feb-Nov)	0	0	3	Under
Three hours (Feb-Oct)	0	0	3	Under

Classroom (8)	Calculated Hours	Days Achieved	Targeted Hours	Difference
Three hours (Jan-Dec)	29	7	3	OK
Three hours (Jan-Nov)	28	7	3	OK
Three hours (Feb-Nov)	27	7	3	OK
Three hours (Feb-Oct)	23	7	3	OK

Classroom (9)	Calculated Hours	Days Achieved	Targeted Hours	Difference
Three hours (Jan-Dec)	40	6	3	OK
Three hours (Jan-Nov)	39	6	3	OK
Three hours (Feb-Nov)	39	6	3	OK
Three hours (Feb-Oct)	37	6	3	OK

Table 8: SotG results for the three worst case glazed areas.

4.10 Annual Sunlight Tracker

To provide a more visual analysis of the expected levels of direct sunlight achieved by the worst-case performing windows on this development, annual sunlight tracker diagrams have been created.

The assessments have been completed on the Nursery Room, and Classrooms 8 & 9, as these are believed to be the rooms which are going to see most of the impact of the surrounding buildings.

The tracker assesses the hour-by-hour availability of direct sunlight on the glazed area, and shows whether there is direct sunlight, partial sunlight and no sunlight.

To take into consideration the change of solar path throughout the year, this assessment is remodelled for each month of the year.

The Annual Sunlight Trackers for the three windows are shown in **Appendix 3**.

There are no predefined targets or requirements to meet in this section. Conclusions and tables can be used as a quick visual guide to the expected levels of direct sunlight available for the assessed rooms.

5. IMPACT FOR EXISTING BUILDINGS

**IN DESIGNING A NEW DEVELOPMENT OR EXTENSION TO A BUILDING, IT IS IMPORTANT TO SAFEGUARD THE DAYLIGHT TO NEARBY BUILDINGS.
A BADLY PLANNED DEVELOPMENT MAY MAKE ADJOINING PROPERTIES GLOOMY AND UNATTRACTIVE.**

Site Layout Planning for Daylight and Sunlight - BRE

5.1 Introduction

If an existing building is to be overlooked by the proposed development, and currently has good levels of sunlight, the occupiers may be concerned that their access to natural light will be noticeably reduced.

This section has not been assessed, as it is not appropriate for this development for the following reasons:

- There are no immediate concerns about how the proposed school building will impact the expected access to daylight and sunlight of existing neighbouring buildings.

6. IMPACT ON FUTURE DEVELOPMENTS

**A WELL DESIGNED BUILDING WILL STAND A REASONABLE
DISTANCE BACK FROM THE BOUNDARIES SO AS TO
ENABLE FUTURE NEARBY DEVELOPMENTS TO ENJOY A
SIMILAR ACCESS TO DAYLIGHT.**

**BY DOING SO IT WILL ALSO KEEP ITS OWN NATURAL LIGHT
WHEN THE ADJOINING LAND IS DEVELOPED.**

Site Layout Planning for Daylight and Sunlight - BRE

6.1 Introduction

If the proposed development is built close to the boundary line of an adjoining plot of land, there is a risk that future developments could suffer with low levels of natural light as a result of the current proposal.

It is not possible to predict the size and location of future developments, so as a rule of thumb the proposed building is mirrored along the boundary line.

If this notional reflection is believed to cause an issue by reducing the amount of available natural light, the Applicant should consider, where possible, moving the location of the building away from the boundary line, or reducing the height of the building.

This section has not been assessed, as it is not appropriate for this development for the following reasons:

- The proposed construction work is part of an existing development, and its location on site cannot be adjusted.
- The proposed construction work is surrounded by existing buildings, and is therefore not close to a boundary of potential future development.

7. CONCLUSIONS

Methodology	Conclusions
Average Daylight Factor (ADF)	Out of the 15 windows assessed the ADF is exceeded on 13 of them (86%). This means the rooms will have sufficient access to natural light without the requirement for additional lighting. The remaining windows are marginally short of the requirements (13%), however, the developer will incorporate into the design a suitable strategy for providing additional electric lighting with adequate controls to ensure that acceptable levels of light are experienced in the classrooms when required.
No Sky Line (NSL)	The NSL is 100% for all rooms with exception of the Nursery Room. This means all other assessed rooms have a direct sight of sky (at 85cm above ground level). Alternative designs for the nursery have been explored, but as a result of the educational requirement for a covered play space for this part of the building, the NSL recommendation is not practically achievable. The NSL result for the nursery room should be considered against the requirement to provide a covered educational space.
Vertical Sky Component (VSC)	The VSC is greater than 27% for 12 of the 15 assessed glazed areas. This will give reasonable levels of daylight. The remaining windows are again just short of the recommended target. Larger windows have been considered by the developer, however, this has not been deemed as a practical approach, as a result, careful room design and suitable lighting systems will be used to minimise the impact on the room occupants.
Single façade room depth	All of the assessed glazing relates to single façade rooms. The amount of available daylight to the upper floors is sufficient given the depth of the room. As covered by the previous ADF and VSC Calculations, the developer is aware that the amount of natural daylight in some areas must be compensated by ensuring lighting systems and internal design is sufficient to offset the amount of available natural light and has considered this as part of the current design.

Summer Overheating Analysis (SOA)	The solar gains analysis taken from the SBEM Calculations shows a consistent improvement over the Part L Target calculations. The Average Daylight Factor is less than 6.0 which means the habitable rooms are not expected to have excessive levels of direct sunlight. It is not expected that these rooms will experience uncomfortable levels of overheating from solar gains.
Annual Probable Sunlight Hours (APSH)	The analysis of Annual Probable Sunlight Hours has shown there is no obstruction to sunlight within the target depth.
Sun on the Ground (SotG)	The centre of the proposed Leisure Area is expected to receive 9 hours of direct sunlight. This far exceeds the minimum recommendation of two hours.
Solar Energy Overshadowing (SEO)	All but one of the classrooms has been designed in such a way that the glazing will receive at least three hours of sunlight on any clear day, at any point throughout the year. The Solar Energy Overshadowing calculation shows the Nursery Room falls short of this recommendation. As noted in previous conclusions the light levels for the Nursery Room will be compensated via electric lighting and a practical design to offset the inclusion of the covered play space which is a requirement for this building type.
Annual Sunlight Tracker	The analysis shows the window of the Nursery Room is not expected to receive full sunlight at any time through the year. The window is constantly partially shaded by the neighbouring Extra care home building and the covered play space situated directly adjacent to the building. Classroom 8 is shown to receive direct sunlight during the afternoon, but will be partially or completely shaded in the mornings, and all day in some winter months. Similarly, Classroom 9 does not receive direct sunlight early on, but will receive sunlight in the afternoons and evenings in the summer and spring months. All other rooms are considered to have suitable levels of natural light without the need for further analysis.

APPENDIX 1

Glossary of terminology:

ADF – Average Daylight Factor.

Assesses the amount of natural light which can enter a room. The calculation considers window sizes, internal room layouts and the height and distance of obstructions which may block light from entering the room.

APSH – Annual Probable Sunlight Hours.

A calculation which involves overlaying a plan of the development over a Sunlight Availability Indicator. These indicators feature 100 nodes of potential sunlight as measured on the Spring Equinox (March 21st).

BER – Building Emission Rate.

The expected CO₂ production of the regulated energy use for a non-residential building, measured in kilograms of CO₂ per square metre per year.

BRE – Building Research Establishment.

Authors of the publication: 'Site Layout Planning for Daylight and Sunlight'. This Energist document follows the process and recommendations used

DER – Dwelling Emission Rate.

The expected CO₂ production of the regulated energy use for a residential building, measured in kilograms of CO₂ per square metre per year.

NSL – No Sky Line.

The No Sky Line assessment checks the percentage of a room which has direct sight of natural light at a height of 85cm above floor level. It is recommended that 80% of the room has a direct sight of natural light. If not, it is highly likely that supplementary electric lighting will be required.

SAP – Standard Assessment Procedure.

Used for calculating emission targets in line with Approved Document Part L for residential developments.

SBEM – Simplified Building Energy Model.

Used for calculating emission targets in line with Approved Document Part L for non-residential developments.

TER – Target Emission Rate

The notionally calculated CO₂ production of the regulated energy use for a building, measured in kilograms of CO₂ per square metre per year.

VSC – Vertical Sky Component.

The Vertical Sky Component measures the amount of skylight which falls on a vertical window. A lower Vertical Sky Component means less natural light within a room.

HIGHLIGHTED TEXT THROUGHOUT THIS
DOCUMENT IS TAKEN FROM THE BRE
PRESS PUBLICATION:

SITE LAYOUT PLANNING FOR DAYLIGHT
AND SUNLIGHT – A GUIDE TO GOOD
PRACTICE (SECOND EDITION)

APPENDIX 2 – IMPACT FOR THE NEW DEVELOPMENT

Window in Nursery

Room Data

Average room height	3.50 m
Room area	56.6 m ²
Room reflectance	0.50

External wall thickness	0.35 m
Internal wall perimeter	30.2 m

Window Data

	Window Area (m ²)	Sill to ground (m)	Window height (m)	Frame factor (%)	Transmittance (%)	Room Depth (m)
Opening 1:	12.10	0.45	2.00	0.90	0.00	8.12
Opening 2:						
Opening 3:						
Opening 4:						
Opening 5:						

Obstacle Data

	Height (m)	Ground Level (m)	Adjusted Height (m)	Distance Away (m)
Obstacle 1:	33.45	0.00	33.45	33.45
Obstacle 2:				
Obstacle 3:				
Obstacle 4:				
Obstacle 5:				

Tree Data

	Type	Height (m)	Ground Level (m)	Adjusted Height (m)	Distance Away (m)
Tree 1:					
Tree 2:					
Tree 3:					
Tree 4:					
Tree 5:					

Average Daylight Factor:

	Glazed Area (A _{gl})	Transmittance (T)	Reflectance (R)	Dirt Correction (M)	Room Envelope (A)
ADF = $\frac{TMA_{\theta}}{A(1-R^2)}$	10.89 m ²	0.68 %	0.50 %	0.90 %	218.72 m ²
Calculated:	0.00%		Target:	6.00%	

Visible Sky Component:

Visible Sky Component:	Angle θ
	46.01 °
Calculated:	15%

Room Depth:

	Room Width (W)	Window height above floor (H)	Reflectance (R)
For single façade rooms only	0.00 m	2.45 m	0.50 %
Calculated:	4.49%		> 4.00%

No Sky Line

No Sky Line	Height (H)	Length (Y)	Length (X)	Distance (D)
d = xh/y	2.45 m	21.62 m	33.45 m	3.79 m
Calculated:		0%	Target:	80%

Window in Classroom 2

Room Data

Average room height	3.50 m
Room area	60.7 m ²
Room reflectance	0.50

External wall thickness	0.35 m
Internal wall perimeter	31.2 m

Window Data

	Window Area (m ²)	Sill to ground (m)	Window height (m)	Frame factor (%)	Transmittance (%)	Room Depth (m)
Opening 1:	13.31	0.45	2.00	0.90	0.00	8.12
Opening 2:						
Opening 3:						
Opening 4:						
Opening 5:						

Obstacle Data

	Height (m)	Ground Level (m)	Adjusted Height (m)	Distance Away (m)
Obstacle 1:	0.00	0.00	0.00	0.00
Obstacle 2:				
Obstacle 3:				
Obstacle 4:				
Obstacle 5:				

Tree Data

	Type	Height (m)	Ground Level (m)	Adjusted Height (m)	Distance Away (m)
Tree 1:					
Tree 2:					
Tree 3:					
Tree 4:					
Tree 5:					

Average Daylight Factor:

	Glassed Area (A _g)	Transmittance (T)	Reflectance (R)	Dirt Correction (d)	Room Envelope (A)
ADF = $\frac{TMA_g \theta}{A(1-R^2)}$	11.98 m ²	0.68 %	0.50 %	0.90 %	230.43 m ²
Calculated:	0.00%		Target:	6.00%	

Visible Sky Component:

	Angle θ
	80.07 °
Calculated:	35%

Room Depth:

	Room Width (W)	Window height above floor (H)	Reflectance (R)
For single façade rooms only	0.00 m	2.45 m	0.50 %
	4.40%		> 4.00%

No Sky Line

No Sky Line	Height (H)	Length (Y)	Length (X)	Distance (D)
d = xh/y	FALSE m	0.00 m	0.00 m	0.00 m
Calculated :	0%		Target:	80%

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Window in Classroom 3

Room Data

Average room height	3.50 m
Room area	61.4 m ²
Room reflectance	0.50

External wall thickness	0.35 m
Internal wall perimeter	37.5 m

Window Data

	Window Area (m ²)	Sill to ground (m)	Window height (m)	Frame factor (%)	Transmittance (%)	Room Depth (m)
Opening 1:	13.31	0.45	2.00	0.90	0.00	8.12
Opening 2:						
Opening 3:						
Opening 4:						
Opening 5:						

Obstacle Data

	Height (m)	Ground Level (m)	Adjusted Height (m)	Distance Away (m)
Obstacle 1:	0.00	0.00	0.00	0.00
Obstacle 2:				
Obstacle 3:				
Obstacle 4:				
Obstacle 5:				

Tree Data

	Type	Height (m)	Ground Level (m)	Adjusted Height (m)	Distance Away (m)
Tree 1:					
Tree 2:					
Tree 3:					
Tree 4:					
Tree 5:					

Average Daylight Factor:

	Glazed Area (A _g)	Transmittance (T)	Reflectance (R)	Dirt Correction (M)	Room Envelope (A)
ADF = $\frac{TMA_{g0}}{A(1-R^2)}$	11.98 m ²	0.68 %	0.50 %	0.90 %	253.97 m ²
Calculated:	0.00%		Target:	6.00%	

Visible Sky Component:

	Angle ϕ
	80.07 °
Calculated:	35%

Room Depth:

	Room Width (W)	Window height above floor (H)	Reflectance (R)
For single facade rooms only	0.00 m	2.45 m	0.50 %
	4.41%		> 4.00%

No Sky Line

No Sky Line	Height (H)	Length (Y)	Length (X)	Distance (D)
d = xh/y	FALSE m	0.00 m	0.00 m	0.00 m
Calculated:		0%	Target:	80%

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Window in Classroom 4

Room Data

Average room height	3.50 m	External wall thickness	0.35 m
Room area	62.7 m ²	Internal wall perimeter	37.9 m
Room reflectance	0.50		

Window Data

	Window Area (m ²)	Sill to ground (m)	Window height (m)	Frame factor (%)	Transmittance (%)	Room Depth (m)
Opening 1:	12.06	0.45	2.00	0.90	0.00	8.22
Opening 2:						
Opening 3:						
Opening 4:						
Opening 5:						

Obstacle Data

	Height (m)	Ground Level (m)	Adjusted Height (m)	Distance Away (m)
Obstacle 1:	0.00	0.00	0.00	0.00
Obstacle 2:				
Obstacle 3:				
Obstacle 4:				
Obstacle 5:				

Tree Data

	Type	Height (m)	Ground Level (m)	Adjusted Height (m)	Distance Away (m)
Tree 1:	Sycamore	9.00	0.00	9.00	12.12
Tree 2:					
Tree 3:					
Tree 4:					
Tree 5:					

Average Daylight Factor:

	Glassed Area (A _g)	Transmittance (T)	Reflectance (R)	Dirt Correction (M)	Room Envelope (A)
ADF = $\frac{TMA_g}{A(1-R^2)}$	10.85 m ²	0.68 %	0.50 %	0.90 %	258.03 m ²
Calculated:	0.00%		Target:	6.00%	

Visible Sky Component:

Angle θ
80.07 °
Calculated:
35%

Room Depth:

	Room Width (W)	Window height above floor (H)	Reflectance (R)
For single façade rooms only	0.00 m	2.45 m	0.50 %
Calculated:	4.51%	>	4.00%

No Sky Line

	Height (h)	Length (Y)	Length (X)	Distance (D)
d = xh/y	FALSE m	0.00 m	0.00 m	0.00 m
Calculated:	0%		Target:	80%

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Window in Classroom 5

Room Data

Average room height	3.50 m
Room area	62.9 m ²
Room reflectance	0.50

External wall thickness	0.35 m
Internal wall perimeter	31.8 m

Window Data

	Window Area (m ²)	Sill in ground (m)	Window height (m)	Frame factor (%)	Transmittance (%)	Room Depth (m)
Opening 1:	13.11	0.45	2.00	0.90	0.00	8.22
Opening 2:						
Opening 3:						
Opening 4:						
Opening 5:						

Obstacle Data

	Height (m)	Ground Level (m)	Adjusted Height (m)	Distance Away (m)
Obstacle 1:	0.00	0.00	0.00	0.00
Obstacle 2:				
Obstacle 3:				
Obstacle 4:				
Obstacle 5:				

Tree Data

	Type	Height (m)	Ground Level (m)	Adjusted Height (m)	Distance Away (m)
Tree 1:	Sycamore	9.00	0.00	9.00	12.12
Tree 2:					
Tree 3:					
Tree 4:					
Tree 5:					

Average Daylight Factor:

	Glassed Area (A _g)	Transmittance (T)	Reflectance (R)	Dirt Correction (M)	Room Envelope (A)
ADF = $\frac{TMA_g}{A(1-R^2)}$	11.79 m ²	0.68 %	0.50 %	0.90 %	237.03 m ²
Calculated:	0.00%		Target:	6.00%	

Visible Sky Component:

Angle θ
80.07 °
Calculated:
35%

Room Depth:

	Room Width (W)	Window height above floor (H)	Reflectance (R)
For single façade rooms only	0.00 m	2.45 m	0.50 %
Calculated:	4.45%		> 4.00%

No Sky Line

No Sky Line	Height (H)	Length (Y)	Length (X)	Distance (D)
d = xh/y	FALSE m	0.00 m	0.00 m	0.00 m
Calculated:		0%	Target:	80%

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Window in Classroom 6

Room Data

Average room height	3.50 m
Room area	62.3 m ²
Room reflectance	0.50

External wall thickness	0.35 m
Internal wall perimeter	32.0 m

Window Data

	Window Area (m ²)	Sill to ground (m)	Window height (m)	Frame factor (%)	Transmittance (%)	Room Depth (m)
Opening 1:	13.48	0.45	2.00	0.90	0.00	8.48
Opening 2:						
Opening 3:						
Opening 4:						
Opening 5:						

Obstacle Data

	Height (m)	Ground Level (m)	Adjusted Height (m)	Distance Away (m)
Obstacle 1:	0.00	0.00	0.00	0.00
Obstacle 2:				
Obstacle 3:				
Obstacle 4:				
Obstacle 5:				

Tree Data

	Type	Height (m)	Ground Level (m)	Adjusted Height (m)	Distance Away (m)
Tree 1:	Sycamore	9.00	0.00	9.00	12.12
Tree 2:					
Tree 3:					
Tree 4:					
Tree 5:					

Average Daylight Factor:

	Glassed Area (A _g)	Transmittance (T)	Reflectance (R)	Dirt Correction (M)	Room Envelope (A)
ADF = $\frac{TMA_g \theta}{A(1-R^2)}$	12.13 m ²	0.68 %	0.50 %	0.90 %	236.65 m ²
Calculated:	0.00%		Target:	6.00%	

Visible Sky Component:

	Angle θ
	80.07 °
Calculated:	35%

Room Depth:

	Room Width (W)	Window height above floor (H)	Reflectance (R)
For single façade rooms only	0.00 m	2.45 m	0.50 %
	4.59%		> 4.00%

No Sky Line

No Sky Line	Height (H)	Length (Y)	Length (X)	Distance (D)
d = xh/y	FALSE m	0.00 m	0.00 m	0.00 m
Calculated :		0%	Target:	80%

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Window in Classroom 7

Room Data

Average room height	3.50 m
Room area	62.3 m ²
Room reflectance	0.50

External wall thickness	0.35 m
Internal wall perimeter	32.0 m

Window Data

	Window Area (m ²)	Sill to ground (m)	Window height (m)	Frame factor (%)	Transmittance (%)	Room Depth (m)
Opening 1:	13.29	0.45	2.00	0.90	0.00	8.48
Opening 2:						
Opening 3:						
Opening 4:						
Opening 5:						

Obstacle Data

	Height (m)	Ground Level (m)	Adjusted Height (m)	Distance Away (m)
Obstacle 1:	0.00	0.00	0.00	0.00
Obstacle 2:				
Obstacle 3:				
Obstacle 4:				
Obstacle 5:				

Tree Data

	Type	Height (m)	Ground Level (m)	Adjusted Height (m)	Distance Away (m)
Tree 1:	Sycamore	9.00	0.00	9.00	12.12
Tree 2:					
Tree 3:					
Tree 4:					
Tree 5:					

Average Daylight Factor:

	Ground Area (A _g)	Transmittance (T)	Reflectance (R)	Dirt Correction (M)	Room Envelope (A)
ADF = $\frac{TMA_g}{A(1-R^2)}$	11.96 m ²	0.68 %	0.50 %	0.90 %	236.65 m ²
Calculated:	0.00%		Target:	6.00%	

Visible Sky Component:

Angle θ
80.07 °
Calculated:
35%

Room Depth:

	Room Width (W)	Window height above floor (H)	Reflectance (R)
For single facade rooms only	0.00 m	2.45 m	0.50 %
Calculated:	4.59%		> 4.00%

No Sky Line

No Sky Line	Height (h)	Length (Y)	Length (X)	Distance (D)
$d = xh/y$	FALSE m	0.00 m	0.00 m	0.00 m
Calculated:	0%		Target:	80%

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Window in Classroom 8

Room Data

Average room height	3.00 m	External wall thickness	0.35 m
Room area	61.6 m ²	Internal wall perimeter	31.4 m
Room reflectance	0.50		

Window Data

	Window Area (m ²)	Sill to ground (m)	Window height (m)	Frame factor (%)	Transmittance (%)	Room Depth (m)
Opening 1:	13.60	3.95	2.00	0.90	0.00	8.12
Opening 2:						
Opening 3:						
Opening 4:						
Opening 5:						

Obstacle Data

	Height (m)	Ground Level (m)	Adjusted Height (m)	Distance Away (m)
Obstacle 1:	33.57	0.00	33.57	33.57
Obstacle 2:				
Obstacle 3:				
Obstacle 4:				
Obstacle 5:				

Tree Data

	Type	Height (m)	Ground Level (m)	Adjusted Height (m)	Distance Away (m)
Tree 1:					
Tree 2:					
Tree 3:					
Tree 4:					
Tree 5:					

Average Daylight Factor:

	Glassed Area (A _g)	Transmittance (T)	Reflectance (R)	Dirt Correction (M)	Room Envelope (A)
ADF = $\frac{TMA_g \theta}{A(1-R^2)}$	12.24 m ²	0.68 %	0.50 %	0.90 %	217.49 m ²
Calculated:	0.00%		Target:	6.00%	

Visible Sky Component:

	Angle θ
	50.41 °
Calculated:	18%

Room Depth:

	Room Width (W)	Window height above floor (H)	Reflectance (R)
For single facade rooms only	0.00 m	5.95 m	0.50 %
	2.45%		< 4.00%

No Sky Line

No Sky Line	Height (H)	Length (Y)	Length (X)	Distance (D)
d = xh/y	FALSE m	0.00 m	0.00 m	0.00 m
Calculated :		0%	Target:	80%

GREEN PARK VILLAGE SCHOOL
SUNLIGHT AND DAYLIGHT IMPACT ASSESSMENT

Window in Classroom 9

Room Data

Average room height	3.00 m	External wall thickness	0.35 m
Room area	61.7 m ²	Internal wall perimeter	31.4 m
Room reflectance	0.50		

Window Data

	Window Area (m ²)	Sill to ground (m)	Window height (m)	Frame factor (%)	Transmittance (%)	Room Depth (m)
Opening 1:	13.60	3.95	2.00	0.90	0.00	8.12
Opening 2:						
Opening 3:						
Opening 4:						
Opening 5:						

Obstacle Data

	Height (m)	Ground Level (m)	Adjusted Height (m)	Distance Away (m)
Obstacle 1:	33.57	0.00	33.57	33.57
Obstacle 2:				
Obstacle 3:				
Obstacle 4:				
Obstacle 5:				

Tree Data

	Type	Height (m)	Ground Level (m)	Adjusted Height (m)	Distance Away (m)
Tree 1:					
Tree 2:					
Tree 3:					
Tree 4:					
Tree 5:					

Average Daylight Factor:

	Glassed Area (A _g)	Transmittance (T)	Reflectance (R)	Dirt Correction (M)	Room Envelope (A)
ADF = $\frac{TMA_g}{A(1-R^2)}$	12.24 m ²	0.68 %	0.50 %	0.90 %	217.65 m ²
Calculated:	0.00%		Target:	6.00%	

Visible Sky Component:

	Angle θ
	50.41 °
Calculated:	18%

Room Depth:

	Room Width (W)	Window height above floor (H)	Reflectance (R)
For single façade rooms only	0.00 m	5.95 m	0.50 %
	2.45%		< 4.00%

No Sky Line

No Sky Line	Height (H)	Length (Y)	Length (X)	Distance (D)
d = xh/y	FALSE m	0.00 m	0.00 m	0.00 m
Calculated:		0%	Target:	80%

GREEN PARK VILLAGE SCHOOL
SUNLIGHT AND DAYLIGHT IMPACT ASSESSMENT

Window in Classroom 10

Room Data

Average room height	3.00 m
Room area	59.4 m ²
Room reflectance	0.50

External wall thickness	0.35 m
Internal wall perimeter	30.9 m

Window Data

	Window Area (m ²)	Sill to ground (m)	Window height (m)	Frame factor (%)	Transmittance (%)	Room Depth (m)
Opening 1:	12.98	3.95	2.00	0.90	0.00	8.12
Opening 2:						
Opening 3:						
Opening 4:						
Opening 5:						

Obstacle Data

	Height (m)	Ground Level (m)	Adjusted Height (m)	Distance Away (m)
Obstacle 1:	0.00	0.00	0.00	0.00
Obstacle 2:				
Obstacle 3:				
Obstacle 4:				
Obstacle 5:				

Tree Data

	Type	Height (m)	Ground Level (m)	Adjusted Height (m)	Distance Away (m)
Tree 1:					
Tree 2:					
Tree 3:					
Tree 4:					
Tree 5:					

Average Daylight Factor:

	Ground Area (A _g)	Transmittance (T)	Reflectance (R)	Dirt Correction (M)	Room Envelope (A)
ADF = $\frac{TMA_g}{A(1-R)}$	11.68 m ²	0.68 %	0.50 %	0.90 %	211.45 m ²
Calculated:	0.00%		Target:	6.00%	

Visible Sky Component:

	Angle θ
	80.07 °
Calculated:	35%

Room Depth:

	Room Width (W)	Window height above floor (H)	Reflectance (R)
For single facade rooms only	0.00 m	5.95 m	0.50 %
	2.48%		< 4.00%

No Sky Line

No Sky Line	Height (H)	Length (Y)	Length (X)	Distance (D)
d = xh/y	FALSE m	0.00 m	0.00 m	0.00 m
Calculated:		0%	Target:	80%

GREEN PARK VILLAGE SCHOOL
SUNLIGHT AND DAYLIGHT IMPACT ASSESSMENT

Window in Classroom 11

Room Data

Average room height	3.00 m	External wall thickness	0.35 m
Room area	61.3 m ²	Internal wall perimeter	31.5 m
Room reflectance	0.50		

Window Data

	Window Area (m ²)	Sill in ground (m)	Window height (m)	Frame factor (%)	Transmittance (%)	Room Depth (m)
Opening 1:	13.50	3.95	2.00	0.90	0.00	8.12
Opening 2:						
Opening 3:						
Opening 4:						
Opening 5:						

Obstacle Data

	Height (m)	Ground Level (m)	Adjusted Height (m)	Distance Away (m)
Obstacle 1:	0.00	0.00	0.00	0.00
Obstacle 2:				
Obstacle 3:				
Obstacle 4:				
Obstacle 5:				

Tree Data

	Type	Height (m)	Ground Level (m)	Adjusted Height (m)	Distance Away (m)
Tree 1:					
Tree 2:					
Tree 3:					
Tree 4:					
Tree 5:					

Average Daylight Factor:

	Glassed Area (A _g)	Transmittance (T)	Reflectance (R)	Dirt Correction (d)	Room Envelope (A)
ADF = $\frac{TMA_g \theta}{A(1-R^2)}$	12.15 m ²	0.68 %	0.50 %	0.90 %	217.13 m ²
Calculated:	0.00%		Target:	6.00%	

Visible Sky Component:

	Angle θ
	80.07 °
Calculated:	35%

Room Depth:

	Room Width (W)	Window height above floor (H)	Reflectance (R)
For single façade rooms only	0.00 m	5.95 m	0.50 %
	2.44%		< 4.00%

No Sky Line

No Sky Line	Height (H)	Length (Y)	Length (X)	Distance (D)
d = xh/y	FALSE m	0.00 m	0.00 m	0.00 m
Calculated:		0%	Target:	80%

GREEN PARK VILLAGE SCHOOL
SUNLIGHT AND DAYLIGHT IMPACT ASSESSMENT

Window in Classroom 12

Room Data

Average room height	3.00 m
Room area	67.0 m ²
Room reflectance	0.50

External wall thickness	0.35 m
Internal wall perimeter	35.0 m

Window Data

	Window Area (m ²)	Sill to ground (m)	Window height (m)	Frame factor (%)	Transmittance (%)	Room Depth (m)
Opening 1:	16.56	3.95	2.00	0.90	0.00	8.23
Opening 2:						
Opening 3:						
Opening 4:						
Opening 5:						

Obstacle Data

	Height (m)	Ground Level (m)	Adjusted Height (m)	Distance Away (m)
Obstacle 1:	0.00	0.00	0.00	0.00
Obstacle 2:				
Obstacle 3:				
Obstacle 4:				
Obstacle 5:				

Tree Data

	Type	Height (m)	Ground Level (m)	Adjusted Height (m)	Distance Away (m)
Tree 1:	Sycamore	9.00	0.00	9.00	12.12
Tree 2:					
Tree 3:					
Tree 4:					
Tree 5:					

Average Daylight Factor:

	Ground Area (A _g)	Transmittance (T)	Reflectance (R)	Dirt Correction (M)	Room Envelope (A)
ADF = $\frac{TMA_g}{A(1-R^2)}$	14.90 m ²	0.68 %	0.50 %	0.90 %	238.89 m ²
Calculated:	0.00%		Target:	6.00%	

Visible Sky Component:

Angle θ
80.07 °
Calculated:
35%

Room Depth:

	Room Width (W)	Window height above floor (H)	Reflectance (R)
For single façade rooms only	0.00 m	5.95 m	0.50 %
Calculated:	2.29%		< 4.00%

No Sky Line

No Sky Line	Height (h)	Length (Y)	Length (X)	Distance (D)
d = xh/y	FALSE m	0.00 m	0.00 m	0.00 m
Calculated at:		0%	Target:	80%

GREEN PARK VILLAGE SCHOOL
SUNLIGHT AND DAYLIGHT IMPACT ASSESSMENT

Window in Classroom 13

Room Data

Average room height	3.00 m
Room area	67.0 m ²
Room reflectance	0.50

External wall thickness	0.35 m
Internal wall perimeter	35.0 m

Window Data

	Window Area (m ²)	Sill to ground (m)	Window height (m)	Frame factor (%)	Transmittance (%)	Room Depth (m)
Opening 1:	16.56	3.95	2.00	0.90	0.00	8.23
Opening 2:						
Opening 3:						
Opening 4:						
Opening 5:						

Obstacle Data

	Height (m)	Ground Level (m)	Adjusted Height (m)	Distance Away (m)
Obstacle 1:	0.00	0.00	0.00	0.00
Obstacle 2:				
Obstacle 3:				
Obstacle 4:				
Obstacle 5:				

Tree Data

	Type	Height (m)	Ground Level (m)	Adjusted Height (m)	Distance Away (m)
Tree 1:	Sycamore	9.00	0.00	9.00	12.12
Tree 2:					
Tree 3:					
Tree 4:					
Tree 5:					

Average Daylight Factor:

	Glazed Area (A _g)	Transmittance (T)	Reflectance (R)	Dirt Correction (M)	Room Envelope (A)
ADF = $\frac{TMA_g}{A(1-R^2)}$	14.90 m ²	0.68 %	0.50 %	0.90 %	238.89 m ²
Calculated:	0.00%		Target:	6.00%	

Visible Sky Component:

	Angle θ
	80.07 °
Calculated:	35%

Room Depth:

	Room Width (W)	Window height above floor (H)	Reflectance (R)
For single façade rooms only	0.00 m	5.95 m	0.50 %
	2.29%		< 4.00%

No Sky Line

No Sky Line	Height (H)	Length (Y)	Length (X)	Distance (D)
d = xh/y	FALSE m	0.00 m	0.00 m	0.00 m
Calculated:		0%	Target:	80%

GREEN PARK VILLAGE SCHOOL
SUNLIGHT AND DAYLIGHT IMPACT ASSESSMENT

Window in Classroom 14

Room Data

Average room height	3.00 m
Room area	66.6 m ²
Room reflectance	0.50

External wall thickness	0.35 m
Internal wall perimeter	35.0 m

Window Data

	Window Area (m ²)	Sill in ground (m)	Window height (m)	Frame factor (%)	Transmittance (%)	Room Depth (m)
Opening 1:	16.56	3.95	2.00	0.90	0.00	8.43
Opening 2:						
Opening 3:						
Opening 4:						
Opening 5:						

Obstacle Data

	Height (m)	Ground Level (m)	Adjusted Height (m)	Distance Away (m)
Obstacle 1:	0.00	0.00	0.00	0.00
Obstacle 2:				
Obstacle 3:				
Obstacle 4:				
Obstacle 5:				

Tree Data

	Type	Height (m)	Ground Level (m)	Adjusted Height (m)	Distance Away (m)
Tree 1:	Sycamore	9.00	0.00	9.00	12.12
Tree 2:					
Tree 3:					
Tree 4:					
Tree 5:					

Average Daylight Factor:

	Ground Area (A _g)	Transmittance (T)	Reflectance (R)	Dirt Correction (M)	Room Envelope (A)
ADF = $\frac{TMA_g\theta}{A(1-R^2)}$	14.90 m ²	0.68 %	0.50 %	0.90 %	238.08 m ²
Calculated:	0.00%		Target:	6.00%	

Visible Sky Component:

Angle θ
80.07 °
Calculated:
35%

Room Depth:

	Room Width (W)	Window height above floor (H)	Reflectance (R)
For single facade rooms only	0.00 m	5.95 m	0.50 %
Calculated:	2.35%		< 4.00%

No Sky Line

No Sky Line	Height (H)	Length (Y)	Length (X)	Distance (D)
d = xh/y	FALSE m	0.00 m	0.00 m	0.00 m
Calculated:		0%	Target:	80%

GREEN PARK VILLAGE SCHOOL
SUNLIGHT AND DAYLIGHT IMPACT ASSESSMENT

Window in Classroom 15

Room Data

Average room height	3.00 m
Room area	66.6 m ²
Room reflectance	0.50

External wall thickness	0.35 m
Internal wall perimeter	35.0 m

Window Data

	Window Area (m ²)	Sill to ground (m)	Window height (m)	Frame factor (%)	Transmittance (%)	Room Depth (m)
Opening 1:	16.56	3.95	2.00	0.90	0.00	8.43
Opening 2:						
Opening 3:						
Opening 4:						
Opening 5:						

Obstacle Data

	Height (m)	Ground Level (m)	Adjusted Height (m)	Distance Away (m)
Obstacle 1:	0.00	0.00	0.00	0.00
Obstacle 2:				
Obstacle 3:				
Obstacle 4:				
Obstacle 5:				

Tree Data

	Type	Height (m)	Ground Level (m)	Adjusted Height (m)	Distance Away (m)
Tree 1:	Sycamore	9.00	0.00	9.00	12.12
Tree 2:					
Tree 3:					
Tree 4:					
Tree 5:					

Average Daylight Factor:

	Ground Area (A _g)	Transmittance (T)	Reflectance (R)	Dirt Correction (M)	Room Envelope (A)
ADF = $\frac{TMA_g R}{A(1-R^2)}$	14.90 m ²	0.68 %	0.50 %	0.90 %	238.08 m ²
Calculated:	0.00%		Target:	6.00%	

Visible Sky Component:

	Angle θ
	80.07 °
Calculated:	35%

Room Depth:

	Room Width (W)	Window height above floor (H)	Reflectance (R)
For single façade rooms only	0.00 m	5.95 m	0.50 %
	2.35%		< 4.00%

No Sky Line

No Sky Line	Height (H)	Length (Y)	Length (X)	Distance (D)
d = xh/y	FALSE m	0.00 m	0.00 m	0.00 m
Calculated:	0%		Target:	80%

APPENDIX 3 – ANNUAL SUNLIGHT TRACKER

Nursery (1) - Annual Sunlight Tracker

	6am	7am	8am	9am	10am	11am	12noon	1pm	2pm	3pm	4pm	5pm	6pm
January:													
February:													
March:													
April:													
May:													
June:													
July:													
August:													
September:													
October:													
November:													
December:													

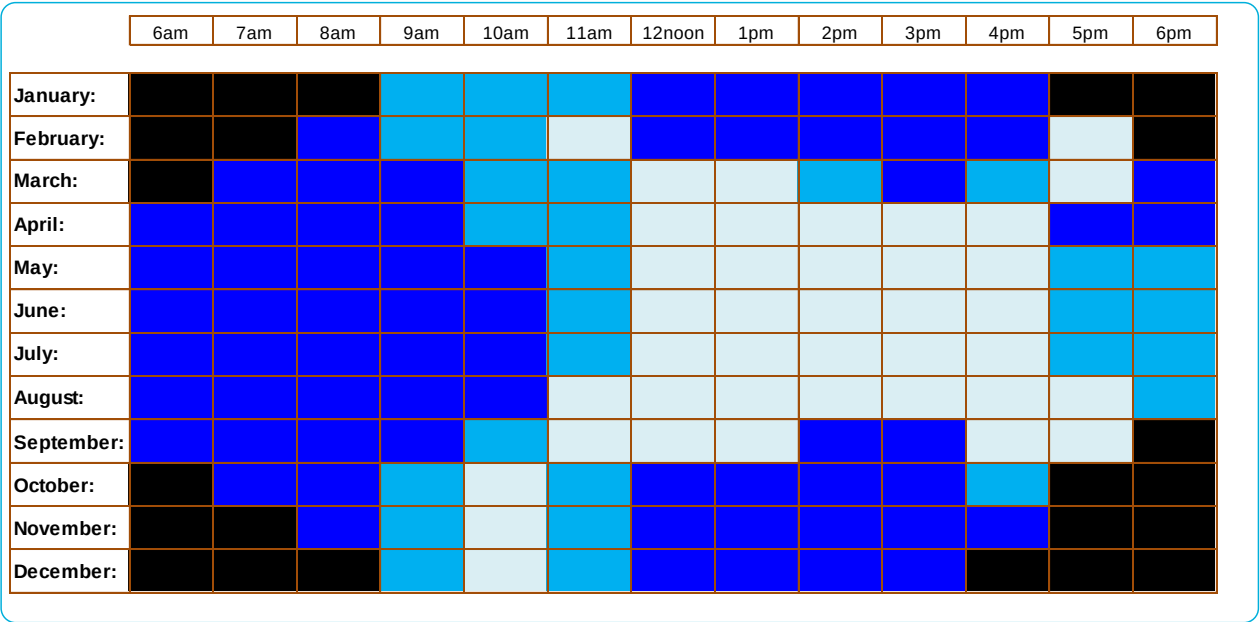
Key:  No sunlight  Fully shaded  Partially shaded  Direct sunlight

Classroom (8) - Annual Sunlight Tracker

	6am	7am	8am	9am	10am	11am	12noon	1pm	2pm	3pm	4pm	5pm	6pm
January:													
February:													
March:													
April:													
May:													
June:													
July:													
August:													
September:													
October:													
November:													
December:													

Key:  No sunlight  Fully shaded  Partially shaded  Direct sunlight

Classroom (9) - Annual Sunlight Tracker



APPENDIX 4

Annual Probable Sunlight Hours – images taken from 3D model





APPENDIX 5

SBEM BRUKL report. Criterion 3 considers the potential for overheating in key rooms.

BRUKL Output Document HM Government

Compliance with England Building Regulations Part L 2013

Project name

Green Park School

As designed

Date: Tue Mar 06 14:37:21 2018

Administrative information

Building Details

Address: Green Park Village School, Longwater Avenue,
READING, RG2

Owner Details

Name: Berkley Homes (Western) Ltd
Telephone number: na
Address: 200 Longwater Avenue, Reading, RG2 6GB

Certification tool

Calculation engine: SBEM
Calculation engine version: v5.3.a.0
Interface to calculation engine: Design Database
Interface to calculation engine version: v26.06.00.05
BRUKL compliance check version: v5.3.a.0

Certifier details

Name: Steve Hull
Telephone number: 08458 386 387
Address: Energist UK, College Farm, Tetbury Road,
Cirencester, GL7 6PY

Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	23.6
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	23.6
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	20
Are emissions from the building less than or equal to the target?	BER ≤ TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	U _{a,Limit}	U _{a,Calc}	U _{i,Calc}	Surface where the maximum value occurs*
Wall**	0.35	0.15	0.15	CIRC FF Wall 1
Floor	0.25	0.1	0.1	CIRC1 GF Exposed Floor 1
Roof	0.25	0.1	0.1	CIRC FF Exposed Roof 1
Windows***, roof windows, and rooflights	2.2	1.4	1.4	CIRC FF Window 1
Personnel doors	2.2	2.2	2.2	CIRC FF Door 1 (Personnel Door)
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"
U _{a,Limit} = Limiting area-weighted average U-values [W/(m ² K)] U _{a,Calc} = Calculated area-weighted average U-values [W/(m ² K)] U _{i,Calc} = Calculated maximum individual element U-values [W/(m ² K)] * There might be more than one surface where the maximum U-value occurs. ** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows. *** Display windows and similar glazing are excluded from the U-value check. N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air Permeability	Worst acceptable standard	This building
m ³ /(h.m ²) at 50 Pa	10	3

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- HVAC 1

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	-	-	-	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

1- Default DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	Hot water provided by HVAC system	0
Standard value	N/A	N/A

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]										HR efficiency	
	ID of system type	A	B	C	D	E	F	G	H	I	Zone	Standard
	Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1		
CIRC FF		-	-	-	-	-	-	-	-	-	-	N/A
CIRC1 GF		-	-	-	-	-	-	-	-	-	-	N/A
CIRC2 GF		-	-	-	-	-	-	-	-	-	-	N/A
CIRC3 GF		-	-	-	-	-	-	-	-	-	-	N/A
CIRC4 GF		-	-	-	-	-	-	-	-	-	-	N/A
CIRC5 GF		-	-	-	-	-	-	-	-	-	-	N/A
CIRC6 GF		-	-	-	-	-	-	-	-	-	-	N/A
CLASS1 FF		-	-	-	-	-	-	-	-	-	-	N/A
CLASS1 GF		-	-	-	-	-	-	-	-	-	-	N/A
CLASS2 FF		-	-	-	-	-	-	-	-	-	-	N/A
CLASS2 GF		-	-	-	-	-	-	-	-	-	-	N/A
CLASS3 FF		-	-	-	-	-	-	-	-	-	-	N/A
CLASS3 GF		-	-	-	-	-	-	-	-	-	-	N/A
CLASS4 FF		-	-	-	-	-	-	-	-	-	-	N/A
CLASS4 GF		-	-	-	-	-	-	-	-	-	-	N/A

GREEN PARK VILLAGE SCHOOL
SUNLIGHT AND DAYLIGHT IMPACT ASSESSMENT

Zone name	SFP [W/(l/s)]										HR efficiency	
	ID of system type	A	B	C	D	E	F	G	H	I	Zone	Standard
	Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1		
CLASS5 FF		-	-	-	-	-	-	-	-	-	-	N/A
CLASS5 GF		-	-	-	-	-	-	-	-	-	-	N/A
CLASS6 FF		-	-	-	-	-	-	-	-	-	-	N/A
CLASS6 GF		-	-	-	-	-	-	-	-	-	-	N/A
CLASS7 FF		-	-	-	-	-	-	-	-	-	-	N/A
CLASS8 FF		-	-	-	-	-	-	-	-	-	-	N/A
CLEANER		-	-	-	-	-	-	-	-	-	-	N/A
CLEANER2		-	-	-	-	-	-	-	-	-	-	N/A
CLEANER3		-	-	-	-	-	-	-	-	-	-	N/A
COATS1 FF		-	-	-	-	-	-	-	-	-	-	N/A
COATS1 GF		-	-	-	-	-	-	-	-	-	-	N/A
COATS2 FF		-	-	-	-	-	-	-	-	-	-	N/A
COATS2 GF		-	-	-	-	-	-	-	-	-	-	N/A
COATS3 FF		-	-	-	-	-	-	-	-	-	-	N/A
COATS3 GF		-	-	-	-	-	-	-	-	-	-	N/A
COATS4 FF		-	-	-	-	-	-	-	-	-	-	N/A
COATS4 GF		-	-	-	-	-	-	-	-	-	-	N/A
COPIER		-	-	-	-	-	-	-	-	-	-	N/A
FOOD DT		-	-	-	-	-	-	-	-	-	-	N/A
GP RM FF		-	-	-	-	-	-	-	-	-	-	N/A
GP RM GF		-	-	-	-	-	-	-	-	-	-	N/A
GP RM2 FF		-	-	-	-	-	-	-	-	-	-	N/A
HALL		-	-	-	-	-	-	-	-	-	-	N/A
HEAD		-	-	-	-	-	-	-	-	-	-	N/A
HYGIENE		-	-	-	-	-	-	-	-	-	-	N/A
INTERVIEW		-	-	-	-	-	-	-	-	-	-	N/A
KITCHEN		-	-	-	-	-	-	-	-	1	-	N/A
LRC		-	-	-	-	-	-	-	-	-	-	N/A
NURSERY		-	-	-	-	-	-	-	-	-	-	N/A
NURSERY GP		-	-	-	-	-	-	-	-	-	-	N/A
OFFICE		-	-	-	-	-	-	-	-	-	-	N/A
SEN GP		-	-	-	-	-	-	-	-	-	-	N/A
SERVER		-	-	-	-	-	-	-	-	-	-	N/A
SICK BAY		-	-	-	-	-	-	-	-	-	-	N/A
ST		-	-	-	-	-	-	-	-	-	-	N/A
ST APP		-	-	-	-	-	-	-	-	-	-	N/A
ST CARE		-	-	-	-	-	-	-	-	-	-	N/A
ST CHAIRS		-	-	-	-	-	-	-	-	-	-	N/A
ST KIT		-	-	-	-	-	-	-	-	-	-	N/A
ST PE		-	-	-	-	-	-	-	-	-	-	N/A
ST SPEC		-	-	-	-	-	-	-	-	-	-	N/A
ST STAGE		-	-	-	-	-	-	-	-	-	-	N/A
STAFF WORK		-	-	-	-	-	-	-	-	-	-	N/A

GREEN PARK VILLAGE SCHOOL
SUNLIGHT AND DAYLIGHT IMPACT ASSESSMENT

Zone name	SFP [W/(l/s)]										HR efficiency	
	ID of system type	A	B	C	D	E	F	G	H	I	Zone	Standard
Standard value		0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1		
STAFF1		-	-	-	-	-	-	-	-	-	-	N/A
STAFF2		-	-	-	-	-	-	-	-	-	-	N/A
STAFF3		-	-	-	-	-	-	-	-	-	-	N/A
STOCK RM		-	-	-	-	-	-	-	-	-	-	N/A
STUDIO		-	-	-	-	-	-	-	-	-	-	N/A
WC ACC FF		0.3	-	-	-	-	-	-	-	-	-	N/A
WC ACC GF		0.3	-	-	-	-	-	-	-	-	-	N/A
WC CHANGE		0.3	-	-	-	-	-	-	-	-	-	N/A
WC1 FF		0.3	-	-	-	-	-	-	-	-	-	N/A
WC1 GF		0.3	-	-	-	-	-	-	-	-	-	N/A
WC2 FF		0.3	-	-	-	-	-	-	-	-	-	N/A
WC2 GF		0.3	-	-	-	-	-	-	-	-	-	N/A
WC3 FF		0.3	-	-	-	-	-	-	-	-	-	N/A
WC3 GF		0.3	-	-	-	-	-	-	-	-	-	N/A
WC4 GF		0.3	-	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
Standard value		60	60	22	
CIRC FF		-	79	-	755
CIRC1 GF		-	90	-	251
CIRC2 GF		-	77	-	193
CIRC3 GF		-	82	-	269
CIRC4 GF		-	82	-	121
CIRC5 GF		-	77	-	208
CIRC6 GF		-	83	-	94
CLASS1 FF		98	-	-	318
CLASS1 GF		98	-	-	317
CLASS2 FF		98	-	-	318
CLASS2 GF		98	-	-	320
CLASS3 FF		98	-	-	318
CLASS3 GF		98	-	-	318
CLASS4 FF		98	-	-	318
CLASS4 GF		96	-	-	321
CLASS5 FF		98	-	-	318
CLASS5 GF		98	-	-	320
CLASS6 FF		98	-	-	320
CLASS6 GF		97	-	-	313
CLASS7 FF		96	-	-	321
CLASS8 FF		97	-	-	317
CLEANER		110	-	-	8
CLEANER2		105	-	-	8
CLEANER3		117	-	-	8

GREEN PARK VILLAGE SCHOOL
SUNLIGHT AND DAYLIGHT IMPACT ASSESSMENT

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name	Standard value	Luminaire	Lamp	Display lamp	
COATS1 FF	96	-	-	-	45
COATS1 GF	62	-	-	-	25
COATS2 FF	108	-	-	-	63
COATS2 GF	76	-	-	-	19
COATS3 FF	135	-	-	-	28
COATS3 GF	62	-	-	-	25
COATS4 FF	86	-	-	-	67
COATS4 GF	62	-	-	-	25
COPIER	91	-	-	-	109
FOOD DT	109	-	-	-	140
GP RM FF	141	-	-	-	60
GP RM GF	145	-	-	-	63
GP RM2 FF	139	-	-	-	63
HALL	-	281	-	-	911
HEAD	119	-	-	-	107
HYGIENE	144	-	-	-	60
INTERVIEW	162	-	-	-	46
KITCHEN	-	338	-	-	309
LRC	106	-	-	-	231
NURSERY	102	-	-	-	273
NURSERY GP	146	-	-	-	53
OFFICE	117	-	-	-	168
SEN GP	131	-	-	-	80
SERVER	176	-	-	-	35
SICK BAY	194	-	-	-	30
ST	68	-	-	-	20
ST APP	103	-	-	-	8
ST CARE	87	-	-	-	15
ST CHAIRS	46	-	-	-	70
ST KIT	132	-	-	-	8
ST PE	90	-	-	-	89
ST SPEC	73	-	-	-	15
ST STAGE	126	-	-	-	7
STAFF WORK	131	-	-	-	84
STAFF1	144	-	-	-	61
STAFF2	131	-	-	-	81
STAFF3	103	-	-	-	262
STOCK RM	55	-	-	-	32
STUDIO	101	-	-	-	274
WC ACC FF	-	286	-	-	17
WC ACC GF	-	286	-	-	16
WC CHANGE	-	134	-	-	348
WC1 FF	-	160	-	-	84

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name	Standard value	Luminaire	Lamp	Display lamp	
WC1 GF	-	-	180	-	56
WC2 FF	-	-	281	-	17
WC2 GF	-	-	175	-	61
WC3 FF	-	-	173	-	59
WC3 GF	-	-	168	-	74
WC4 GF	-	-	166	-	78

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
CLASS1 FF	NO (-62.9%)	NO
CLASS1 GF	NO (-64.2%)	NO
CLASS2 FF	NO (-68.1%)	NO
CLASS2 GF	NO (-62.7%)	NO
CLASS3 FF	NO (-62.9%)	NO
CLASS3 GF	NO (-71.4%)	NO
CLASS4 FF	NO (-67.8%)	NO
CLASS4 GF	NO (-82.2%)	NO
CLASS5 FF	NO (-72%)	NO
CLASS5 GF	NO (-70.4%)	NO
CLASS6 FF	NO (-69.4%)	NO
CLASS6 GF	NO (-80.1%)	NO
CLASS7 FF	NO (-80.2%)	NO
CLASS8 FF	NO (-81.7%)	NO
COPIER	N/A	N/A
FOOD DT	NO (-76.5%)	NO
GP RM FF	NO (-48.4%)	NO
GP RM GF	NO (-76%)	NO
GP RM2 FF	NO (-60.1%)	NO
HALL	NO (-12.5%)	NO
HEAD	NO (-78.2%)	NO
HYGIENE	N/A	N/A
INTERVIEW	N/A	N/A
LRC	NO (-80%)	NO
NURSERY	NO (-53.3%)	NO
NURSERY GP	NO (-84.9%)	NO
OFFICE	NO (-74.5%)	NO
SEN GP	NO (-82.6%)	NO
SERVER	N/A	N/A
SICK BAY	N/A	N/A
STAFF WORK	NO (-78.5%)	NO
STAFF1	NO (-53%)	NO
STAFF2	NO (-81.4%)	NO
STAFF3	NO (-74.5%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
STUDIO	NO (-86.8%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters			Building Use	
	Actual	Notional	% Area	Building Type
Area [m ²]	2341.5	2341.5		A1/A2 Retail/Financial and Professional services
External area [m ²]	3830.3	3830.3		A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
Weather	SWI	SWI		B1 Offices and Workshop businesses
Infiltration [m ³ /hm ² @ 50Pa]	3	4		B2 to B7 General Industrial and Special Industrial Groups
Average conductance [W/K]	1113.92	1405.16		B8 Storage or Distribution
Average U-value [W/m ² K]	0.29	0.37		C1 Hotels
Alpha value* [%]	21.64	15.2		C2 Residential Institutions: Hospitals and Care Homes
* Percentage of the building's average heat transfer coefficient which is due to thermal bridging				C2 Residential Institutions: Residential schools
				C2 Residential Institutions: Universities and colleges
				C2A Secure Residential Institutions
				Residential spaces
				D1 Non-residential Institutions: Community/Day Centre
				D1 Non-residential Institutions: Libraries, Museums, and Galleries
			100	D1 Non-residential Institutions: Education
				D1 Non-residential Institutions: Primary Health Care Building
				D1 Non-residential Institutions: Crown and County Courts
				D2 General Assembly and Leisure, Night Clubs, and Theatres
				Others: Passenger terminals
				Others: Emergency services
				Others: Miscellaneous 24hr activities
				Others: Car Parks 24 hrs
				Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	18.53	21.97
Cooling	0	0
Auxiliary	1.08	1
Lighting	11.24	12.08
Hot water	54.15	56.79
Equipment*	15.54	15.54
TOTAL**	85	91.85

* Energy used by equipment does not count towards the total for calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	4	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	123.59	131.61
Primary energy* [kWh/m ²]	126.49	135.25
Total emissions [kg/m ²]	20	23.6

* Primary energy (net) of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance									
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity									
Actual	60.2	63.4	18.5	0	1.1	0.9	0	0.96	0
Notional	65.1	66.5	22	0	1	0.82	0	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEEF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.15	CIRC FF Wall 1
Floor	0.2	0.1	CIRC1 GF Exposed Floor 1
Roof	0.15	0.1	CIRC FF Exposed Roof 1
Windows, roof windows, and rooflights	1.5	1.4	CIRC FF Window 1
Personnel doors	1.5	2.2	CIRC FF Door 1 (Personnel Door)
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"
U _{i-Typ} = Typical individual element U-values [W/(m²K)]		U _{i-Min} = Minimum individual element U-values [W/(m²K)]	
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3