

06

**APPENDIX 7: DAYLIGHT, SUNLIGHT AND OVERSHADOWING ASSESSMENT PREPARED  
BY BPC ENGINEERS**

AN BORD PLEANÁLA

13 MAY 2024

LTR DATED \_\_\_\_\_ FROM *H. Leahy*

LDG- **319719-24**

ABP- \_\_\_\_\_

# 1NWQ, Dublin 1

## Daylight, Sunlight & Overshadowing Assessment

Project Ref: 20340

Client: NWQ Devco Ltd.

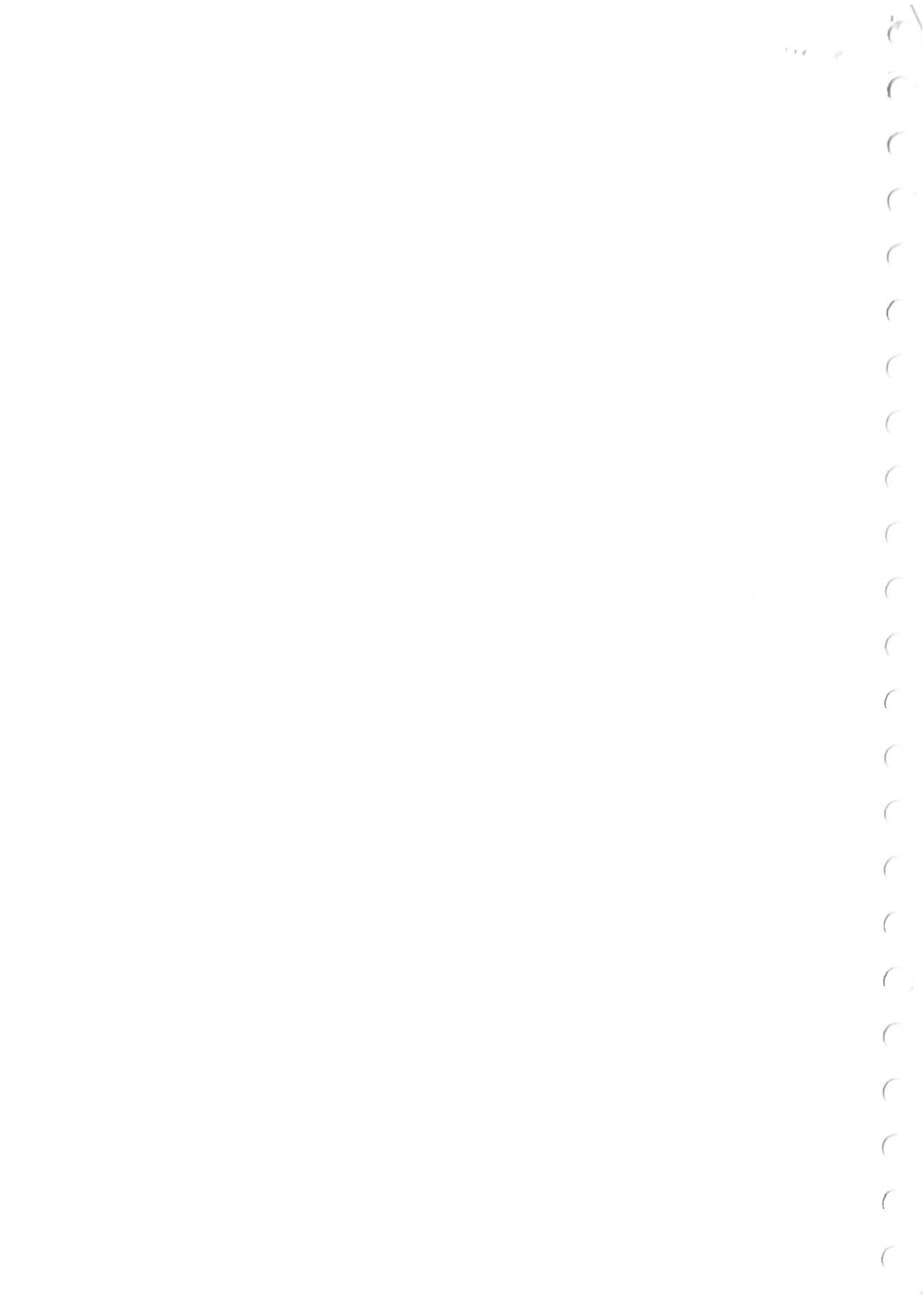
Date: 10/05/2024

**Report by:**

Building Performance Consulting Engineers



BUILDING PERFORMANCE CONSULTING



| Rev    | Description                                                              | Date:      | Written By | Approved By:                        |
|--------|--------------------------------------------------------------------------|------------|------------|-------------------------------------|
| P13-01 | Final Report: Response to reasons for refusal from the planner's report. | 09/05/2024 | J. Gleeson | J. Gleeson<br>CEng MIEI, CMVP (AEE) |
| P13-02 | Final Report: Response to reasons for refusal from the planner's report. | 10/05/2024 | J. Gleeson | J. Gleeson<br>CEng MIEI, CMVP (AEE) |
| P13-03 | Final Report: Response to reasons for refusal from the planner's report. | 10/05/2024 | J. Gleeson | J. Gleeson<br>CEng MIEI, CMVP (AEE) |



## Contents

|                                                                                       |    |                                     |                                                           |     |
|---------------------------------------------------------------------------------------|----|-------------------------------------|-----------------------------------------------------------|-----|
| Glossary.....                                                                         | 3  | 5.2.2                               | APSH Analysis.....                                        | 47  |
| 1 Executive Summary .....                                                             | 4  | 5.2.3                               | Neighbouring Properties Details.....                      | 101 |
| 2 Introduction .....                                                                  | 5  | 5.3                                 | Impact to Sunlight in Existing Neighbouring Amenity ..... | 104 |
| 3 Site Description .....                                                              | 6  | 5.4                                 | Sunlight to proposed park .....                           | 106 |
| 3.1 Location & Context.....                                                           | 6  | 6                                   | Conclusion.....                                           | 107 |
| 3.2 Proposed Development.....                                                         | 7  | Appendix A: Shadow Images.....      |                                                           | 108 |
| 3.3 Sensitive Receptors .....                                                         | 8  | A.1 March 21 <sup>st</sup> .....    |                                                           | 108 |
| 4 Methodology & Assessment Criteria .....                                             | 10 | A.2 June 21 <sup>st</sup> .....     |                                                           | 113 |
| The following sub-sections outline the methodology and assessment criteria used. .... | 10 | A.3 December 21 <sup>st</sup> ..... |                                                           | 119 |
| 4.1 Existing Buildings .....                                                          | 10 | 7                                   | Bibliography .....                                        | 123 |
| 4.1.1 Vertical Sky Component (VSC) .....                                              | 10 |                                     |                                                           |     |
| 4.1.2 Sunlight to Gardens & Open Spaces .....                                         | 11 |                                     |                                                           |     |
| 4.1.3 Shadow Plots.....                                                               | 11 |                                     |                                                           |     |
| 4.2 Impact Classification.....                                                        | 12 |                                     |                                                           |     |
| 4.2.1 Light from the Sky.....                                                         | 13 |                                     |                                                           |     |
| 4.2.2 Sun lighting.....                                                               | 15 |                                     |                                                           |     |
| 4.2.3 Sunlight to Proposed Open Spaces .....                                          | 16 |                                     |                                                           |     |
| 5 Analysis .....                                                                      | 17 |                                     |                                                           |     |
| 5.1 Overview of Computational Models.....                                             | 17 |                                     |                                                           |     |
| 5.2 Existing Neighbouring Buildings .....                                             | 18 |                                     |                                                           |     |
| 5.2.1 VSC Analysis .....                                                              | 18 |                                     |                                                           |     |



## Glossary

### Illuminance

A measure of the amount of light falling on a surface, usually measured in lux.

### Target illuminance ( $E_t$ )

Illuminance from daylight that should be achieved for at least half of annual daylight hours across a specified fraction of the reference plane in a daylight space.

### Minimum target illuminance ( $E_{TM}$ )

Illuminance from daylight that should be achieved for at least half of annual daylight hours across 95% of the reference plane in spaces with vertical and/or inclined daylight apertures.

### Daylight factor (D)

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

### Daylight, natural light

Part of global solar radiation capable of causing a visual sensation. (CIE, 2020)  
(Combined skylight and sunlight.)

### No sky line

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

### Obstruction Angle

The angular altitude of the top of an obstruction above the horizontal, measured from a reference point in a vertical plane in a section perpendicular to the vertical plane.

### Skylight

Part of *diffuse* sky radiation capable of causing a visual sensation. (CIE, 2020)

### Sunlight

Part of direct solar radiation capable of causing a visual sensation. (CIE, 2020)

### Vertical Sky Component (VSC)

Ratio of that part of illuminance, at a point on a given vertical plane, that is received directly from a sky of assumed or known luminance distribution (usually CIE standard overcast sky), to illuminance on a horizontal plane due to an unobstructed hemisphere of this sky. Usually the 'given vertical plane' is the outside of a window wall. The VSC does not include reflected light, either from the ground or from other buildings.

### Reference plane or working plane

Horizontal, vertical or inclined plane in which a visual task lies. Normally the working plane may be taken to be horizontal, 0.85 m above the floor in houses and factories, 0.7 m above the floor in offices.



## 1 Executive Summary

This report has been prepared to respond to the planner's report on reasons to refuse permission for the proposed building at 1 North Wall Quay and specifically relates to items raised regarding sunlight and daylight performance of the proposed building on existing surrounding buildings.

This report has also included a reduction in the proposed massing following comments made in the planners report of the previous planning application refusal to improve the daylight effect on neighbouring apartments. The proposed development replaces a building which is currently occupied by Citi Bank and we now refer to as 1NWQ.

Dublin City Council (DCC) development plan acknowledges that good quality, higher density developments can make a positive contribution to the evolving urban form and structure of the city and can help to achieve sustainable land use and movement patterns. RGRE objectives align to DCC's objective to provide for increased density in a sustainable manner whilst ensuring the highest standards of design as well as the protection of existing amenities and the natural and historical assets of the city.

The developer and design team critically evaluated the proposed development while also being cognisant of the local development plan. During this "challenge" phase of the design process there has been a significant reduction in the proposed developments massing to limit the effect of the proposed development on existing neighbouring amenity areas and properties.

The daylight effect of the proposed building has predominantly been limited to a small number of bedrooms which will have a minor adverse impact with respect to access to skylight. In terms of apartments only four apartments within Block 12 and 2 apartments within Block 2 which will have a noticeable reduction in daylight.

However, given the current daylight levels in the apartments affected are currently low one could assume artificial lighting would likely to be predominantly used which will continue to be the case after the proposed development.

The analysis shows that 96% of the existing neighbouring dwellings windows achieve the BRE's recommendation for annual probable sunlight hours on annual basis and on a winter basis.

The existing neighbouring amenity space tested confirms that 50% of the area should receive at least two hours of sunlight on 21 March. Therefore, the existing neighbouring amenity space achieves the BRE's recommendation for sunlight and should appear adequately sunlit throughout the year.

As part of the proposed development a park is created to the east of the proposed building. The BRE guide recommends that amenity spaces should receive at least 2 hours of sunlight on March 21<sup>st</sup> to at least 50% of their amenity space. The proposed park achieves 64.07% and therefore it can be said it therefore achieves the recommendations within the BRE Guide.

Overall, the development has been designed with due consideration for sunlight and daylight. BPC Engineers believe the proposed development performs at an exemplar level for a scheme of this scale and meets many of the recommendations as set out in the BRE Guide – BR 209 "Site Layout Planning for Daylight and Sunlight, A guide to good practice (2022)".



## 2 Introduction

Site layout planning to achieve good daylighting and sunlighting, within buildings and in the open spaces around them is an important aspect in designing new buildings or developments and extensions to existing buildings. Daylight animates an interior and makes it attractive and interesting, as well as providing light to work or read by. Good daylight and sunlight can contribute to making a building energy-efficient; they can reduce the need for electric lighting, while winter solar gain can reduce heating requirements.

The proposed development involves the demolition of the existing structure and the development of a new office building with 17 storeys.

This report has assessed the possible daylight and sunlight impact of the proposed development on neighbouring residential buildings and amenity areas.

The proposed development is located at the 1NWQ, Dublin 1.

This area of Dublin is located in the Central Business District (CBD) where land availability for commercial development is limited and therefore it is important on sustainability grounds that buildings extend upwards to gain usable floor area.

Housing Quality and Standards objective 11.3 (d) relates to daylight and sunlight. It states:

"The design of developments should provide sufficient daylight and sunlight to new and surrounding housing that is appropriate for its context, whilst, minimising overshadowing and maximising the useability of outdoor amenity space."

*The Building Research Establishment (BRE) guidelines 'Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice (2022) and BS EN 17037 - provide useful guidance on avoiding unacceptable loss of light and ensuring developments provide minimum standards of daylight for new units.'*

The analysis and assessments in this report have been carried in line with the recommendations of BRE's "Site Layout Planning for daylight and sunlight, a Guide to good practice" (PJ Littlefair), 2022 and BS EN 17037. The aforementioned BRE guide is also known as BRE Guide BR 209 and may be referenced as such or simply as the "BRE Guide" hereafter in this document.

This report assesses the proposed developments impact on daylight/sunlight to the nearest existing buildings by the following means:

- Vertical Sky Component
- Sunlight to private open spaces
- Annual Probable Sunlight Hours

Additionally, Appendix A provides shadow plots for the proposed scenarios.



### 3 Site Description

#### 3.1 Location & Context

1NWQ is located on North Wall Quay, Dublin 1 between the Sean O'Casey Bridge and Samuel Beckett Bridge and within Dublin's Central Business District. It is an important area of the capital where commercial enterprises have long been developed to meet the requirements of the growing population.

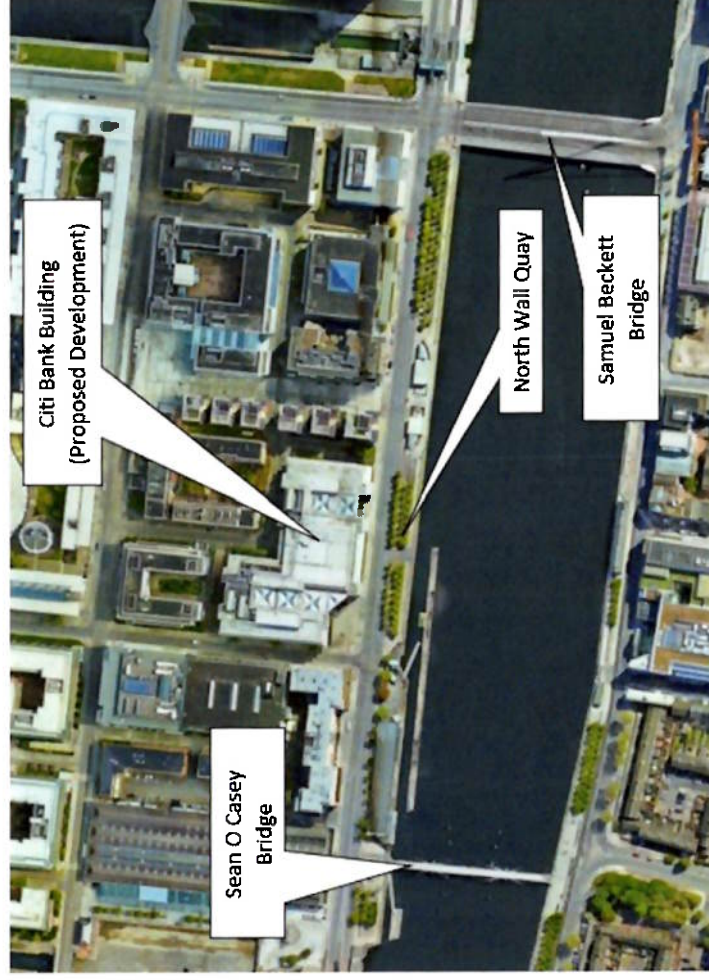


Figure 1: Site Location



Figure 2: Existing Street view of Citi Bank building (Taken from Google Maps)



The existing commercial office building has been modelled for the comparative sunlight/daylight analysis to the proposed development which includes an additional 7 storeys. The image below illustrates the existing commercial office model used for the sunlight daylight analysis in green.

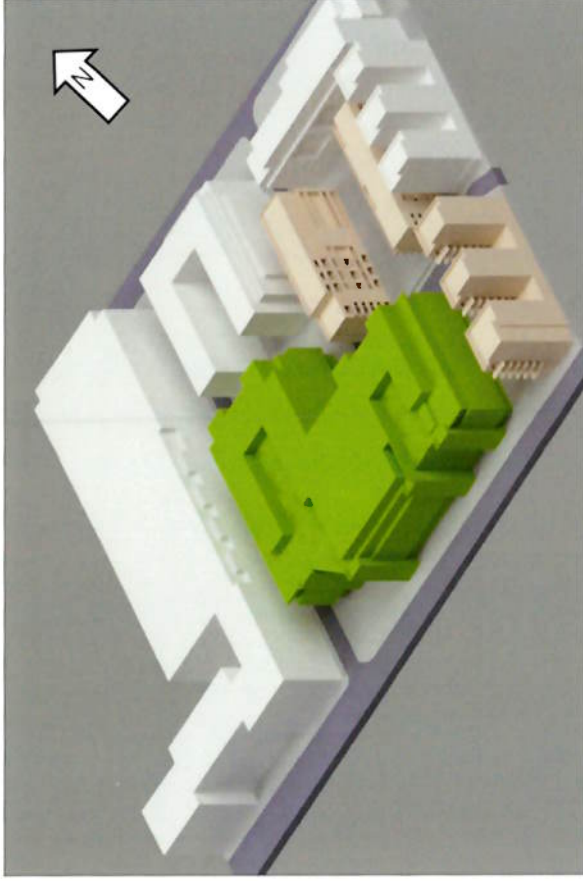


Figure 3: Existing building performance model (view for South-East)

### 3.2 Proposed Development

The proposed development provides for the demolition of the existing building and construction of a new building ranging in height from 9 no. to 17 no. storeys over lower ground floor and double basement comprising of office accommodation, arts/community/cultural uses and a retail/café/restaurant unit. Office accommodation is provided from lower ground floor to 15th floor level, arts/community/cultural uses are

provided at lower ground, ground, 1st and 16th floor level with a retail/café/restaurant unit at ground floor level. Landscaped terraces are located at 8th, 9th, 10th, 11th, 15th, 16th floor level with winter terraces located at 4th, 6th 9th floor level. Provision of a new landscaped street to the east of the building to include external arts/community/cultural uses. The double basement comprises 30 no. car parking spaces, 923 no. bicycle parking spaces and 6 no. motorbike spaces as well as shower/changing facilities and plantroom. The proposed development is a similar massing to the existing but has the inclusion of an additional storeys. This report has also included a reduction in the proposed massing since the previous application to improve the daylight effect on neighbouring apartments as is illustrated in Figure 4.

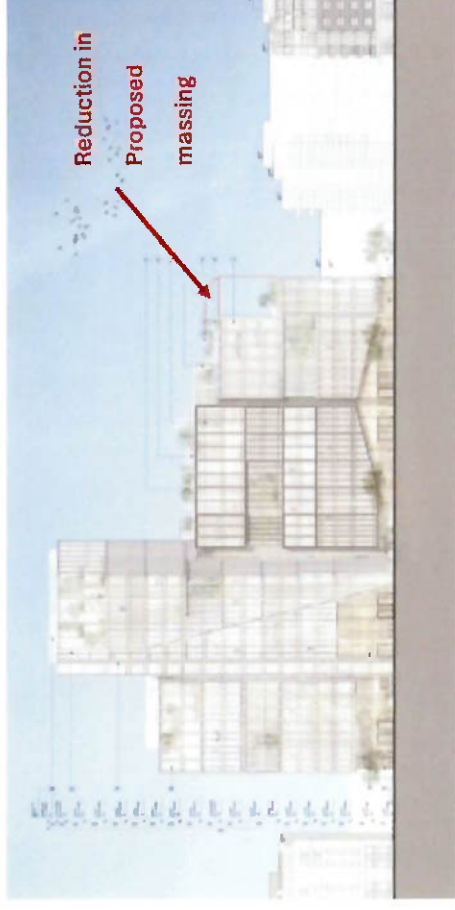


Figure 4: Reduction of proposed massing



The updated proposed development is illustrated in the image below in blue.

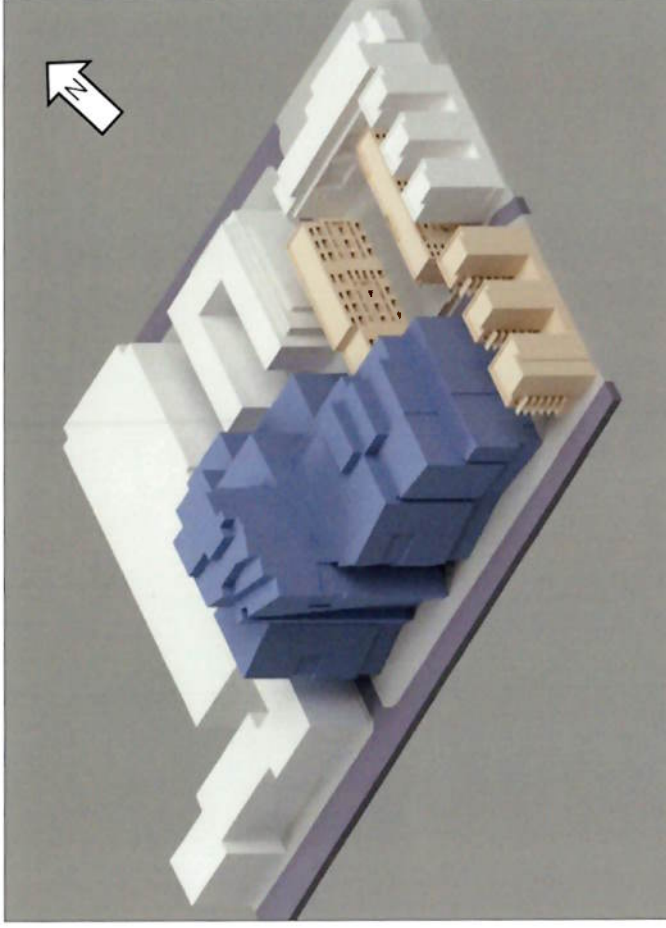


Figure 5: Updated Proposed building with reduced massing (view for South-East)

### 3.3 Sensitive Receptors

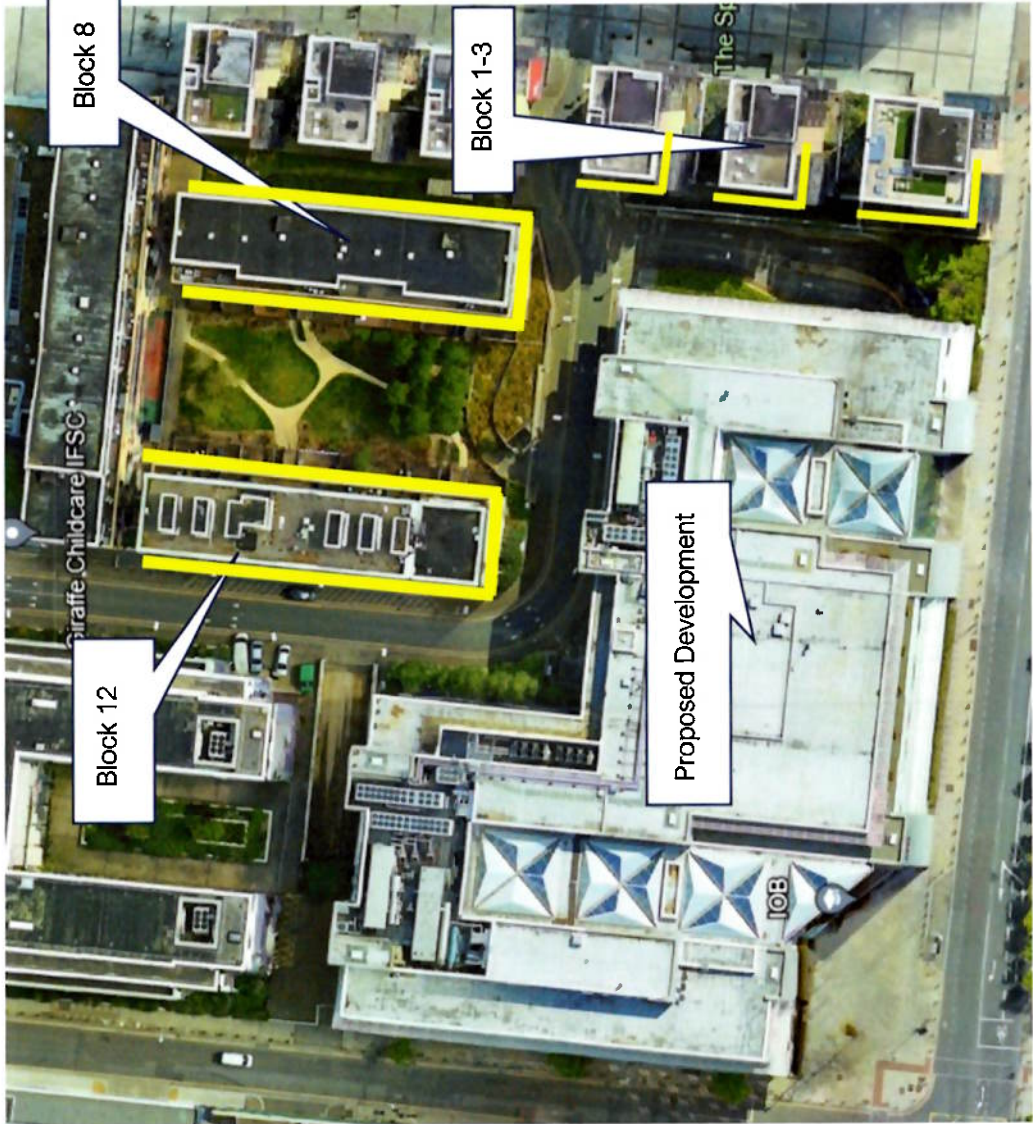
The BRE guide states that when assessing the potential effects of a proposed development on existing buildings, only those windows and rooms that have a 'reasonable expectation' of daylight and sunlight need to be considered. Windows and rooms which meet this criteria are considered to be 'sensitive receptors'. Paragraph

2.2.2 of the BRE guide clarifies what are considered sensitive receptors with respect to sunlight and daylight as follows:

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

The properties highlighted below were identified as sensitive receptors that may be affected by the proposed development.



| Potentially Sensitive Receptors | <div></div> <div><p>Identifies nearest section of existing neighbouring dwellings included in the analysis.</p></div> |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



## 4 Methodology & Assessment Criteria

The analyses and assessments are based on the guidelines set out in the BRE guide (BR 209) "Site Layout Planning for Daylight and Sunlight, A Guide to Good Practice" (BRE Building Technology Group, 2022). This guide is intended to be used in conjunction with interior lighting recommendations in BS EN 17037 Daylight in buildings, and in the CIBSE publication LG 10 Daylighting – a guide for designers.

It should also be noted that although the BRE guide gives numerical guidelines, "these should be interpreted flexibly since natural lighting is only one of many factors in site layout design." (BRE Building Technology Group, 2022)

Advanced lighting simulation software is used to perform the analysis. The software combines 3D modelling capabilities with a suite of programs which employ advanced ray-tracing. The software fully meets all relevant guidelines set out in the BRE Guide BR209. The software has the ability to perform annual simulations based on hourly climatic data.

Throughout this report an effort will be made to differentiate between metrics used to assess skylight versus sunlight. As defined in the glossary of the BRE Guide, "Daylight" is an umbrella term that includes both skylight and sunlight—the diffuse and direct components of light from the sky respectively. Unfortunately, the terms daylight and skylight are often used interchangeably but this report will aim to specify when daylight specifically refers to skylight or when it also encompasses sunlight.

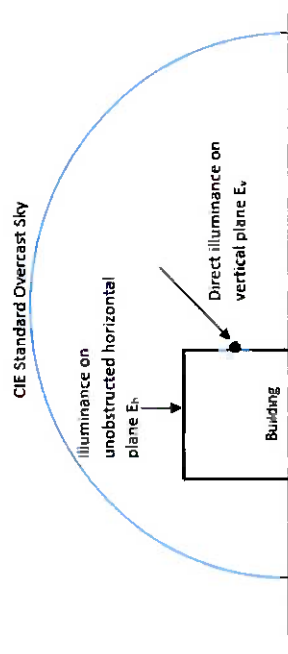
The following sub-sections outline the methodology and assessment criteria used.

### 4.1 Existing Buildings

The impact of the proposed development on the existing buildings (sensitive receptors only) with respect to daylight is assessed using the following methodologies.

#### 4.1.1 Vertical Sky Component (VSC)

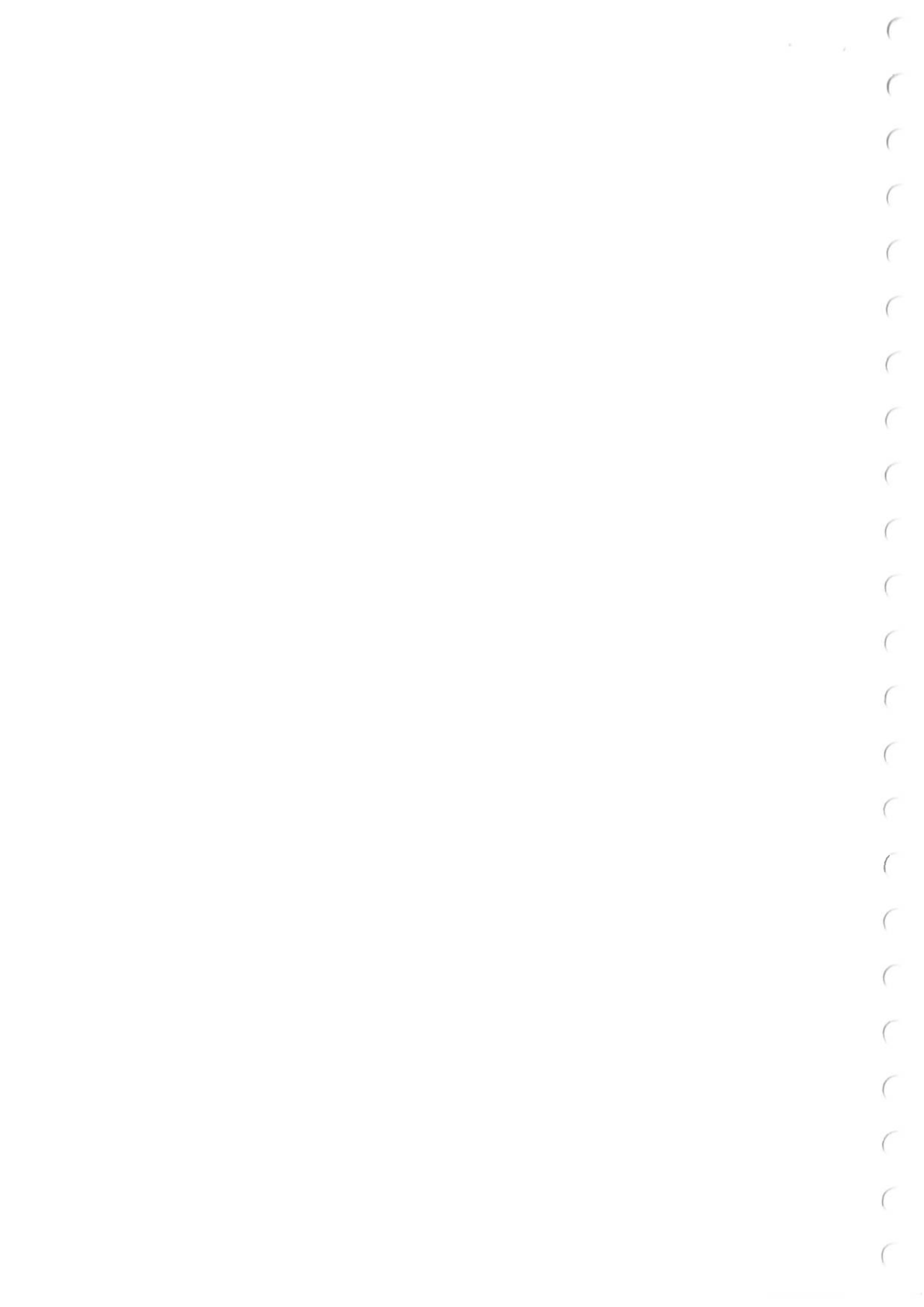
Any reduction in the total amount of skylight for the existing properties is calculated by finding the VSC at the centre of each main window. The Vertical Sky Component (VSC) is the ratio of the direct sky illuminance at the vertical reference point, to the simultaneous illuminance on an unobstructed horizontal plane. Reflected light is not included.



In the case of a floor-to-ceiling window such as a patio door, a point 1.6 m above ground (or balcony level for an upper storey) on the centre line of the window is used. The reference point is in the external plane of the window wall. Windows to bathrooms, toilets, storerooms, circulation areas and garages are not analysed.

The diffuse daylighting of any existing building may be adversely affected if:

*"the VSC measured at the centre of an existing main window [or 1.6m above bottom of glazed door] is less than 27%, and less than 0.8 times its former value." (Littlefair, 2011)*



### 4.1.2 Sunlight to Gardens & Open Spaces

Good site layout planning for daylight and sunlight should not limit itself to providing natural lighting inside buildings. Sunlight in the spaces between buildings has an important impact on the overall appearance and ambience of a development.

*"It is recommended that for it to appear adequately sunlit throughout the year, at least half of a garden or amenity area should receive at least two hours of sunlight on 21 March. If as a result of new development an existing garden or amenity area does not meet the above, and the area which can receive two hours of sun on 21 March is less than 0.8 times its former value, then the loss of sunlight is likely to be noticeable."* (Littlefair, BR209, 2022)

We have performed a sunlight analysis to the shared amenity area of the apartments which are located to the north of the proposed development at Clarion Quay.

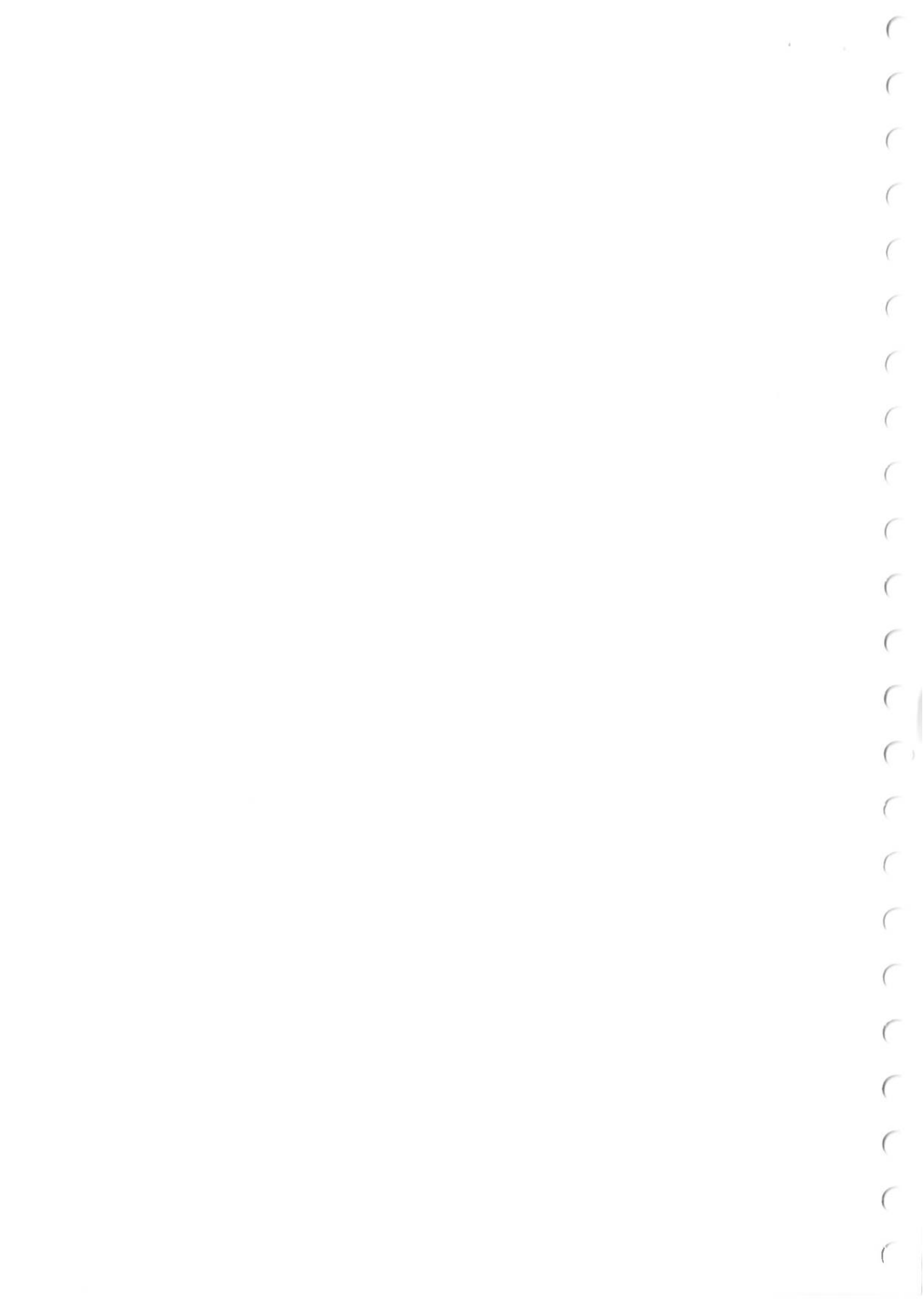
### 4.1.3 Shadow Plots

The BRE guide states: *"Where a large building is proposed which may affect a number of gardens or open spaces it is often illustrative to plot a shadow plan showing the location of shadows at different times of day and year."*

'Before' and 'after' shadow plots are used to show the difference that the proposed building makes. In interpreting the impact of such differences, it must be borne in mind that nearly all structures will create areas of new shadow, and some degree of overshadowing of a space is to be expected.

Shadow plots were created for March 21<sup>st</sup>, June 21<sup>st</sup> and December 21<sup>st</sup>. March 21<sup>st</sup> is the equinox and as such provides the average level of shadowing that can be expected. June 21<sup>st</sup> is a summertime plot and represents the best case for shadow. December 21<sup>st</sup> is the winter solstice and is a time of year even low buildings will cast long shadows. In a built-up area, it is common for large areas of the ground to be in shadow in December.)

The shadow plots are purely illustrative (as opposed to other quantitative metrics used in the analysis) and are shown in Appendix A.



## 4.2 Impact Classification

Appendix I of the BRE Guide – “Environmental Impact Assessment” states that the impact of a new building on its surroundings can be classified as negligible, minor, moderate or major adverse. Where the loss of skylight or sunlight fully meets the guidelines in the BRE guide, the impact is assessed as negligible or minor adverse.

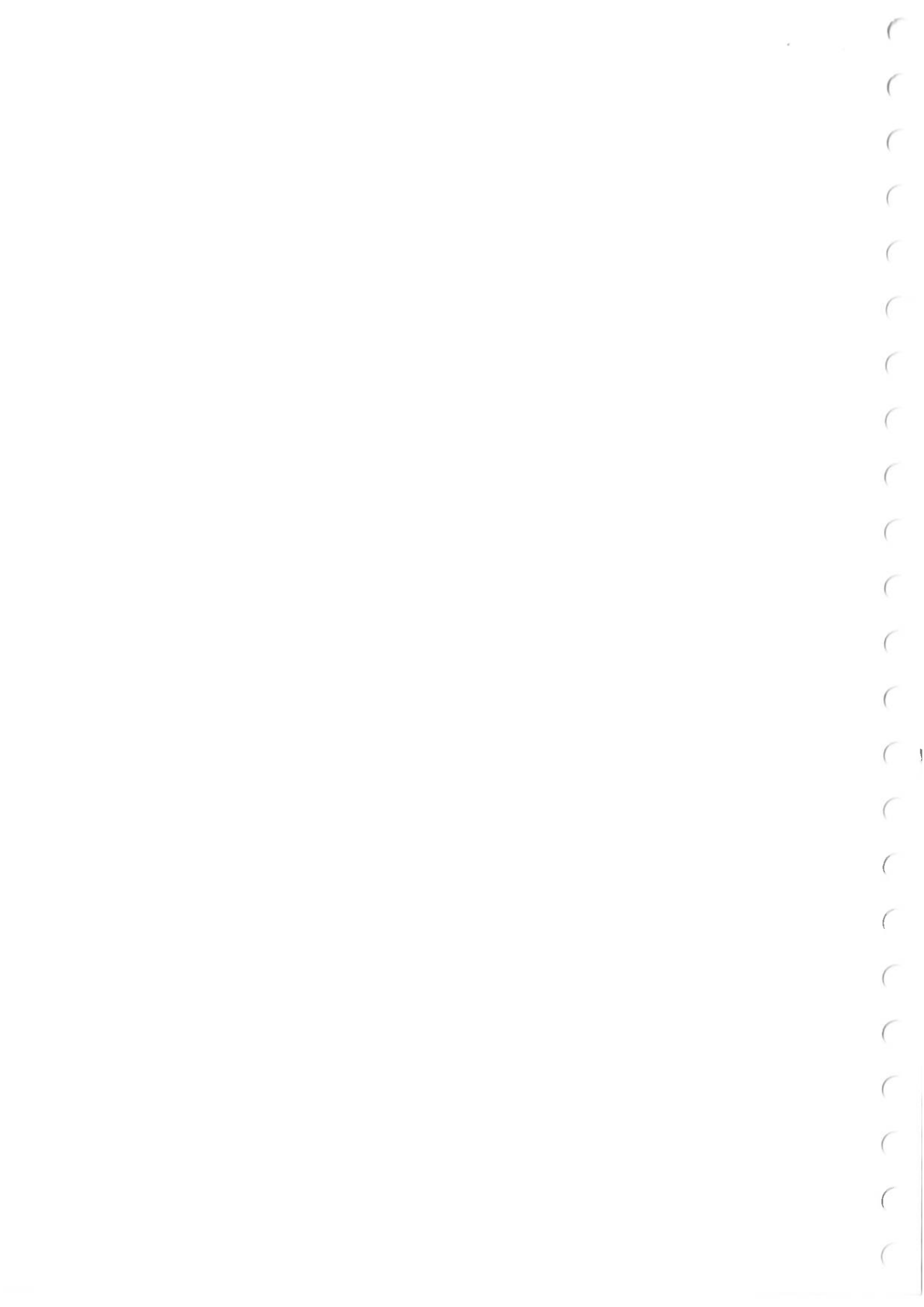
Where the loss of skylight or sunlight does not meet the BRE guidelines, the impact is assessed as minor, moderate or major adverse.

Table 1 below provides a more detailed description of the impact classification.

Table 1: Environmental Impact Assessment: Impact Classification

|                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Negligible adverse impact</b> | <ul style="list-style-type: none"> <li>• Loss of light well within guidelines, or</li> <li>• only a small number of windows losing light (within the guidelines) or</li> <li>• limited area of open space losing light (within the guidelines)</li> </ul>                                                                                                                                                                                                                                 |
| <b>Minor adverse impact (a)</b>  | <ul style="list-style-type: none"> <li>• Loss of light only just within guidelines <b>and</b> <ul style="list-style-type: none"> <li>○ a larger number of windows are affected or</li> <li>○ larger area of open space is affected (within the guidelines)</li> </ul> </li> </ul>                                                                                                                                                                                                         |
| <b>Minor adverse impact (b)</b>  | <ul style="list-style-type: none"> <li>• only a small number of windows or limited open space areas are affected</li> <li>• the loss of light is only marginally outside the guidelines</li> <li>• an affected room has other sources of skylight or sunlight</li> <li>• the affected building or open space only has a low level requirement for skylight or sunlight</li> <li>• there are particular reasons why an alternative, less stringent, guideline should be applied</li> </ul> |
| <b>Major adverse impact</b>      | <ul style="list-style-type: none"> <li>• large number of windows or large open space areas are affected</li> <li>• the loss of light is substantially outside the guidelines</li> <li>• all the windows in a particular property are affected</li> <li>• the affected indoor or outdoor spaces have a particularly strong requirement for skylight or sunlight (living rooms / playground)</li> </ul>                                                                                     |

A moderate adverse impact obviously falls between the criteria for “Minor Adverse Impact (b)” and “Major Adverse Impact”.



## 4.2.1 Light from the Sky

Section 2.1.8 of the BRE Guide states that:

*"Daylight provision in new rooms may be checked using either of the methods in BS EN 17037 Daylight in Buildings: direct prediction of illuminance levels using hourly climate data, or the use of the daylight factor (D)".*

Both methods are measures of the overall amount of daylight in a space.

The daylight factor (D) method addresses daylight provision as a ratio of unobstructed external illuminance under overcast sky conditions. This method involves calculating the daylight factor (D) that would be exceeded over half of the room, i.e. the median daylight factor (this is not the same as the average daylight factor used in the previous standard, BS8206-2). The recommended daylight factor values are location specific. This method will not be discussed in any more detail in this report as the illuminance method is the preferred option.

### 4.2.1.1 Illuminance Method (Target Illuminance $E_T$ )

The illuminance method "involves using climatic data for the location of the site (via the use of an appropriate, typical or average year, weather file within the software) to calculate the illuminance from daylight at each point on an assessment grid on the reference plane at an at least hourly interval for a typical year."

*"A target illuminance ( $E_T$ ) should be achieved across at least half of the reference plane in a daylight space for at least half of the daylight hours. Another target illuminance ( $E_{TM}$ ) should also be achieved across 95% of the reference plane for at least half of the daylight hours; this is the minimum target illuminance to be achieved towards the back of the room."* (BRE Building Technology Group, 2022)

(Note that since hourly climatic data is used based on the location of the site, location and orientation are accounted for. The target illuminance can therefore be considered a daylight metric, i.e. incorporating both skylight and sunlight.)

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

Table 2 gives the target illuminances for side lit rooms. Different targets, given in Table A2 of BS EN 17037, apply in spaces with horizontal rooflights.

Table 2: EN 17037 Target Illuminances

| Level of recommendation | Target illuminance<br>$E_T$ (lx) for half of assessment<br>grid | Target illuminance<br>$E_{TM}$ (lx) for 95% of<br>assessment grid |
|-------------------------|-----------------------------------------------------------------|-------------------------------------------------------------------|
| Minimum                 | 300                                                             | 100                                                               |
| Medium                  | 500                                                             | 300                                                               |
| High                    | 750                                                             | 500                                                               |

The guidance contained in BR 209 is intended to be used with BS EN 17037 and its UK National Annex. The UK National Annex gives specific minimum recommendations for habitable rooms in dwellings in the UK. Although Ireland adopted EN17037 directly as IS EN EN17037, it is expected that all councils in Ireland will adopt the UK National Annex recommendations.

Even if a predominantly daylight appearance is not achievable for a room in a dwelling, the National Annex NA recommends that the target illuminance values given in Table 3 are exceeded over 50% of the points on a reference plane 0.85 m above the floor, for at least half of the daylight hours.

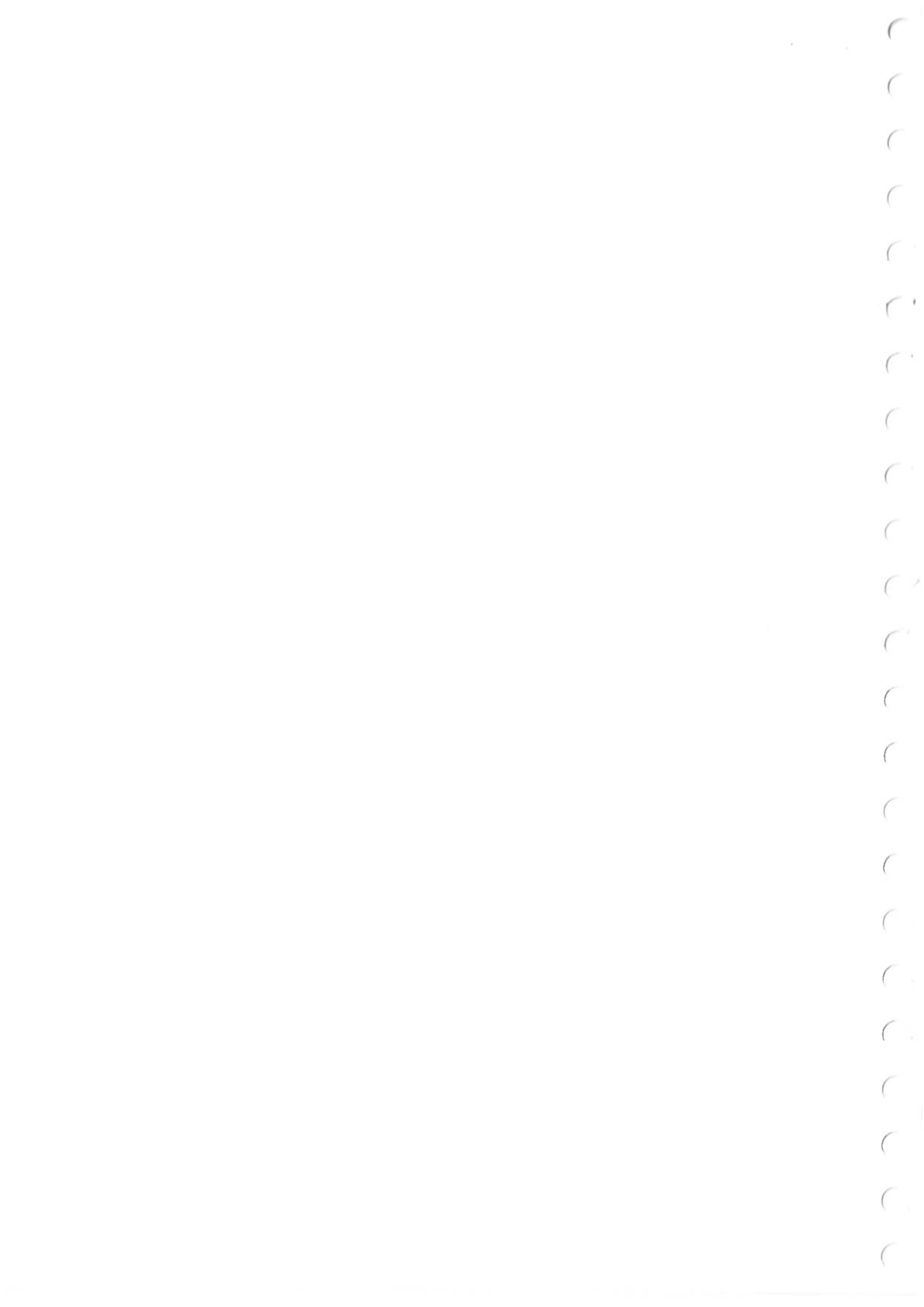


Table 3: BS EN 17037 NA Target Illuminances for dwellings

| Room type   | Target illuminance<br>$E_T$ (lx) |
|-------------|----------------------------------|
| Bedroom     | 100                              |
| Living Room | 150                              |
| Kitchen     | 200                              |

Where one room in a dwelling serves more than a single purpose, it is recommended that the target illuminance is that for the room type with the highest value – for example, in a space that combines a living room and a kitchen the target illuminance is recommended to be 200 lx.

However, it is recommended that local authorities use discretion here. For example:

*“the target for a living room could be used for a combined living/dining/kitchen area if the kitchens are not treated as habitable spaces.”* (BRE Building Technology Group, 2022) This may be appropriate in instances where small internal kitchens are unavoidable in apartment developments.

The minimum target illuminance level to be achieved across 95% of the reference plane within a space need not be applied to rooms in dwellings.

To avoid any confusion, the targets in Table 3 are those used for the purposes of this analysis.

The illuminance method is detailed and calculation intensive. It can take some time to process depending on the software, detail of the calculation model and the available computing power hence why the daylight factor (D) method may be preferred by some.

However, it can provide additional information beyond the limits of the Daylight Factor method due to the use of hourly climate data.

There are a few ways the results of this type of analysis can be presented. One method is to report the % area of the reference plane exceeding the target illuminance  $E_T$  (for half of the daylight hours.) (This area should be greater than 50% to meet the BS EN 17037 recommendations.) This is equivalent to Spatial Daylight Autonomy (sDA)<sup>1</sup>. BR209 recommends reporting the median illuminance (exceeded over 50% of the reference plane) as this enables comparison with the different recommendations in BS EN 17037. It says that “As an optional extra, the proportional area of the reference plane exceeding a particular target value may be presented”. It should be noted that the calculation methodology and results are the same in both instances. It is only the presented result that differs. For completeness, the results will be presented in both ways, i.e. both of the below metrics will be presented:

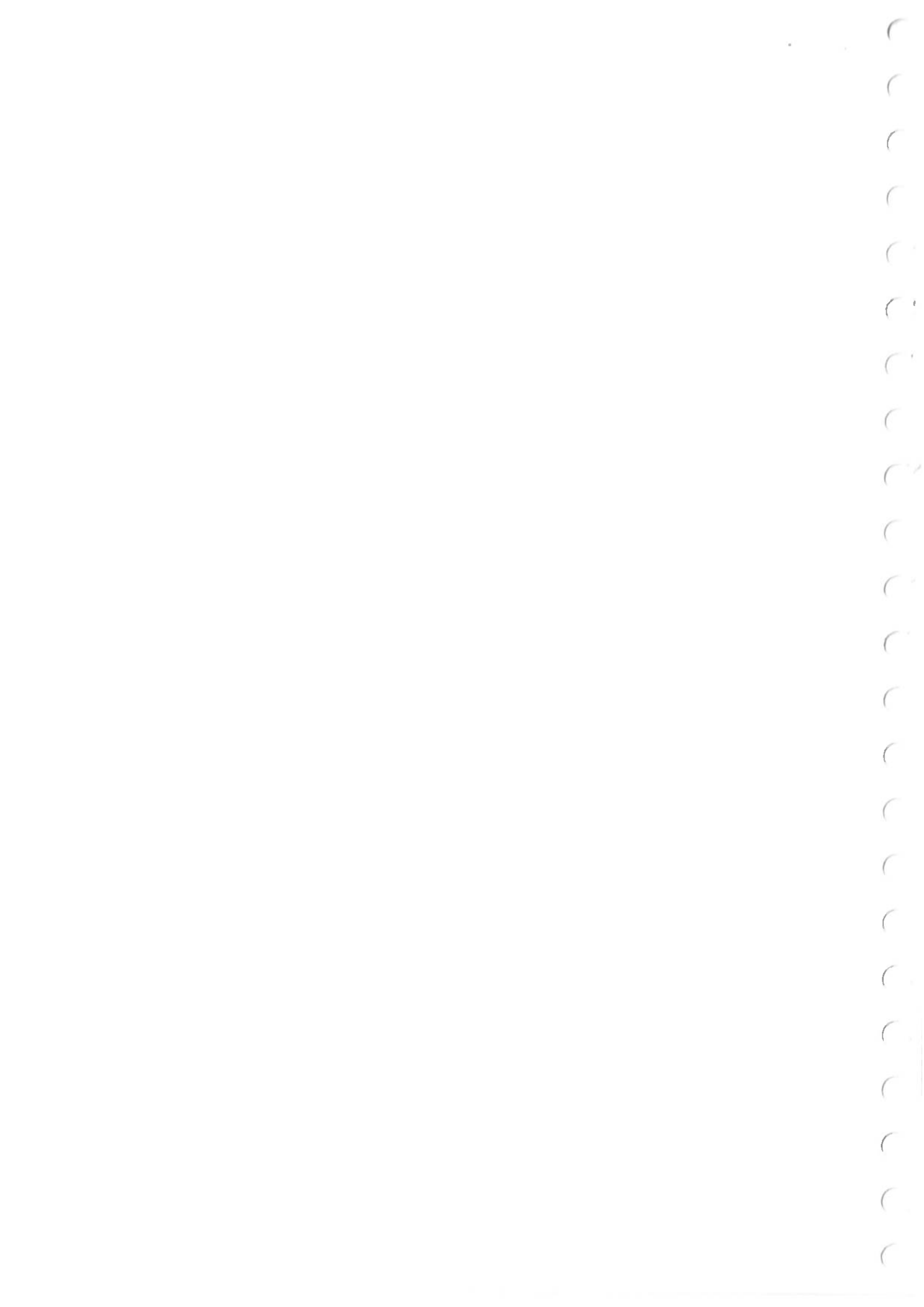
- The **median illuminance** (the illuminance exceeded over 50% of the reference plane), presented as  $E_{MED}$  (lux).
- The **% area** of the reference plane exceeding a particular target illuminance (lux).

The presentation of the internal daylight provision results and how the various metrics are related are discussed in more detail in **Error! Reference source not found..**

The settings used in the computational model for the illuminance calculations are outlined below:

- The reference/working plane is taken to be 0.85m above the floor.
- The grid spacing is 0.1m.
- A band of 0.3m from the walls is excluded from the grid.

<sup>1</sup> Some additional information on sDA is provided in **Error! Reference source not found..**



- Window frame factor is set to 20% (This is based on the size of the window openings and the area of the window which is framing.)
- The glazing transmittance (normal) was set to 0.70.
- The glazing maintenance factor is set to 96% (This accounts for the reduction in glazing transmittance due to dirt. 4% loss of daylight compared with clean glazing.)
- The illuminance calculations take account of light which has been reflected from both external and internal surfaces. In the absence of detailed information on surface reflectances the recommended default reflectances from BR209 2022 have been used. These are detailed in Table 4 below.

Table 4: Surface Reflectances

| Surface Type                    | Reflectance |
|---------------------------------|-------------|
| Interior walls                  | 0.50        |
| Floors                          | 0.20        |
| Ceilings                        | 0.70        |
| Exterior walls and obstructions | 0.20        |
| Exterior Ground                 | 0.20        |

Table 5: Balcony Glazing Properties

| Surface Type    | Properties                                    |
|-----------------|-----------------------------------------------|
| Balcony Glazing | Transmittance: 0.80<br>Refractive Index: 1.52 |

## 4.2.2 Sun lighting

For interiors, access to sunlight can be quantified based on the methodology set out in BS EN 17037.

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

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

*Where groups of dwellings are planned, site layout design should aim to maximise the number of dwellings with a main living room that meets the above recommendations."* (BRE Building Technology Group, 2022)

There are 3 levels of recommendation provided in EN 17037 relating to sunlight to a room:

- 1.5 hours is the minimum level,
- 3 hours is the medium level, and
- 4 hours is the high level.

For dwellings, as outlined above, at least one habitable room, preferably a main living room, should meet at least the minimum criterion.

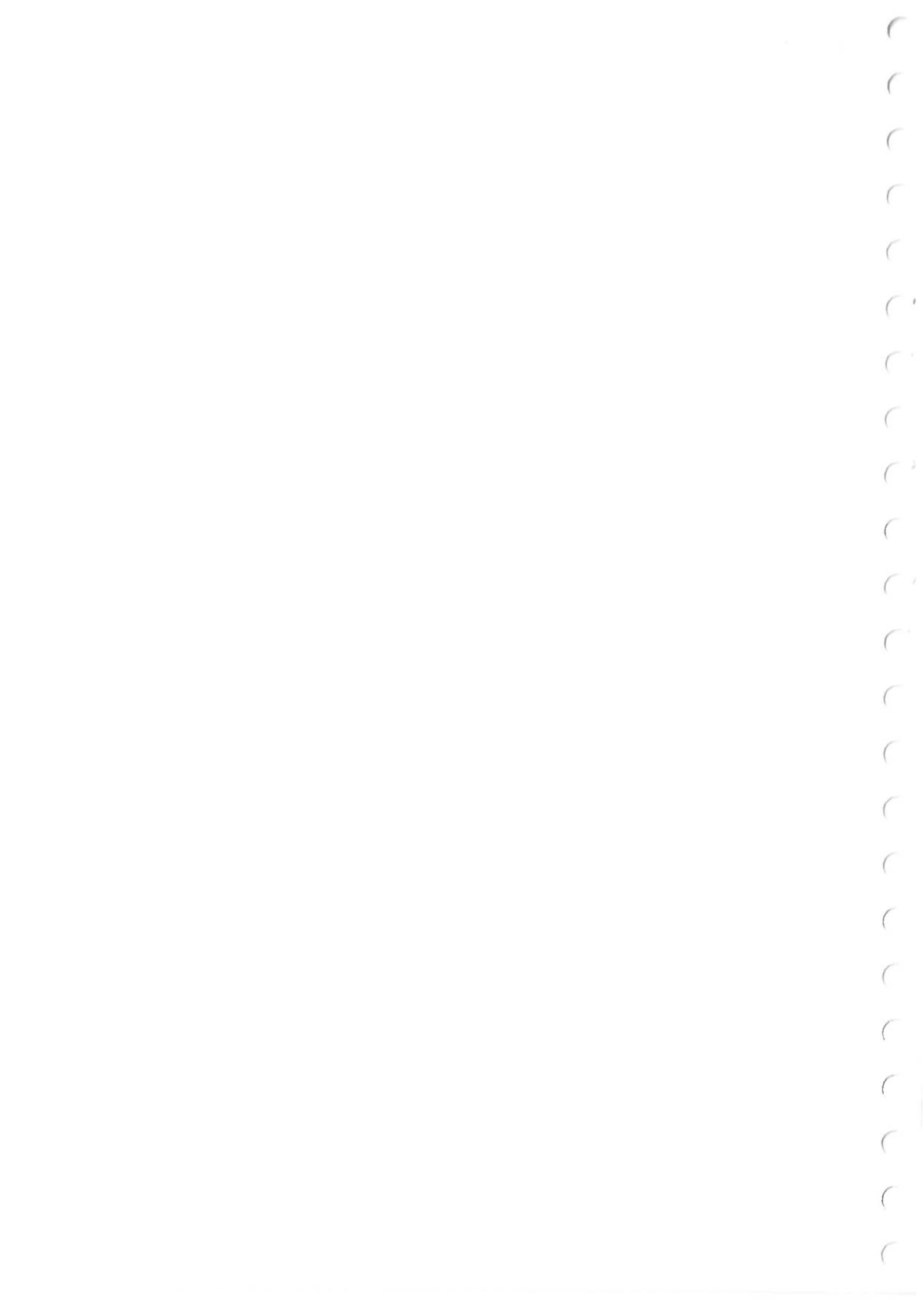


### 4.2.3 Sunlight to Proposed Open Spaces

The BRE Guide 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 21 March.”*

The open spaces within the development, including communal courtyards, roof terraces and public parks, are analysed and assessed against the above criterion.



## 5 Analysis

### 5.1 Overview of Computational Models

3D models of the existing and proposed scenarios were created. The site plans and existing 3D models of the surrounding context provided by the architect were used to correctly position the surrounding buildings relative to the existing and proposed buildings.

In the following figures the beige elements represent the existing surrounding buildings, the green element represents the existing building (1NWQ) and the blue elements represent the proposed building.

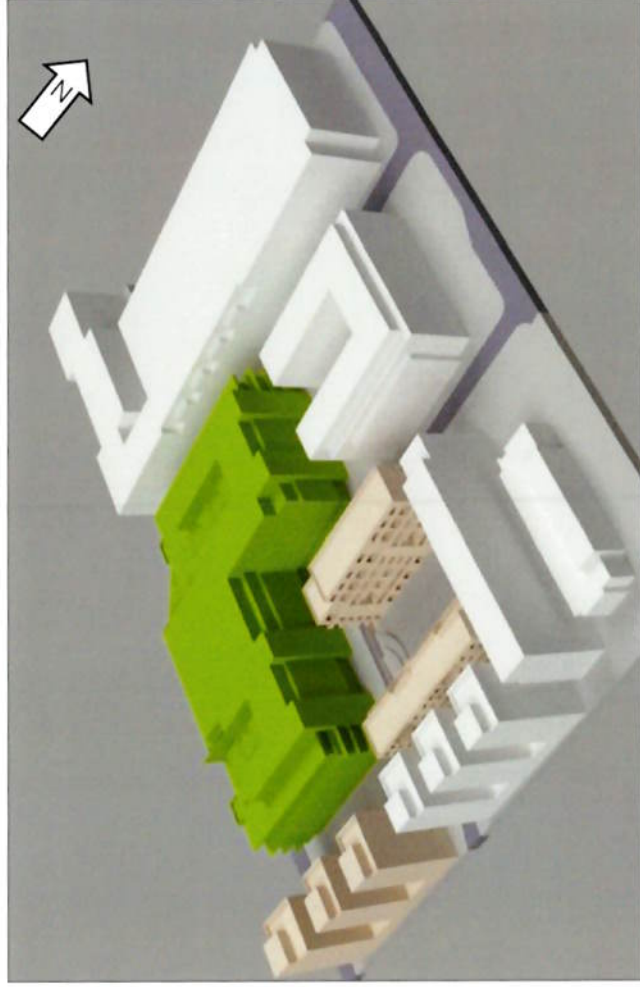


Figure 6: Existing Buildings Model (View from South-West)

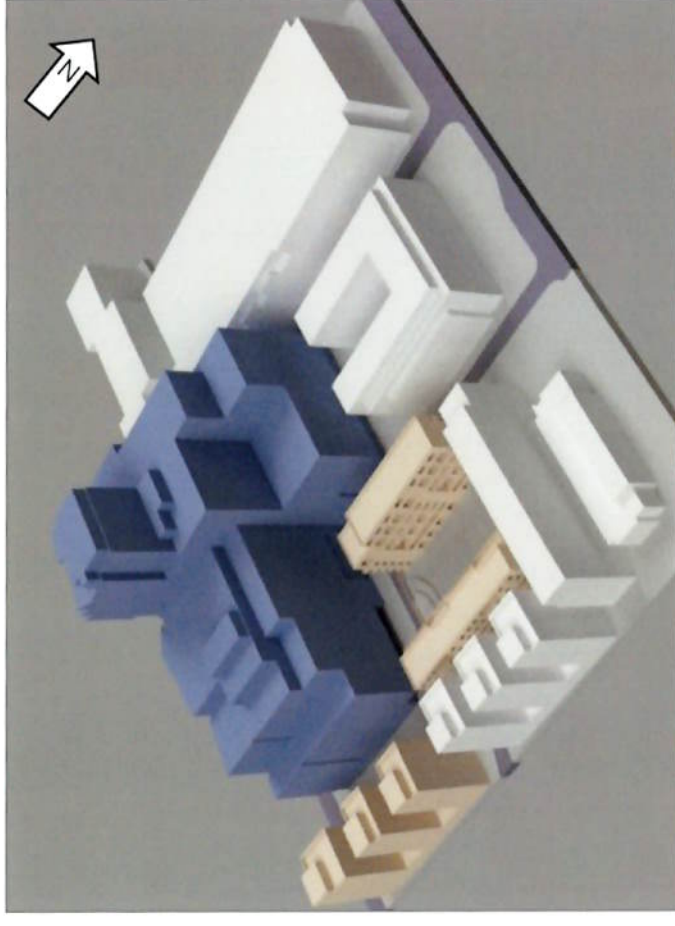


Figure 7: Updated Proposed building with reduced massing (View from North-East)



## 5.2 Existing Neighbouring Buildings

### 5.2.1 VSC Analysis

Multiple VSC points spaced evenly across each facade facing the proposed development were used for each property. Points where skylight availability may change considerably, e.g. because of self-obstruction, were also considered. The VSC points for each property are shown in the following figures.

The following is a legend used in the results section.

Legend

YES

When the Proposed/Existing VSC value is above 0.8 i.e. there is less than a 20% reduction with the proposed building when compared to the existing scenario and/or the resultant VSC is above 27%.

YES\*

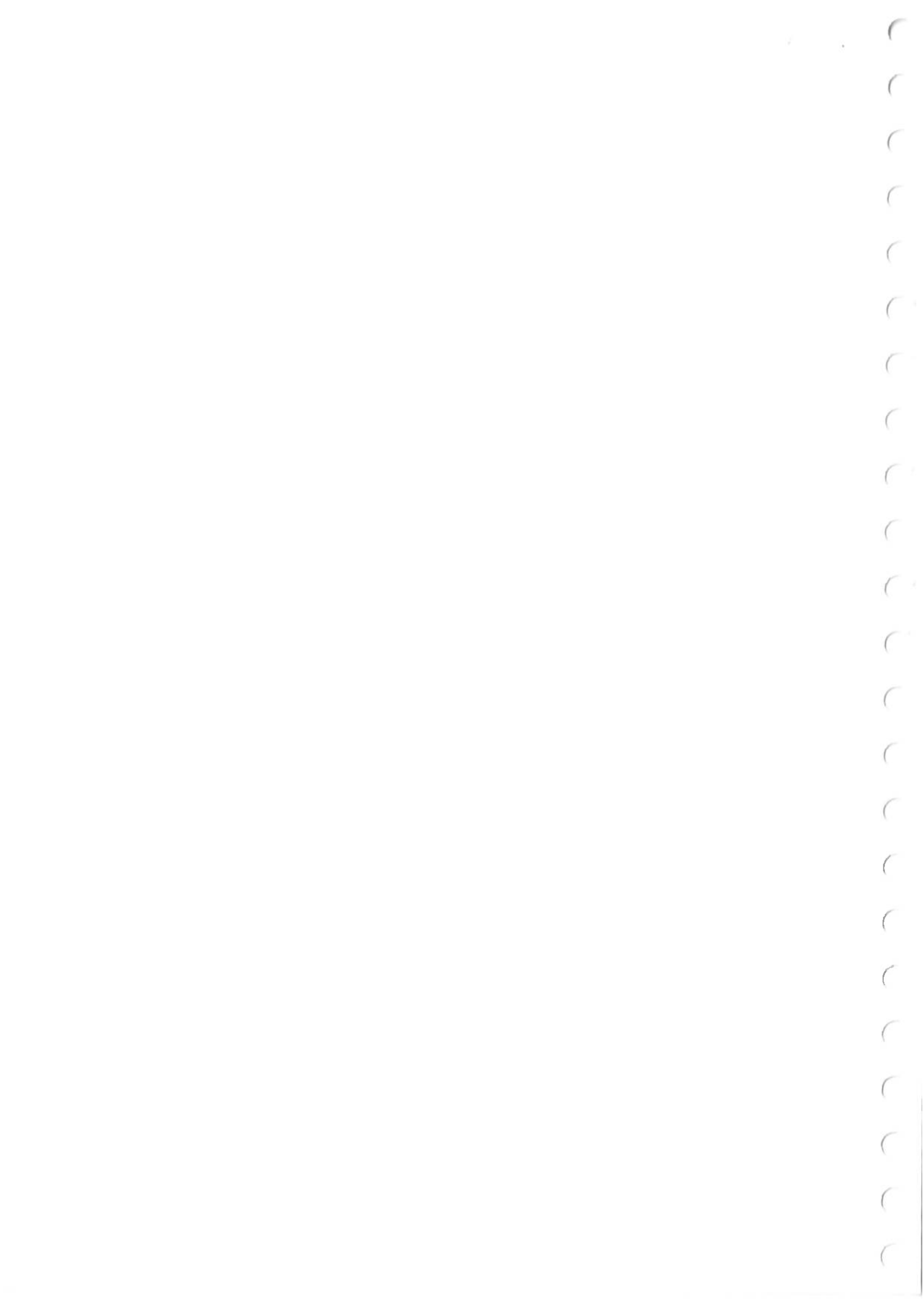
When the Proposed/Existing VSC value is above 0.75 and/or the Proposed VSC value is above 15%.The BRE guide provides guidance that larger windows which has a VSC between 15% and 27% provide adequate daylight.

NO\*

When the Proposed/Existing VSC value is below 0.75 and/or the Proposed VSC value is below 15% but above 13.5%.

NO

When the Proposed/Existing VSC value is below 0.75 and/or the Proposed VSC value is below 13.5%.



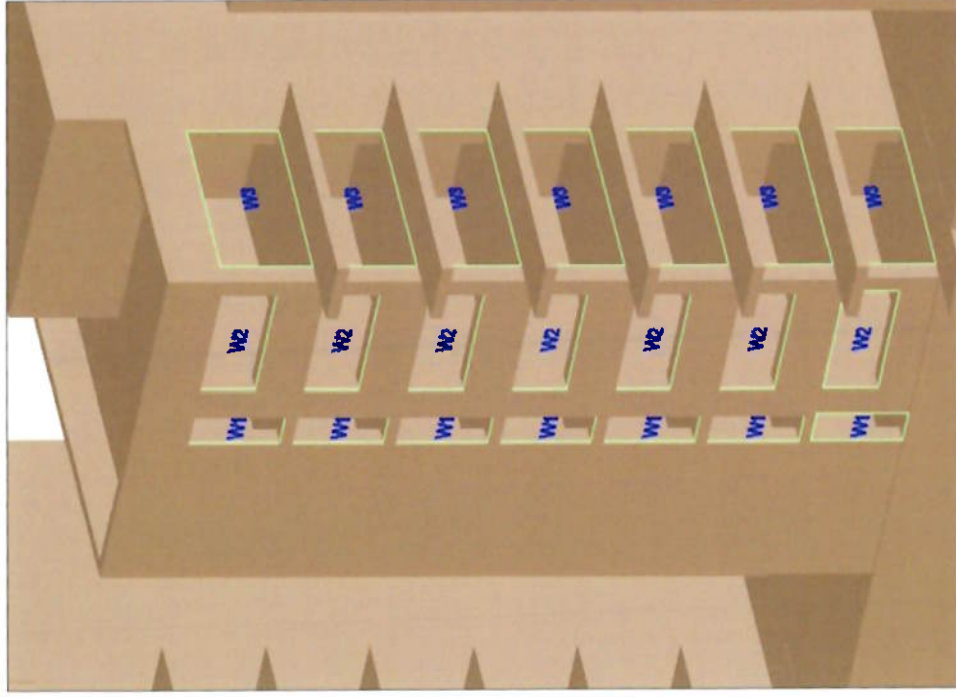


Figure 8: Block 1 Window Labels

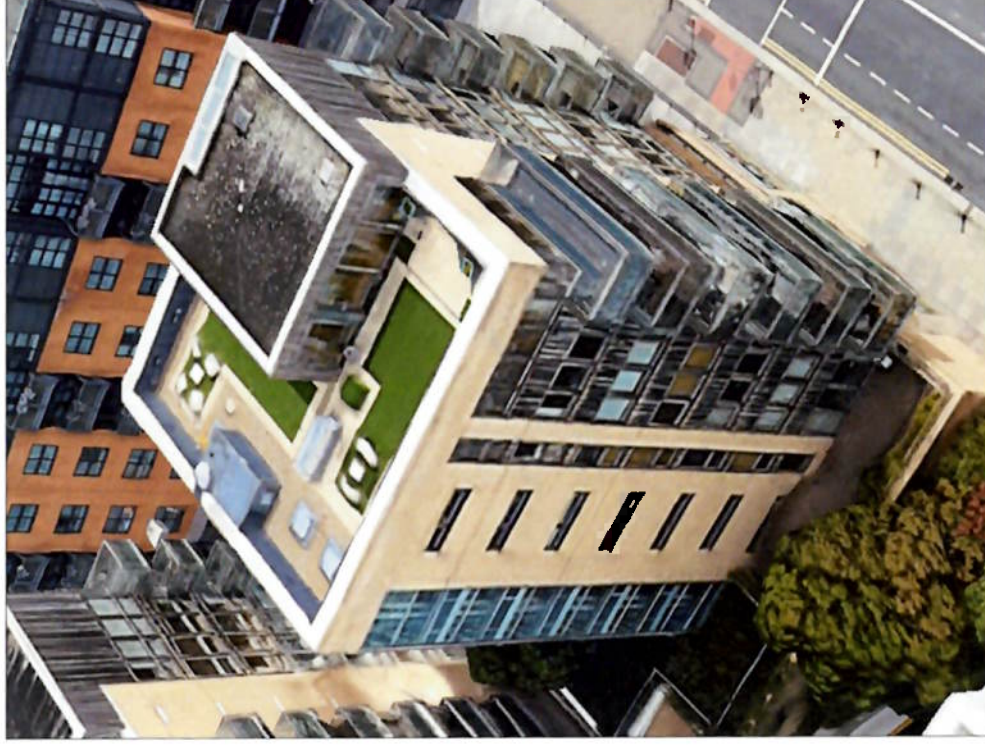


Figure 9: Block 1 Google Image.



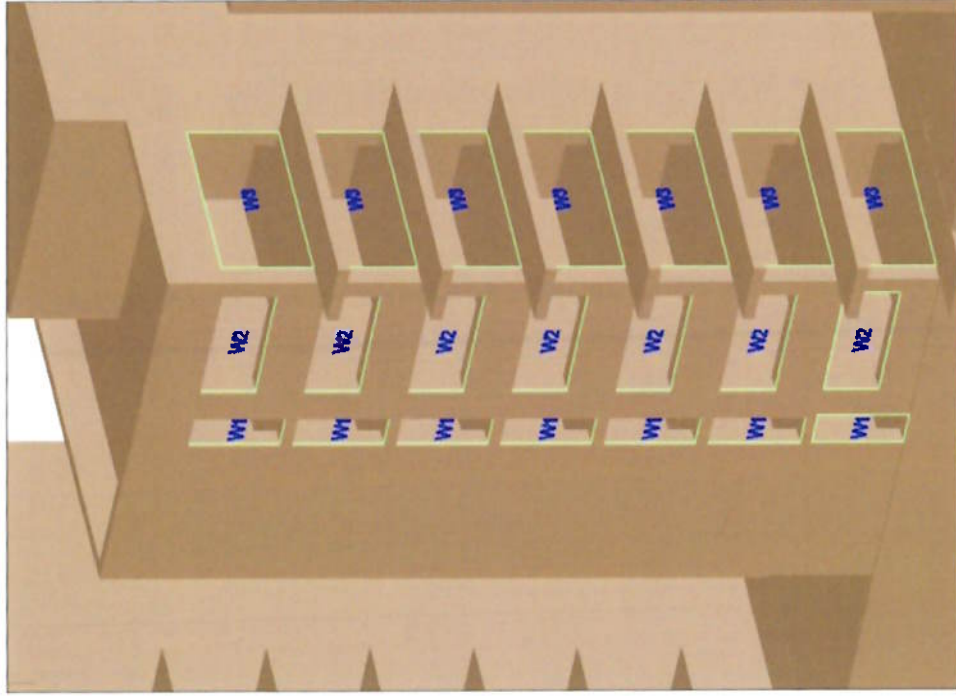
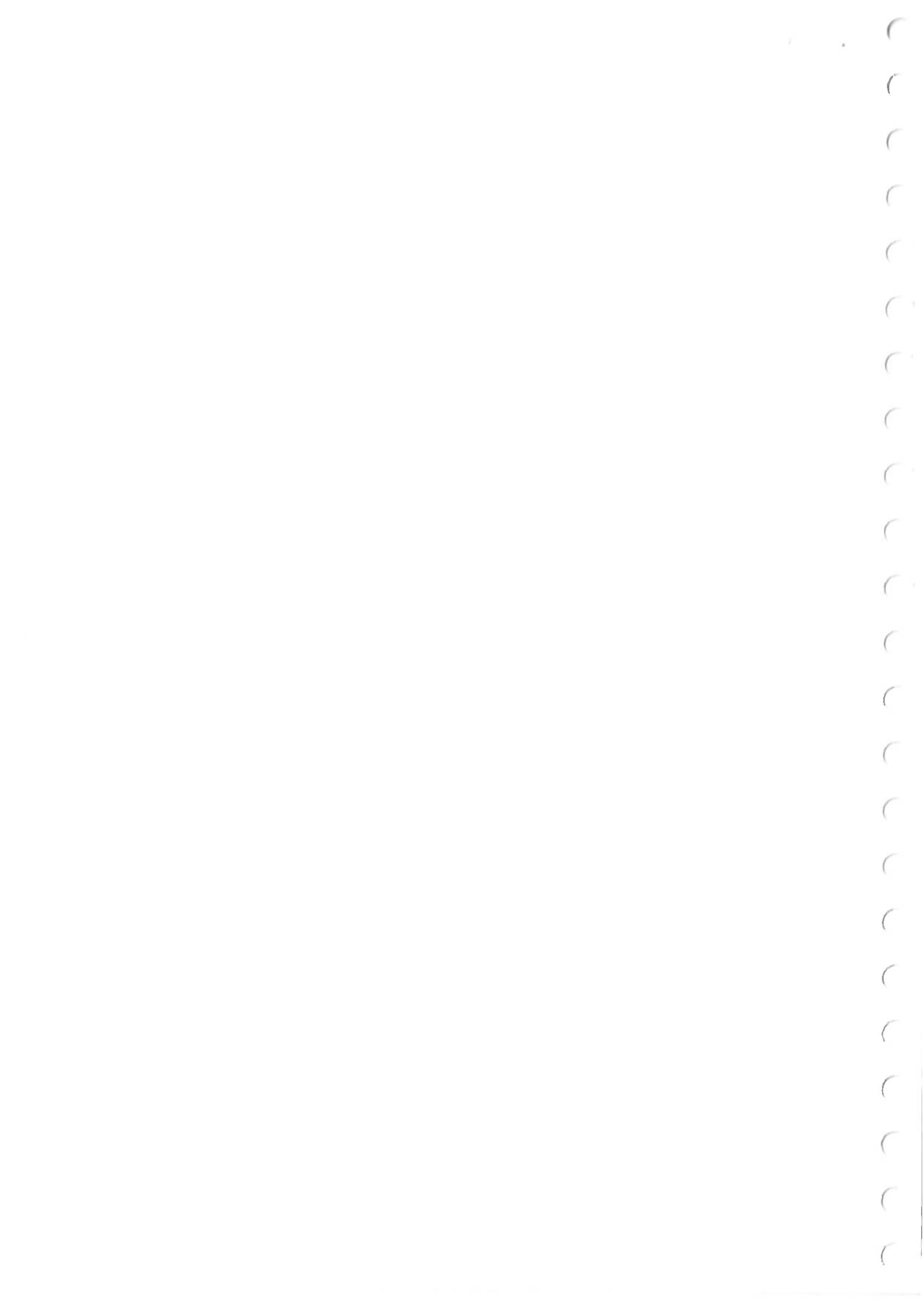


Figure 10: Block 2 Window Labels



Figure 11: Block 2 Google Image.



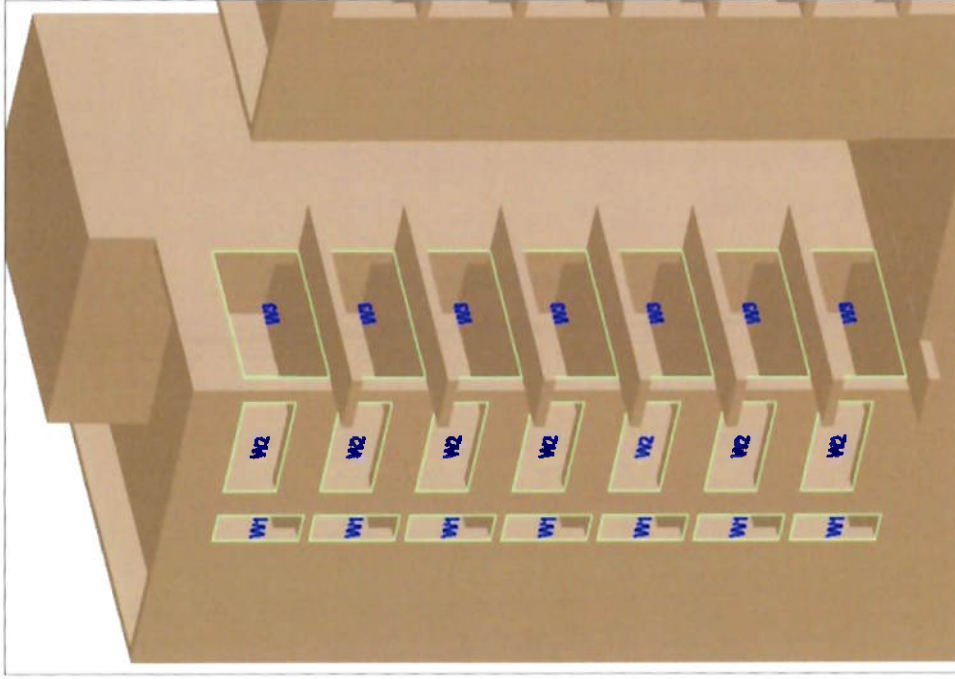


Figure 12: Block 3 Window Labels

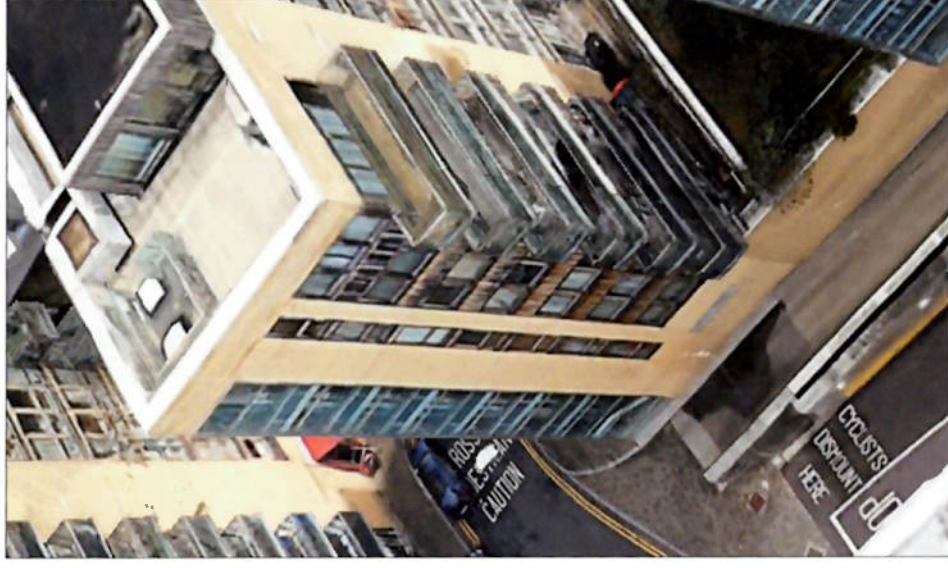


Figure 13: Block 3 Google Image.



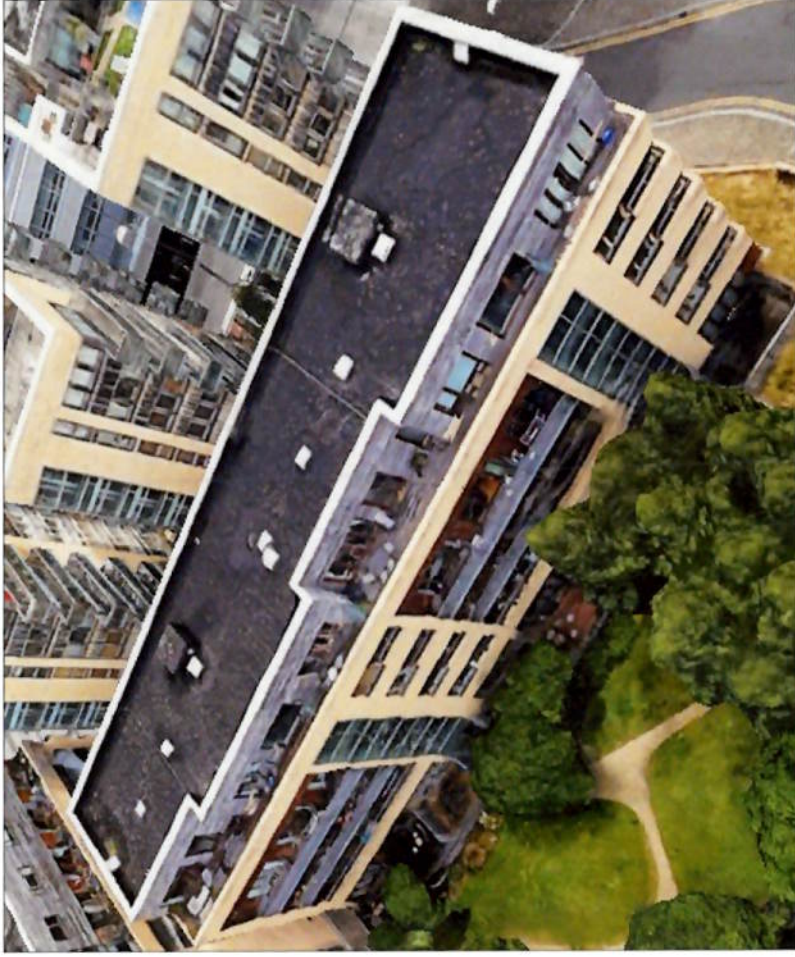


Figure 14: Block 8 (Google Image-West Side)

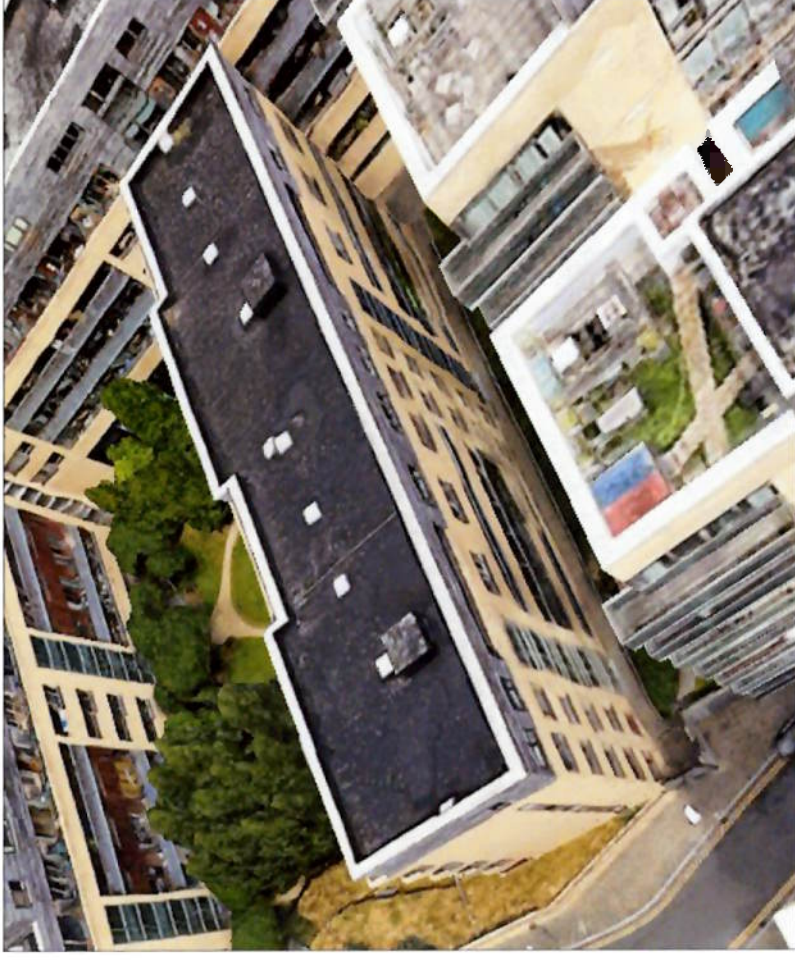
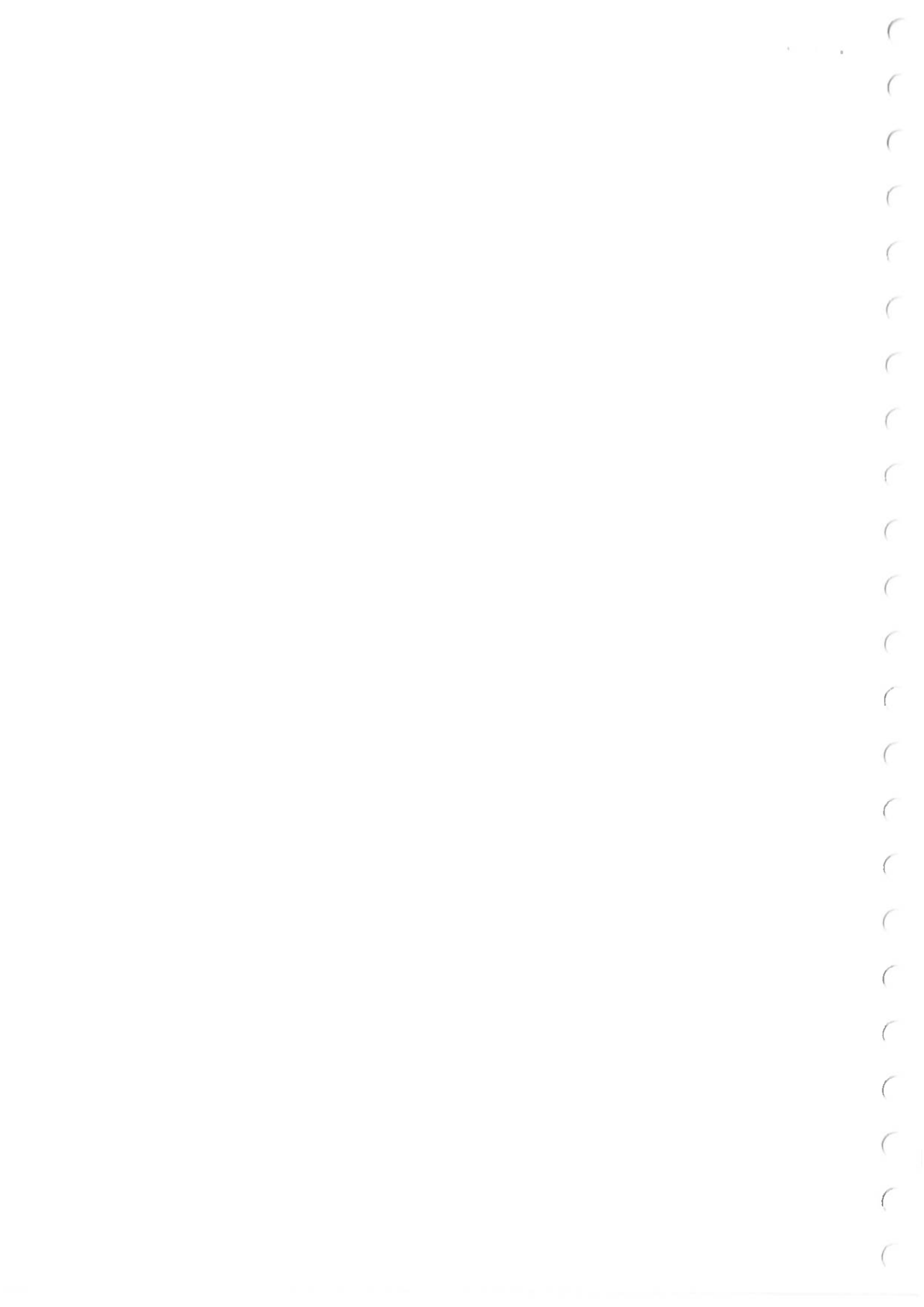


Figure 15: Block 8 (Google Image-East Side)



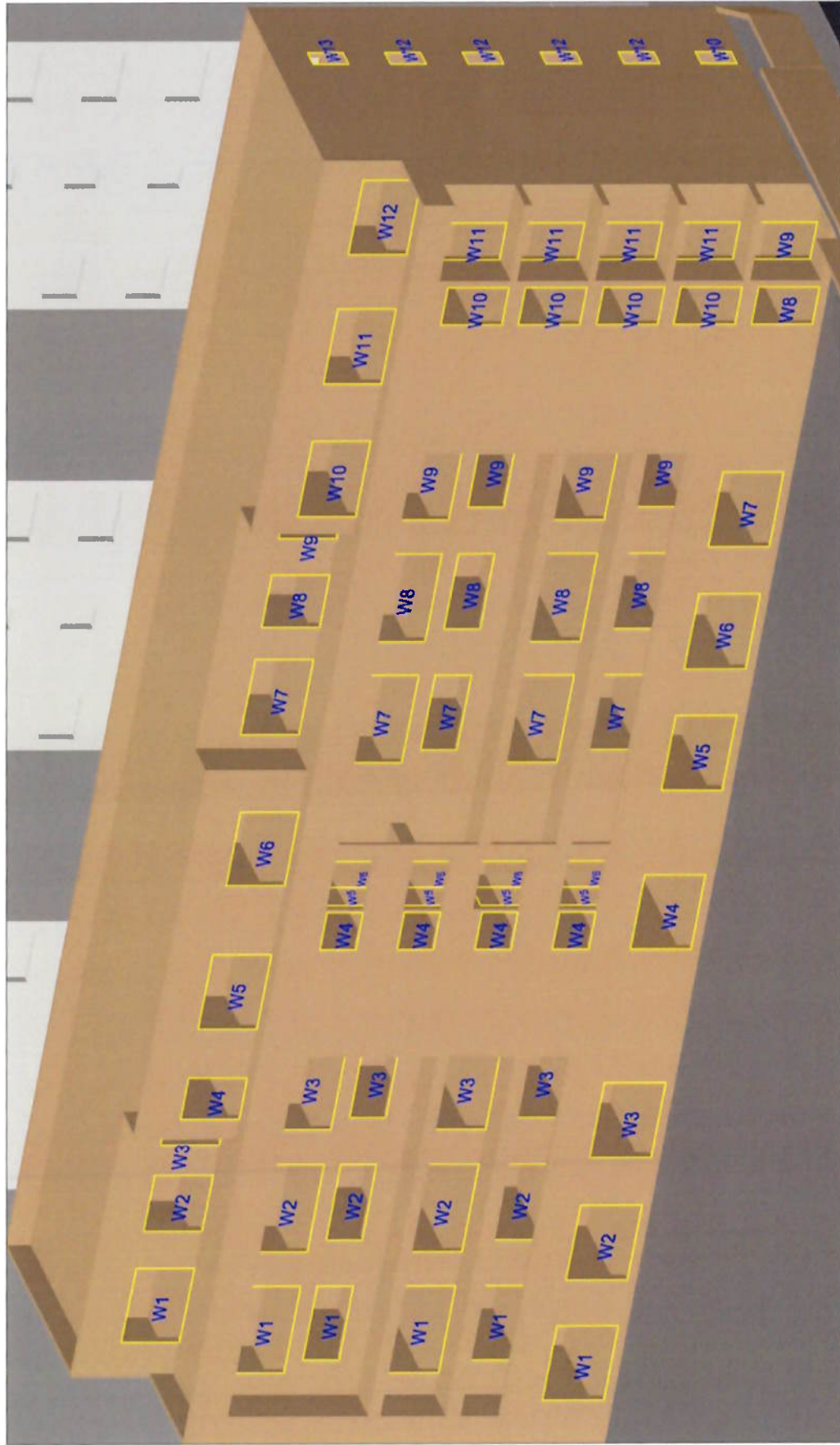


Figure 16: Block 8 Windows Lable (West Side)





Figure 17: Block 8 Window Lable (East Side)

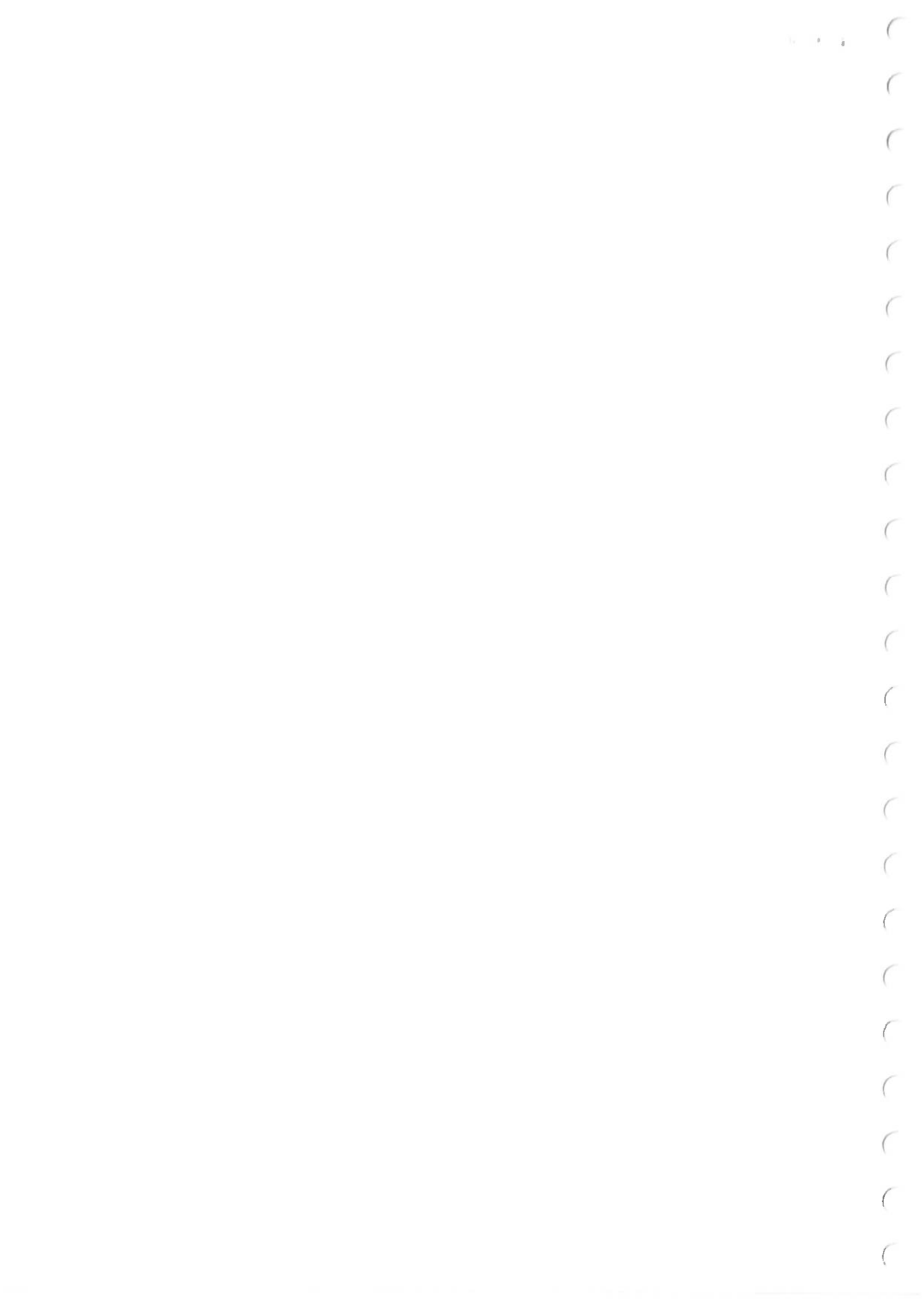
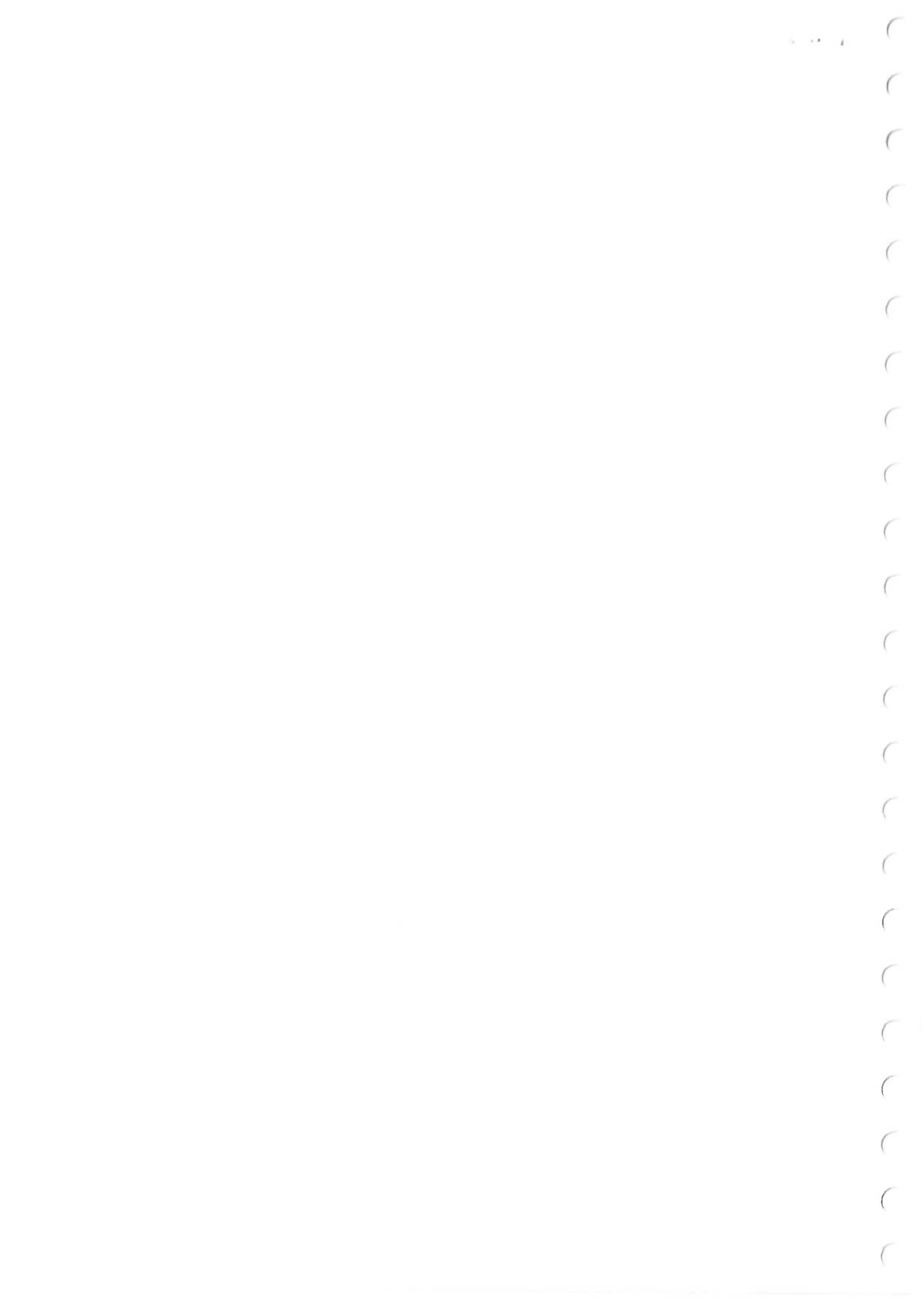




Figure 18: Block 8 (Google Image-Wesat Side)



Figure 19: Block 8 (Google Image-East Side)



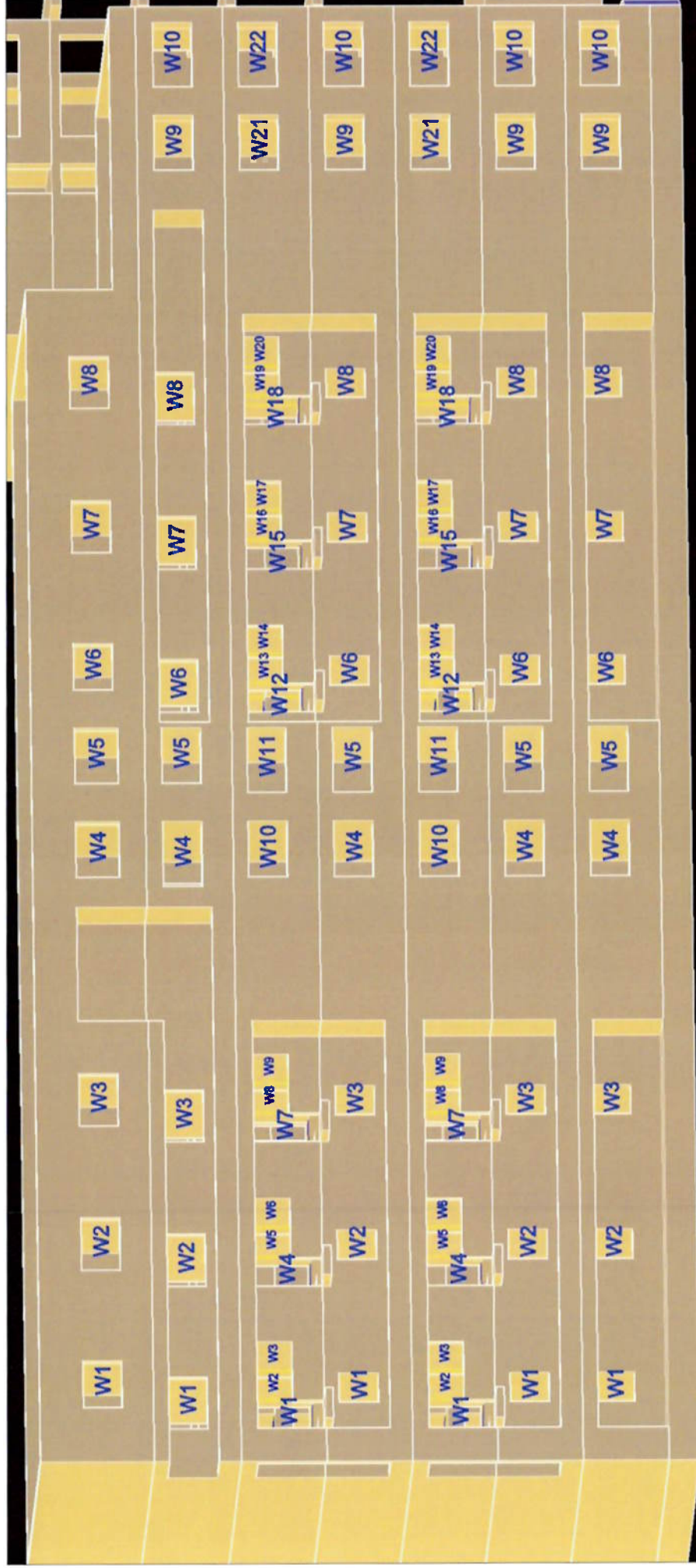


Figure 20: Block 12 Window Table (West Side)



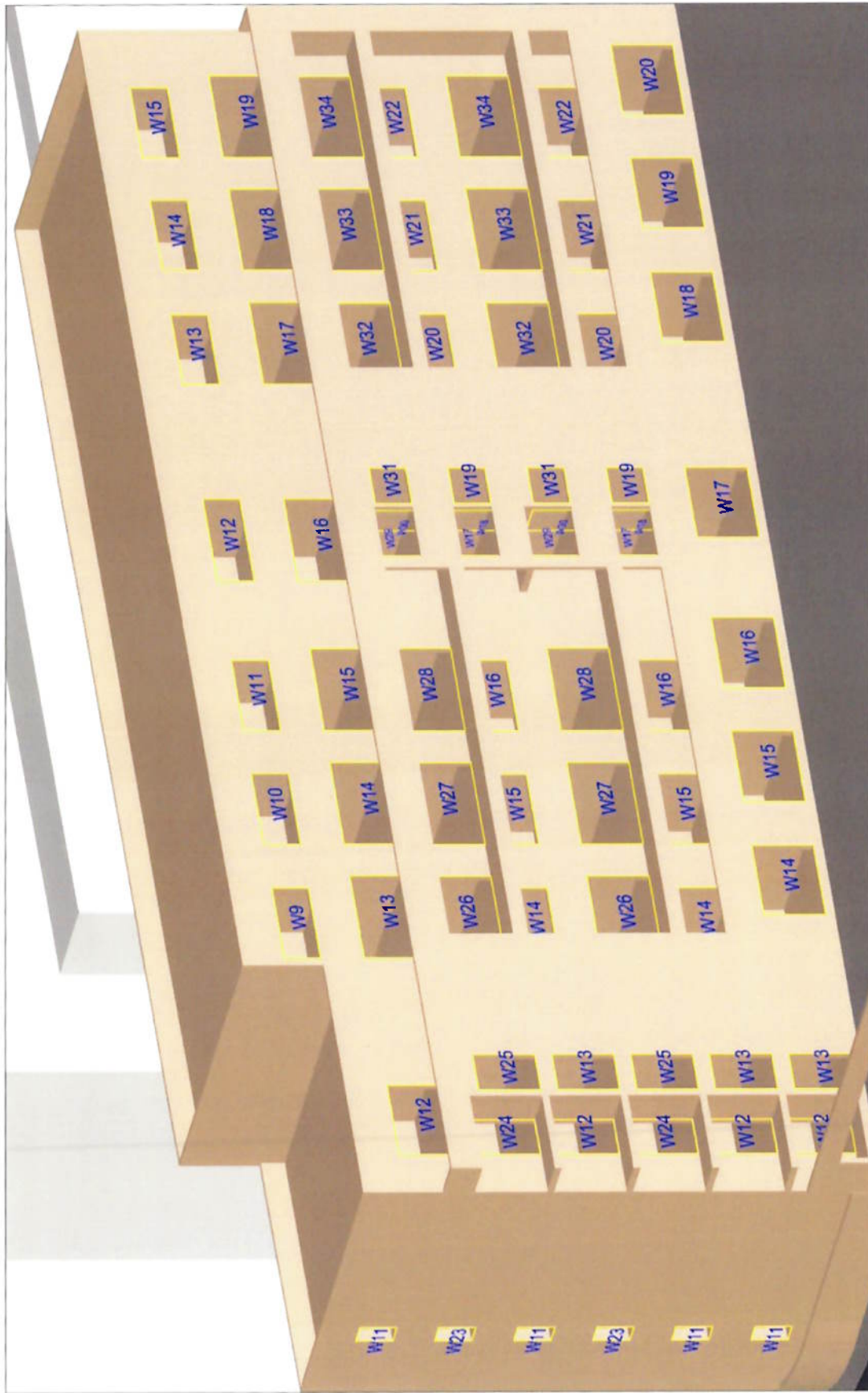


Figure 21: Block 12 Window Table (East Side)

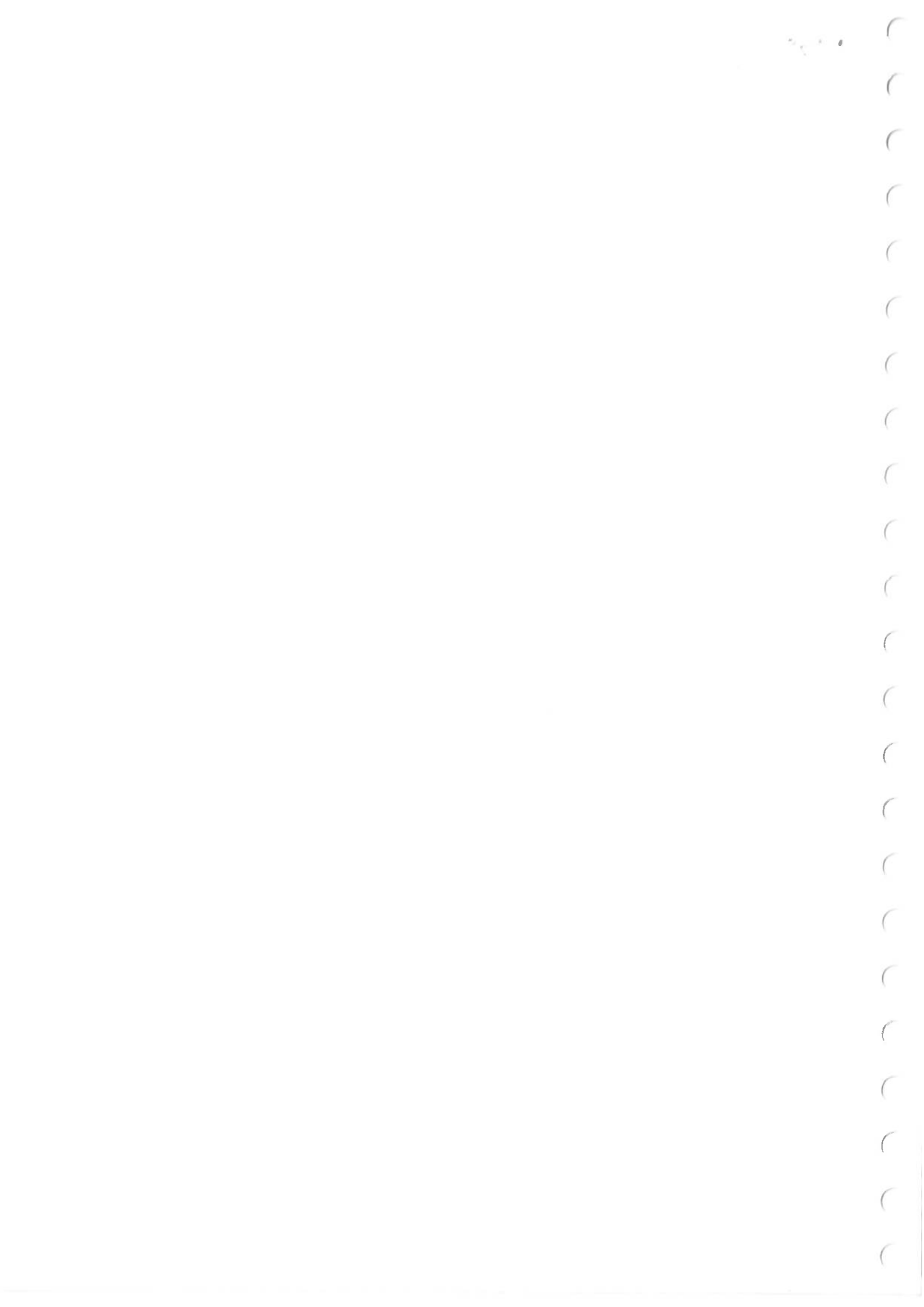


Table 6: VSC Results...

| Property     | Number of Windows Tested | Windows that meet BRE Guidelines |            |
|--------------|--------------------------|----------------------------------|------------|
|              |                          | No.                              | %          |
| BLOCK 1      | 28                       | 28                               | 100%       |
| BLOCK 2      | 21                       | 19                               | 90%        |
| BLOCK 3      | 21                       | 20                               | 95%        |
| BLOCK 8      | 145                      | 126                              | 87%        |
| BLOCK 12     | 166                      | 132                              | 80%        |
| <b>Total</b> | <b>381</b>               | <b>325</b>                       | <b>85%</b> |

In interpreting the results below it is important to be aware of section 2.2.13 of the BRE guide which states” Existing windows with balconies above them typically receive less daylight. Because the balcony cuts out light from the top part of the sky, even a modest

obstruction opposite may result in a large relative impact on the VSC, and on the area receiving direct skylight.”

When we take this into account the effect on the existing neighbouring buildings is limited to a handful of bedroom windows. Overall, we believe this confirms the proposed building has been designed with due consideration for daylight to existing neighbouring dwellings and meets many of the recommendations as set out in the BRE Guide – BR 209 “Site Layout Planning for Daylight and Sunlight, A guide to good practice (2022).”



Table 7: VSC Results...

| Floor Ref.     | Window Ref. | VSC                              | Pr/Ex | Meets BRE Criteria |
|----------------|-------------|----------------------------------|-------|--------------------|
| <b>BLOCK 1</b> |             |                                  |       |                    |
| First          | W1          | Existing 25.53<br>Proposed 19.89 | 0.78  | YES*               |
|                | W2          | Existing 26.75<br>Proposed 21.72 | 0.81  | YES                |
|                | W3          | Existing 28.02<br>Proposed 23.81 | 0.85  | YES                |
|                | W4          | Existing 11.10<br>Proposed 11.10 | 1.00  | YES                |
| Second         | W1          | Existing 27.82<br>Proposed 20.94 | 0.75  | YES*               |
|                | W2          | Existing 28.82<br>Proposed 22.62 | 0.78  | YES*               |
|                | W3          | Existing 29.80<br>Proposed 24.56 | 0.82  | YES                |
|                | W4          | Existing 18.33<br>Proposed 18.33 | 1.00  | YES                |
| Third          | W1          | Existing 30.29<br>Proposed 22.22 | 0.73  | YES*               |
|                | W2          | Existing 31.05<br>Proposed 23.74 | 0.76  | YES*               |
|                | W3          | Existing 31.70<br>Proposed 25.53 | 0.81  | YES                |
|                | W4          | Existing 18.33<br>Proposed 18.33 | 1.00  | YES                |

Table 8: VSC Results...

| Floor Ref.     | Window Ref. | VSC                              | Pr/Ex | Meets BRE Criteria |
|----------------|-------------|----------------------------------|-------|--------------------|
| <b>BLOCK 1</b> |             |                                  |       |                    |
| Fourth         | W1          | Existing 32.66<br>Proposed 23.75 | 0.73  | YES*               |
|                | W2          | Existing 33.20<br>Proposed 25.12 | 0.76  | YES*               |
|                | W3          | Existing 33.57<br>Proposed 26.72 | 0.80  | YES                |
|                | W4          | Existing 18.33<br>Proposed 18.33 | 1.00  | YES                |
| Fifth          | W1          | Existing 35.02<br>Proposed 25.48 | 0.73  | YES*               |
|                | W2          | Existing 35.35<br>Proposed 26.69 | 0.76  | YES*               |
|                | W3          | Existing 35.50<br>Proposed 28.17 | 0.79  | YES                |
|                | W4          | Existing 18.33<br>Proposed 18.33 | 1.00  | YES                |
| Sixth          | W1          | Existing 37.02<br>Proposed 27.38 | 0.74  | YES                |
|                | W2          | Existing 37.21<br>Proposed 28.43 | 0.76  | YES                |
|                | W3          | Existing 37.33<br>Proposed 29.95 | 0.80  | YES                |
|                | W4          | Existing 18.33<br>Proposed 18.33 | 1.00  | YES                |

4.

( )

Table 69: APSH Results...

| BLOCK 8    |           |             |                      |                    |                |        |                    |
|------------|-----------|-------------|----------------------|--------------------|----------------|--------|--------------------|
| Floor Ref. | Room Ref. | Window Ref. | Pr/Ex                | Window Orientation | Annual         | Pr/Ex  | Meets BRE Criteria |
| Fourth     | R1        | W1          | Existing<br>Proposed | 275°N              |                | *North | *North             |
|            | R2        | W2          | Existing<br>Proposed | 275°N              |                | *North | *North             |
|            | R3        | W3          | Existing<br>Proposed | 275°N              |                | *North | *North             |
|            | R4        | W4          | Existing<br>Proposed | 275°N              | 44.06<br>32.32 | *North | *North             |
|            |           | W5          | Existing<br>Proposed | 185°               | 22.14<br>13.21 | 0.60   | NO                 |
|            |           | W6          | Existing<br>Proposed | 275°N              | 13.75<br>9.48  | *North | *North             |
|            | R5        | W7          | Existing<br>Proposed | 275°N              | 10.33<br>2.64  | *North | *North             |
|            | R6        | W8          | Existing<br>Proposed | 275°N              | 4.90<br>0.16   | 0.03   | NO                 |

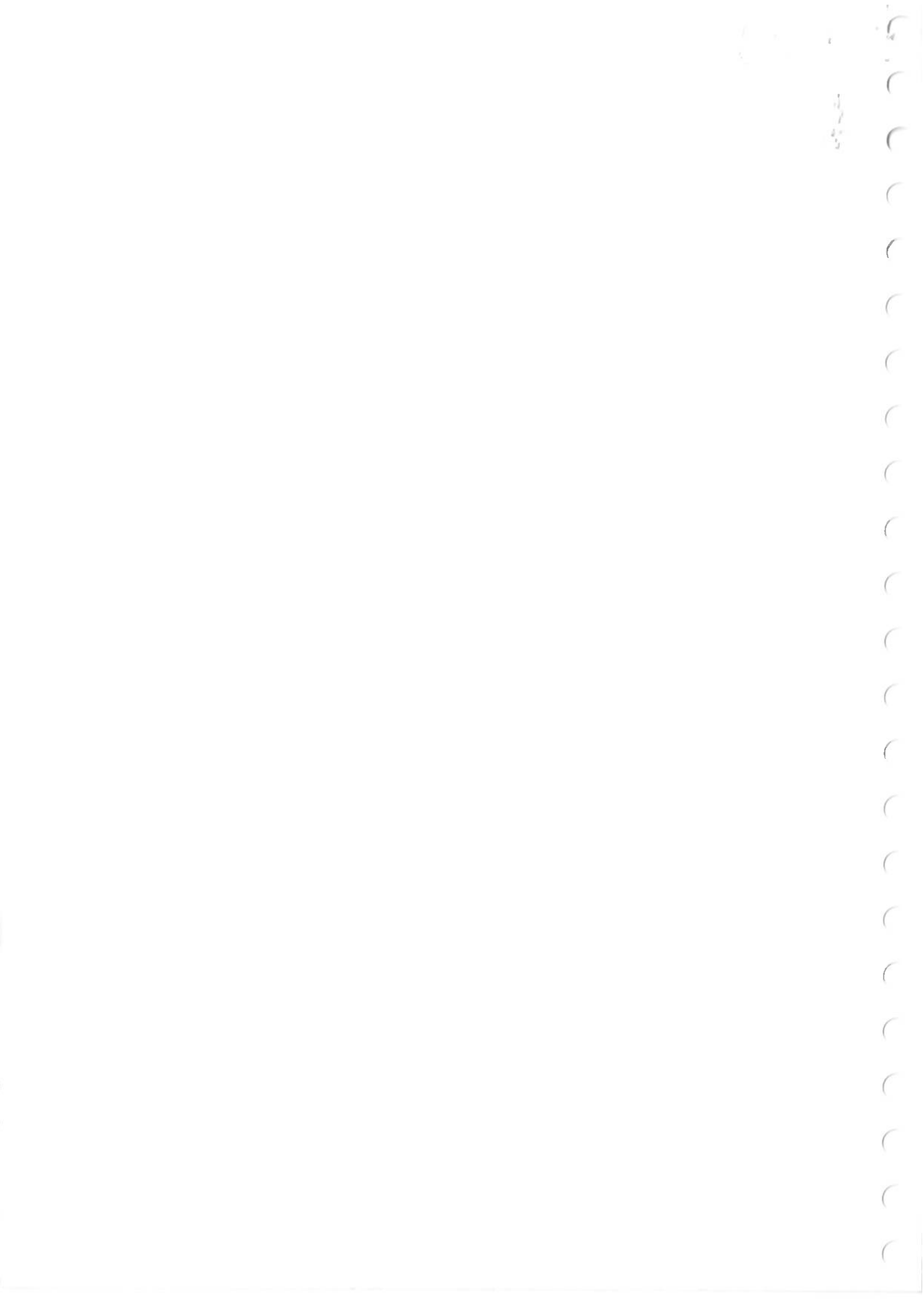


Table 70: APSH Results...

| BLOCK 8    |           |             |                      |                    |                |        |                    |                |        |                    |
|------------|-----------|-------------|----------------------|--------------------|----------------|--------|--------------------|----------------|--------|--------------------|
| Floor Ref. | Room Ref. | Window Ref. | Pr/Ex                | Window Orientation | Annual         | Pr/Ex  | Meets BRE Criteria | Winter         | Pr/Ex  | Meets BRE Criteria |
| Fourth     | R7        | W9          | Existing<br>Proposed | 275°N              |                | *North | *North             |                | *North | *North             |
|            | R8        | W10         | Existing<br>Proposed | 275°N              |                | *North | *North             |                | *North | *North             |
|            |           | W11         | Existing<br>Proposed | 275°N              |                | *North | *North             |                | *North | *North             |
|            | R9        | W12         | Existing<br>Proposed | 185°               | 68.38<br>54.55 | 0.80   | YES                | 14.45<br>12.28 | 0.85   | YES                |
|            |           | W13         | Existing<br>Proposed | 95°                | 34.58<br>34.58 | 1.00   | YES                | 7.23<br>7.23   | 1.00   | YES                |
|            | R10       | W14         | Existing<br>Proposed | 95°                | 33.41<br>33.41 | 1.00   | YES                | 6.92<br>6.92   | 1.00   | YES                |
|            | R11       | W15         | Existing<br>Proposed | 95°                | 20.51<br>20.51 | 1.00   | YES                | 7.54<br>7.54   | 1.00   | YES                |
|            |           |             |                      |                    |                |        |                    |                |        |                    |
|            |           |             |                      |                    |                |        |                    |                |        |                    |
|            |           |             |                      |                    |                |        |                    |                |        |                    |



Table 71: APSH Results...

| Floor Ref. | Room Ref. | Window Ref. | Pr/Ex                | Window Orientation | Annual         | Pr/Ex | Meets BRE Criteria | Winter       | Pr/Ex | Meets BRE Criteria |
|------------|-----------|-------------|----------------------|--------------------|----------------|-------|--------------------|--------------|-------|--------------------|
| BLOCK 8    |           |             |                      |                    |                |       |                    |              |       |                    |
| Fourth     | R12       | W16         | Existing<br>Proposed | 95°                | 22.61<br>22.61 | 1.00  | YES                | 6.37<br>6.37 | 1.00  | YES                |
|            | R13       | W17         | Existing<br>Proposed | 95°                | 24.86<br>24.86 | 1.00  | YES                | 5.83<br>5.83 | 1.00  | YES                |
|            | R14       | W18         | Existing<br>Proposed | 95°                | 24.48<br>24.48 | 1.00  | YES                | 5.59<br>5.59 | 1.00  | YES                |
|            | R15       | W19         | Existing<br>Proposed | 95°                | 18.41<br>18.41 | 1.00  | YES                | 4.04<br>4.04 | 1.00  | YES                |
|            | R16       | W20         | Existing<br>Proposed | 95°                | 21.68<br>21.68 | 1.00  | YES                | 4.90<br>4.90 | 1.00  | YES                |
|            | R17       | W21         | Existing<br>Proposed | 95°                | 26.57<br>26.57 | 1.00  | YES                | 5.21<br>5.21 | 1.00  | YES                |
|            | R18       | W22         | Existing<br>Proposed | 95°                | 18.18<br>18.18 | 1.00  | YES                | 3.57<br>3.57 | 1.00  | YES                |
|            |           |             |                      |                    |                |       |                    |              |       |                    |

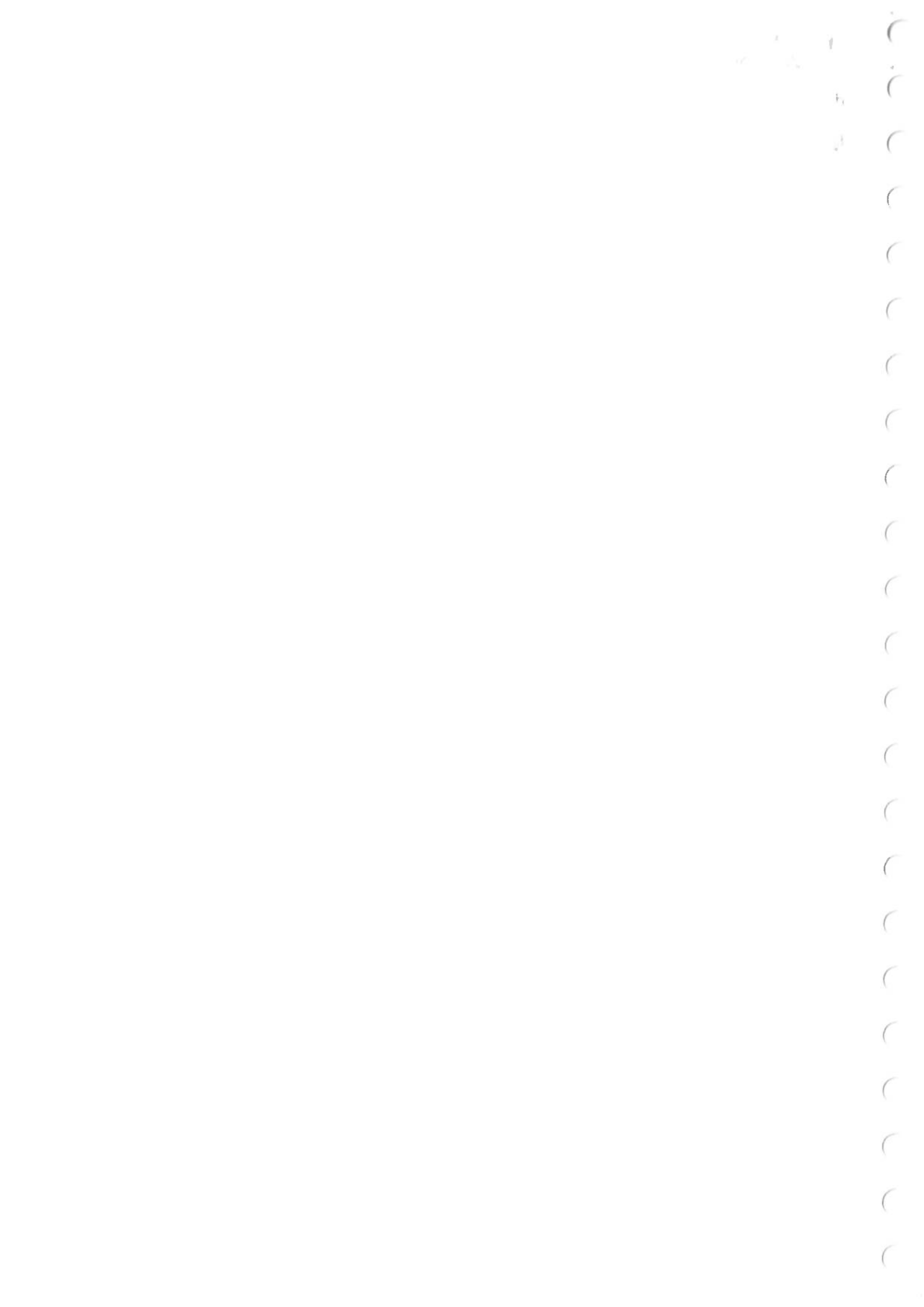


Table 72: APSH Results...

| Floor Ref. | Room Ref. | Window Ref. | Existing<br>Proposed | Pr/Ex | Window<br>Orientation | Annual | Pr/Ex  | Meets<br>BRE<br>Criteria | Winter | Pr/Ex  | Meets<br>BRE<br>Criteria |
|------------|-----------|-------------|----------------------|-------|-----------------------|--------|--------|--------------------------|--------|--------|--------------------------|
| BLOCK 8    |           |             |                      |       |                       |        |        |                          |        |        |                          |
| Fifth      | R1        | W1          | Existing<br>Proposed | 1.00  | 276°N                 |        | *North | *North                   |        | *North | *North                   |
|            | R2        | W2          | Existing<br>Proposed | 1.00  | 276°N                 |        | *North | *North                   |        | *North | *North                   |
|            |           | W3          | Existing<br>Proposed | 1.00  | 276°N                 |        | *North | *North                   |        | *North | *North                   |
|            | R3        | W4          | Existing<br>Proposed | 1.00  | 275°N                 |        | *North | *North                   |        | *North | *North                   |
|            | R4        | W5          | Existing<br>Proposed | 1.00  | 275°N                 |        | *North | *North                   |        | *North | *North                   |
|            | R5        | W6          | Existing<br>Proposed | 1.00  | 275°N                 |        | *North | *North                   |        | *North | *North                   |
|            | R6        | W7          | Existing<br>Proposed | 1.00  | 275°N                 |        | *North | *North                   |        | *North | *North                   |

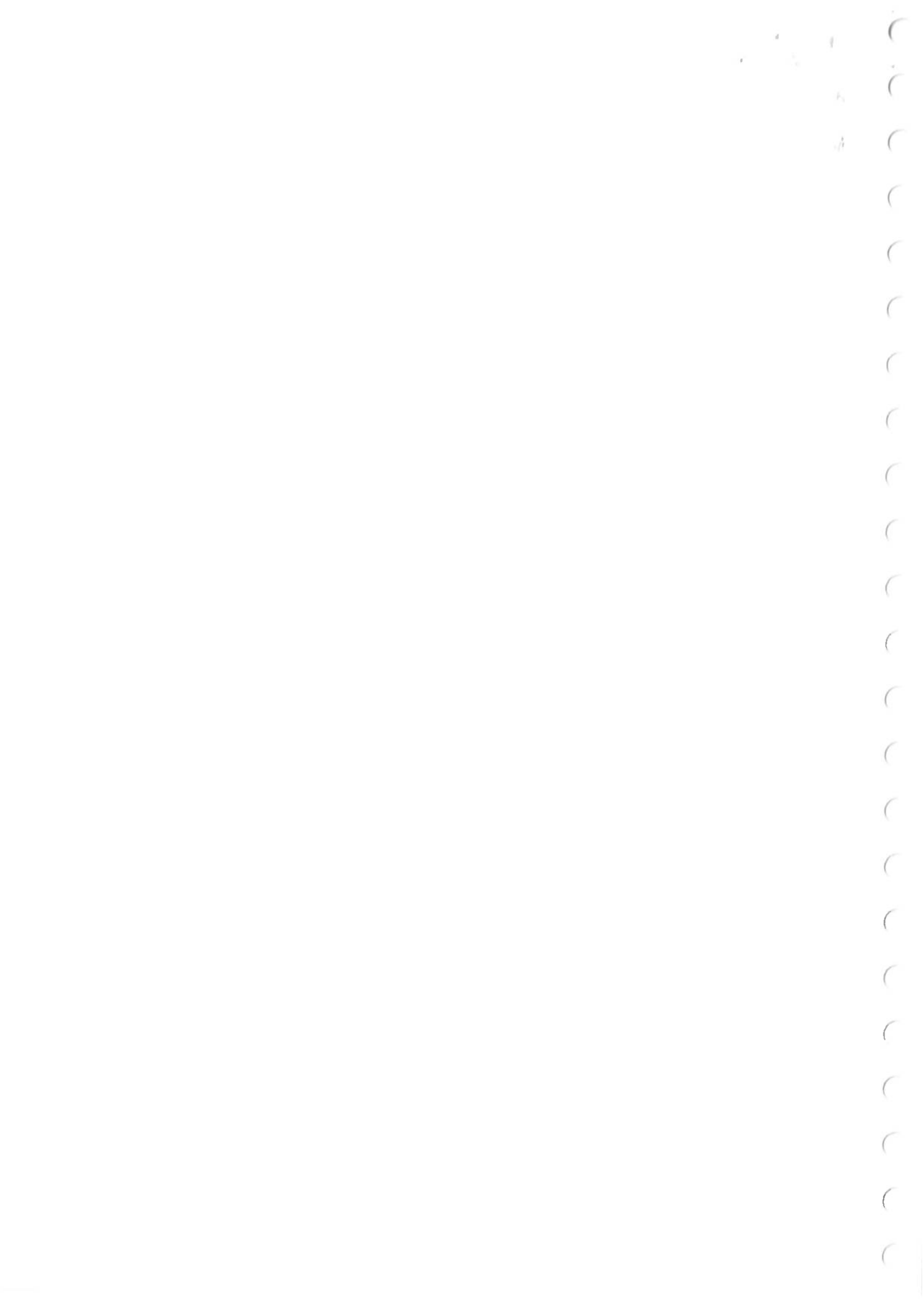


Table 73: APSH Results...

| Floor Ref. |     | Room Ref. | Window Ref.          | Pr/Ex | Window Orientation | Annual         | Pr/Ex  | Meets BRE Criteria | Winter         | Pr/Ex  | Meets BRE Criteria |
|------------|-----|-----------|----------------------|-------|--------------------|----------------|--------|--------------------|----------------|--------|--------------------|
| BLOCK 8    |     |           |                      |       |                    |                |        |                    |                |        |                    |
| Fifth      | R7  | W8        | Existing<br>Proposed | 1.00  | 275°N              |                | *North | *North             | *North         | *North | *North             |
|            |     | W9        | Existing<br>Proposed | 1.00  | 275°N              |                | *North | *North             | *North         | *North | *North             |
|            | R8  | W10       | Existing<br>Proposed | 1.00  | 275°N              |                | *North | *North             | *North         | *North | *North             |
|            |     | W11       | Existing<br>Proposed | 1.00  | 275°N              |                | *North | *North             | *North         | *North | *North             |
|            | R10 | W12       | Existing<br>Proposed | 1.00  | 275°N              |                | *North | *North             | *North         | *North | *North             |
|            |     | W13       | Existing<br>Proposed | 1.00  | 185°               | 74.98<br>59.36 | 0.79   | YES                | 19.11<br>13.83 | 0.72   | YES                |
|            | R11 | W14       | Existing<br>Proposed | 1.00  | 95°                | 36.83<br>36.83 | 1.00   | YES                | 8.24<br>8.24   | 1.00   | YES                |
|            |     |           |                      |       |                    |                |        |                    |                |        |                    |
|            |     |           |                      |       |                    |                |        |                    |                |        |                    |
|            |     |           |                      |       |                    |                |        |                    |                |        |                    |

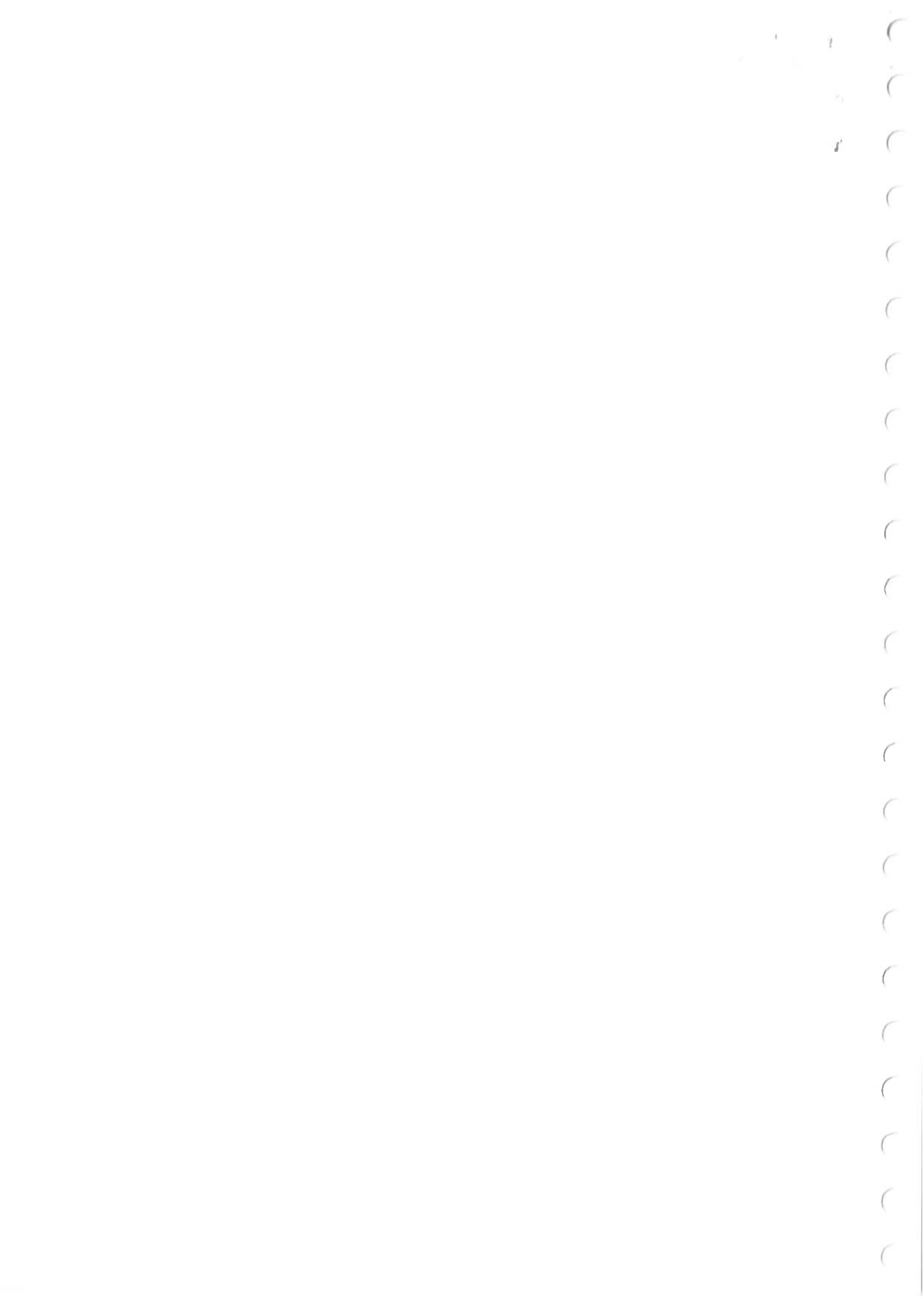


Table 74: APSH Results...

| Floor Ref. | Room Ref. | Window Ref. | Pr/Ex                | Window Orientation | Annual         | Pr/Ex | Meets BRE Criteria | Winter       | Pr/Ex | Meets BRE Criteria |
|------------|-----------|-------------|----------------------|--------------------|----------------|-------|--------------------|--------------|-------|--------------------|
| BLOCK 8    |           |             |                      |                    |                |       |                    |              |       |                    |
| Fifth      | R12       | W15         | Existing<br>Proposed | 95°                | 35.28<br>35.28 | 1.00  | YES                | 8.78<br>8.78 | 1.00  | YES                |
|            | R13       | W16         | Existing<br>Proposed | 95°                | 7.30<br>7.30   | 1.00  | YES                | 4.35<br>4.35 | 1.00  | YES                |
|            | R14       | W17         | Existing<br>Proposed | 95°                | 3.42<br>3.42   | 1.00  | YES                | 3.03<br>3.03 | 1.00  | YES                |
|            | R15       | W18         | Existing<br>Proposed | 95°                | 26.26<br>26.26 | 1.00  | YES                | 7.46<br>7.46 | 1.00  | YES                |
|            | R16       | W19         | Existing<br>Proposed | 95°                | 28.67<br>28.67 | 1.00  | YES                | 6.53<br>6.53 | 1.00  | YES                |

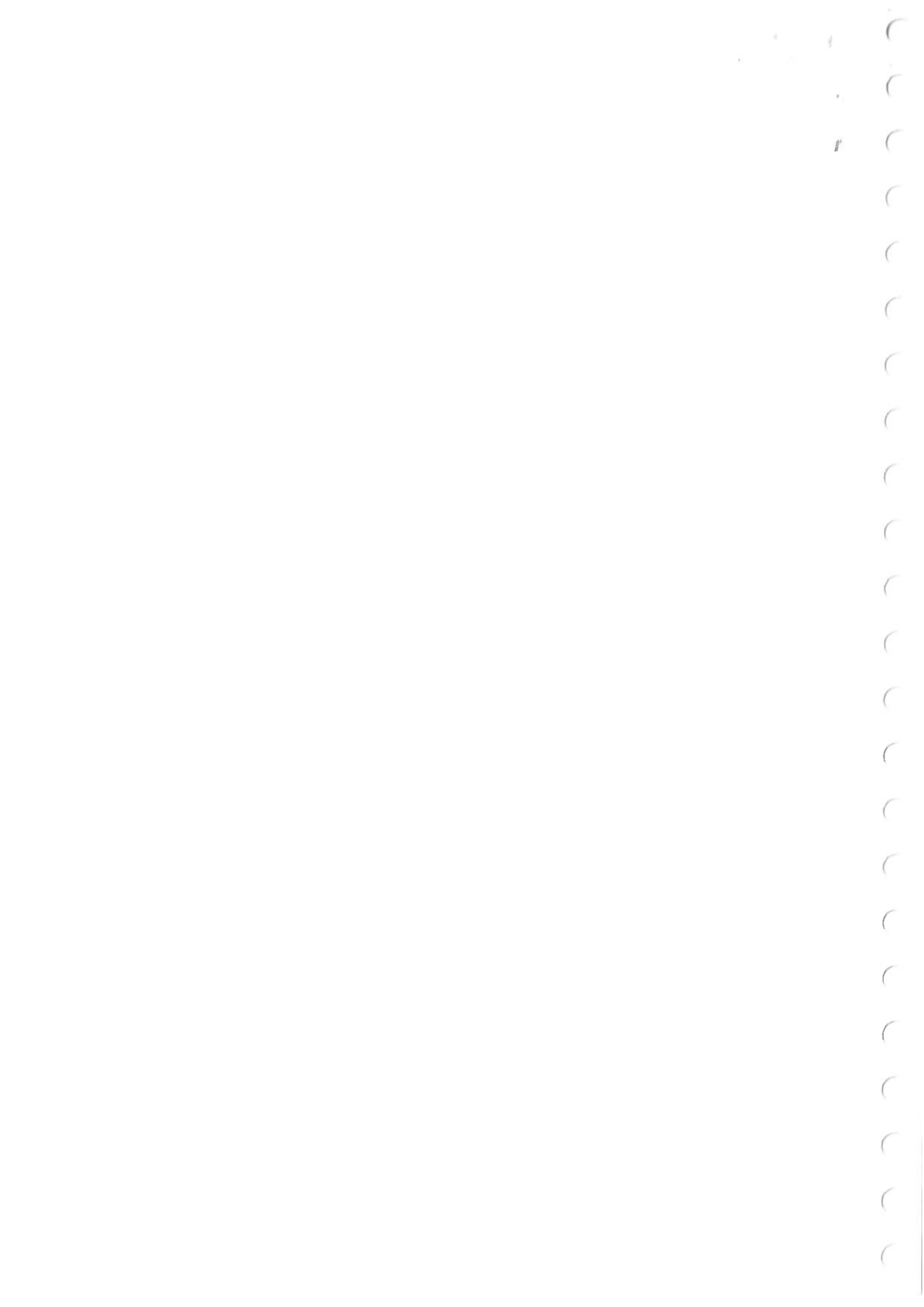


Table 75: APSH Results...

| Floor Ref. |     | Room Ref. | Window Ref.          | Pr/Ex | Window Orientation | Annual         | Pr/Ex | Meets BRE Criteria | Winter       | Pr/Ex | Meets BRE Criteria |
|------------|-----|-----------|----------------------|-------|--------------------|----------------|-------|--------------------|--------------|-------|--------------------|
| BLOCK 8    |     |           |                      |       |                    |                |       |                    |              |       |                    |
| Fifth      | R17 | W20       | Existing<br>Proposed | 1.00  | 95°                | 27.43<br>27.43 | 1.00  | YES                | 7.30<br>7.30 | 1.00  | YES                |
|            | R18 | W21       | Existing<br>Proposed | 1.00  | 95°                | 21.21<br>21.21 | 1.00  | YES                | 5.36<br>5.36 | 1.00  | YES                |
|            | R19 | W22       | Existing<br>Proposed | 1.00  | 95°                | 2.64<br>2.64   | 1.00  | YES                | 0.16<br>0.16 | 1.00  | YES                |
|            | R20 | W23       | Existing<br>Proposed | 1.00  | 95°                | 5.98<br>5.98   | 1.00  | YES                | 0.16<br>0.16 | 1.00  | YES                |
|            | R21 | W24       | Existing<br>Proposed | 1.00  | 95°                | 29.60<br>29.60 | 1.00  | YES                | 6.14<br>6.14 | 1.00  | YES                |
|            | R22 | W25       | Existing<br>Proposed | 1.00  | 95°                | 21.21<br>21.21 | 1.00  | YES                | 5.36<br>5.36 | 1.00  | YES                |

Table 76: APSH Results...

| Floor Ref. |    | Room Ref. |                      | Window Orientation |       | Annual |        | Meets BRE Criteria |        | Meets BRE Criteria |  |
|------------|----|-----------|----------------------|--------------------|-------|--------|--------|--------------------|--------|--------------------|--|
| BLOCK 12   |    |           |                      |                    |       |        |        |                    |        |                    |  |
| Ground     | R1 | W1        | Existing<br>Proposed | 1.00               | 275°N | *North | *North | *North             | *North |                    |  |
|            | R2 | W2        | Existing<br>Proposed | 1.00               | 275°N | *North | *North | *North             | *North |                    |  |
|            | R3 | W3        | Existing<br>Proposed | 1.00               | 275°N | *North | *North | *North             | *North |                    |  |
|            | R4 | W4        | Existing<br>Proposed | 1.00               | 275°N | *North | *North | *North             | *North |                    |  |
|            | R5 | W5        | Existing<br>Proposed | 1.00               | 275°N | *North | *North | *North             | *North |                    |  |
|            | R6 | W6        | Existing<br>Proposed | 1.00               | 275°N | *North | *North | *North             | *North |                    |  |
|            | R7 | W7        | Existing<br>Proposed | 1.00               | 275°N | *North | *North | *North             | *North |                    |  |

Table 77: APSH Results...

| Floor Ref. |     | Room Ref. | Pr/Ex                | Window Orientation | Annual         | Pr/Ex  | Meets BRE Criteria | Winter       | Pr/Ex  | Meets BRE Criteria |
|------------|-----|-----------|----------------------|--------------------|----------------|--------|--------------------|--------------|--------|--------------------|
| BLOCK 12   |     |           |                      |                    |                |        |                    |              |        |                    |
| Ground     | R8  | W8        | Existing<br>Proposed | 275°N              |                | *North | *North             |              | *North | *North             |
|            | R9  | W9        | Existing<br>Proposed | 275°N              |                | *North | *North             |              | *North | *North             |
|            | R10 | W10       | Existing<br>Proposed | 275°N              | 12.74<br>0.00  | *North | *North             | 0.00<br>0.00 | *North | *North             |
|            |     | W11       | Existing<br>Proposed | 185°               | 27.58<br>7.85  | 0.28   | NO                 | 0.39<br>0.23 | 0.60   | NO                 |
|            | R11 | W12       | Existing<br>Proposed | 95°                | 8.47<br>8.08   | 0.95   | YES                | 0.23<br>0.23 | 1.00   | YES                |
|            |     | W13       | Existing<br>Proposed | 95°                | 18.26<br>12.43 | 0.68   | NO                 | 0.16<br>0.03 | 0.50   | NO                 |
|            | R12 | W14       | Existing<br>Proposed | 95°                | 21.83<br>17.72 | 0.81   | YES                | 0.78<br>0.31 | 0.40   | NO                 |
|            | R13 | W15       | Existing<br>Proposed | 95°                | 22.77<br>19.27 | 0.85   | YES                | 1.48<br>0.62 | 0.42   | YES                |

Table 78: APSH Results...

| Floor Ref. | Room Ref. | Pr/Ex | Window Orientation   | Annual | Pr/Ex | Meets BRE Criteria | Winter | Pr/Ex | Meets BRE Criteria |      |     |
|------------|-----------|-------|----------------------|--------|-------|--------------------|--------|-------|--------------------|------|-----|
| BLOCK 12   |           |       |                      |        |       |                    |        |       |                    |      |     |
| Ground     | R14       | W16   | Existing<br>Proposed | 1.00   | 95°   | 24.32<br>21.29     | 0.88   | YES   | 2.80<br>1.01       | 0.36 | YES |
|            | R15       | W17   | Existing<br>Proposed | 1.00   | 95°   | 25.02<br>22.92     | 0.92   | YES   | 3.73<br>1.86       | 0.50 | YES |
|            | R16       | W18   | Existing<br>Proposed | 1.00   | 95°   | 26.88<br>24.24     | 0.90   | YES   | 5.44<br>2.80       | 0.51 | YES |
|            | R17       | W19   | Existing<br>Proposed | 1.00   | 95°   | 27.66<br>25.10     | 0.91   | YES   | 6.45<br>3.89       | 0.60 | YES |
|            | R18       | W20   | Existing<br>Proposed | 1.00   | 95°   | 30.30<br>28.13     | 0.93   | YES   | 7.15<br>4.97       | 0.70 | YES |

Table 79: APSH Results...

| Floor Ref. | Room Ref. | Pr/Ex | Window Orientation   | Annual | Pr/Ex | Meets BRE Criteria | Winter | Pr/Ex  | Meets BRE Criteria |
|------------|-----------|-------|----------------------|--------|-------|--------------------|--------|--------|--------------------|
| BLOCK 12   |           |       |                      |        |       |                    |        |        |                    |
| First      | R1        | W1    | Existing<br>Proposed | 1.00   | 275°N | *North             | *North | *North | *North             |
|            | R2        | W2    | Existing<br>Proposed | 1.00   | 275°N | *North             | *North | *North | *North             |
|            | R3        | W3    | Existing<br>Proposed | 1.00   | 275°N | *North             | *North | *North | *North             |
|            | R4        | W4    | Existing<br>Proposed | 1.00   | 275°N | *North             | *North | *North | *North             |
|            | R5        | W5    | Existing<br>Proposed | 1.00   | 275°N | *North             | *North | *North | *North             |
|            | R6        | W6    | Existing<br>Proposed | 1.00   | 275°N | *North             | *North | *North | *North             |
|            | R7        | W7    | Existing<br>Proposed | 1.00   | 275°N | *North             | *North | *North | *North             |



Table 80: APSH Results...

| Floor Ref. |     | Room Ref. | Pr/Ex                | Window Orientation | Annual | Pr/Ex          | Meets BRE Criteria | Winter       | Pr/Ex  | Meets BRE Criteria |
|------------|-----|-----------|----------------------|--------------------|--------|----------------|--------------------|--------------|--------|--------------------|
| BLOCK 12   |     |           |                      |                    |        |                |                    |              |        |                    |
| First      | R8  | W8        | Existing<br>Proposed | 1.00               | 275°N  |                | *North             |              | *North | *North             |
|            | R9  | W9        | Existing<br>Proposed | 1.00               | 275°N  |                | *North             |              | *North | *North             |
|            | R10 | W10       | Existing<br>Proposed | 1.00               | 275°N  | 15.93<br>0.00  | *North             | 0.00<br>0.00 | *North | *North             |
|            |     | W11       | Existing<br>Proposed | 1.00               | 185°   | 34.65<br>9.01  | 0.26               | 0.39<br>0.23 | 0.60   | NO                 |
|            | R11 | W12       | Existing<br>Proposed | 1.00               | 95°    | 10.18<br>9.40  | 0.92               | 0.78<br>0.47 | 0.60   | YES                |
|            |     | W13       | Existing<br>Proposed | 1.00               | 95°    | 21.29<br>15.93 | 0.75               | 0.62<br>0.31 | 0.50   | NO                 |
|            | R12 | W14       | Existing<br>Proposed | 1.00               | 95°    | 8.47<br>8.00   | 0.94               | 1.09<br>0.62 | 0.57   | YES                |
|            | R13 | W15       | Existing<br>Proposed | 1.00               | 95°    | 9.48<br>8.39   | 0.89               | 2.10<br>1.01 | 0.48   | YES                |

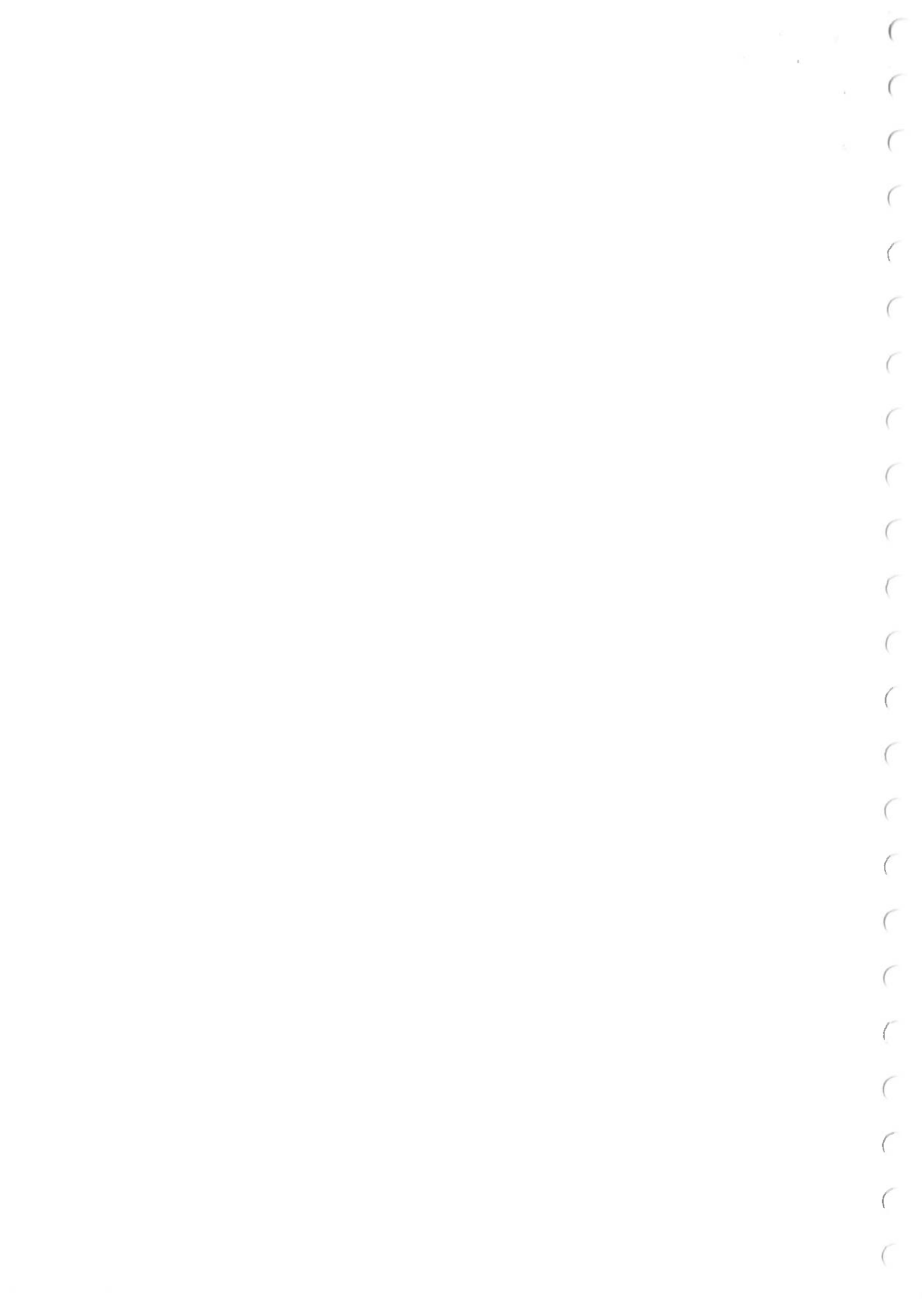


Table 81: APSH Results...

| Floor Ref. | Room Ref. | Pr/Ex                | Window Orientation   | Annual | Pr/Ex          | Meets BRE Criteria | Winter | Pr/Ex        | Meets BRE Criteria |      |     |
|------------|-----------|----------------------|----------------------|--------|----------------|--------------------|--------|--------------|--------------------|------|-----|
| BLOCK 12   |           |                      |                      |        |                |                    |        |              |                    |      |     |
| First      | R14       | W16                  | Existing<br>Proposed | 1.00   | 95°            | 9.17<br>8.47       | 0.92   | YES          | 2.10<br>1.40       | 0.67 | YES |
|            | R15       | W17                  | Existing<br>Proposed | 1.00   | 95°            | 9.17<br>8.55       | 0.93   | YES          | 2.10<br>1.48       | 0.70 | YES |
|            |           | W18                  | Existing<br>Proposed | 1.00   | 185°           | 16.47<br>14.76     | 0.90   | YES          | 4.74<br>3.03       | 0.64 | YES |
|            |           | W19                  | Existing<br>Proposed | 1.00   | 95°            | 29.91<br>26.96     | 0.90   | YES          | 6.22<br>3.26       | 0.53 | YES |
|            |           |                      |                      |        |                |                    |        |              |                    |      |     |
|            | R16       | W20                  | Existing<br>Proposed | 1.00   | 95°            | 9.25<br>9.25       | 1.00   | YES          | 1.86<br>1.86       | 1.00 | YES |
|            | R17       | W21                  | Existing<br>Proposed | 1.00   | 95°            | 10.96<br>10.18     | 0.93   | YES          | 3.57<br>2.80       | 0.78 | YES |
|            |           |                      |                      |        |                |                    |        |              |                    |      |     |
| R18        | W22       | Existing<br>Proposed | 1.00                 | 95°    | 12.35<br>11.11 | 0.90               | YES    | 4.12<br>2.87 | 0.70               | YES  |     |

## BLOCK 12

78

Table 83: APSH Results...

| Floor Ref. | Room Ref. | Pr/Ex | Window Orientation   | Annual         | Pr/Ex | Meets BRE Criteria | Winter | Pr/Ex  | Meets BRE Criteria |
|------------|-----------|-------|----------------------|----------------|-------|--------------------|--------|--------|--------------------|
| BLOCK 12   |           |       |                      |                |       |                    |        |        |                    |
| Second     | R4        | W10   | Existing<br>Proposed | 1.00           | 275°N | *North             | *North | *North | *North             |
|            | R5        | W11   | Existing<br>Proposed | 1.00           | 275°N | *North             | *North | *North | *North             |
|            | R6        | W12   | Existing<br>Proposed | 1.00           | 275°N | *North             | *North | *North | *North             |
|            |           | W13   | Existing<br>Proposed | 1.00           | 275°N | *North             | *North | *North | *North             |
|            |           | W14   | Existing<br>Proposed | 1.00           | 275°N | *North             | *North | *North | *North             |
|            |           | W28   | Existing<br>Proposed | 1.00           | 95°   | *North             | *North | *North | *North             |
|            |           |       |                      | 6.45<br>4.90   |       | 0.91               | YES    | 0.54   | YES                |
|            |           |       |                      | 1.09<br>1.09   |       | 0.00               | 0.00   | 0.00   | 0.00               |
|            |           |       |                      | 1.09<br>25.10  |       | 0.00               | 0.00   | 0.00   | 0.00               |
|            |           |       |                      | 22.77          |       | 0.00               | 0.00   | 0.00   | 0.00               |
|            | R7        | W15   | Existing<br>Proposed | 1.00           | 275°N | *North             | *North | *North | *North             |
|            |           | W16   | Existing<br>Proposed | 1.00           | 275°N | *North             | *North | *North | *North             |
|            |           | W17   | Existing<br>Proposed | 1.00           | 275°N | *North             | *North | *North | *North             |
|            |           | W27   | Existing<br>Proposed | 1.00           | 95°   | *North             | *North | *North | *North             |
|            |           |       |                      | 2.95<br>2.95   |       | 0.89               | YES    | 0.43   | YES                |
|            |           |       |                      | 0.78<br>0.78   |       | 0.00               | 0.00   | 0.00   | 0.00               |
|            |           |       |                      | 0.62<br>0.62   |       | 0.00               | 0.00   | 0.00   | 0.00               |
|            |           |       |                      | 24.48<br>21.76 |       | 0.00               | 0.00   | 0.00   | 0.00               |
|            |           |       |                      | 3.81<br>1.63   |       | 0.00               | 0.00   | 0.00   | 0.00               |

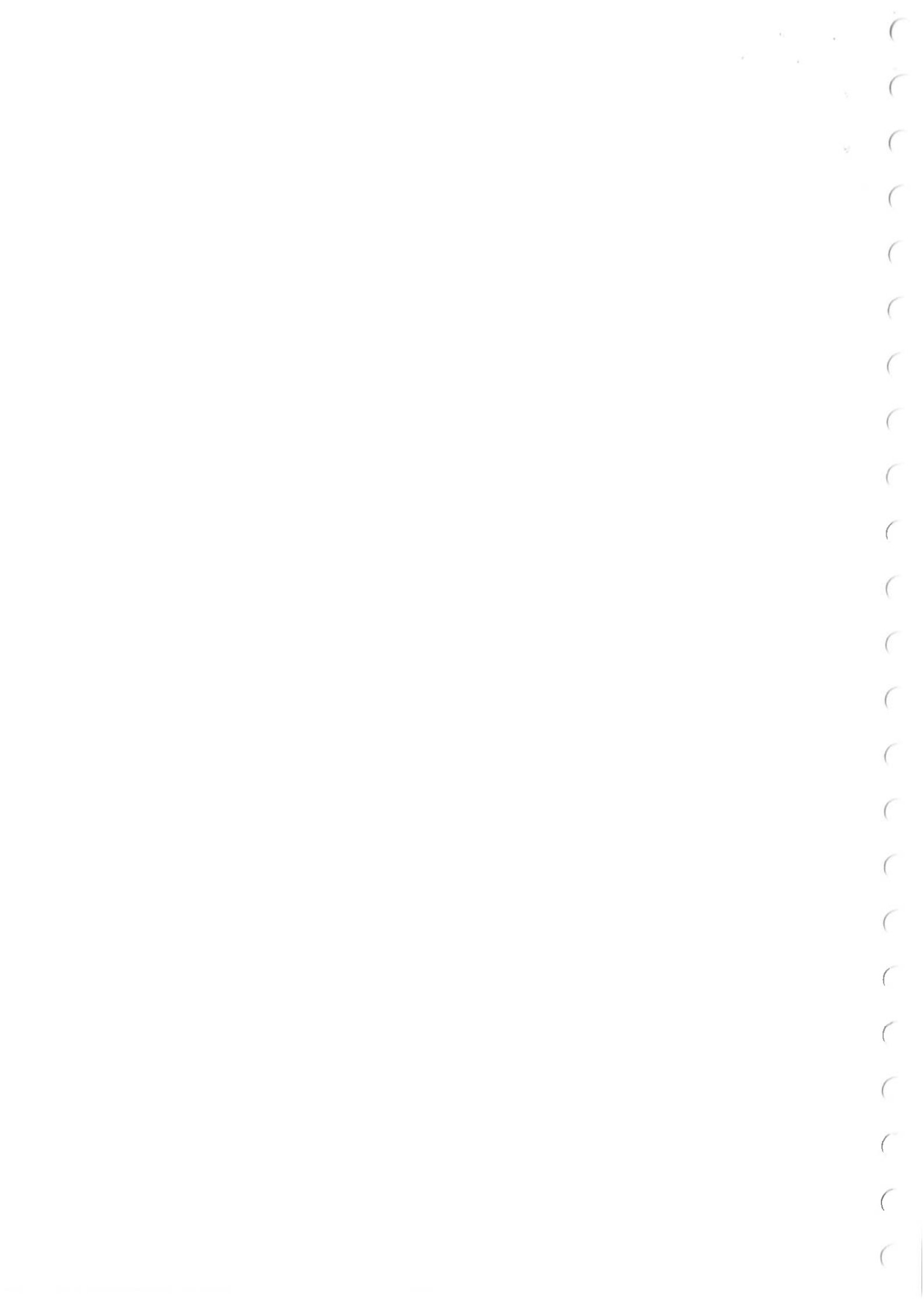


Table 84: APSH Results...

20340\_1NWQ, Dublin 1  
10/05/2024  
© BPC Engineers

Table 85: APSH Results...

| Floor Ref. | Room Ref. | Pr/Ex | Window Orientation   | Annual | Pr/Ex | Meets BRE Criteria | Winter | Pr/Ex  | Meets BRE Criteria |        |        |
|------------|-----------|-------|----------------------|--------|-------|--------------------|--------|--------|--------------------|--------|--------|
| BLOCK 12   |           |       |                      |        |       |                    |        |        |                    |        |        |
| Second     | R12       | W29   | Existing<br>Proposed | 1.00   | 95°   | 16.39<br>13.99     | 0.85   | YES    | 4.82<br>2.41       | 0.50   | YES    |
|            |           | W30   | Existing<br>Proposed | 1.00   | 185°  | 20.44<br>17.72     | 0.87   | YES    | 6.76<br>4.04       | 0.60   | YES    |
|            |           | W31   | Existing<br>Proposed | 1.00   | 95°   | 34.42<br>31.08     | 0.90   | YES    | 8.24<br>4.90       | 0.59   | YES    |
| Third      | R1        | W1    | Existing<br>Proposed | 1.00   | 275°N |                    | *North | *North |                    | *North | *North |
|            | R2        | W2    | Existing<br>Proposed | 1.00   | 275°N |                    | *North | *North |                    | *North | *North |
|            | R3        | W3    | Existing<br>Proposed | 1.00   | 275°N |                    | *North | *North |                    | *North | *North |
|            | R4        | W4    | Existing<br>Proposed | 1.00   | 275°N |                    | *North | *North |                    | *North | *North |
|            | R5        | W5    | Existing<br>Proposed | 1.00   | 275°N |                    | *North | *North |                    | *North | *North |

Table 86: APSH Results...

| Floor Ref. Room Ref. |     | Pr/Ex | Window Orientation   | Annual | Pr/Ex | Meets BRE Criteria | Winter | Pr/Ex  | Meets BRE Criteria |
|----------------------|-----|-------|----------------------|--------|-------|--------------------|--------|--------|--------------------|
| BLOCK 12             |     |       |                      |        |       |                    |        |        |                    |
| Third                | R6  | W6    | Existing<br>Proposed | 1.00   | 275°N | *North             | *North | *North | *North             |
|                      | R7  | W7    | Existing<br>Proposed | 1.00   | 275°N | *North             | *North | *North | *North             |
|                      | R8  | W8    | Existing<br>Proposed | 1.00   | 275°N | *North             | *North | *North | *North             |
|                      | R9  | W9    | Existing<br>Proposed | 1.00   | 275°N | *North             | *North | *North | *North             |
|                      | R10 | W10   | Existing<br>Proposed | 1.00   | 275°N | *North             | *North | *North | *North             |
|                      |     | W11   | Existing<br>Proposed | 1.00   | 185°  | 0.22               | 0.63   | 0.63   | NO                 |
|                      | R11 | W12   | Existing<br>Proposed | 1.00   | 95°   | 0.88               | 1.17   | 0.40   | YES                |
|                      |     | W13   | Existing<br>Proposed | 1.00   | 95°   | 0.78               | 1.24   | 0.50   | NO                 |
|                      |     |       |                      |        |       |                    |        |        |                    |
|                      |     |       |                      |        |       |                    |        |        |                    |
|                      |     |       |                      |        |       |                    |        |        |                    |
|                      |     |       |                      |        |       |                    |        |        |                    |
|                      |     |       |                      |        |       |                    |        |        |                    |

Table 87: APSH Results...

| Floor Ref. | Room Ref. | BLOCK 12 |                      |        |       |                    | BLOCK 13      |       |                    |        |       |
|------------|-----------|----------|----------------------|--------|-------|--------------------|---------------|-------|--------------------|--------|-------|
|            |           | Pr/Ex    | Window Orientation   | Annual | Pr/Ex | Meets BRE Criteria | Winter        | Pr/Ex | Meets BRE Criteria | Annual | Pr/Ex |
| Third      | R12       | W14      | Existing<br>Proposed | 1.00   | 95°   | 7.61<br>6.92       | 2.18<br>1.48  | 0.91  | YES                | 0.68   | YES   |
|            | R13       | W15      | Existing<br>Proposed | 1.00   | 95°   | 9.01<br>8.39       | 2.18<br>1.55  | 0.93  | YES                | 0.71   | YES   |
|            | R14       | W16      | Existing<br>Proposed | 1.00   | 95°   | 7.46<br>7.38       | 2.56<br>2.49  | 0.99  | YES                | 0.97   | YES   |
|            | R15       | W17      | Existing<br>Proposed | 1.00   | 95°   | 13.21<br>12.98     | 3.34<br>3.11  | 0.98  | YES                | 0.93   | YES   |
|            |           | W18      | Existing<br>Proposed | 1.00   | 185°  | 19.97<br>17.79     | 7.38<br>5.21  | 0.89  | YES                | 0.71   | YES   |
|            |           | W19      | Existing<br>Proposed | 1.00   | 95°   | 37.68<br>33.88     | 10.33<br>6.53 | 0.90  | YES                | 0.63   | YES   |
|            | R16       | W20      | Existing<br>Proposed | 1.00   | 95°   | 8.94<br>8.94       | 2.10<br>2.10  | 1.00  | YES                | 1.00   | YES   |
|            | R17       | W21      | Existing<br>Proposed | 1.00   | 95°   | 8.39<br>7.54       | 3.50<br>2.64  | 0.90  | YES                | 0.76   | YES   |
|            | R18       | W22      | Existing<br>Proposed | 1.00   | 95°   | 8.39<br>7.69       | 3.50<br>2.80  | 0.92  | YES                | 0.80   | YES   |
|            |           |          |                      |        |       |                    |               |       |                    |        |       |

Table 88: APSH Results...

| Floor Ref. | Room Ref. | Pr/Ex | Window Orientation | Annual | Pr/Ex | Meets BRE Criteria | Winter | Pr/Ex  | Meets BRE Criteria |
|------------|-----------|-------|--------------------|--------|-------|--------------------|--------|--------|--------------------|
| BLOCK 12   |           |       |                    |        |       |                    |        |        |                    |
| Fourth     | R1        | W1    | Existing           | 1.00   | 275°N | 9.48               | *North | *North | *North             |
|            |           | W2    | Proposed           | 1.00   | 275°N | 6.84               | *North | *North | *North             |
|            |           | W3    | Proposed           | 1.00   | 275°N | 0.00               | *North | *North | *North             |
|            |           | W34   | Existing           | 1.00   | 95°   | 0.00               | 1.00   | 1.00   | YES                |
|            | R2        | W4    | Existing           | 1.00   | 275°N | 18.88              | *North | *North | *North             |
|            |           | W5    | Proposed           | 1.00   | 275°N | 9.56               | *North | *North | *North             |
|            |           | W6    | Existing           | 1.00   | 275°N | 6.22               | *North | *North | *North             |
|            |           | W33   | Proposed           | 1.00   | 95°   | 0.08               | 0.93   | 0.83   | YES                |
|            | R3        | W7    | Existing           | 1.00   | 275°N | 0.00               | *North | *North | *North             |
|            |           | W8    | Proposed           | 1.00   | 275°N | 19.97              | *North | *North | *North             |
|            |           | W9    | Existing           | 1.00   | 275°N | 18.65              | *North | *North | *North             |
|            |           | W32   | Proposed           | 1.00   | 95°   | 8.55               | 1.00   | 1.00   | YES                |



Table 89: APSH Results...

| Floor Ref. | Room Ref. | Pr/Ex | Window Orientation   | Annual | Pr/Ex | Meets BRE Criteria | Winter       | Pr/Ex        | Meets BRE Criteria |
|------------|-----------|-------|----------------------|--------|-------|--------------------|--------------|--------------|--------------------|
| BLOCK 12   |           |       |                      |        |       |                    |              |              |                    |
| Fourth     | R4        | W10   | Existing<br>Proposed | 1.00   | 275°N |                    |              | *North       | *North             |
|            | R5        | W11   | Existing<br>Proposed | 1.00   | 275°N |                    |              | *North       | *North             |
|            | R6        | W12   | Existing<br>Proposed | 1.00   | 275°N | 9.17<br>5.75       | 0.62<br>0.00 | *North       | *North             |
|            |           | W13   | Existing<br>Proposed | 1.00   | 275°N | 1.09<br>1.09       | 0.00<br>0.00 | *North       | *North             |
|            |           | W14   | Existing<br>Proposed | 1.00   | 275°N | 1.09<br>1.09       | 0.00<br>0.00 | *North       | *North             |
|            |           | W28   | Existing<br>Proposed | 1.00   | 95°   | 18.41<br>16.94     | 5.83<br>4.35 | 0.92<br>0.75 | YES<br>YES         |
|            | R7        | W15   | Existing<br>Proposed | 1.00   | 275°N | 8.94<br>4.43       | 0.62<br>0.00 | *North       | *North             |
|            |           | W16   | Existing<br>Proposed | 1.00   | 275°N | 1.24<br>1.09       | 0.00<br>0.00 | *North       | *North             |
|            |           | W17   | Existing<br>Proposed | 1.00   | 275°N | 1.01<br>0.93       | 0.00<br>0.00 | *North       | *North             |
|            |           | W27   | Existing<br>Proposed | 1.00   | 95°   | 18.18<br>17.02     | 5.05<br>3.96 | 0.77<br>0.77 | YES<br>YES         |



Table 90: APSH Results...

| Floor Ref. | Room Ref. | Pr/Ex | Window Orientation | Annual | Pr/Ex | Meets BRE Criteria | Winter | Pr/Ex | Meets BRE Criteria |
|------------|-----------|-------|--------------------|--------|-------|--------------------|--------|-------|--------------------|
| BLOCK 12   |           |       |                    |        |       |                    |        |       |                    |
| Fourth     | R8        | W18   | Existing           | 1.00   | 275°N | 5.83               | *North | 0.23  | *North             |
|            |           |       | Proposed           | 0.31   |       |                    | 0.00   |       |                    |
|            |           | W19   | Existing           | 1.00   | 275°N | 0.31               | *North | 0.00  | *North             |
|            |           |       | Proposed           | 0.31   |       |                    | 0.00   |       |                    |
|            | R9        | W20   | Existing           | 1.00   | 275°N | 0.31               | *North | 0.00  | *North             |
|            |           |       | Proposed           | 0.31   |       |                    | 0.00   |       |                    |
|            |           | W26   | Existing           | 1.00   | 95°   | 16.24              | YES    | 3.81  | YES                |
|            |           |       | Proposed           | 14.92  |       |                    | 2.49   |       |                    |
|            | R10       | W21   | Existing           | 1.00   | 275°N |                    | *North |       | *North             |
|            |           |       | Proposed           |        |       |                    |        |       |                    |
|            |           | W22   | Existing           | 1.00   | 275°N | 29.14              | *North | 2.18  | *North             |
|            |           |       | Proposed           | 1.79   |       |                    | 0.00   |       |                    |
|            | R11       | W23   | Existing           | 1.00   | 185°  | 55.17              | NO     | 2.49  | NO                 |
|            |           |       | Proposed           | 13.29  |       |                    | 0.47   |       |                    |
|            |           | W24   | Existing           | 1.00   | 95°   | 18.73              | YES    | 2.18  | YES                |
|            |           |       | Proposed           | 16.16  |       |                    | 0.73   |       |                    |
|            |           | W25   | Existing           | 1.00   | 95°   | 32.63              | YES    | 2.87  | NO                 |
|            |           |       | Proposed           | 26.65  |       |                    | 1.24   |       |                    |
|            |           |       |                    |        |       |                    |        |       |                    |
|            |           |       |                    |        |       |                    |        |       |                    |
|            |           |       |                    |        |       |                    |        |       |                    |
|            |           |       |                    |        |       |                    |        |       |                    |
|            |           |       |                    |        |       |                    |        |       |                    |
|            |           |       |                    |        |       |                    |        |       |                    |



Table 91: APSH Results...

| Floor Ref. | Room Ref. | Pr/Ex | Window Orientation   | Annual | Pr/Ex | Meets BRE Criteria | Winter | Pr/Ex  | Meets BRE Criteria |        |        |
|------------|-----------|-------|----------------------|--------|-------|--------------------|--------|--------|--------------------|--------|--------|
| BLOCK 12   |           |       |                      |        |       |                    |        |        |                    |        |        |
| Fourth     | R12       | W29   | Existing<br>Proposed | 1.00   | 95°   | 15.62<br>15.23     | 0.98   | YES    | 4.58<br>4.20       | 0.92   | YES    |
|            |           | W30   | Existing<br>Proposed | 1.00   | 185°  | 22.53<br>19.81     | 0.88   | YES    | 9.40<br>6.58       | 0.71   | YES    |
|            |           | W31   | Existing<br>Proposed | 1.00   | 95°   | 42.74<br>38.54     | 0.90   | YES    | 13.05<br>8.86      | 0.68   | YES    |
| Fifth      | R1        | W1    | Existing<br>Proposed | 1.00   | 275°N | 4.43<br>3.50       | *North | *North | 1.01<br>0.08       | *North | *North |
|            |           | W19   | Existing<br>Proposed | 1.00   | 95°   | 45.84<br>43.75     | 0.95   | YES    | 16.47<br>14.37     | 0.87   | YES    |
|            | R2        | W2    | Existing<br>Proposed | 1.00   | 275°N | 4.20<br>3.19       | *North | *North | 0.78<br>0.00       | *North | *North |
|            |           | W18   | Existing<br>Proposed | 1.00   | 95°   | 48.56<br>45.53     | 0.94   | YES    | 16.55<br>13.52     | 0.82   | YES    |
|            | R3        | W3    | Existing<br>Proposed | 1.00   | 275°N | 5.59<br>2.95       | *North | *North | 2.18<br>0.00       | *North | *North |
|            |           | W17   | Existing<br>Proposed | 1.00   | 95°   | 48.48<br>44.60     | 0.92   | YES    | 16.94<br>13.05     | 0.77   | YES    |
|            | R4        | W4    | Existing<br>Proposed | 1.00   | 275°N |                    | *North | *North |                    | *North | *North |
|            |           |       |                      |        |       |                    |        |        |                    |        |        |

Table 92: APSH Results...

| Floor Ref. | Room Ref. | Pr/Ex | Window Orientation   | Annual | Pr/Ex | Meets BRE Criteria | Winter        | Pr/Ex  | Meets BRE Criteria |
|------------|-----------|-------|----------------------|--------|-------|--------------------|---------------|--------|--------------------|
| BLOCK 12   |           |       |                      |        |       |                    |               |        |                    |
| Fifth      | R5        | W5    | Existing<br>Proposed | 1.00   | 275°N | *North             | *North        | *North | *North             |
|            | R6        | W6    | Existing<br>Proposed | 1.00   | 275°N | *North             | *North        | *North | *North             |
|            |           | W15   | Existing<br>Proposed | 1.00   | 95°   | 0.83               | 0.31<br>0.00  | 0.47   | YES<br>YES         |
|            |           |       |                      |        |       |                    | 15.07<br>7.15 |        |                    |
|            | R7        | W7    | Existing<br>Proposed | 1.00   | 275°N | *North             | *North        | *North | *North             |
|            |           | W14   | Existing<br>Proposed | 1.00   | 95°   | 0.84               | 0.00<br>0.00  | 0.47   | YES<br>YES         |
|            |           |       |                      |        |       |                    | 12.74<br>5.93 |        |                    |
|            | R8        | W8    | Existing<br>Proposed | 1.00   | 275°N | *North             | *North        | *North | *North             |
|            |           | W13   | Existing<br>Proposed | 1.00   | 95°   | 0.82               | 0.00<br>0.00  | 0.39   | NO<br>NO           |
|            |           |       |                      |        |       |                    | 11.42<br>4.43 |        |                    |
|            | R9        | W9    | Existing<br>Proposed | 1.00   | 275°N | *North             | *North        | *North | *North             |

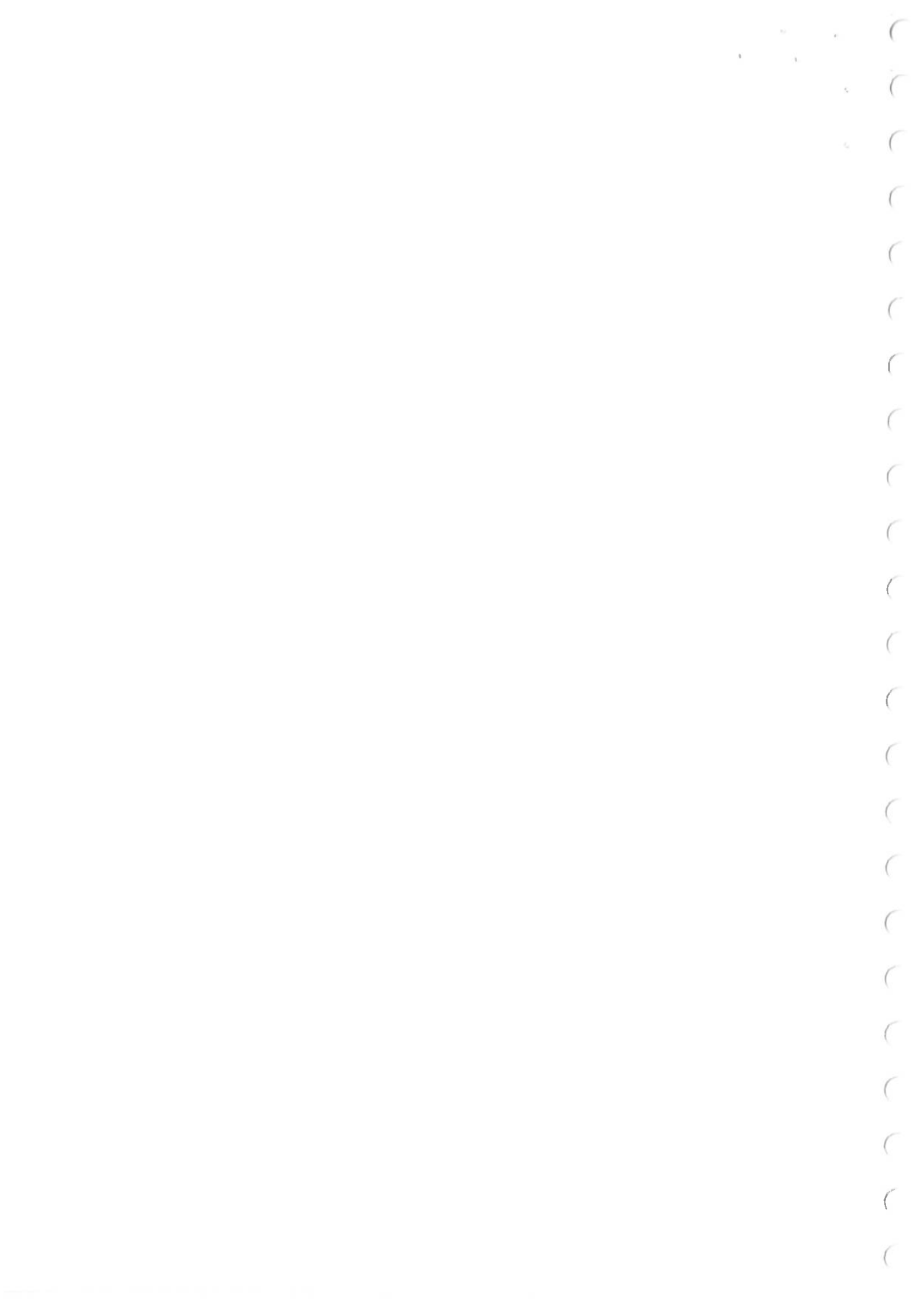


Table 93: APSH Results...

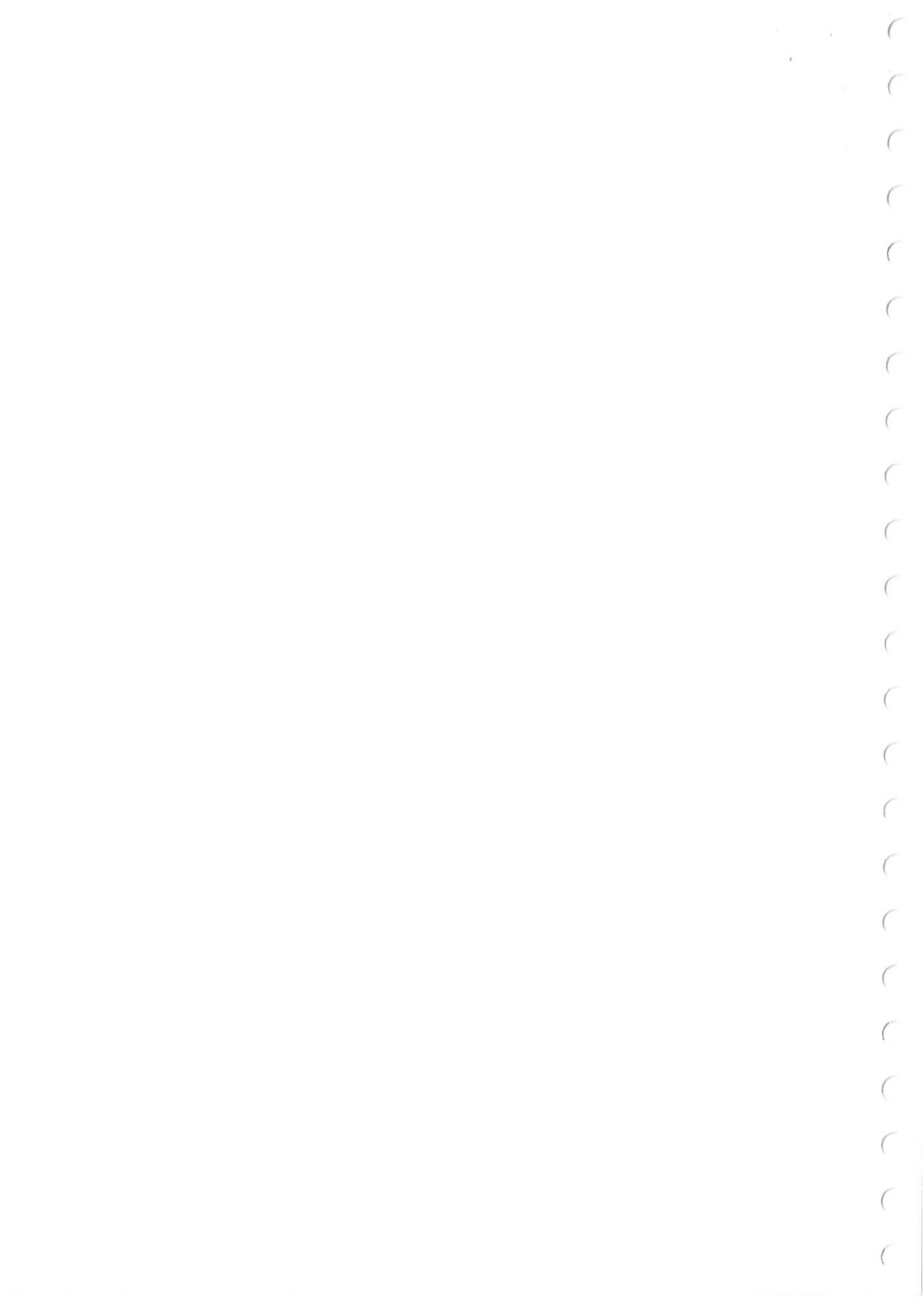
| Floor Ref. | Room Ref. | Pr/Ex | Window Orientation   | Annual | Pr/Ex | Meets BRE Criteria | Winter | Pr/Ex          | Meets BRE Criteria |
|------------|-----------|-------|----------------------|--------|-------|--------------------|--------|----------------|--------------------|
| BLOCK 12   |           |       |                      |        |       |                    |        |                |                    |
| Fifth      | R10       | W10   | Existing<br>Proposed | 1.00   | 275°N | 34.58<br>2.56      | *North | 5.21<br>0.00   | *North             |
|            |           | W11   | Existing<br>Proposed | 1.00   | 185°  | 62.55<br>17.87     | 0.29   | 7.85<br>0.54   | NO                 |
|            | R11       | W12   | Existing<br>Proposed | 1.00   | 95°   | 38.31<br>28.28     | 0.74   | 6.22<br>1.32   | YES                |
|            | R12       | W16   | Existing<br>Proposed | 1.00   | 95°   | 47.16<br>40.87     | 0.87   | 16.71<br>10.41 | YES                |
| Sixth      | R1        | W1    | Existing<br>Proposed | 1.00   | 275°N |                    | *North |                | *North             |
|            | R2        | W2    | Existing<br>Proposed | 1.00   | 275°N |                    | *North |                | *North             |
|            | R3        | W3    | Existing<br>Proposed | 1.00   | 275°N |                    | *North |                | *North             |
|            | R4        | W4    | Existing<br>Proposed | 1.00   | 275°N |                    | *North |                | *North             |

Table 94: APSH Results...

| Floor Ref. Room Ref. |     | Pr/Ex | Window Orientation   | Annual | Pr/Ex | Meets BRE Criteria | Winter | Pr/Ex  | Meets BRE Criteria |
|----------------------|-----|-------|----------------------|--------|-------|--------------------|--------|--------|--------------------|
| BLOCK 12             |     |       |                      |        |       |                    |        |        |                    |
| Sixth                | R5  | W5    | Existing<br>Proposed | 1.00   | 275°N | *North             | *North | *North | *North             |
|                      | R6  | W6    | Existing<br>Proposed | 1.00   | 275°N | *North             | *North | *North | *North             |
|                      | R7  | W7    | Existing<br>Proposed | 1.00   | 275°N | *North             | *North | *North | *North             |
|                      | R8  | W8    | Existing<br>Proposed | 1.00   | 275°N | *North             | *North | *North | *North             |
|                      | R9  | W9    | Existing<br>Proposed | 1.00   | 95°   | 0.79               | YES    | 0.36   | YES                |
|                      | R10 | W10   | Existing<br>Proposed | 1.00   | 95°   | 0.81               | YES    | 0.46   | YES                |
|                      | R11 | W11   | Existing<br>Proposed | 1.00   | 95°   | 0.86               | YES    | 0.59   | YES                |

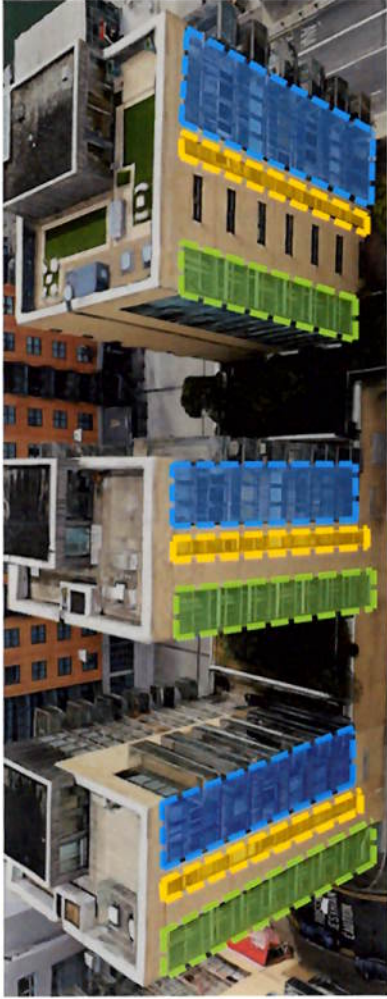
Table 95: APSH Results...

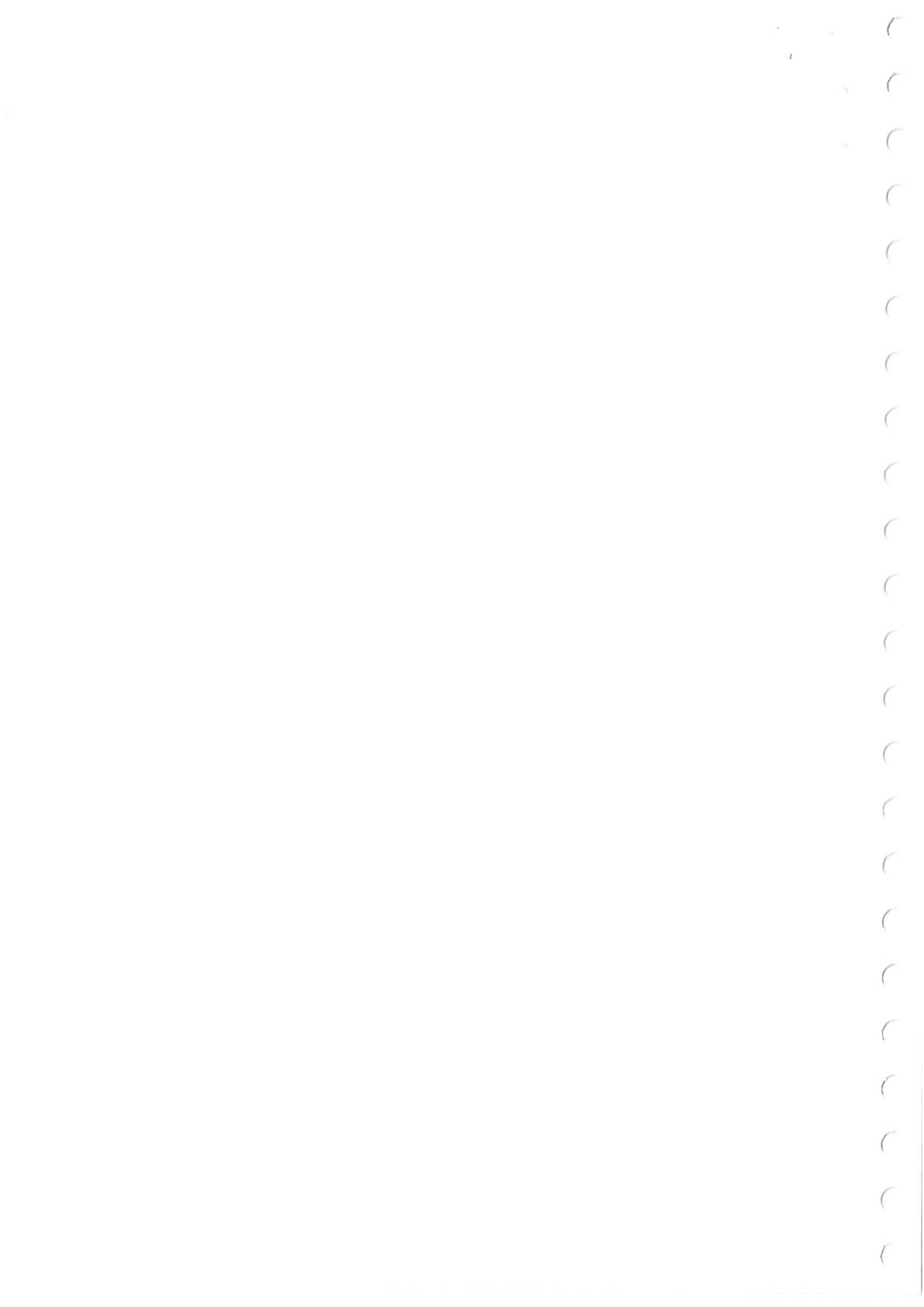
| Floor Ref. | Room Ref. | Pr/Ex | Window Orientation   | Annual | Pr/Ex | Meets BRE Criteria | Winter | Pr/Ex | Meets BRE Criteria |      |     |
|------------|-----------|-------|----------------------|--------|-------|--------------------|--------|-------|--------------------|------|-----|
| BLOCK 12   |           |       |                      |        |       |                    |        |       |                    |      |     |
| Sixth      | R12       | W12   | Existing<br>Proposed | 1.00   | 95°   | 50.51<br>45.61     | 0.90   | YES   | 18.03<br>13.13     | 0.73 | YES |
|            | R13       | W13   | Existing<br>Proposed | 1.00   | 95°   | 50.04<br>47.01     | 0.94   | YES   | 17.64<br>14.61     | 0.83 | YES |
|            | R14       | W14   | Existing<br>Proposed | 1.00   | 95°   | 50.58<br>48.25     | 0.95   | YES   | 18.03<br>15.70     | 0.87 | YES |
|            | R15       | W15   | Existing<br>Proposed | 1.00   | 95°   | 49.49<br>47.71     | 0.96   | YES   | 17.79<br>16.01     | 0.90 | YES |



### 5.2.3 Neighbouring Properties Details

As described in Section 4, the impact on the neighbouring buildings' access to skylight was assessed by means of VSC. Analysis was complete on the nearest dwellings to the proposed.

| Apartment Block1-3                                                                  |                                                                                                                                                                                                                                       |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>The windows highlighted in green are to a stair core and are therefore not critical to be analysed.</p> <p>The windows highlighted in orange are bedrooms.</p> <p>The windows highlighted in blue are to living/Kitchen rooms.</p> |



| Apartment Block 8                                                                    | The windows highlighted in orange are bedrooms. |
|--------------------------------------------------------------------------------------|-------------------------------------------------|
|  |                                                 |



| Apartment Block 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <p>The windows highlighted in orange are to bedrooms.</p> <p>The windows highlighted in green and blue are also to bedrooms.</p> <p>There is a significant reduction of daylight (i.e greater than 20%) to bedrooms of the apartments from Ground to Third floor. However, given the current daylight levels in the apartments affected are currently low one could assume artificial lighting would likely to be predominantly used which will continue to be the case after the proposed development.</p> |  |

### 5.3 Impact to Sunlight in Existing Neighbouring Amenity

We have completed sunlight analysis on the neighbouring residential amenity which we have illustrated below due to this being the nearest amenity to the proposed development.

The BRE guide recommends that existing neighbouring amenity spaces should receive at least 2 hours of sunlight on March 21<sup>st</sup> to at least 50% of their amenity space.

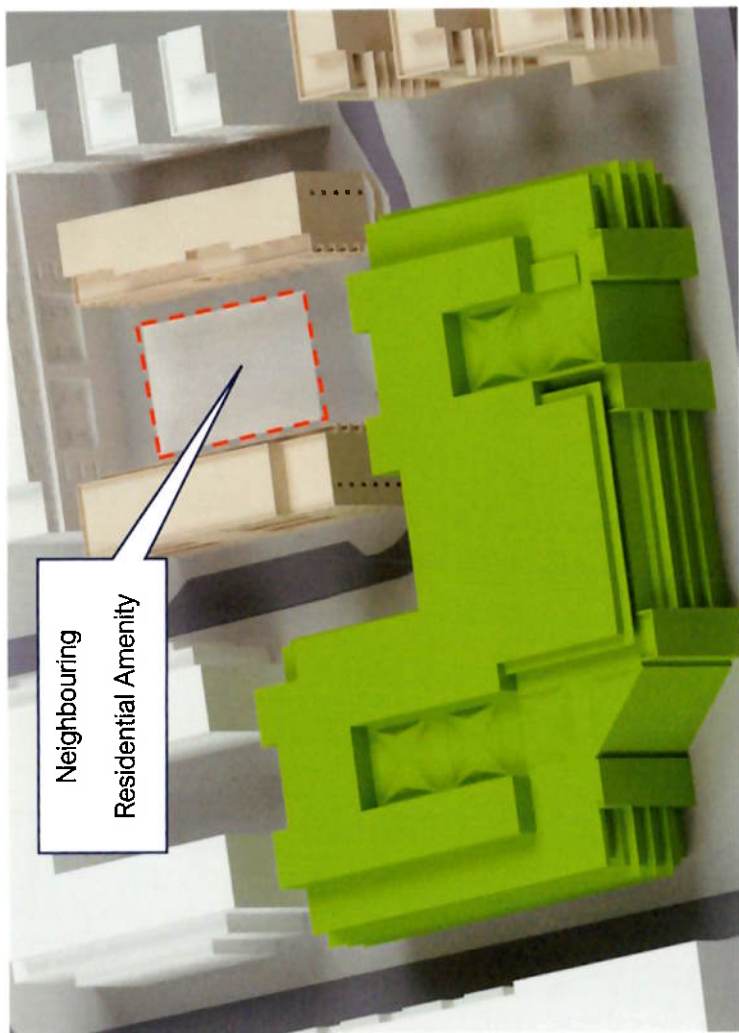


Figure 22: Neighbouring Residential Amenity within model

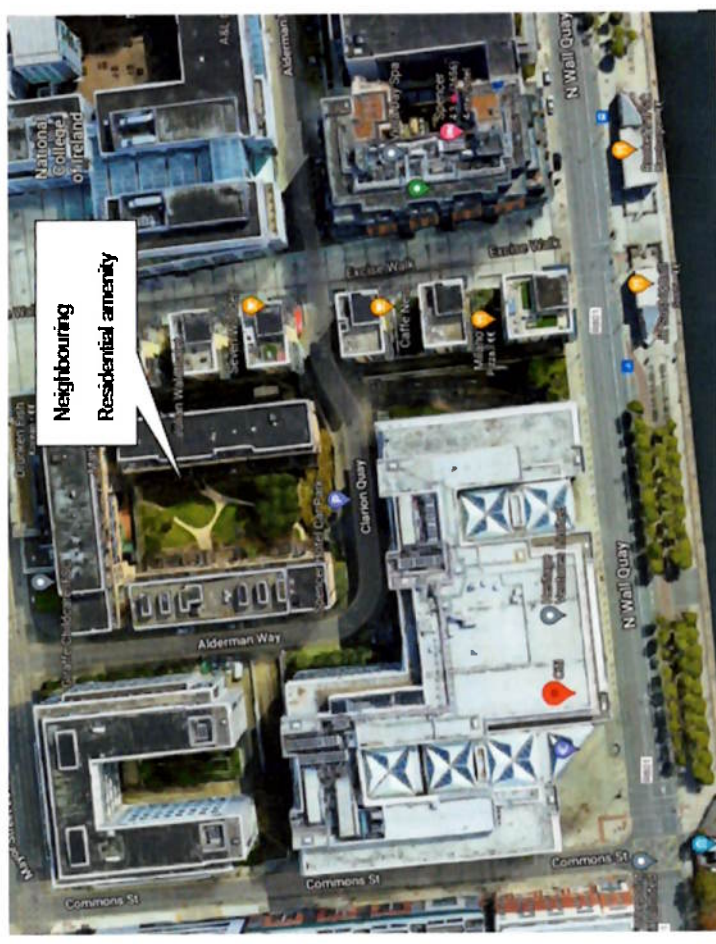


Figure 23: Neighbouring Residential Amenity satellite view

The sunlight availability was checked and illustrated in the image below.

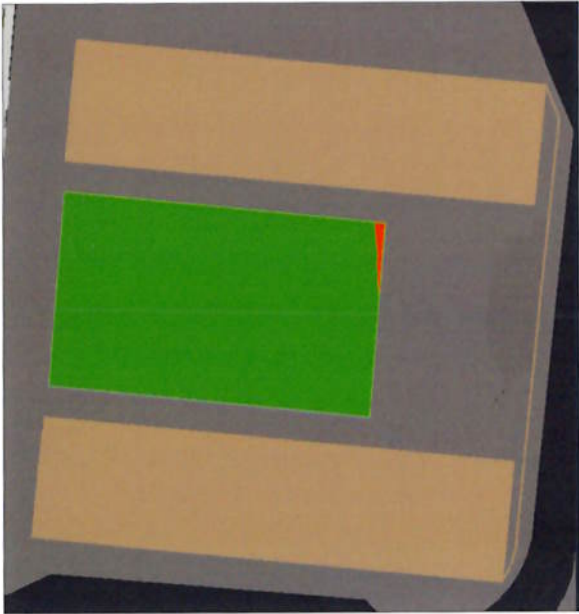


Figure 24: Existing Sunlight to Neighbouring Amenity space

| Legend                         |  |
|--------------------------------|--|
| < 2hrs for Existing & Proposed |  |
| > 2hrs for Existing & Proposed |  |
| Loss                           |  |
| Gain                           |  |

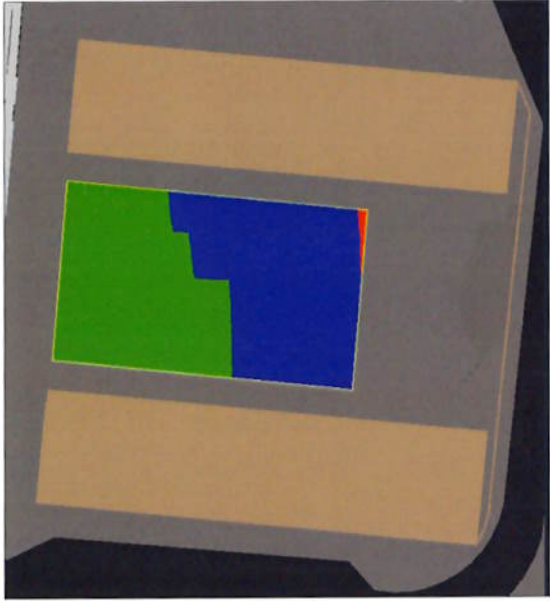


Figure 25: Proposed Sunlight to Neighbouring Amenity space

Table 42: Sunlight to existing neighbouring amenity space

| Floor Ref | Amenity Ref | Amenity Area          | Lit Area Existing | Lit Area Proposed | Pr/Ex | Meets BRE Criteria |
|-----------|-------------|-----------------------|-------------------|-------------------|-------|--------------------|
| BLOCK 8   |             |                       |                   |                   |       |                    |
| Ground    | A1          | Area m2<br>Percentage | 693.85<br>100%    | 344.28<br>50%     | 0.50  | YES                |

The results above show that 100% of the existing neighbouring amenity space currently receives at least 2 hours of sunlight on March 21<sup>st</sup> which reduces to 50% after the proposed development.

In a new development having 50% of the amenity area receiving 2 hours of sunlight on March 21<sup>st</sup> is achieving the recommendation of the BRE guide.



As the analysis shows 50% of the amenity area receives at least 2hrs of sunlight on March 21<sup>st</sup> after the proposed development, it can be said it therefore achieves the recommendations within the BRE Guide.

## 5.4 Sunlight to proposed park

As part of the proposed development a park is created to the east of the proposed building at 1 NWQ. We have completed sunlight analysis on the park and have illustrated the area which is achieving 2 hours of sunlight on March 21<sup>st</sup> in Green.

| Facade Name | Facade Area | Lit Area Proposed | Lit Area Proposed % |
|-------------|-------------|-------------------|---------------------|
| Park (east) | 472.27      | 302.60            | 64.07%              |

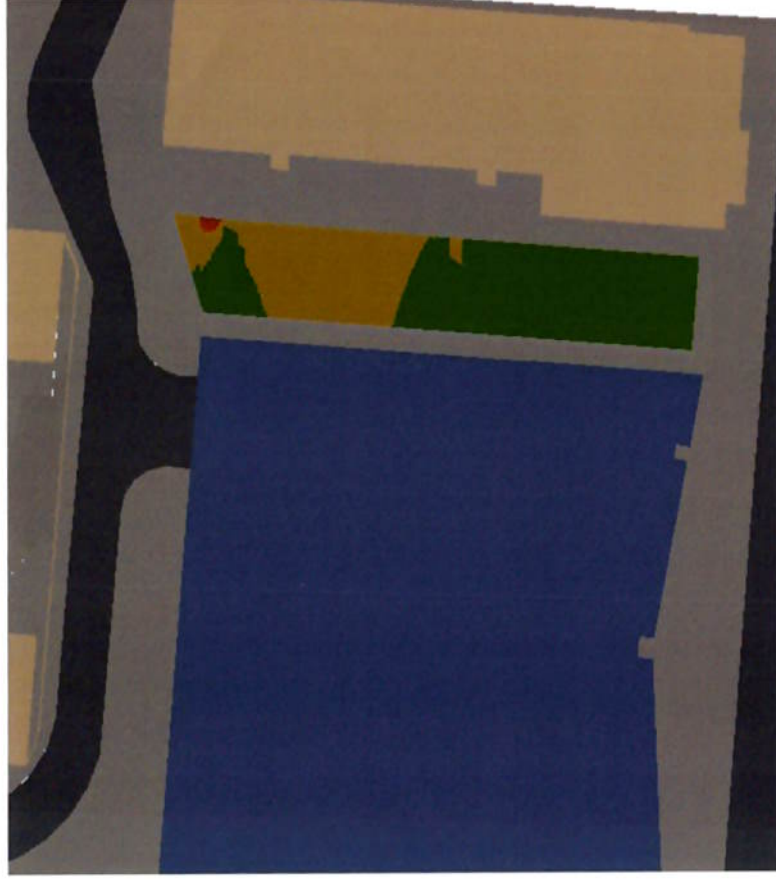


Figure 26: Sunlight to the proposed park

The BRE guide recommends that amenity spaces should receive at least 2 hours of sunlight on March 21<sup>st</sup> to at least 50% of their amenity space. The proposed park achieves 64.07% and therefore it can be said it therefore achieves the recommendations within the BRE Guide.



## 6 Conclusion

This report was complete to assess the sunlight daylight performance from a planning perspective of the proposed commercial office at 1NWWQ.

The results show that the proposed development effect has predominantly being limited to a small number of bedrooms which will have a minor adverse impact with respect to access to skylight and access to sunlight.

The effect of the proposed development has been limited to bedrooms of four apartments within Block 12 and 2 apartments within Block 2 which will have a noticeable reduction in daylight.

However, given the current daylight levels in the apartments affected are currently low one could assume artificial lighting would likely to be predominantly used which will continue to be the case after the proposed development.

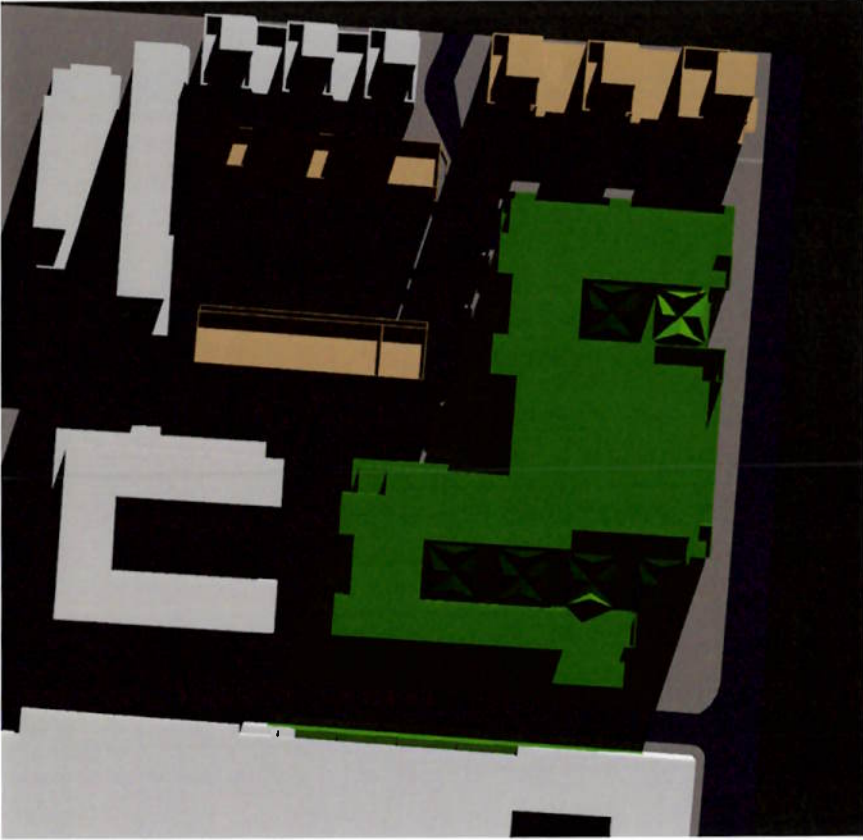
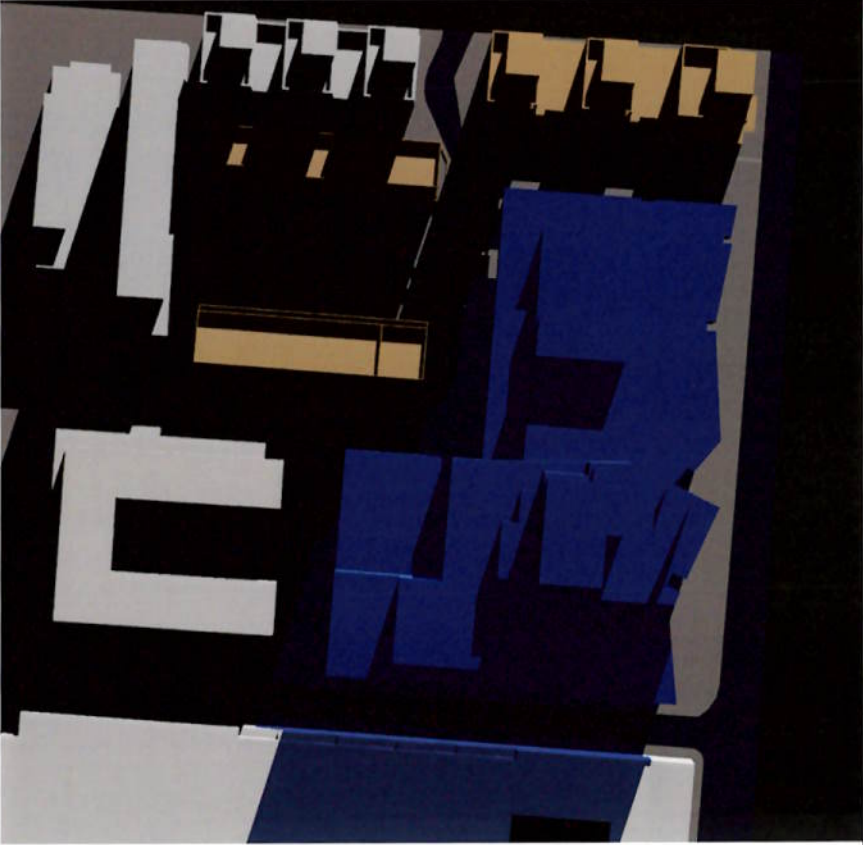
The existing neighbouring amenity space tested confirms that 50% of the area should receive at least two hours of sunlight on 21 March. Therefore, the existing neighbouring amenity space achieves the BRE's recommendation for sunlight and should appear adequately sunlit throughout the year.

Overall, the development has been designed with due consideration for sunlight and daylight. BPC Engineers believe the proposed development performs at an exemplar level for a scheme of this scale and meets many of the recommendations as set out in the BRE Guide – BR 209 "Site Layout Planning for Daylight and Sunlight, A guide to good practice (2022)".



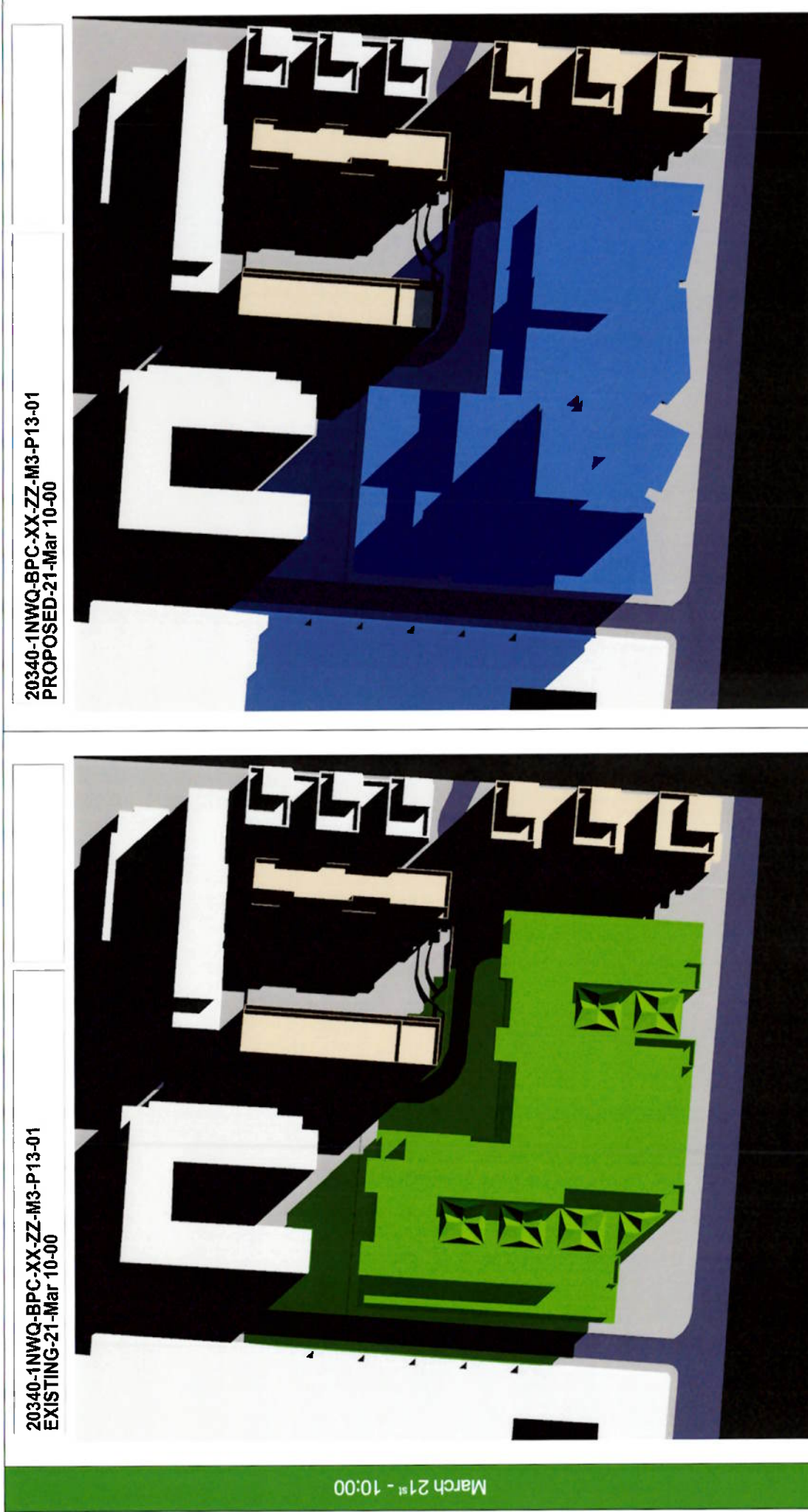
## Appendix A: Shadow Images

A.1 March 21<sup>st</sup>

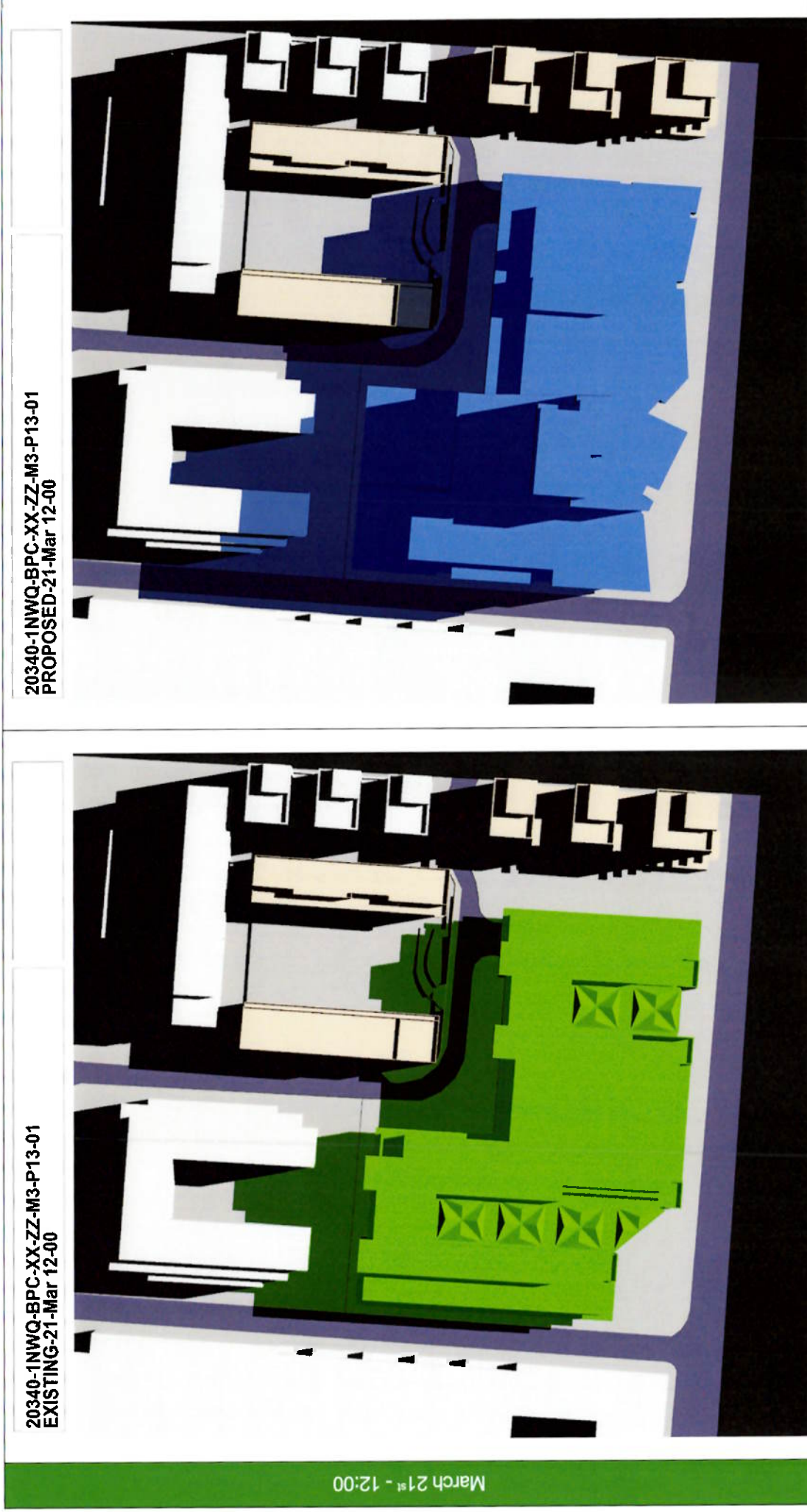
| Existing                                                                                                                                                 |  | Proposed                                                                                                                                                |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <div>20340-1NWQ-BPC-XX-ZZ-M3-P13-01<br/>EXISTING-21-Mar 08-00</div>  |  | <div>20340-1NWQ-BPC-XX-ZZ-M3-P13-01<br/>PROPOSED-21-Mar 08-00</div>  |  |

March 21<sup>st</sup> - 8:00



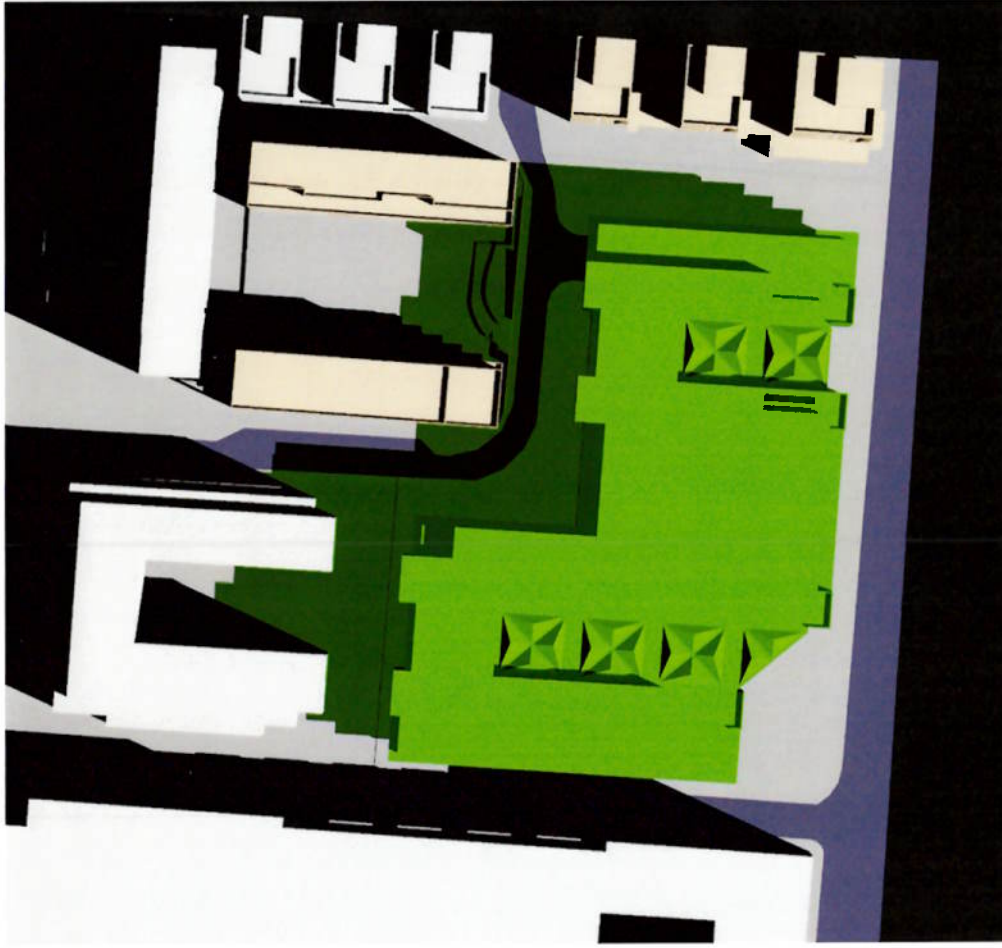




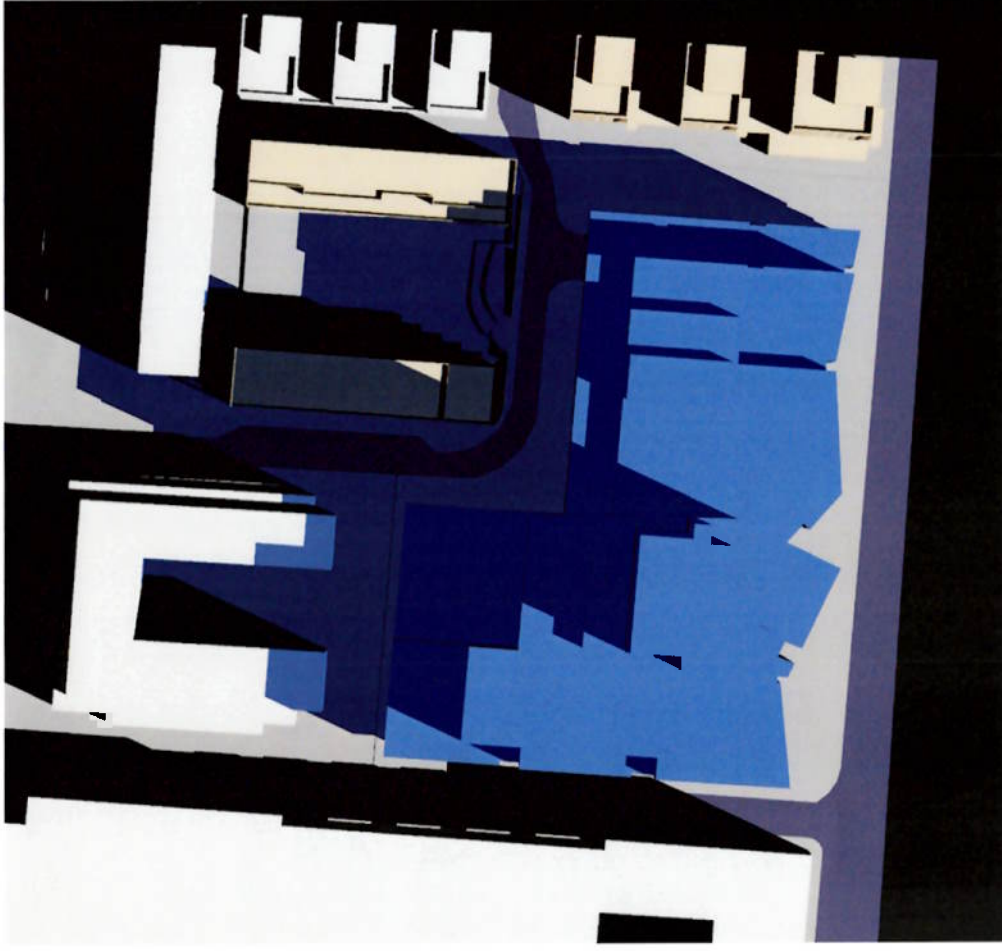




20340-1NWQ-BPC-XX-ZZ-M3-P13-01  
EXISTING-21-Mar 14:00



20340-1NWQ-BPC-XX-ZZ-M3-P13-01  
PROPOSED-21-Mar 14:00





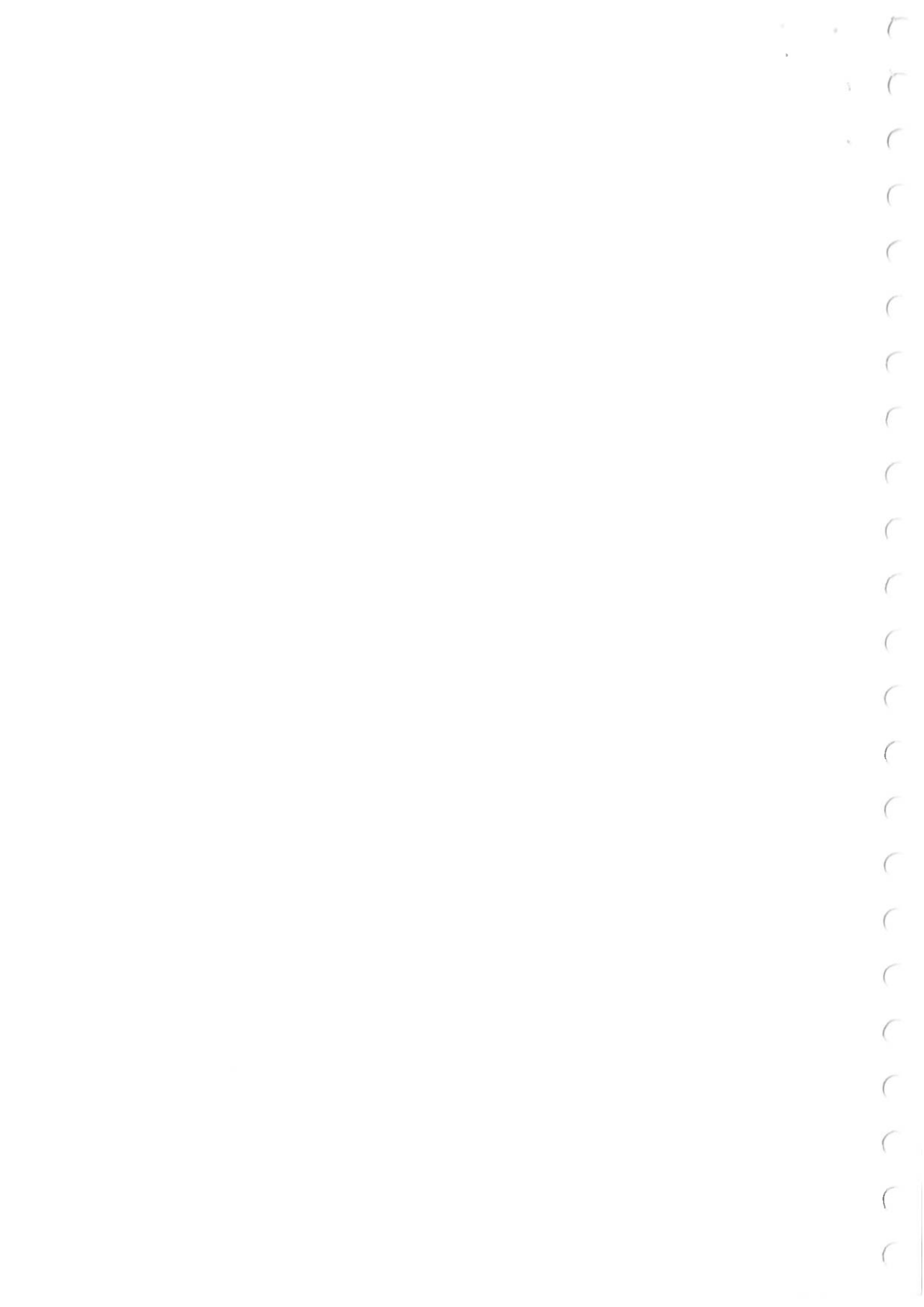
20340-1NWQ-BPC-XX-ZZ-M3-P13-01  
EXISTING-21-Mar 16:00



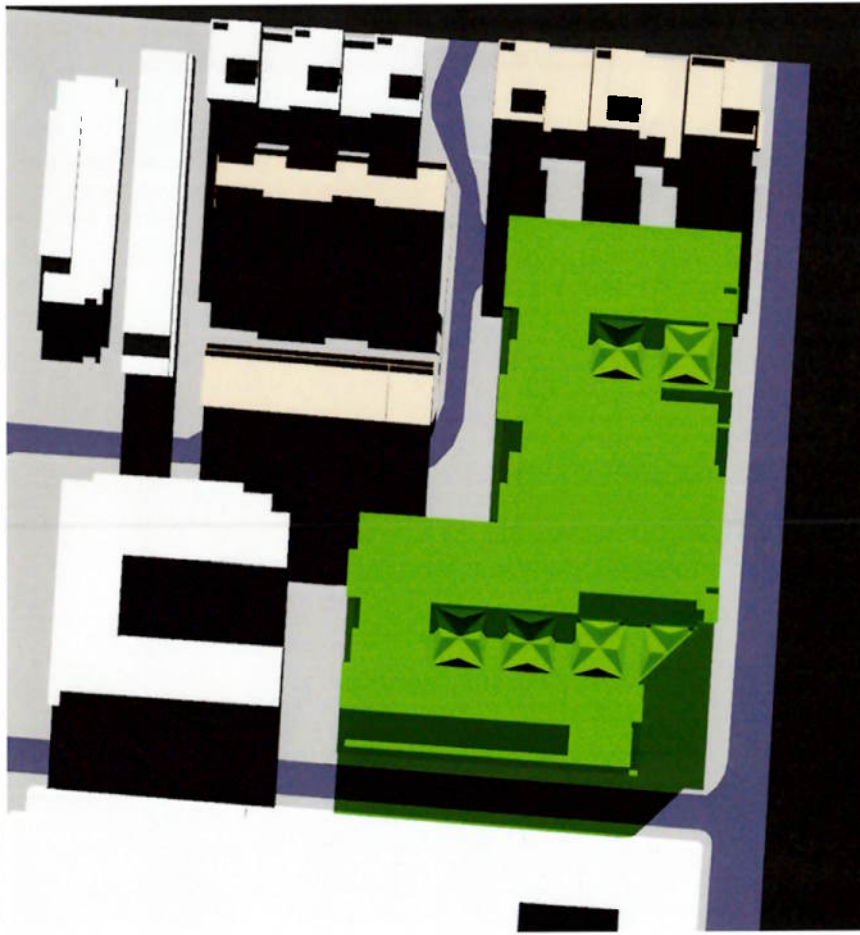
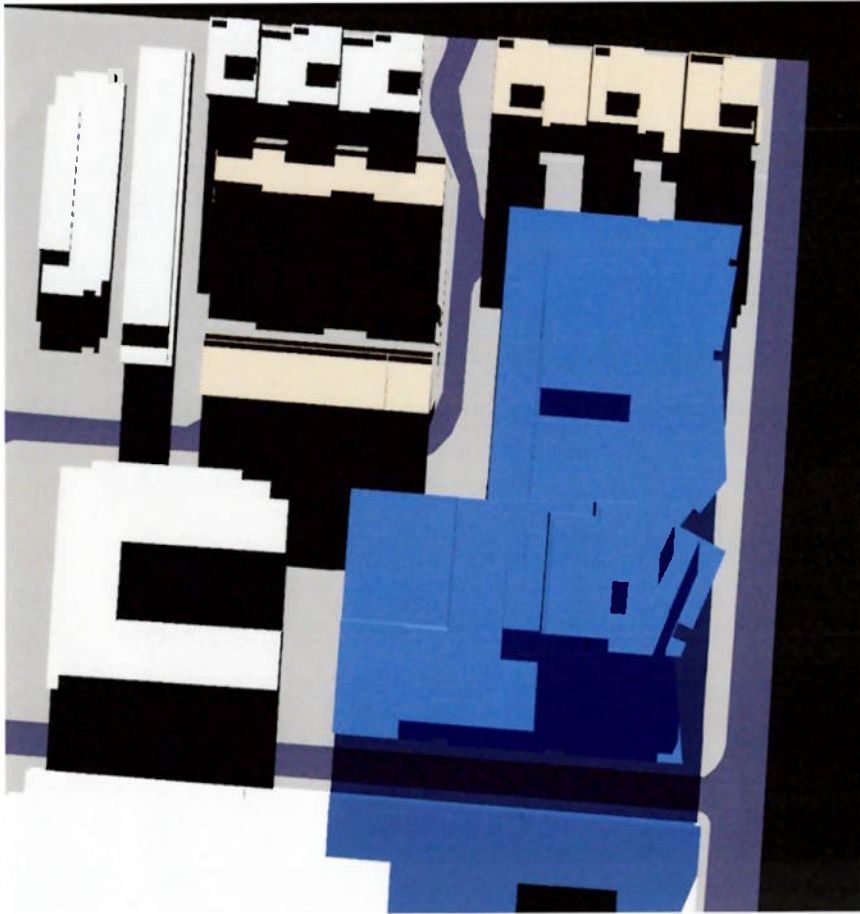
March 21<sup>st</sup> - 16:00

20340-1NWQ-BPC-XX-ZZ-M3-P13-01  
PROPOSED-21-Mar 16:00





A.2 June 21<sup>st</sup>

| Existing                                                                                                                                                                                                                                    | Proposed                                                                                                                                                                                                                                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div> <p>20340-1NWQ-BPC-XX-ZZ-M3-P13-01<br/>EXISTING-21-Jun 08-00</p> </div> <div>  </div> | <div> <p>20340-1NWQ-BPC-XX-ZZ-M3-P13-01<br/>PROPOSED-21-Jun 08-00</p> </div> <div>  </div> |

June 21<sup>st</sup> - 8:00



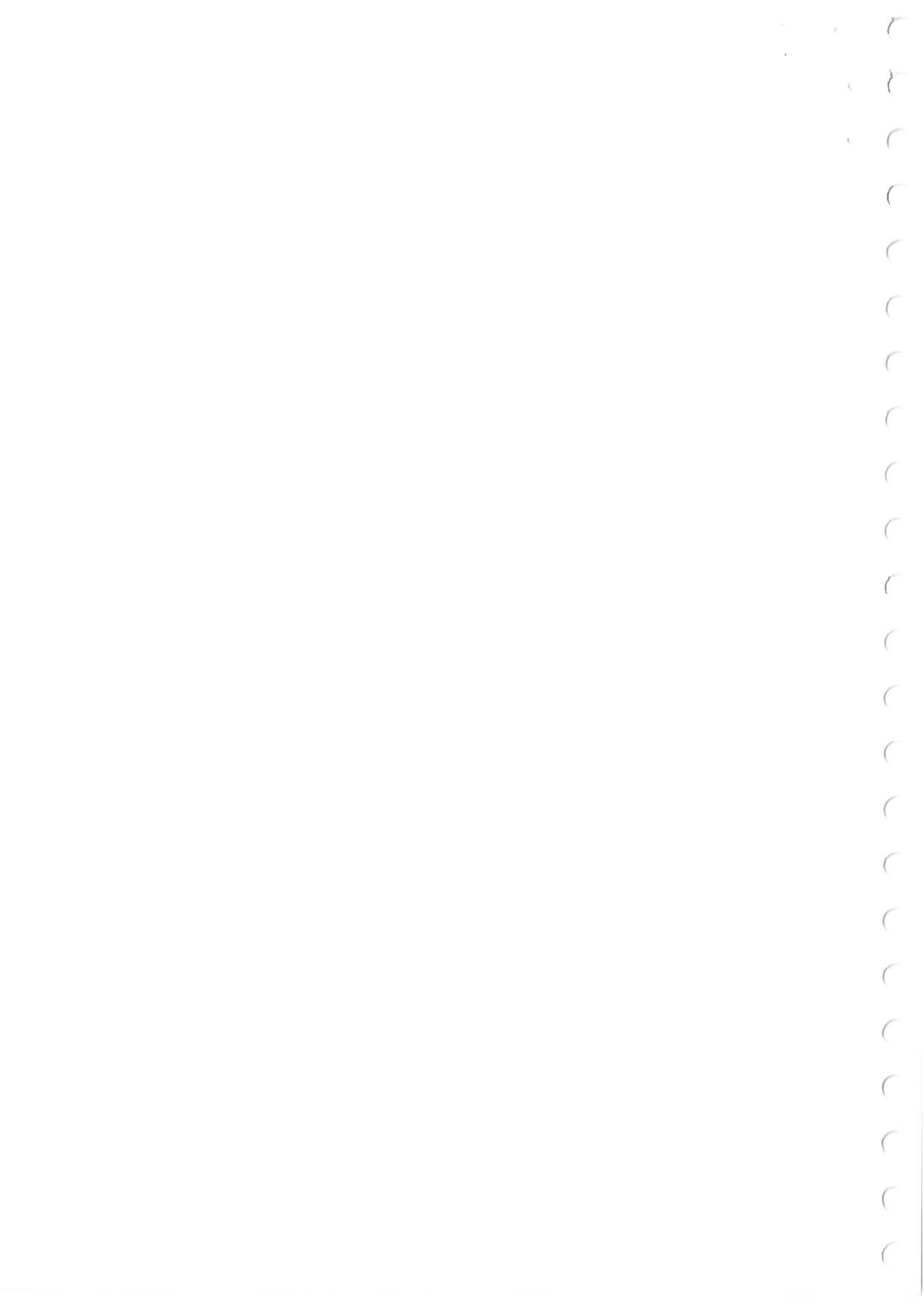
20340-1NWQ-BPC-XX-ZZ-M3-P13-01  
EXISTING-21-Jun 10:00



June 21<sup>st</sup> - 10:00

20340-1NWQ-BPC-XX-ZZ-M3-P13-01  
PROPOSED-21-Jun 10:00

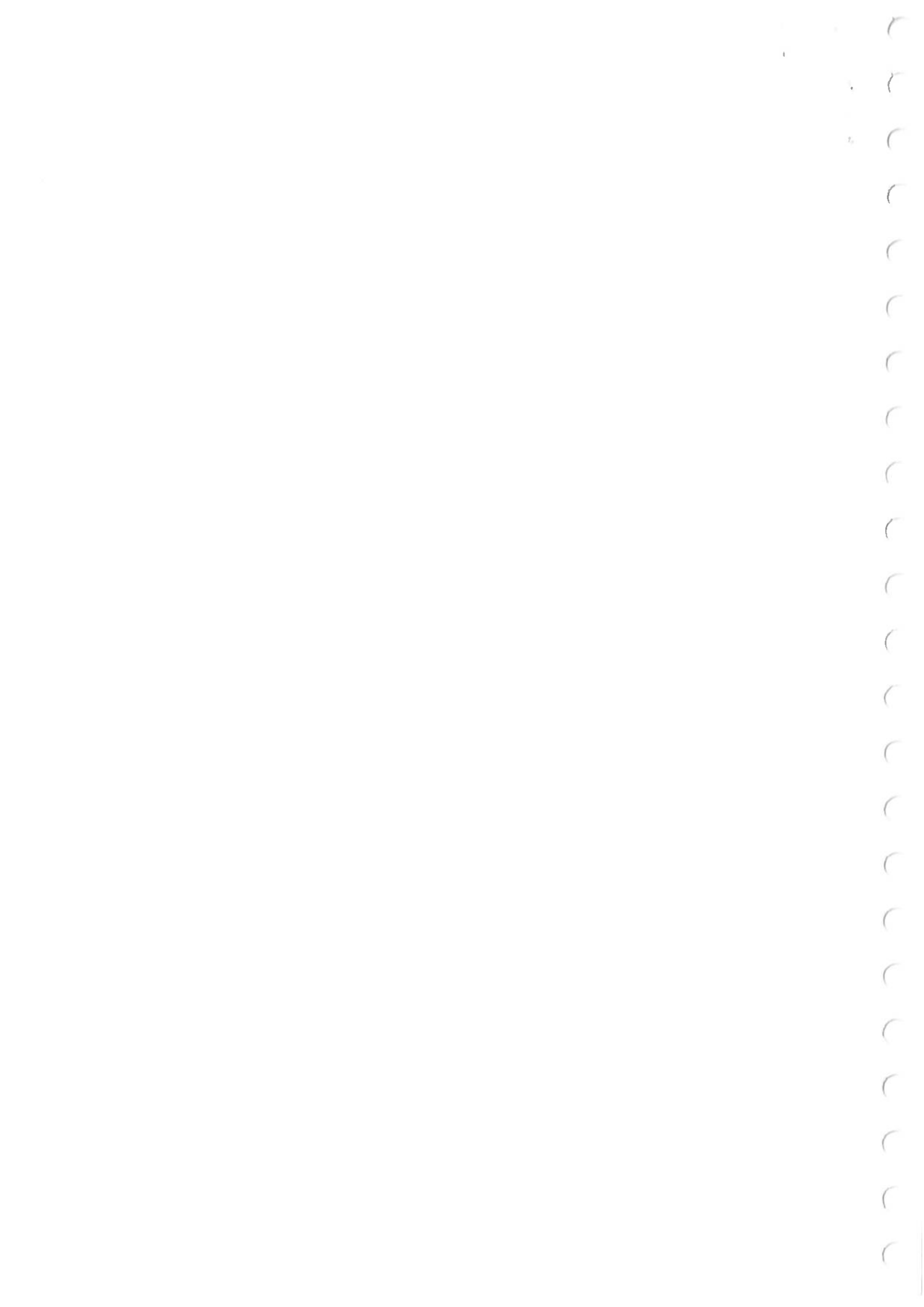




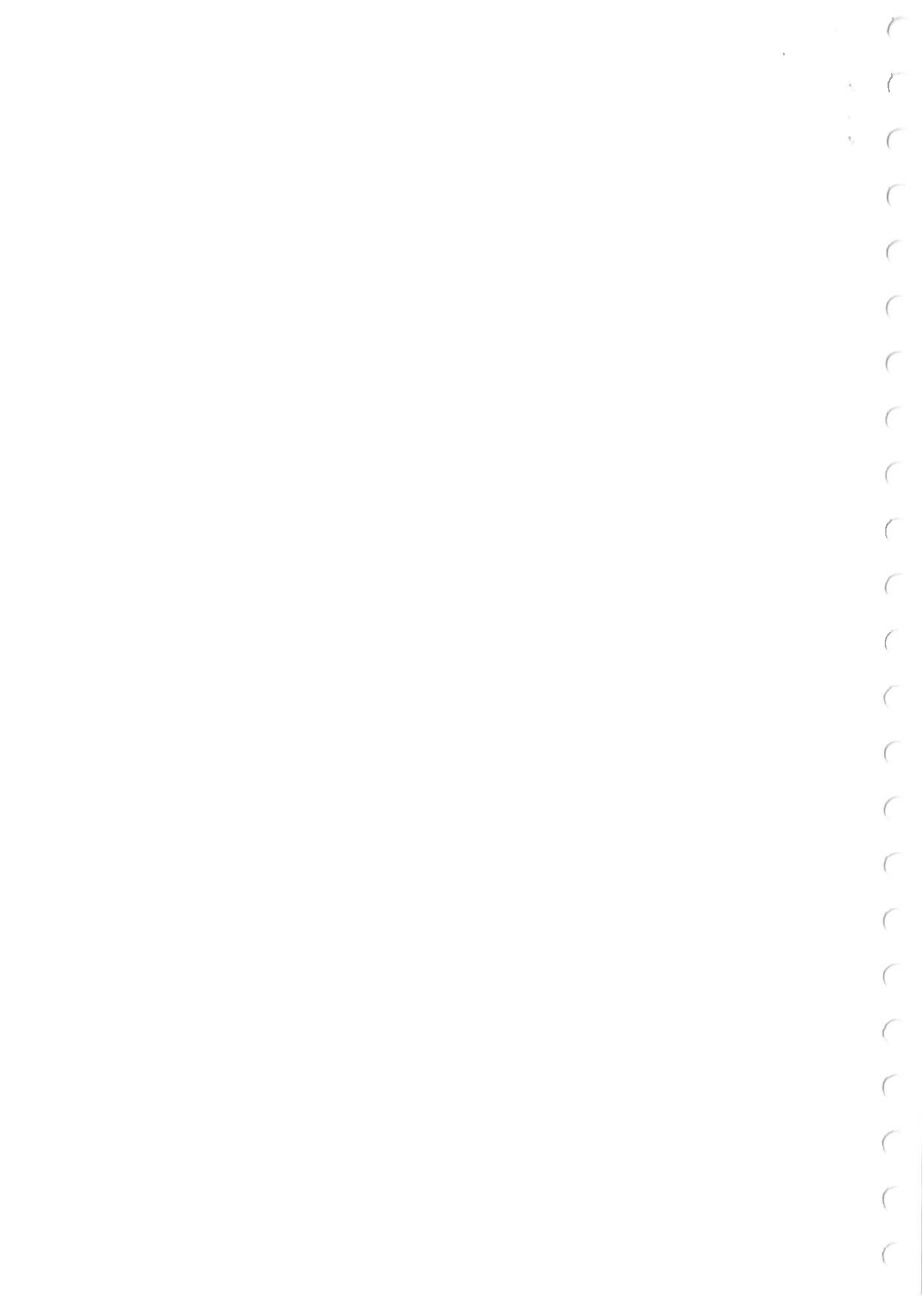












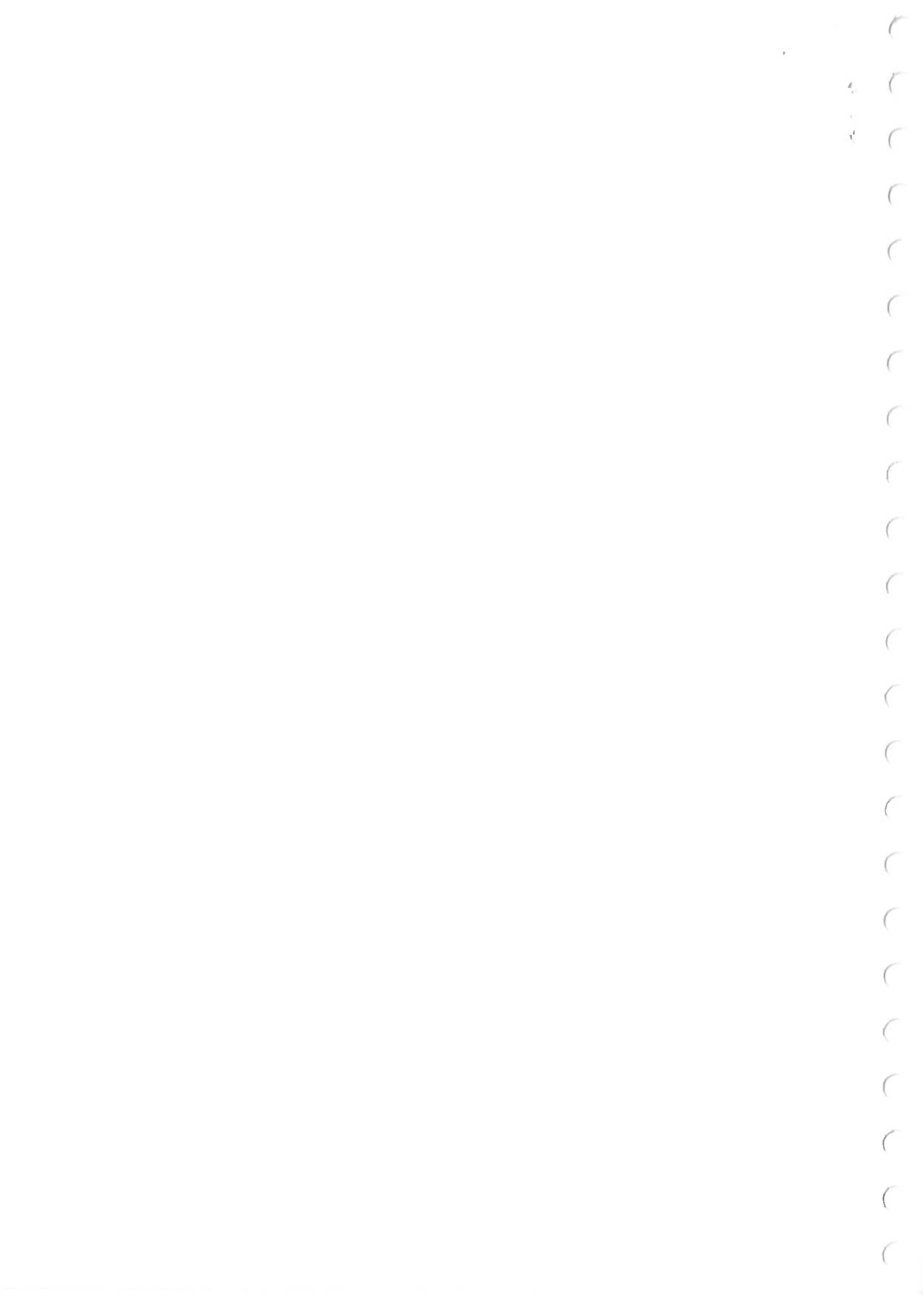
20340-1NWQ-BPC-XX-ZZ-M3-P13-01  
EXISTING-21-Jun 18:00



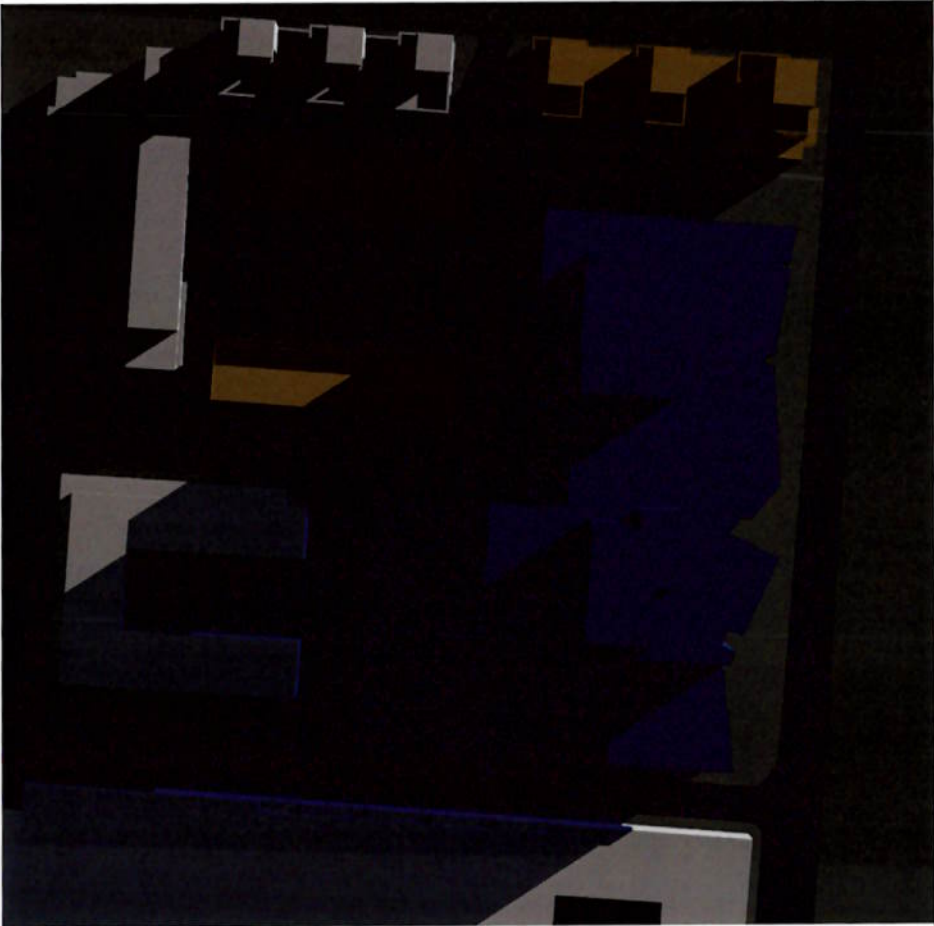
June 21<sup>st</sup> - 18:00

20340-1NWQ-BPC-XX-ZZ-M3-P13-01  
PROPOSED-21-Jun 18:00





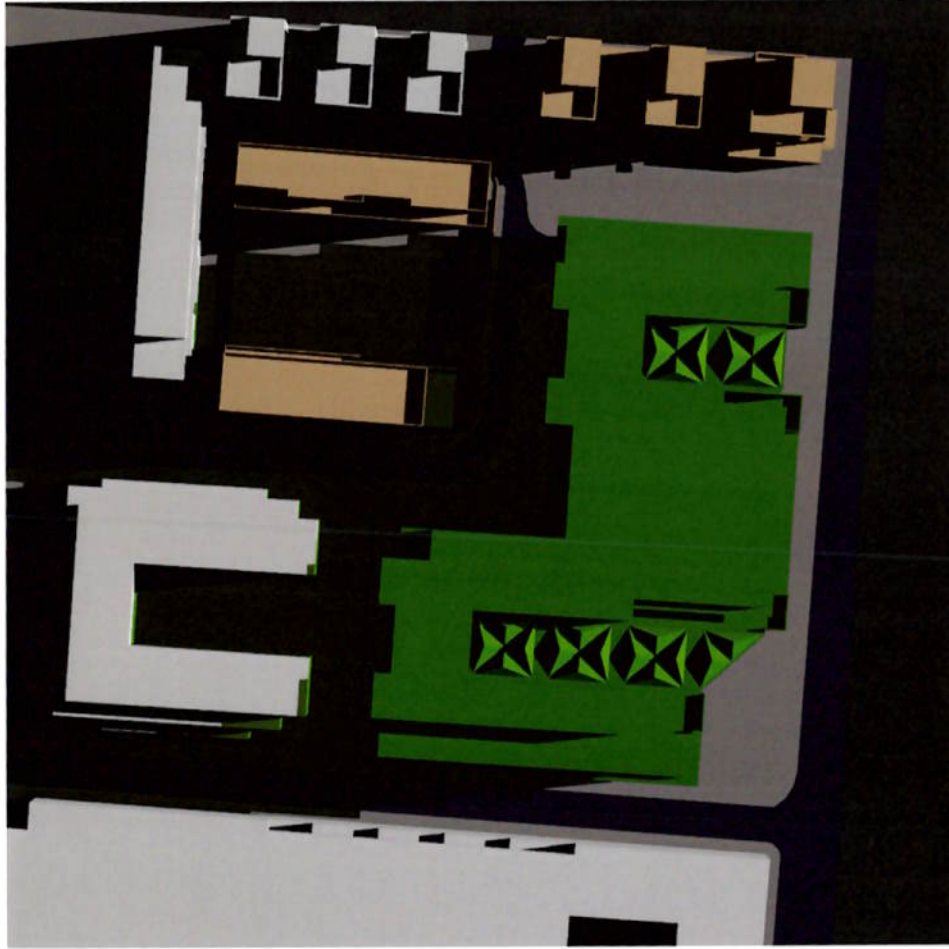
A.3 December 21<sup>st</sup>

| Existing                                                                                                                                                 |  | Proposed                                                                                                                                                |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <div>20340-1NWQ-BPC-XX-ZZ-M3-P13-01<br/>EXISTING-21-Dec 10-00</div>  |  | <div>20340-1NWQ-BPC-XX-ZZ-M3-P13-01<br/>PROPOSED-21-Dec 10-00</div>  |  |

December 21st - 10:00

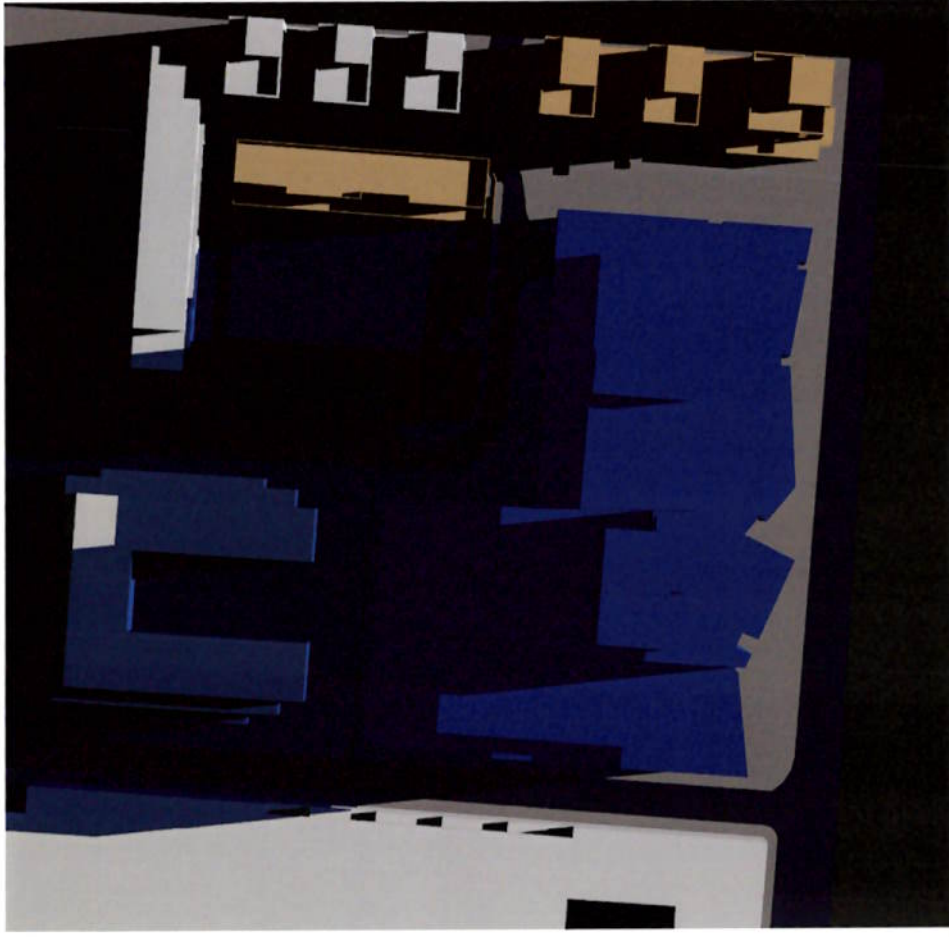


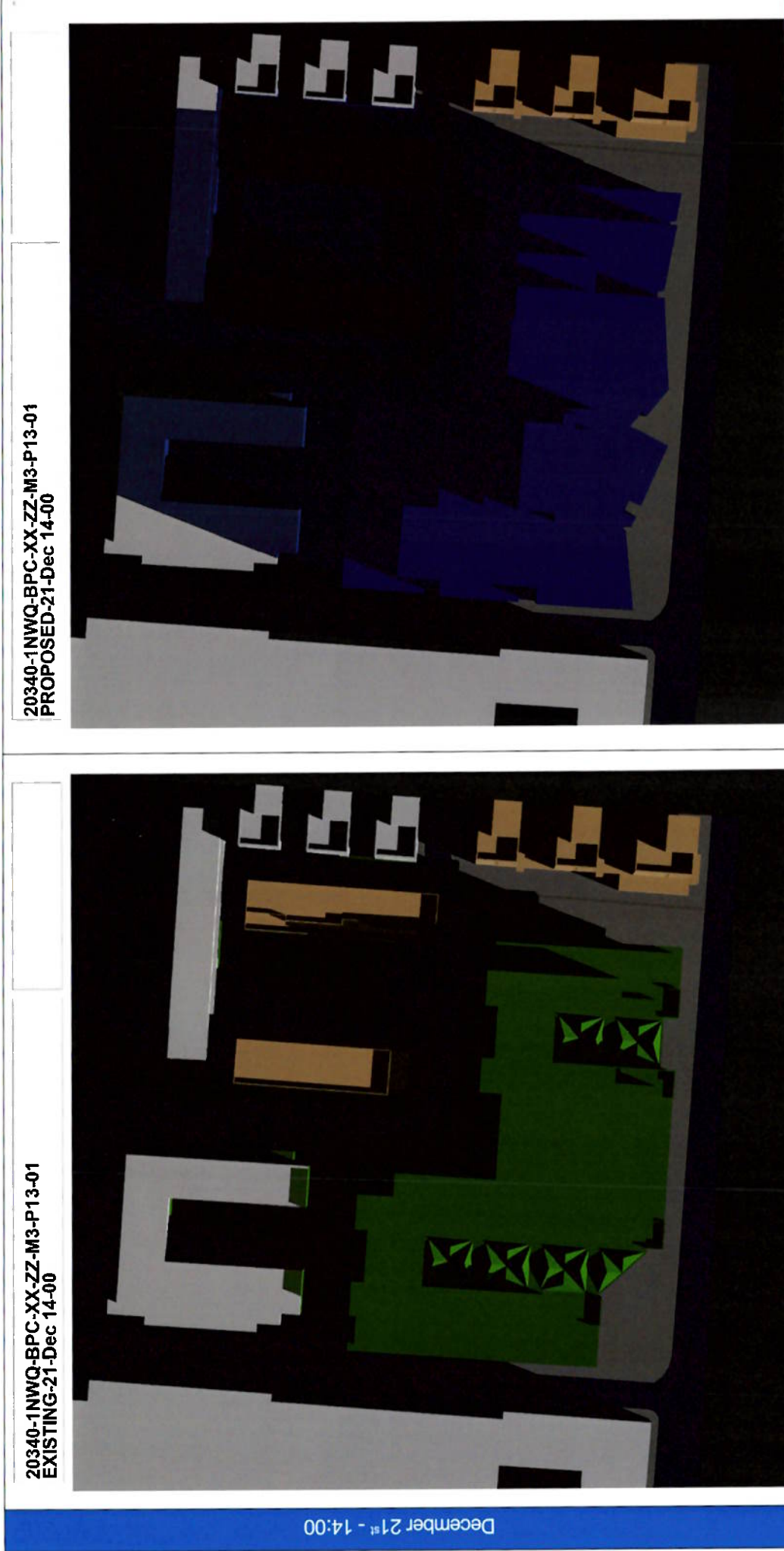
20340-1NWQ-BPC-XX-ZZ-M3-P13-01  
EXISTING-21-Dec 12:00



December 21st - 12:00

20340-1NWQ-BPC-XX-ZZ-M3-P13-01  
PROPOSED-21-Dec 12:00





五

1

1

1

1

Table 9: VSC Results...

| Floor Ref.     | Window Ref. | VSC            | Pr/Ex | Meets BRE Criteria |
|----------------|-------------|----------------|-------|--------------------|
| <b>BLOCK 1</b> |             |                |       |                    |
| Seventh        | W1          | Existing 38.47 | 0.76  | YES                |
|                |             | Proposed 29.17 |       |                    |
|                | W2          | Existing 38.53 | 0.78  | YES                |
|                |             | Proposed 30.05 |       |                    |
|                | W3          | Existing 38.81 | 0.81  | YES                |
|                |             | Proposed 31.63 |       |                    |
|                | W4          | Existing 39.08 | 1.00  | YES                |
|                |             | Proposed 39.08 |       |                    |

Table 10: VSC Results...

| Floor Ref.     | Window Ref. | VSC            | Pr/Ex | Meets BRE Criteria |
|----------------|-------------|----------------|-------|--------------------|
| <b>BLOCK 2</b> |             |                |       |                    |
| First          | W1          | Existing 21.01 | 0.70  | NO*                |
|                |             | Proposed 14.72 |       |                    |
|                | W2          | Existing 20.97 | 0.69  | NO*                |
|                |             | Proposed 14.37 |       |                    |
|                | W3          | Existing 13.13 | 0.89  | YES                |
|                |             | Proposed 11.69 |       |                    |
| Second         | W1          | Existing 23.43 | 0.68  | YES*               |
|                |             | Proposed 15.83 |       |                    |
|                | W2          | Existing 23.10 | 0.66  | YES*               |
|                |             | Proposed 15.14 |       |                    |
|                | W3          | Existing 5.69  | 0.91  | YES                |
|                |             | Proposed 5.20  |       |                    |
| Third          | W1          | Existing 26.57 | 0.66  | YES*               |
|                |             | Proposed 17.59 |       |                    |
|                | W2          | Existing 26.18 | 0.65  | YES*               |
|                |             | Proposed 16.89 |       |                    |
|                | W3          | Existing 5.84  | 0.89  | YES                |
|                |             | Proposed 5.21  |       |                    |
| Fourth         | W1          | Existing 29.43 | 0.67  | YES*               |
|                |             | Proposed 19.58 |       |                    |
|                | W2          | Existing 29.05 | 0.65  | YES*               |
|                |             | Proposed 18.89 |       |                    |
|                | W3          | Existing 6.11  | 0.87  | YES                |
|                |             | Proposed 5.33  |       |                    |



Table 11: VSC Results...

| Floor Ref.     | Window Ref. | VSC                              | Pr/Ex | Meets BRE Criteria |
|----------------|-------------|----------------------------------|-------|--------------------|
| <b>BLOCK 2</b> |             |                                  |       |                    |
| Fifth          | W1          | Existing 32.22<br>Proposed 21.76 | 0.68  | YES*               |
|                | W2          | Existing 31.94<br>Proposed 21.15 | 0.66  | YES*               |
|                | W3          | Existing 6.50<br>Proposed 5.54   | 0.85  | YES                |
| Sixth          | W1          | Existing 34.84<br>Proposed 24.08 | 0.69  | YES*               |
|                | W2          | Existing 34.96<br>Proposed 23.92 | 0.68  | YES*               |
|                | W3          | Existing 8.50<br>Proposed 7.37   | 0.87  | YES                |
| Seventh        | W1          | Existing 37.07<br>Proposed 26.30 | 0.71  | YES*               |
|                | W2          | Existing 37.67<br>Proposed 26.77 | 0.71  | YES*               |
|                | W3          | Existing 34.82<br>Proposed 33.02 | 0.95  | YES                |

Table 12: VSC Results...

| Floor Ref.     | Window Ref. | VSC                              | Pr/Ex | Meets BRE Criteria |
|----------------|-------------|----------------------------------|-------|--------------------|
| <b>BLOCK 3</b> |             |                                  |       |                    |
| First          | W1          | Existing 22.88<br>Proposed 18.63 | 0.81  | YES                |
|                | W2          | Existing 22.62<br>Proposed 18.05 | 0.80  | YES                |
|                | W3          | Existing 11.51<br>Proposed 9.35  | 0.81  | YES                |
| Second         | W1          | Existing 25.63<br>Proposed 20.65 | 0.81  | YES                |
|                | W2          | Existing 24.95<br>Proposed 19.68 | 0.79  | YES*               |
|                | W3          | Existing 4.31<br>Proposed 3.37   | 0.78  | YES*               |
| Third          | W1          | Existing 28.64<br>Proposed 22.87 | 0.80  | YES                |
|                | W2          | Existing 27.83<br>Proposed 21.76 | 0.78  | YES*               |
|                | W3          | Existing 4.74<br>Proposed 3.54   | 0.75  | YES*               |
| Fourth         | W1          | Existing 31.46<br>Proposed 25.20 | 0.80  | YES                |
|                | W2          | Existing 30.59<br>Proposed 23.93 | 0.78  | YES*               |
|                | W3          | Existing 5.23<br>Proposed 3.75   | 0.72  | YES*               |



Table 13: VSC Results...

| Floor Ref.     | Window Ref. | VSC                              | Pr/Ex | Meets BRE Criteria |
|----------------|-------------|----------------------------------|-------|--------------------|
| <b>BLOCK 3</b> |             |                                  |       |                    |
| Fifth          | W1          | Existing 34.22<br>Proposed 27.52 | 0.80  | YES                |
|                | W2          | Existing 33.33<br>Proposed 26.27 | 0.79  | YES*               |
|                | W3          | Existing 5.77<br>Proposed 4.00   | 0.69  | NO                 |
| Sixth          | W1          | Existing 36.47<br>Proposed 29.42 | 0.81  | YES                |
|                | W2          | Existing 35.99<br>Proposed 28.69 | 0.80  | YES                |
|                | W3          | Existing 8.00<br>Proposed 5.91   | 0.74  | YES*               |
| Seventh        | W1          | Existing 38.28<br>Proposed 30.99 | 0.81  | YES                |
|                | W2          | Existing 38.44<br>Proposed 30.90 | 0.80  | YES                |
|                | W3          | Existing 34.06<br>Proposed 31.11 | 0.91  | YES                |

Table 14: VSC Results...

| Floor Ref.     | Window Ref. | VSC                              | Pr/Ex | Meets BRE Criteria |
|----------------|-------------|----------------------------------|-------|--------------------|
| <b>BLOCK 8</b> |             |                                  |       |                    |
| Ground         | W1          | Existing 17.07<br>Proposed 15.62 | 0.92  | YES                |
|                | W2          | Existing 18.42<br>Proposed 16.77 | 0.91  | YES                |
|                | W3          | Existing 19.31<br>Proposed 17.43 | 0.90  | YES                |
|                | W4          | Existing 20.15<br>Proposed 17.80 | 0.88  | YES                |
|                | W5          | Existing 20.47<br>Proposed 17.65 | 0.86  | YES                |
|                | W6          | Existing 20.63<br>Proposed 17.43 | 0.84  | YES                |
|                | W7          | Existing 20.66<br>Proposed 17.10 | 0.83  | YES                |
|                | W8          | Existing 20.19<br>Proposed 16.18 | 0.80  | YES                |
|                | W9          | Existing 13.77<br>Proposed 9.74  | 0.71  | NO                 |
|                | W10         | Existing 19.20<br>Proposed 15.99 | 0.83  | YES                |

Table 15: VSC Results...

| Floor Ref.     | Window Ref. | VSC            | Pr/Ex | Meets BRE Criteria |
|----------------|-------------|----------------|-------|--------------------|
| <b>BLOCK 8</b> |             |                |       |                    |
| Ground         | W11         | Existing 17.07 | 1.00  | YES                |
|                | W12         | Proposed 17.07 | 1.00  | YES                |
|                | W13         | Existing 16.24 | 1.00  | YES                |
|                | W14         | Proposed 16.24 | 1.00  | YES                |
|                | W15         | Existing 0.65  | 1.00  | YES                |
|                | W16         | Proposed 0.65  | 1.00  | YES                |
|                | W17         | Existing 0.86  | 1.00  | YES                |
|                | W18         | Proposed 0.90  | 1.00  | YES                |
|                | W19         | Existing 7.23  | 1.00  | YES                |
|                | W20         | Proposed 7.23  | 1.00  | YES                |
|                | W21         | Existing 4.91  | 1.00  | YES                |

Table 16: VSC Results...

| Floor Ref.     | Window Ref. | VSC            | Pr/Ex | Meets BRE Criteria |
|----------------|-------------|----------------|-------|--------------------|
| <b>BLOCK 8</b> |             |                |       |                    |
| First          | W1          | Existing 5.05  | 0.83  | YES                |
|                | W2          | Proposed 4.20  | 0.82  | YES                |
|                | W3          | Existing 5.26  | 0.83  | YES                |
|                | W4          | Proposed 4.30  | 0.88  | YES                |
|                | W5          | Existing 5.21  | 0.38  | NO                 |
|                | W6          | Proposed 4.30  | 0.75  | YES*               |
|                | W7          | Existing 23.09 | 0.70  | NO                 |
|                | W8          | Proposed 20.37 | 0.66  | NO                 |
|                | W9          | Existing 4.27  | 0.63  | NO                 |
|                | W10         | Proposed 1.64  | 0.80  | YES                |
|                | W11         | Existing 4.81  | 0.70  | NO                 |

Table 17: VSC Results...

| Floor Ref.     | Window Ref. | VSC                              | Pr/Ex | Meets BRE Criteria |
|----------------|-------------|----------------------------------|-------|--------------------|
| <b>BLOCK 8</b> |             |                                  |       |                    |
| First          | W12         | Existing 21.15<br>Proposed 17.52 | 0.83  | YES                |
|                | W13         | Existing 18.18<br>Proposed 18.18 | 1.00  | YES                |
|                | W14         | Existing 17.29<br>Proposed 17.29 | 1.00  | YES                |
|                | W15         | Existing 3.03<br>Proposed 3.03   | 1.00  | YES                |
|                | W16         | Existing 6.36<br>Proposed 6.36   | 1.00  | YES                |
|                | W17         | Existing 6.09<br>Proposed 6.09   | 1.00  | YES                |
|                | W18         | Existing 8.82<br>Proposed 8.82   | 1.00  | YES                |
|                | W19         | Existing 6.06<br>Proposed 6.06   | 1.00  | YES                |
|                | W20         | Existing 5.62<br>Proposed 5.62   | 1.00  | YES                |
|                | W21         | Existing 5.67<br>Proposed 5.67   | 1.00  | YES                |
|                | W22         | Existing 1.15<br>Proposed 1.15   | 1.00  | YES                |

Table 18: VSC Results...

| Floor Ref.     | Window Ref. | VSC                              | Pr/Ex | Meets BRE Criteria |
|----------------|-------------|----------------------------------|-------|--------------------|
| <b>BLOCK 8</b> |             |                                  |       |                    |
| Second         | W1          | Existing 7.90<br>Proposed 6.44   | 0.82  | YES                |
|                | W2          | Existing 8.45<br>Proposed 6.82   | 0.81  | YES                |
|                | W3          | Existing 8.56<br>Proposed 6.98   | 0.82  | YES                |
|                | W4          | Existing 25.88<br>Proposed 22.69 | 0.88  | YES                |
|                | W5          | Existing 6.12<br>Proposed 2.94   | 0.48  | NO                 |
|                | W6          | Existing 9.09<br>Proposed 7.03   | 0.77  | YES*               |
|                | W7          | Existing 9.36<br>Proposed 6.76   | 0.72  | NO                 |
|                | W8          | Existing 9.49<br>Proposed 6.57   | 0.69  | NO                 |
|                | W9          | Existing 9.52<br>Proposed 6.35   | 0.67  | NO                 |
|                | W10         | Existing 25.16<br>Proposed 19.96 | 0.79  | YES*               |
|                | W11         | Existing 17.20<br>Proposed 12.04 | 0.70  | NO                 |

Table 19: VSC Results...

| Floor Ref.     | Window Ref. | VSC            | Pr/Ex | Meets BRE Criteria |
|----------------|-------------|----------------|-------|--------------------|
| <b>BLOCK 8</b> |             |                |       |                    |
| Second         | W12         | Existing 23.39 | 0.82  | YES                |
|                | W13         | Proposed 19.27 | 1.00  | YES                |
|                | W14         | Existing 19.61 | 1.00  | YES                |
|                | W15         | Proposed 19.61 | 1.00  | YES                |
|                | W16         | Existing 18.64 | 1.00  | YES                |
|                | W17         | Proposed 18.64 | 1.00  | YES                |
|                | W18         | Existing 0.00  | 1.00  | YES                |
|                | W19         | Proposed 0.63  | 1.00  | YES                |
|                | W20         | Existing 0.63  | 1.00  | YES                |
|                | W21         | Proposed 0.97  | 1.00  | YES                |
|                | W22         | Existing 0.97  | 1.00  | YES                |
|                | W23         | Proposed 1.06  | 1.00  | YES                |
|                | W24         | Existing 1.41  | 1.00  | YES                |
|                | W25         | Proposed 1.41  | 1.00  | YES                |
|                | W26         | Existing 2.70  | 1.00  | YES                |
|                | W27         | Proposed 2.70  | 1.00  | YES                |
|                | W28         | Existing 1.50  | 1.00  | YES                |
|                | W29         | Proposed 1.50  | 1.00  | YES                |
|                | W30         | Existing 1.51  | 1.00  | YES                |
|                | W31         | Proposed 1.51  | 1.00  | YES                |

Table 20: VSC Results...

| Floor Ref.     | Window Ref. | VSC            | Pr/Ex | Meets BRE Criteria |
|----------------|-------------|----------------|-------|--------------------|
| <b>BLOCK 8</b> |             |                |       |                    |
| Second         | W23         | Existing 2.73  | 1.00  | YES                |
|                | W24         | Proposed 2.73  | 1.00  | YES                |
|                | W25         | Existing 10.29 | 1.00  | YES                |
|                | W26         | Proposed 10.29 | 1.00  | YES                |
|                | W27         | Existing 7.61  | 1.00  | YES                |
|                | W28         | Proposed 7.61  | 1.00  | YES                |
|                | W29         | Existing 1.58  | 1.00  | YES                |
|                | W30         | Proposed 1.58  | 1.00  | YES                |
|                | W31         | Existing 1.63  | 1.00  | YES                |
|                | W32         | Proposed 1.63  | 1.00  | YES                |
|                | W33         | Existing 2.85  | 1.00  | YES                |
|                | W34         | Proposed 2.85  | 1.00  | YES                |
|                | W35         | Existing 1.63  | 1.00  | YES                |
|                | W36         | Proposed 1.63  | 1.00  | YES                |
|                | W37         | Existing 1.59  | 1.00  | YES                |
|                | W38         | Proposed 1.59  | 1.00  | YES                |
|                | W39         | Existing 2.23  | 1.00  | YES                |
|                | W40         | Proposed 2.23  | 1.00  | YES                |
|                | W41         | Existing 0.25  | 1.00  | YES                |
|                | W42         | Proposed 0.25  | 1.00  | YES                |
|                | W43         | Existing 0.00  | 1.00  | YES                |
|                | W44         | Proposed 0.00  | 1.00  | YES                |
|                | W45         | Existing 0.02  | 1.00  | YES                |
|                | W46         | Proposed 0.02  | 1.00  | YES                |



Table 21: VSC Results...

| Floor Ref. | Window Ref. | VSC                              | Pr/Ex | Meets BRE Criteria |
|------------|-------------|----------------------------------|-------|--------------------|
| BLOCK 8    |             |                                  |       |                    |
| Third      | W1          | Existing 21.89<br>Proposed 19.37 | 0.88  | YES                |
|            | W2          | Existing 23.43<br>Proposed 20.64 | 0.88  | YES                |
|            | W3          | Existing 22.26<br>Proposed 20.09 | 0.90  | YES                |
|            | W4          | Existing 28.80<br>Proposed 25.08 | 0.87  | YES                |
|            | W5          | Existing 6.14<br>Proposed 2.26   | 0.37  | NO                 |
|            | W6          | Existing 9.30<br>Proposed 6.67   | 0.72  | NO                 |
|            | W7          | Existing 25.18<br>Proposed 20.68 | 0.82  | YES                |
|            | W8          | Existing 25.32<br>Proposed 20.32 | 0.80  | YES                |
|            | W9          | Existing 23.13<br>Proposed 18.91 | 0.82  | YES                |
|            | W10         | Existing 27.89<br>Proposed 21.87 | 0.78  | YES*               |
|            | W11         | Existing 18.45<br>Proposed 12.48 | 0.68  | NO                 |

Table 22: VSC Results...

| Floor Ref. | Window Ref. | VSC                              | Pr/Ex | Meets BRE Criteria |
|------------|-------------|----------------------------------|-------|--------------------|
| BLOCK 8    |             |                                  |       |                    |
| Third      | W12         | Existing 26.00<br>Proposed 21.37 | 0.82  | YES                |
|            | W13         | Existing 21.48<br>Proposed 21.48 | 1.00  | YES                |
|            | W14         | Existing 20.39<br>Proposed 20.39 | 1.00  | YES                |
|            | W15         | Existing 0.76<br>Proposed 0.76   | 1.00  | YES                |
|            | W16         | Existing 1.83<br>Proposed 1.83   | 1.00  | YES                |
|            | W17         | Existing 1.92<br>Proposed 1.92   | 1.00  | YES                |
|            | W18         | Existing 12.29<br>Proposed 12.29 | 1.00  | YES                |
|            | W19         | Existing 9.71<br>Proposed 9.71   | 1.00  | YES                |
|            | W20         | Existing 1.89<br>Proposed 1.89   | 1.00  | YES                |
|            | W21         | Existing 1.85<br>Proposed 1.85   | 1.00  | YES                |
|            | W22         | Existing 0.00<br>Proposed 0.00   | 1.00  | YES                |



Table 23: VSC Results...

| Floor Ref. | Window Ref. | VSC            | Pr/Ex | Meets BRE Criteria |
|------------|-------------|----------------|-------|--------------------|
| BLOCK 8    |             |                |       |                    |
| Fourth     | W1          | Existing 11.02 | 0.79  | YES*               |
|            | W2          | Proposed 8.75  | 0.79  | YES*               |
|            | W3          | Existing 11.89 | 0.79  | YES*               |
|            | W4          | Proposed 9.38  | 0.80  | YES                |
|            | W5          | Existing 12.04 | 0.80  | YES                |
|            | W6          | Proposed 9.63  | 0.87  | YES                |
|            | W7          | Existing 31.70 | 0.87  | YES                |
|            | W8          | Proposed 27.46 | 0.40  | NO                 |
|            | W9          | Existing 6.48  | 0.40  | NO                 |
|            | W10         | Proposed 2.61  | 0.74  | YES*               |
|            | W11         | Existing 11.08 | 0.74  | YES*               |
| Fourth     | W12         | Proposed 8.23  | 0.71  | NO                 |
|            | W13         | Existing 13.03 | 0.69  | NO                 |
|            | W14         | Proposed 9.27  | 0.69  | NO                 |
|            | W15         | Existing 13.06 | 0.67  | NO                 |
|            | W16         | Proposed 8.95  | 0.67  | NO                 |
|            | W17         | Existing 12.82 | 0.78  | YES*               |
|            | W18         | Proposed 8.59  | 0.55  | NO                 |
|            | W19         | Existing 30.67 | 0.55  | NO                 |
|            | W20         | Proposed 23.80 | 0.55  | NO                 |
|            | W21         | Existing 12.55 | 0.55  | NO                 |
|            | W22         | Proposed 6.96  | 0.55  | NO                 |

Table 24: VSC Results...

| Floor Ref. | Window Ref. | VSC            | Pr/Ex | Meets BRE Criteria |
|------------|-------------|----------------|-------|--------------------|
| BLOCK 8    |             |                |       |                    |
| Fourth     | W12         | Existing 28.84 | 0.82  | YES                |
|            | W13         | Proposed 23.74 | 1.00  | YES                |
|            | W14         | Existing 23.90 | 1.00  | YES                |
|            | W15         | Proposed 23.90 | 1.00  | YES                |
|            | W16         | Existing 22.67 | 1.00  | YES                |
|            | W17         | Proposed 22.67 | 1.00  | YES                |
|            | W18         | Existing 14.24 | 1.00  | YES                |
|            | W19         | Proposed 14.24 | 1.00  | YES                |
|            | W20         | Existing 17.01 | 1.00  | YES                |
|            | W21         | Proposed 17.01 | 1.00  | YES                |
|            | W22         | Existing 17.15 | 1.00  | YES                |
| Fourth     | W23         | Proposed 17.15 | 1.00  | YES                |
|            | W24         | Existing 15.06 | 1.00  | YES                |
|            | W25         | Proposed 15.06 | 1.00  | YES                |
|            | W26         | Existing 12.65 | 1.00  | YES                |
|            | W27         | Proposed 12.65 | 1.00  | YES                |
|            | W28         | Existing 16.80 | 1.00  | YES                |
|            | W29         | Proposed 16.80 | 1.00  | YES                |
|            | W30         | Existing 16.65 | 1.00  | YES                |
|            | W31         | Proposed 16.65 | 1.00  | YES                |
|            | W32         | Existing 12.05 | 1.00  | YES                |
|            | W33         | Proposed 12.05 | 1.00  | YES                |

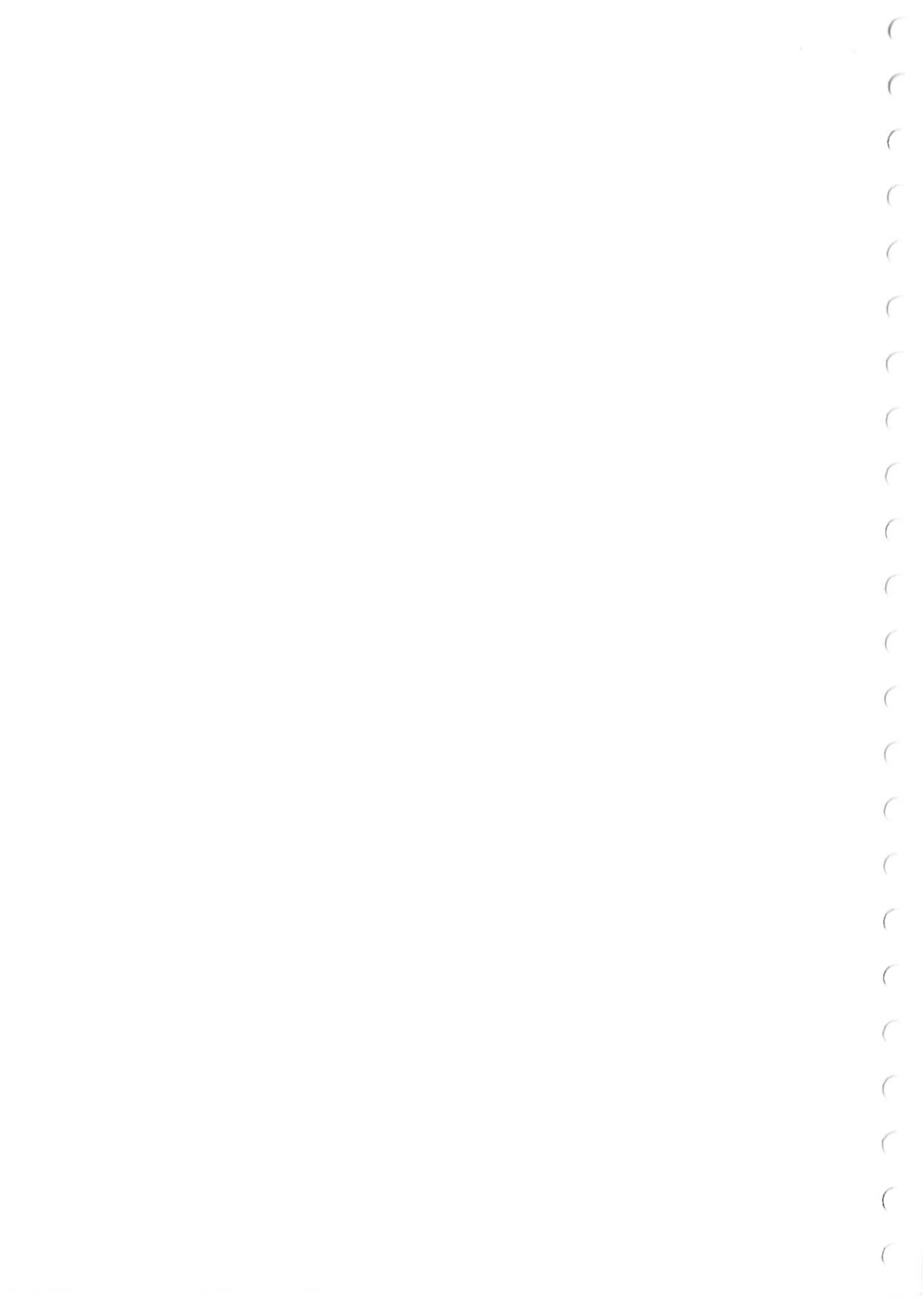


Table 25: VSC Results...

| Floor Ref. | Window Ref. | VSC                              | Pr/Ex | Meets BRE Criteria |
|------------|-------------|----------------------------------|-------|--------------------|
| BLOCK 8    |             |                                  |       |                    |
| Fifth      | W1          | Existing 31.01<br>Proposed 27.86 | 0.90  | YES                |
|            | W2          | Existing 32.08<br>Proposed 28.85 | 0.90  | YES                |
|            | W3          | Existing 22.98<br>Proposed 22.72 | 0.99  | YES                |
|            | W4          | Existing 33.69<br>Proposed 29.74 | 0.88  | YES                |
|            | W5          | Existing 34.11<br>Proposed 29.80 | 0.87  | YES                |
|            | W6          | Existing 34.40<br>Proposed 29.54 | 0.86  | YES                |
|            | W7          | Existing 32.39<br>Proposed 27.08 | 0.84  | YES                |
|            | W8          | Existing 33.91<br>Proposed 28.46 | 0.84  | YES                |
|            | W9          | Existing 23.96<br>Proposed 22.68 | 0.95  | YES                |
|            | W10         | Existing 34.27<br>Proposed 27.85 | 0.81  | YES                |
|            | W11         | Existing 33.91<br>Proposed 26.92 | 0.79  | YES*               |
|            | W12         | Existing 33.21<br>Proposed 25.81 | 0.78  | YES*               |
|            | W13         | Existing 31.83<br>Proposed 26.33 | 0.83  | YES                |

Table 26: VSC Results...

| Floor Ref. | Window Ref. | VSC                              | Pr/Ex | Meets BRE Criteria |
|------------|-------------|----------------------------------|-------|--------------------|
| BLOCK 8    |             |                                  |       |                    |
| Fifth      | W14         | Existing 26.61<br>Proposed 26.61 | 1.00  | YES                |
|            | W15         | Existing 25.31<br>Proposed 25.31 | 1.00  | YES                |
|            | W16         | Existing 5.00<br>Proposed 5.00   | 1.00  | YES                |
|            | W17         | Existing 2.33<br>Proposed 2.33   | 1.00  | YES                |
|            | W18         | Existing 20.10<br>Proposed 20.10 | 1.00  | YES                |
|            | W19         | Existing 20.39<br>Proposed 20.39 | 1.00  | YES                |
|            | W20         | Existing 18.46<br>Proposed 18.46 | 1.00  | YES                |
|            | W21         | Existing 16.26<br>Proposed 16.26 | 1.00  | YES                |
|            | W22         | Existing 2.46<br>Proposed 2.46   | 1.00  | YES                |
|            | W23         | Existing 3.77<br>Proposed 3.77   | 1.00  | YES                |
|            | W24         | Existing 20.04<br>Proposed 20.04 | 1.00  | YES                |
|            | W25         | Existing 15.95<br>Proposed 15.95 | 1.00  | YES                |



Table 27: VSC Results...

| Floor Ref. | Window Ref. | VSC            | Pr/Ex | Meets BRE Criteria |
|------------|-------------|----------------|-------|--------------------|
| BLOCK 12   |             |                |       |                    |
| Ground     | W1          | Existing 0.00  | 1.00  | YES                |
|            | W2          | Proposed 0.16  | 1.00  | YES                |
|            | W3          | Proposed 0.16  | 1.00  | YES                |
|            | W4          | Proposed 0.14  | 0.84  | YES                |
|            | W5          | Proposed 16.19 | 0.83  | YES                |
|            | W6          | Proposed 16.18 | 0.91  | YES                |
|            | W7          | Proposed 0.49  | 0.96  | YES                |
|            | W8          | Proposed 0.54  | 0.67  | NO                 |
|            | W9          | Proposed 0.26  | 0.61  | NO                 |
|            | W10         | Proposed 9.39  | 0.58  | NO                 |
|            |             | Existing 14.54 |       |                    |
|            |             | Proposed 8.37  |       |                    |

Table 28: VSC Results...

| Floor Ref. | Window Ref. | VSC            | Pr/Ex | Meets BRE Criteria |
|------------|-------------|----------------|-------|--------------------|
| BLOCK 12   |             |                |       |                    |
| Ground     | W11         | Existing 10.32 | 0.35  | NO                 |
|            | W12         | Proposed 3.57  | 0.93  | YES                |
|            | W13         | Proposed 7.27  | 0.93  | YES                |
|            | W14         | Proposed 20.84 | 0.95  | YES                |
|            | W15         | Proposed 21.77 | 0.96  | YES                |
|            | W16         | Proposed 22.22 | 0.97  | YES                |
|            | W17         | Proposed 22.38 | 0.97  | YES                |
|            | W18         | Proposed 21.63 | 0.98  | YES                |
|            | W19         | Proposed 20.46 | 0.98  | YES                |
|            | W20         | Proposed 20.12 | 0.99  | YES                |
|            |             | Existing 19.17 |       |                    |
|            |             | Proposed 18.90 |       |                    |



Table 29: VSC Results...

| Floor Ref. | Window Ref. | VSC                              | Pr/Ex | Meets BRE Criteria |
|------------|-------------|----------------------------------|-------|--------------------|
| BLOCK 12   |             |                                  |       |                    |
| First      | W1          | Existing 10.68<br>Proposed 9.13  | 0.85  | YES                |
|            | W2          | Existing 10.90<br>Proposed 8.89  | 0.82  | YES                |
|            | W3          | Existing 10.03<br>Proposed 8.41  | 0.84  | YES                |
|            | W4          | Existing 21.71<br>Proposed 18.13 | 0.84  | YES                |
|            | W5          | Existing 21.86<br>Proposed 18.15 | 0.83  | YES                |
|            | W6          | Existing 11.89<br>Proposed 8.44  | 0.71  | NO                 |
|            | W7          | Existing 12.31<br>Proposed 8.55  | 0.69  | NO                 |
|            | W8          | Existing 10.23<br>Proposed 6.61  | 0.65  | NO                 |
|            | W9          | Existing 17.87<br>Proposed 10.77 | 0.60  | NO                 |
|            | W10         | Existing 16.88<br>Proposed 9.66  | 0.57  | NO                 |
|            | W11         | Existing 12.35<br>Proposed 4.10  | 0.33  | NO                 |

Table 30: VSC Results...

| Floor Ref. | Window Ref. | VSC                              | Pr/Ex | Meets BRE Criteria |
|------------|-------------|----------------------------------|-------|--------------------|
| BLOCK 12   |             |                                  |       |                    |
| First      | W12         | Existing 9.20<br>Proposed 8.57   | 0.93  | YES                |
|            | W13         | Existing 24.79<br>Proposed 22.99 | 0.93  | YES                |
|            | W14         | Existing 8.25<br>Proposed 7.89   | 0.96  | YES                |
|            | W15         | Existing 8.34<br>Proposed 8.00   | 0.96  | YES                |
|            | W16         | Existing 8.29<br>Proposed 8.02   | 0.97  | YES                |
|            | W17         | Existing 6.78<br>Proposed 6.74   | 0.99  | YES                |
|            | W18         | Existing 5.02<br>Proposed 4.44   | 0.88  | YES                |
|            | W19         | Existing 25.75<br>Proposed 25.16 | 0.98  | YES                |
|            | W20         | Existing 7.23<br>Proposed 7.23   | 1.00  | YES                |
|            | W21         | Existing 7.20<br>Proposed 7.09   | 0.98  | YES                |
|            | W22         | Existing 6.95<br>Proposed 6.85   | 0.99  | YES                |



Table 31: VSC Results...

| Floor Ref. | Window Ref. | VSC           | Pr/Ex | Meets BRE Criteria |
|------------|-------------|---------------|-------|--------------------|
| BLOCK 12   |             |               |       |                    |
| Second     | W1          | Existing 1.39 | 0.92  | YES                |
|            | W2          | Proposed 1.28 | 1.00  | YES                |
|            | W3          | Existing 0.31 | 1.00  | YES                |
|            | W4          | Proposed 0.31 | 1.00  | YES                |
|            | W5          | Existing 0.14 | 0.57  | NO                 |
|            | W6          | Proposed 0.14 | 1.00  | YES                |
|            | W7          | Existing 0.69 | 0.31  | NO                 |
|            | W8          | Proposed 0.39 | 0.81  | YES                |
|            | W9          | Existing 0.17 | 0.57  | NO                 |
|            | W10         | Proposed 0.17 | 0.84  | YES                |
|            | W11         | Existing 0.16 | 0.83  | YES                |
|            | W12         | Proposed 0.13 | 0.80  | YES                |

Table 32: VSC Results...

| Floor Ref. | Window Ref. | VSC           | Pr/Ex | Meets BRE Criteria |
|------------|-------------|---------------|-------|--------------------|
| BLOCK 12   |             |               |       |                    |
| Second     | W13         | Existing 0.81 | 0.90  | YES                |
|            | W14         | Proposed 0.73 | 0.93  | YES                |
|            | W15         | Existing 0.82 | 0.92  | YES                |
|            | W16         | Proposed 0.76 | 0.97  | YES                |
|            | W17         | Existing 2.83 | 0.85  | YES                |
|            | W18         | Proposed 2.61 | 0.88  | YES                |
|            | W19         | Existing 0.88 | 0.87  | YES                |
|            | W20         | Proposed 2.57 | 0.87  | YES                |
|            | W21         | Existing 2.24 | 0.73  | NO*                |
|            | W22         | Proposed 0.70 | 0.63  | NO                 |
|            | W23         | Existing 0.51 | 0.60  | NO                 |
|            | W24         | Proposed 0.64 | 0.57  | NO                 |

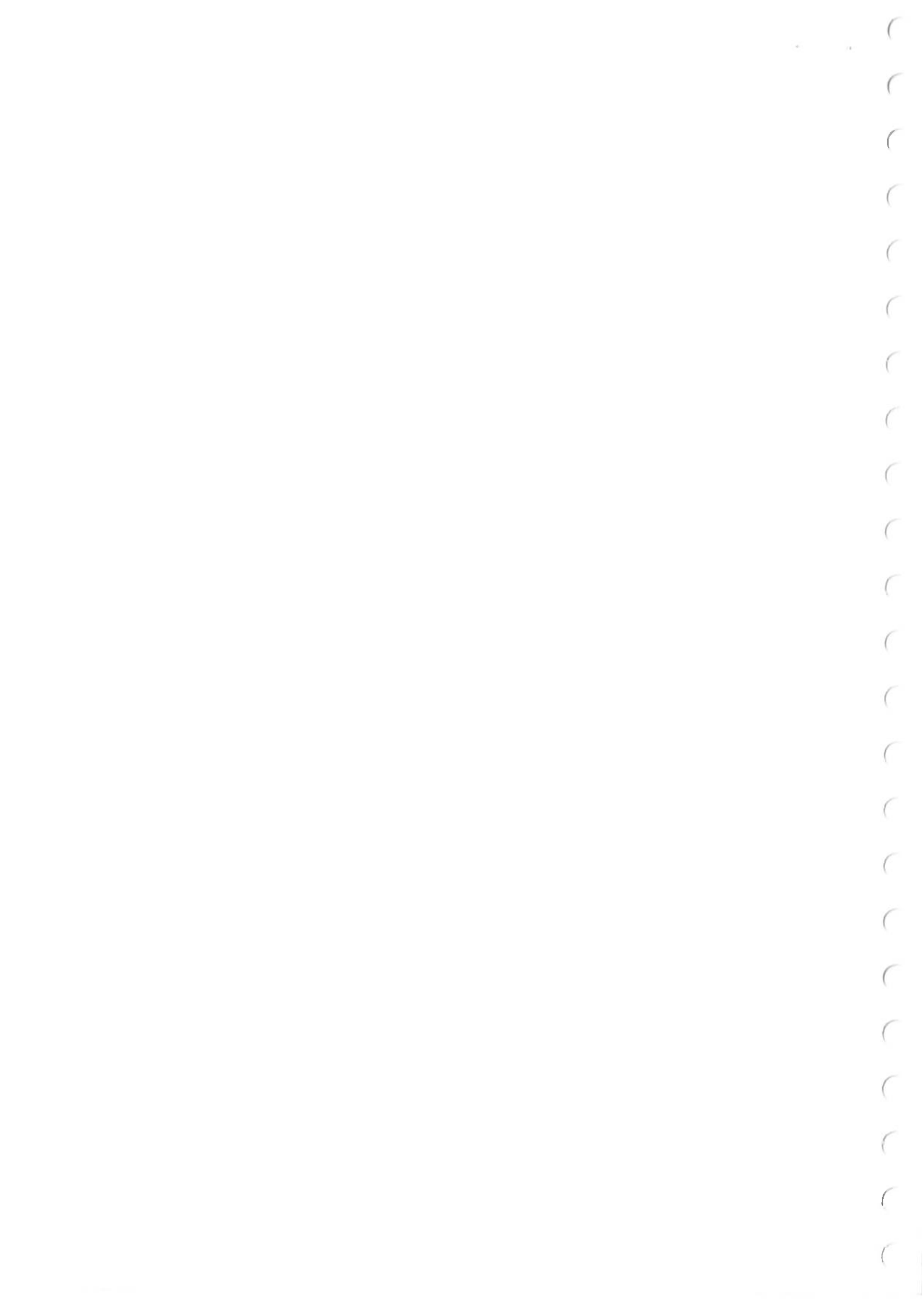


Table 33: VSC Results...

| Floor Ref. | Window Ref. | VSC            | Pr/Ex | Meets BRE Criteria |
|------------|-------------|----------------|-------|--------------------|
| BLOCK 12   |             |                |       |                    |
| Second     | W25         | Existing 27.14 | 0.92  | YES                |
|            | W26         | Proposed 25.10 | 0.98  | YES                |
|            | W27         | Existing 23.57 | 0.96  | YES                |
|            | W28         | Proposed 23.03 | 0.97  | YES                |
|            | W29         | Existing 25.13 | 0.96  | YES                |
|            | W30         | Proposed 24.13 | 0.96  | YES                |
|            | W31         | Existing 24.27 | 0.85  | YES                |
|            | W32         | Proposed 11.35 | 0.98  | YES                |
|            | W33         | Existing 10.92 | 1.00  | YES                |
|            | W34         | Proposed 7.20  | 0.99  | YES                |
|            |             | Existing 28.27 | 0.99  | YES                |

Table 34: VSC Results...

| Floor Ref. | Window Ref. | VSC            | Pr/Ex | Meets BRE Criteria |
|------------|-------------|----------------|-------|--------------------|
| BLOCK 12   |             |                |       |                    |
| Third      | W1          | Existing 16.11 | 0.87  | YES                |
|            | W2          | Proposed 14.00 | 0.84  | YES                |
|            | W3          | Existing 16.60 | 0.87  | YES                |
|            | W4          | Proposed 14.01 | 0.83  | YES                |
|            | W5          | Existing 15.22 | 0.83  | YES                |
|            | W6          | Proposed 13.20 | 0.72  | NO                 |
|            | W7          | Existing 27.16 | 0.70  | NO                 |
|            | W8          | Proposed 22.64 | 0.69  | NO                 |
|            | W9          | Existing 27.25 | 0.61  | NO                 |
|            | W10         | Proposed 22.56 | 0.58  | NO                 |
|            | W11         | Existing 16.51 | 0.31  | NO                 |

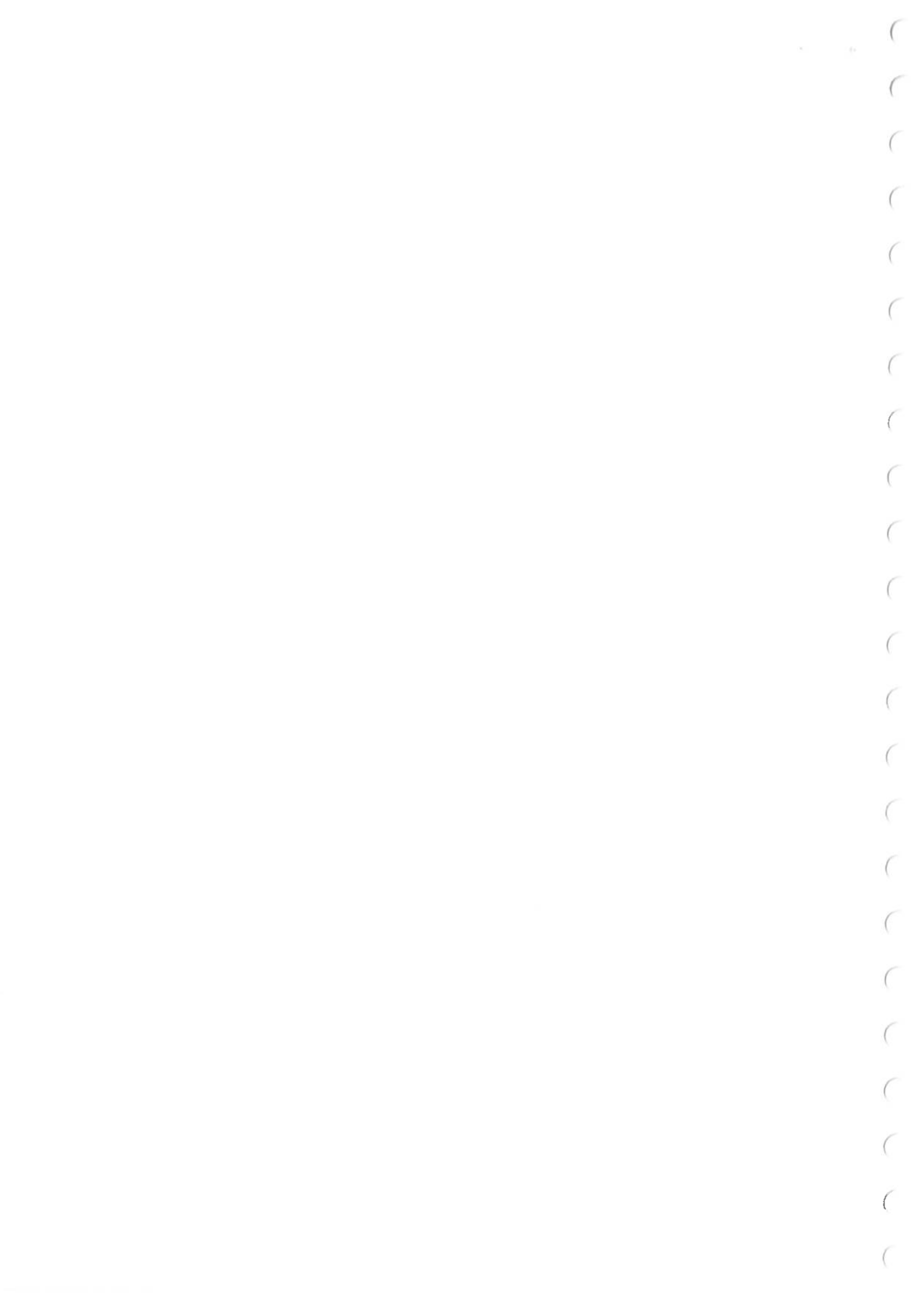


Table 35: VSC Results...

| Floor Ref. | Window Ref. | VSC            | Pr/Ex | Meets BRE Criteria |
|------------|-------------|----------------|-------|--------------------|
| BLOCK 12   |             |                |       |                    |
| Third      | W12         | Existing 11.67 | 0.92  | YES                |
|            | W13         | Proposed 10.75 | 0.92  | YES                |
|            | W14         | Existing 29.31 | 0.92  | YES                |
|            | W15         | Proposed 27.05 | 0.95  | YES                |
|            | W16         | Existing 5.30  | 0.96  | YES                |
|            | W17         | Proposed 5.06  | 0.96  | YES                |
|            | W18         | Existing 5.38  | 0.97  | YES                |
|            | W19         | Proposed 5.15  | 0.97  | YES                |
|            | W20         | Existing 5.35  | 0.99  | YES                |
|            | W21         | Proposed 5.17  | 0.99  | YES                |
|            | W22         | Existing 10.22 | 0.90  | YES                |
|            |             | Proposed 10.14 | 0.98  | YES                |
| Fourth     | W1          | Existing 6.40  | 0.84  | YES                |
|            | W2          | Proposed 5.39  | 0.94  | YES                |
|            | W3          | Existing 0.33  | 0.87  | YES                |
|            | W4          | Proposed 0.31  | 0.81  | YES                |
|            | W5          | Existing 0.23  | 0.69  | NO                 |
|            | W6          | Proposed 0.20  | 0.62  | NO                 |
|            | W7          | Existing 6.56  | 0.76  | YES*               |
|            | W8          | Proposed 5.01  | 0.35  | NO                 |
|            | W9          | Existing 0.46  | 0.28  | NO                 |
|            | W10         | Proposed 0.16  | 0.83  | YES                |
|            | W11         | Existing 30.19 | 0.82  | YES                |
|            | W12         | Proposed 25.16 | 0.71  | NO                 |

Table 36: VSC Results...

| Floor Ref. | Window Ref. | VSC            | Pr/Ex | Meets BRE Criteria |
|------------|-------------|----------------|-------|--------------------|
| BLOCK 12   |             |                |       |                    |
| Fourth     | W1          | Existing 6.40  | 0.84  | YES                |
|            | W2          | Proposed 5.39  | 0.94  | YES                |
|            | W3          | Existing 0.33  | 0.87  | YES                |
|            | W4          | Proposed 0.31  | 0.81  | YES                |
|            | W5          | Existing 0.23  | 0.69  | NO                 |
|            | W6          | Proposed 0.20  | 0.62  | NO                 |
|            | W7          | Existing 6.56  | 0.76  | YES*               |
|            | W8          | Proposed 5.01  | 0.35  | NO                 |
|            | W9          | Existing 0.46  | 0.28  | NO                 |
|            | W10         | Proposed 0.16  | 0.83  | YES                |
|            | W11         | Existing 30.19 | 0.82  | YES                |
|            | W12         | Proposed 25.16 | 0.71  | NO                 |

Table 37: VSC Results...

| Floor Ref.      | Window Ref. | VSC            | Pr/Ex | Meets BRE Criteria |
|-----------------|-------------|----------------|-------|--------------------|
| <b>BLOCK 12</b> |             |                |       |                    |
| Fourth          | W13         | Existing 1.42  | 0.85  | YES                |
|                 | W14         | Proposed 1.20  | 0.87  | YES                |
|                 | W15         | Existing 1.45  | 0.75  | YES*               |
|                 | W16         | Proposed 1.26  | 0.95  | YES                |
|                 | W17         | Existing 6.92  | 0.97  | YES                |
|                 | W18         | Proposed 5.16  | 0.66  | NO                 |
|                 | W19         | Existing 1.53  | 0.81  | YES                |
|                 | W20         | Proposed 1.46  | 0.74  | YES*               |
|                 | W21         | Existing 1.32  | 0.61  | NO                 |
|                 | W22         | Proposed 1.07  | 0.58  | NO                 |
|                 | W23         | Existing 1.25  | 0.30  | NO                 |
|                 | W24         | Proposed 26.84 | 0.90  | YES                |
|                 |             | Existing 16.41 |       |                    |
|                 |             | Proposed 26.02 |       |                    |
|                 |             | Existing 15.06 |       |                    |
|                 |             | Proposed 21.43 |       |                    |
|                 |             | Existing 6.52  |       |                    |
|                 |             | Proposed 13.08 |       |                    |
|                 |             | Existing 11.80 |       |                    |

Table 38: VSC Results...

| Floor Ref.      | Window Ref. | VSC            | Pr/Ex | Meets BRE Criteria |
|-----------------|-------------|----------------|-------|--------------------|
| <b>BLOCK 12</b> |             |                |       |                    |
| Fourth          | W25         | Existing 31.48 | 0.92  | YES                |
|                 | W26         | Proposed 29.00 | 0.97  | YES                |
|                 | W27         | Existing 13.65 | 0.97  | YES                |
|                 | W28         | Proposed 13.23 | 0.98  | YES                |
|                 | W29         | Existing 13.96 | 0.99  | YES                |
|                 | W30         | Proposed 13.54 | 0.90  | YES                |
|                 | W31         | Existing 13.99 | 0.98  | YES                |
|                 | W32         | Proposed 13.65 | 1.00  | YES                |
|                 | W33         | Existing 11.79 | 0.99  | YES                |
|                 | W34         | Proposed 11.62 | 0.99  | YES                |



Table 39: VSC Results...

| Floor Ref. | Window Ref. | VSC            | Pr/Ex | Meets BRE Criteria |
|------------|-------------|----------------|-------|--------------------|
| BLOCK 12   |             |                |       |                    |
| Fifth      | W1          | Existing 4.96  | 0.84  | YES                |
|            | W2          | Proposed 4.09  | 0.80  | YES                |
|            | W3          | Existing 4.45  | 0.80  | YES                |
|            | W3          | Proposed 3.57  | 0.74  | YES*               |
|            | W4          | Existing 4.50  | 0.83  | YES                |
|            | W4          | Proposed 3.32  | 0.83  | YES                |
|            | W5          | Existing 33.28 | 0.82  | YES                |
|            | W5          | Proposed 27.78 | 0.82  | YES                |
|            | W6          | Existing 33.23 | 0.76  | YES*               |
|            | W6          | Proposed 27.31 | 0.76  | YES*               |
| Fifth      | W7          | Existing 4.01  | 0.82  | YES                |
|            | W7          | Proposed 3.03  | 0.82  | YES                |
|            | W8          | Existing 4.12  | 0.75  | YES*               |
|            | W8          | Proposed 3.37  | 0.75  | YES*               |
|            | W9          | Existing 3.57  | 0.62  | YES*               |
|            | W9          | Proposed 2.68  | 0.62  | YES*               |
|            | W10         | Existing 30.26 | 0.59  | YES*               |
|            | W10         | Proposed 18.82 | 0.59  | YES*               |
|            | W10         | Existing 29.58 | 0.59  | YES*               |
|            | W10         | Proposed 17.41 | 0.59  | YES*               |

Table 40: VSC Results...

| Floor Ref. | Window Ref. | VSC            | Pr/Ex | Meets BRE Criteria |
|------------|-------------|----------------|-------|--------------------|
| BLOCK 12   |             |                |       |                    |
| Fifth      | W11         | Existing 25.71 | 0.30  | NO                 |
|            | W12         | Proposed 7.75  | 0.91  | YES                |
|            | W13         | Existing 33.56 | 0.95  | YES                |
|            | W13         | Proposed 30.51 | 0.95  | YES                |
|            | W14         | Existing 34.42 | 0.96  | YES                |
|            | W14         | Proposed 32.68 | 0.96  | YES                |
|            | W15         | Existing 34.65 | 0.97  | YES                |
|            | W15         | Proposed 33.39 | 0.97  | YES                |
|            | W16         | Existing 34.69 | 0.98  | YES                |
|            | W16         | Proposed 33.74 | 0.98  | YES                |
| Fifth      | W17         | Existing 34.55 | 0.99  | YES                |
|            | W17         | Proposed 33.87 | 0.99  | YES                |
|            | W18         | Existing 33.96 | 0.99  | YES                |
|            | W18         | Proposed 33.52 | 0.99  | YES                |
|            | W19         | Existing 33.18 | 0.99  | YES                |
|            | W19         | Proposed 32.82 | 0.99  | YES                |
|            | W19         | Existing 31.69 | 0.99  | YES                |
|            | W19         | Proposed 31.39 | 0.99  | YES                |

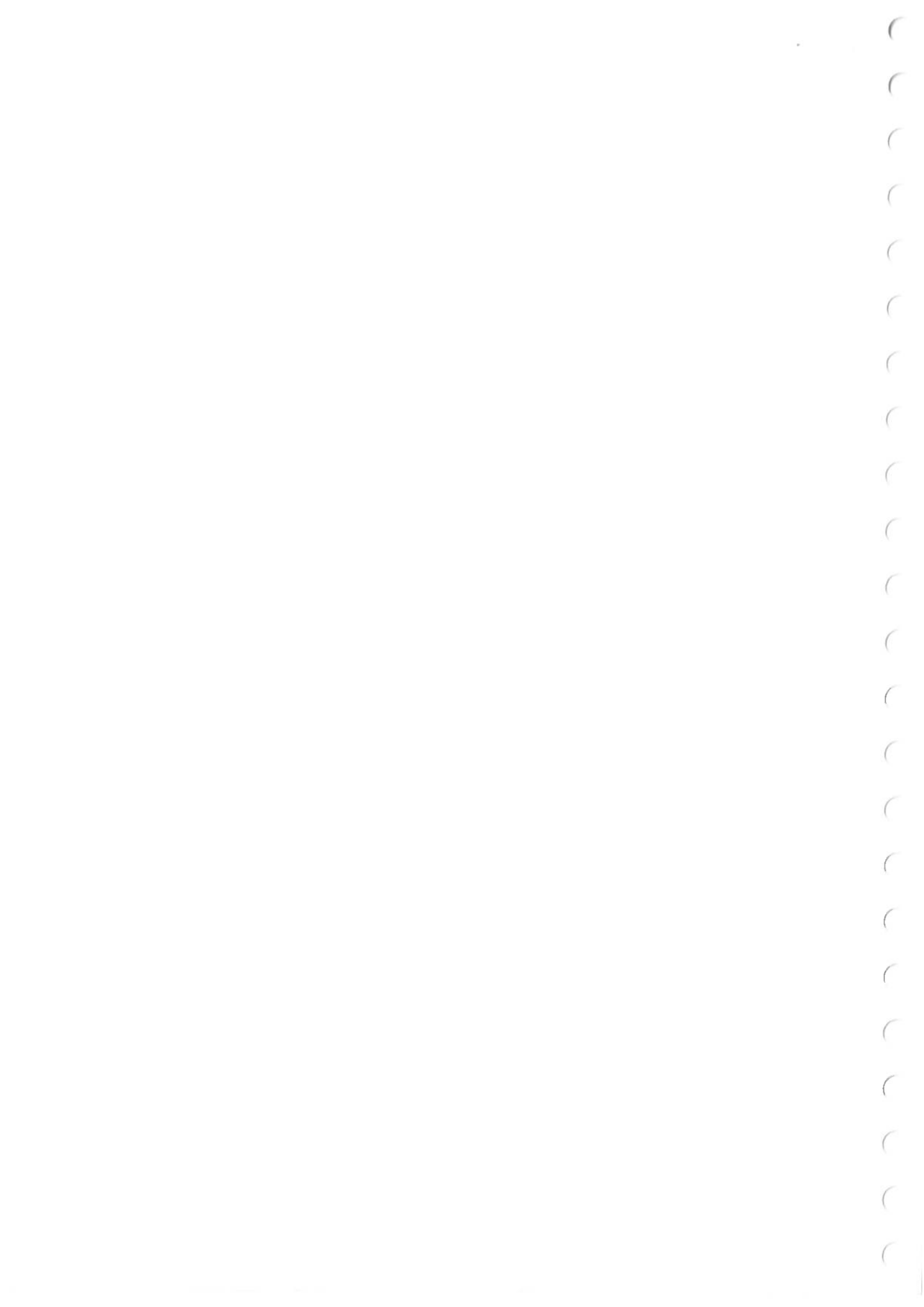


Table 41: VSC Results...

| Floor Ref. | Window Ref. | VSC                              | Pr/Ex | Meets BRE Criteria |
|------------|-------------|----------------------------------|-------|--------------------|
| BLOCK 12   |             |                                  |       |                    |
| Sixth      | W1          | Existing 36.68<br>Proposed 33.20 | 0.91  | YES                |
|            | W2          | Existing 36.54<br>Proposed 32.51 | 0.89  | YES                |
|            | W3          | Existing 36.37<br>Proposed 31.72 | 0.87  | YES                |
|            | W4          | Existing 36.21<br>Proposed 30.25 | 0.84  | YES                |
|            | W5          | Existing 36.09<br>Proposed 29.63 | 0.82  | YES                |
|            | W6          | Existing 36.01<br>Proposed 29.01 | 0.81  | YES                |
|            | W7          | Existing 35.67<br>Proposed 27.78 | 0.78  | YES                |
|            | W8          | Existing 35.07<br>Proposed 25.56 | 0.73  | YES*               |

Table 42: VSC Results...

| Floor Ref. | Window Ref. | VSC                              | Pr/Ex | Meets BRE Criteria |
|------------|-------------|----------------------------------|-------|--------------------|
| BLOCK 12   |             |                                  |       |                    |
| Sixth      | W9          | Existing 36.55<br>Proposed 34.80 | 0.95  | YES                |
|            | W10         | Existing 36.70<br>Proposed 35.45 | 0.97  | YES                |
|            | W11         | Existing 36.73<br>Proposed 35.80 | 0.97  | YES                |
|            | W12         | Existing 36.66<br>Proposed 36.02 | 0.98  | YES                |
|            | W13         | Existing 36.37<br>Proposed 35.94 | 0.99  | YES                |
|            | W14         | Existing 35.96<br>Proposed 35.62 | 0.99  | YES                |
|            | W15         | Existing 35.08<br>Proposed 34.80 | 0.99  | YES                |



### 5.2.2 APSH Analysis

The following table summarises the annual probable sunlight hours to the existing neighbouring dwellings. The analysis shows that 96% of the existing neighbouring dwellings windows achieve the BRE's recommendation for APSH on annual basis and on a winter basis.

Overall, the development we believe this confirms the proposed building has been designed with due consideration for sunlight and meets many of the recommendations as set out in the BRE Guide – BR 209 "Site Layout Planning for Daylight and Sunlight; A guide to good practice (2022)."

Table 43: APSH Summary Result

| Property | Number of Windows Tested | Annual                         |      | Winter                         |      |
|----------|--------------------------|--------------------------------|------|--------------------------------|------|
|          |                          | Rooms that meet BRE Guidelines |      | Rooms that meet BRE Guidelines |      |
|          |                          | No.                            | %    | No.                            | %    |
| BLOCK 1  | 28                       | 28                             | 100% | 28                             | 100% |
| BLOCK 2  | 21                       | 21                             | 100% | 21                             | 100% |
| BLOCK 3  | 21                       | 21                             | 100% | 21                             | 100% |
| BLOCK 8  | 145                      | 141                            | 97%  | 141                            | 97%  |
| BLOCK 12 | 166                      | 156                            | 94%  | 153                            | 92%  |
| Total    | 381                      | 367                            | 96%  | 364                            | 96%  |







Table 44: APSH Results...

| Floor Ref. |    | Room Ref. | Window Ref. | VSC                  | Pr/Ex | Window Orientation | Annual         | Pr/Ex  | Meets BRE Criteria | Winter       | Pr/Ex  | Meets BRE Criteria |
|------------|----|-----------|-------------|----------------------|-------|--------------------|----------------|--------|--------------------|--------------|--------|--------------------|
| BLOCK 1    |    |           |             |                      |       |                    |                |        |                    |              |        |                    |
| First      | R1 | W1        | 275°N       | Existing<br>Proposed | 1.00  | 275°N              |                | *North | *North             | *North       | *North | *North             |
|            |    |           |             | N/R                  |       |                    |                |        |                    |              |        |                    |
|            |    |           |             | N/R                  |       |                    |                |        |                    |              |        |                    |
|            |    |           |             | N/R                  |       |                    |                |        |                    |              |        |                    |
|            | R2 | W2        | 275°N       | Existing<br>Proposed | 1.00  | 275°N              |                | *North | *North             | *North       | *North | *North             |
|            |    |           |             | N/R                  |       |                    |                |        |                    |              |        |                    |
|            |    |           |             | N/R                  |       |                    |                |        |                    |              |        |                    |
|            |    |           |             | N/R                  |       |                    |                |        |                    |              |        |                    |
|            | R3 | W3        | 275°N       | Existing<br>Proposed | 1.00  | 275°N              | 33.02<br>33.02 | *North | *North             | *North       | *North | *North             |
|            |    |           |             | N/R                  |       |                    |                |        |                    |              |        |                    |
|            |    |           |             | N/R                  |       |                    |                |        |                    |              |        |                    |
|            |    |           |             | N/R                  |       |                    |                |        |                    |              |        |                    |
|            | R4 | W4        | 185°        | Existing<br>Proposed | 1.00  | 185°               | 19.74<br>19.74 | 1.00   | YES                | 8.00<br>8.00 | 1.00   | YES                |
|            |    |           |             | N/R                  |       |                    |                |        |                    |              |        |                    |
|            |    |           |             | N/R                  |       |                    |                |        |                    |              |        |                    |
|            |    |           |             | N/R                  |       |                    |                |        |                    |              |        |                    |
| Second     | R1 | W1        | 275°N       | Existing<br>Proposed | 1.00  | 275°N              |                | *North | *North             | *North       | *North | *North             |
|            |    |           |             | N/R                  |       |                    |                |        |                    |              |        |                    |
|            |    |           |             | N/R                  |       |                    |                |        |                    |              |        |                    |
|            |    |           |             | N/R                  |       |                    |                |        |                    |              |        |                    |
|            | R2 | W2        | 275°N       | Existing<br>Proposed | 1.00  | 275°N              |                | *North | *North             | *North       | *North | *North             |
|            |    |           |             | N/R                  |       |                    |                |        |                    |              |        |                    |
|            |    |           |             | N/R                  |       |                    |                |        |                    |              |        |                    |
|            |    |           |             | N/R                  |       |                    |                |        |                    |              |        |                    |
|            | R3 | W3        | 275°N       | Existing<br>Proposed | 1.00  | 275°N              | 33.02<br>33.02 | *North | *North             | *North       | *North | *North             |
|            |    |           |             | N/R                  |       |                    |                |        |                    |              |        |                    |
|            |    |           |             | N/R                  |       |                    |                |        |                    |              |        |                    |
|            |    |           |             | N/R                  |       |                    |                |        |                    |              |        |                    |
|            | R4 | W4        | 185°        | Existing<br>Proposed | 1.00  | 185°               | 32.01<br>32.01 | 1.00   | YES                | 8.00<br>8.00 | 1.00   | YES                |
|            |    |           |             | N/R                  |       |                    |                |        |                    |              |        |                    |
|            |    |           |             | N/R                  |       |                    |                |        |                    |              |        |                    |
|            |    |           |             | N/R                  |       |                    |                |        |                    |              |        |                    |



Table 45: APSH Results...

| Floor Ref. | Room Ref. | Window Ref. | VSC                  | Pr/Ex      | Window Orientation | Annual | Pr/Ex                            | Meets BRE Criteria | Winter                         | Pr/Ex  | Meets BRE Criteria |
|------------|-----------|-------------|----------------------|------------|--------------------|--------|----------------------------------|--------------------|--------------------------------|--------|--------------------|
| BLOCK 1    |           |             |                      |            |                    |        |                                  |                    |                                |        |                    |
| Third      | R1        | W1          | Existing<br>Proposed | N/R<br>N/R | 1.00               | 275°N  |                                  | *North             | *North                         | *North | *North             |
|            | R2        | W2          | Existing<br>Proposed | N/R<br>N/R | 1.00               | 275°N  |                                  | *North             | *North                         | *North | *North             |
|            | R3        | W3          | Existing<br>Proposed | N/R<br>N/R | 1.00               | 275°N  | 33.02<br>33.02<br>32.01<br>32.01 | *North             | *North                         | *North | *North             |
|            |           | W4          | Existing<br>Proposed | N/R<br>N/R | 1.00               | 185°   |                                  | 1.00               | 8.00<br>8.00<br>31.08<br>31.08 | 1.00   | YES                |
| Fourth     | R1        | W1          | Existing<br>Proposed | N/R<br>N/R | 1.00               | 275°N  |                                  | *North             | *North                         | *North | *North             |
|            | R2        | W2          | Existing<br>Proposed | N/R<br>N/R | 1.00               | 275°N  |                                  | *North             | *North                         | *North | *North             |
|            | R3        | W3          | Existing<br>Proposed | N/R<br>N/R | 1.00               | 275°N  | 35.35<br>33.02<br>32.01<br>32.01 | *North             | *North                         | *North | *North             |
|            |           | W4          | Existing<br>Proposed | N/R<br>N/R | 1.00               | 185°   |                                  | 1.00               | 8.00<br>8.00<br>31.08<br>31.08 | 1.00   | YES                |

Table 46: APSH Results...

| Floor Ref. | Room Ref. | Window Ref. | VSC                          | Pr/Ex | Window Orientation | Annual                           | Pr/Ex | Meets BRE Criteria | Winter                         | Pr/Ex  | Meets BRE Criteria |
|------------|-----------|-------------|------------------------------|-------|--------------------|----------------------------------|-------|--------------------|--------------------------------|--------|--------------------|
| BLOCK 1    |           |             |                              |       |                    |                                  |       |                    |                                |        |                    |
| Fifth      | R1        | W1          | Existing N/R<br>Proposed N/R | 1.00  | 275°N              |                                  |       | *North             |                                | *North | *North             |
|            | R2        | W2          | Existing N/R<br>Proposed N/R | 1.00  | 275°N              |                                  |       | *North             |                                | *North | *North             |
|            | R3        | W3          | Existing N/R<br>Proposed N/R | 1.00  | 275°N              | 38.85<br>35.43<br>32.01<br>32.01 |       | *North             | 8.00<br>8.00<br>31.08<br>31.08 | *North | *North             |
|            |           | W4          | Existing N/R<br>Proposed N/R | 1.00  | 185°               |                                  |       | 1.00               | 31.08<br>31.08                 | 1.00   | YES                |
| Sixth      | R1        | W1          | Existing N/R<br>Proposed N/R | 1.00  | 275°N              |                                  |       | *North             |                                | *North | *North             |
|            | R2        | W2          | Existing N/R<br>Proposed N/R | 1.00  | 275°N              |                                  |       | *North             |                                | *North | *North             |
|            | R3        | W3          | Existing N/R<br>Proposed N/R | 1.00  | 275°N              | 42.35<br>38.93<br>32.01<br>32.01 |       | *North             | 8.00<br>8.00<br>31.08<br>31.08 | *North | *North             |
|            |           | W4          | Existing N/R<br>Proposed N/R | 1.00  | 185°               |                                  |       | 1.00               | 31.08<br>31.08                 | 1.00   | YES                |

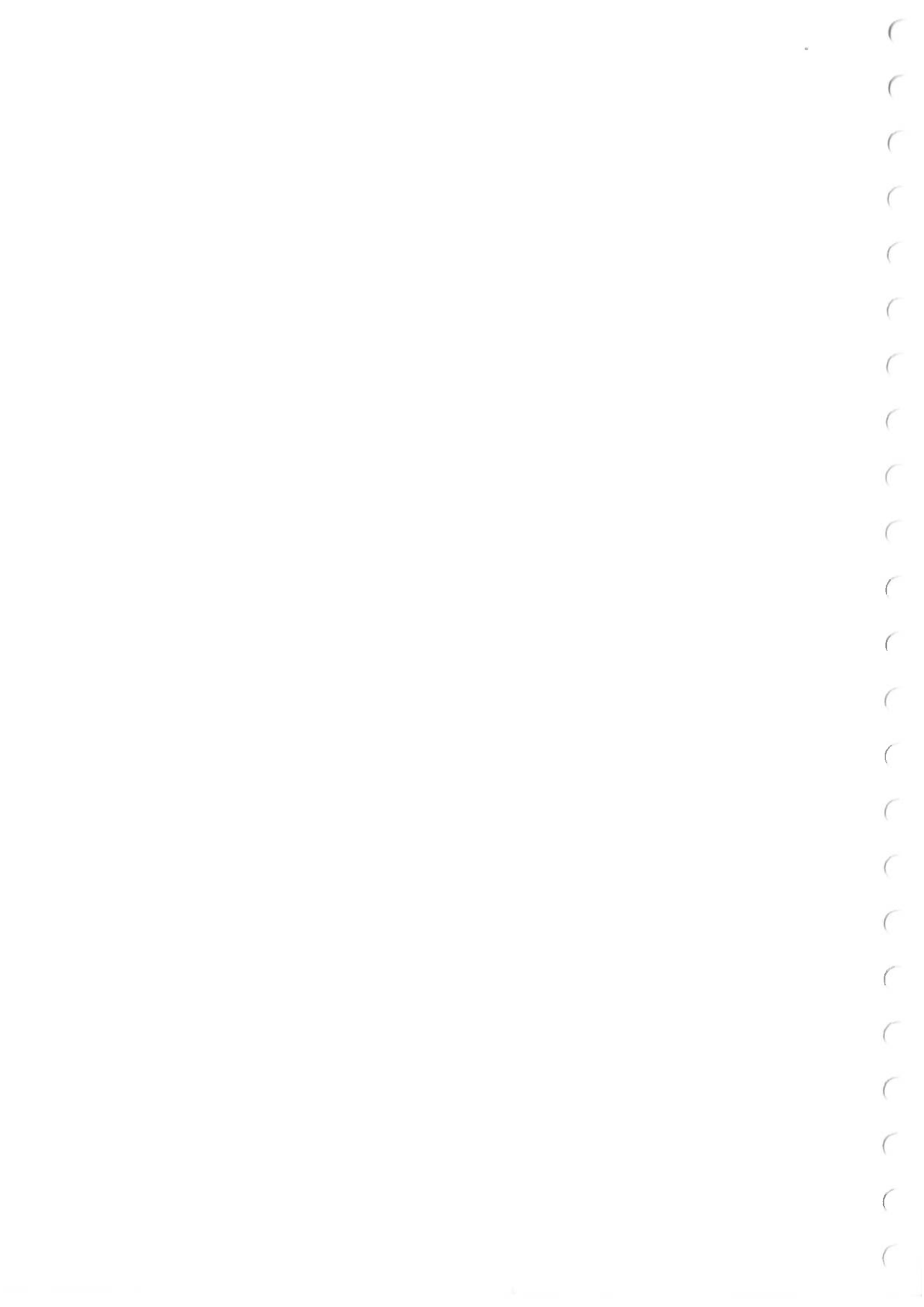


Table 47: APSH Results...

| Floor Ref. | Room Ref. | Window Ref. | VSC                  | Pr/Ex      | Window Orientation | Annual | Pr/Ex          | Meets BRE Criteria | Winter         | Pr/Ex  | Meets BRE Criteria |
|------------|-----------|-------------|----------------------|------------|--------------------|--------|----------------|--------------------|----------------|--------|--------------------|
| BLOCK 1    |           |             |                      |            |                    |        |                |                    |                |        |                    |
| Seventh    | R1        | W1          | Existing<br>Proposed | N/R<br>N/R | 1.00               | 275°N  |                | *North             | *North         | *North | *North             |
|            | R2        | W2          | Existing<br>Proposed | N/R<br>N/R | 1.00               | 275°N  |                | *North             | *North         | *North | *North             |
|            | R3        | W3          | Existing<br>Proposed | N/R<br>N/R | 1.00               | 275°N  | 47.24<br>44.13 | *North             | 12.90<br>12.90 | *North | *North             |
|            |           | W4          | Existing<br>Proposed | N/R<br>N/R | 1.00               | 185°   | 82.44<br>82.44 | 1.00               | 31.86<br>31.86 | 1.00   | YES                |



Table 48: APSH Results...

| Floor Ref. |    | Room Ref. | Window Ref. | Window Orientation | Annual | Pr/Ex  | Meets BRE Criteria | Winter | Pr/Ex  | Meets BRE Criteria |
|------------|----|-----------|-------------|--------------------|--------|--------|--------------------|--------|--------|--------------------|
| BLOCK 2    |    |           |             |                    |        |        |                    |        |        |                    |
| First      | R1 | W1        | Existing    | 275°N              | *North | *North | *North             | *North | *North | *North             |
|            |    |           | Proposed    |                    |        |        |                    |        |        |                    |
|            |    |           |             |                    |        |        |                    |        |        |                    |
|            | R2 | W2        | Existing    | 275°N              | 25.95  | *North | *North             | 10.02  | *North | *North             |
| Second     | R1 | W1        | Existing    | 275°N              | *North | *North | *North             | *North | *North | *North             |
|            |    |           | Proposed    |                    |        |        |                    |        |        |                    |
|            |    |           |             |                    |        |        |                    |        |        |                    |
|            | R2 | W2        | Existing    | 275°N              | 21.76  | *North | *North             | 4.20   | *North | *North             |
|            | R1 | W1        | Existing    | 275°N              | *North | *North | *North             | *North | *North | *North             |
|            |    |           | Proposed    |                    |        |        |                    |        |        |                    |
|            |    |           |             |                    |        |        |                    |        |        |                    |
|            | R2 | W2        | Existing    | 275°N              | 13.99  | *North | *North             | 2.56   | *North | *North             |
|            | R1 | W1        | Existing    | 275°N              | *North | *North | *North             | *North | *North | *North             |
|            |    |           | Proposed    |                    |        |        |                    |        |        |                    |
|            |    |           |             |                    |        |        |                    |        |        |                    |
|            | R2 | W2        | Existing    | 275°N              | 13.29  | *North | *North             | 10.49  | *North | *North             |
|            | R1 | W1        | Existing    | 275°N              | *North | *North | *North             | *North | *North | *North             |
|            |    |           | Proposed    |                    |        |        |                    |        |        |                    |
|            |    |           |             |                    |        |        |                    |        |        |                    |
|            | R2 | W2        | Existing    | 275°N              | 12.98  | *North | *North             | 10.18  | *North | *North             |



Table 49: APSH Results...

| Floor Ref. | Room Ref. | Window Ref. | Window Orientation   | Annual         | Pr/Ex  | Meets BRE Criteria | Winter         | Pr/Ex  | Meets BRE Criteria |
|------------|-----------|-------------|----------------------|----------------|--------|--------------------|----------------|--------|--------------------|
| BLOCK 2    |           |             |                      |                |        |                    |                |        |                    |
| Third      | R1        | W1          | Existing<br>Proposed |                | *North | *North             |                | *North | *North             |
|            |           | W2          | Existing<br>Proposed | 26.11<br>14.61 | *North | *North             | 4.58<br>2.72   | *North | *North             |
|            | R2        | W3          | Existing<br>Proposed | 13.36<br>12.98 | 0.97   | YES                | 10.49<br>10.18 | 0.97   | YES                |
|            |           |             |                      |                |        |                    |                |        |                    |
| Fourth     | R1        | W1          | Existing<br>Proposed |                | *North | *North             |                | *North | *North             |
|            |           | W2          | Existing<br>Proposed | 29.14<br>16.39 | *North | *North             | 5.05<br>3.19   | *North | *North             |
|            | R2        | W3          | Existing<br>Proposed | 13.83<br>12.98 | 0.94   | YES                | 10.96<br>10.18 | 0.93   | YES                |
|            |           |             |                      |                |        |                    |                |        |                    |

Table 50: APSH Results...

| Floor Ref. | Room Ref. | Window Ref. | Window Orientation   | Annual         | Pr/Ex  | Meets BRE Criteria | Winter         | Pr/Ex  | Meets BRE Criteria |
|------------|-----------|-------------|----------------------|----------------|--------|--------------------|----------------|--------|--------------------|
| BLOCK 2    |           |             |                      |                |        |                    |                |        |                    |
| Fifth      | R1        | W1          | Existing<br>Proposed |                | *North | *North             |                | *North | *North             |
|            |           | W2          | Existing<br>Proposed | 32.01<br>18.80 | *North | *North             | 5.52<br>3.73   | *North | *North             |
|            | R2        | W3          | Existing<br>Proposed | 14.22<br>13.05 | 0.92   | YES                | 11.19<br>10.26 | 0.92   | YES                |
|            |           |             |                      |                |        |                    |                |        |                    |
| Sixth      | R1        | W1          | Existing<br>Proposed |                | *North | *North             |                | *North | *North             |
|            |           | W2          | Existing<br>Proposed | 36.44<br>24.40 | *North | *North             | 5.59<br>4.43   | *North | *North             |
|            | R2        | W3          | Existing<br>Proposed | 15.93<br>14.61 | 0.92   | YES                | 12.67<br>11.81 | 0.93   | YES                |
|            |           |             |                      |                |        |                    |                |        |                    |

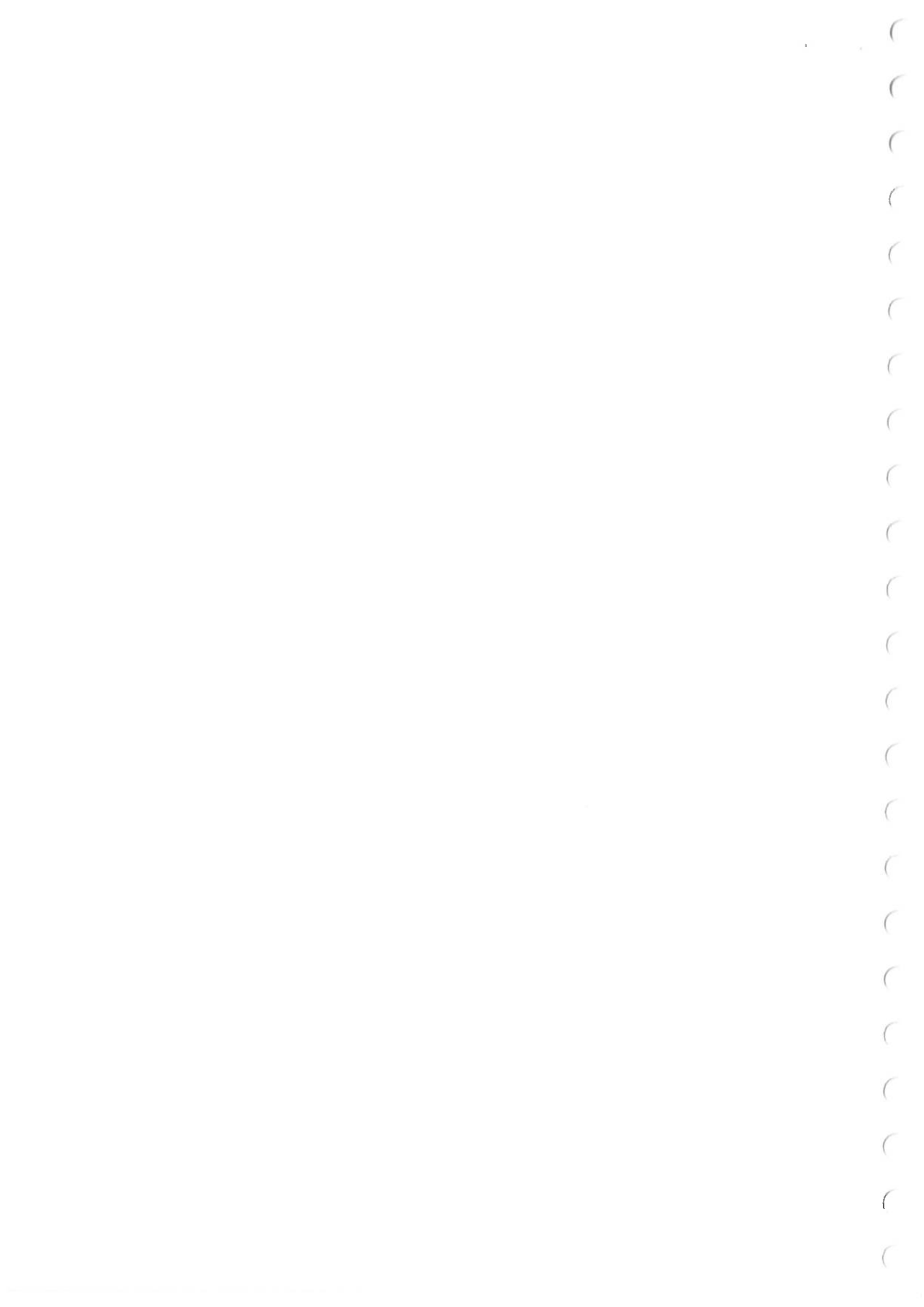


Table 51: APSH Results...

| Floor Ref. | Room Ref. | Window Ref. | Window Orientation | Annual | Pr/Ex  | Meets BRE Criteria | Winter | Pr/Ex  | Meets BRE Criteria |
|------------|-----------|-------------|--------------------|--------|--------|--------------------|--------|--------|--------------------|
| BLOCK 2    |           |             |                    |        |        |                    |        |        |                    |
| Seventh    | R1        | W1          | Existing           |        | *North | *North             |        | *North | *North             |
|            |           |             | Proposed           |        |        |                    |        |        |                    |
|            | R2        | W2          | Existing           | 41.80  | *North | *North             | 10.96  | *North | *North             |
|            |           | W3          | Proposed           | 31.47  |        |                    | 10.26  |        |                    |
|            |           |             | Existing           | 79.95  | 0.93   | YES                | 23.93  | 0.97   | YES                |
|            |           |             | Proposed           | 74.28  |        |                    | 23.31  |        |                    |



Table 52: APSH Results...

| Floor Ref.     | Room Ref. | Window Ref. | Window Orientation   | Annual         | Pr/Ex  | Meets BRE Criteria | Winter       | Pr/Ex  | Meets BRE Criteria |
|----------------|-----------|-------------|----------------------|----------------|--------|--------------------|--------------|--------|--------------------|
| <b>BLOCK 3</b> |           |             |                      |                |        |                    |              |        |                    |
| First          | R1        | W1          | Existing<br>Proposed |                | *North | *North             |              | *North | *North             |
|                |           | W2          | Existing<br>Proposed | 24.09<br>15.54 | *North | *North             | 7.77<br>6.37 | *North | *North             |
|                |           | W3          | Existing<br>Proposed | 36.05<br>29.68 | 0.82   | YES                | 7.77<br>7.07 | 0.91   | YES                |
|                | R2        |             |                      |                |        |                    |              |        |                    |
| Second         | R1        | W1          | Existing<br>Proposed |                | *North | *North             |              | *North | *North             |
|                |           | W2          | Existing<br>Proposed | 21.52<br>12.28 | *North | *North             | 2.72<br>2.02 | *North | *North             |
|                |           | W3          | Existing<br>Proposed | 11.19<br>9.79  | 0.88   | YES                | 8.39<br>6.99 | 0.83   | YES                |
|                | R2        |             |                      |                |        |                    |              |        |                    |



Table 53: APSH Results...

| Floor Ref.     | Room Ref. | Window Ref. | Window Orientation   | Annual         | Pr/Ex          | Meets BRE Criteria | Winter        | Pr/Ex          | Meets BRE Criteria |
|----------------|-----------|-------------|----------------------|----------------|----------------|--------------------|---------------|----------------|--------------------|
| <b>BLOCK 3</b> |           |             |                      |                |                |                    |               |                |                    |
| Third          | R1        | W1          | Existing<br>Proposed | 26.03<br>13.83 | *North<br>0.83 | *North<br>YES      | 3.50<br>2.25  | *North<br>0.79 | *North<br>YES      |
|                |           | W2          | Existing<br>Proposed |                |                |                    |               |                |                    |
|                | R2        | W3          | Existing<br>Proposed | 11.97<br>9.95  | *North<br>0.83 | *North<br>YES      | 9.09<br>7.15  | *North<br>0.79 | *North<br>YES      |
|                |           | W2          | Existing<br>Proposed |                |                |                    |               |                |                    |
| Fourth         | R1        | W1          | Existing<br>Proposed | 29.37<br>16.01 | *North<br>0.81 | *North<br>YES      | 4.35<br>2.25  | *North<br>0.76 | *North<br>YES      |
|                |           | W2          | Existing<br>Proposed |                |                |                    |               |                |                    |
|                | R2        | W3          | Existing<br>Proposed | 12.90<br>10.41 | *North<br>0.81 | *North<br>YES      | 10.02<br>7.61 | *North<br>0.76 | *North<br>YES      |
|                |           | W2          | Existing<br>Proposed |                |                |                    |               |                |                    |



Table 54: APSH Results...

| Floor Ref. | Room Ref. | Window Ref. | Window Orientation   | Annual         | Pr/Ex          | Meets BRE Criteria | Winter         | Pr/Ex          | Meets BRE Criteria |
|------------|-----------|-------------|----------------------|----------------|----------------|--------------------|----------------|----------------|--------------------|
| BLOCK 3    |           |             |                      |                |                |                    |                |                |                    |
| Fifth      | R1        | W1          | Existing<br>Proposed | 32.79<br>18.41 | *North<br>0.76 | *North<br>YES      | 5.59<br>2.41   | *North<br>0.70 | *North<br>YES      |
|            |           | W2          | Existing<br>Proposed |                |                |                    |                |                |                    |
|            | R2        | W3          | Existing<br>Proposed | 13.99<br>10.57 | *North<br>0.76 | *North<br>YES      | 11.03<br>7.77  | *North<br>0.70 | *North<br>YES      |
|            |           | W2          | Existing<br>Proposed |                |                |                    |                |                |                    |
| Sixth      | R1        | W1          | Existing<br>Proposed | 40.33<br>26.88 | *North<br>0.80 | *North<br>YES      | 5.98<br>3.11   | *North<br>0.79 | *North<br>YES      |
|            |           | W2          | Existing<br>Proposed |                |                |                    |                |                |                    |
|            | R2        | W3          | Existing<br>Proposed | 15.93<br>12.82 | *North<br>0.80 | *North<br>YES      | 12.67<br>10.02 | *North<br>0.79 | *North<br>YES      |
|            |           | W2          | Existing<br>Proposed |                |                |                    |                |                |                    |

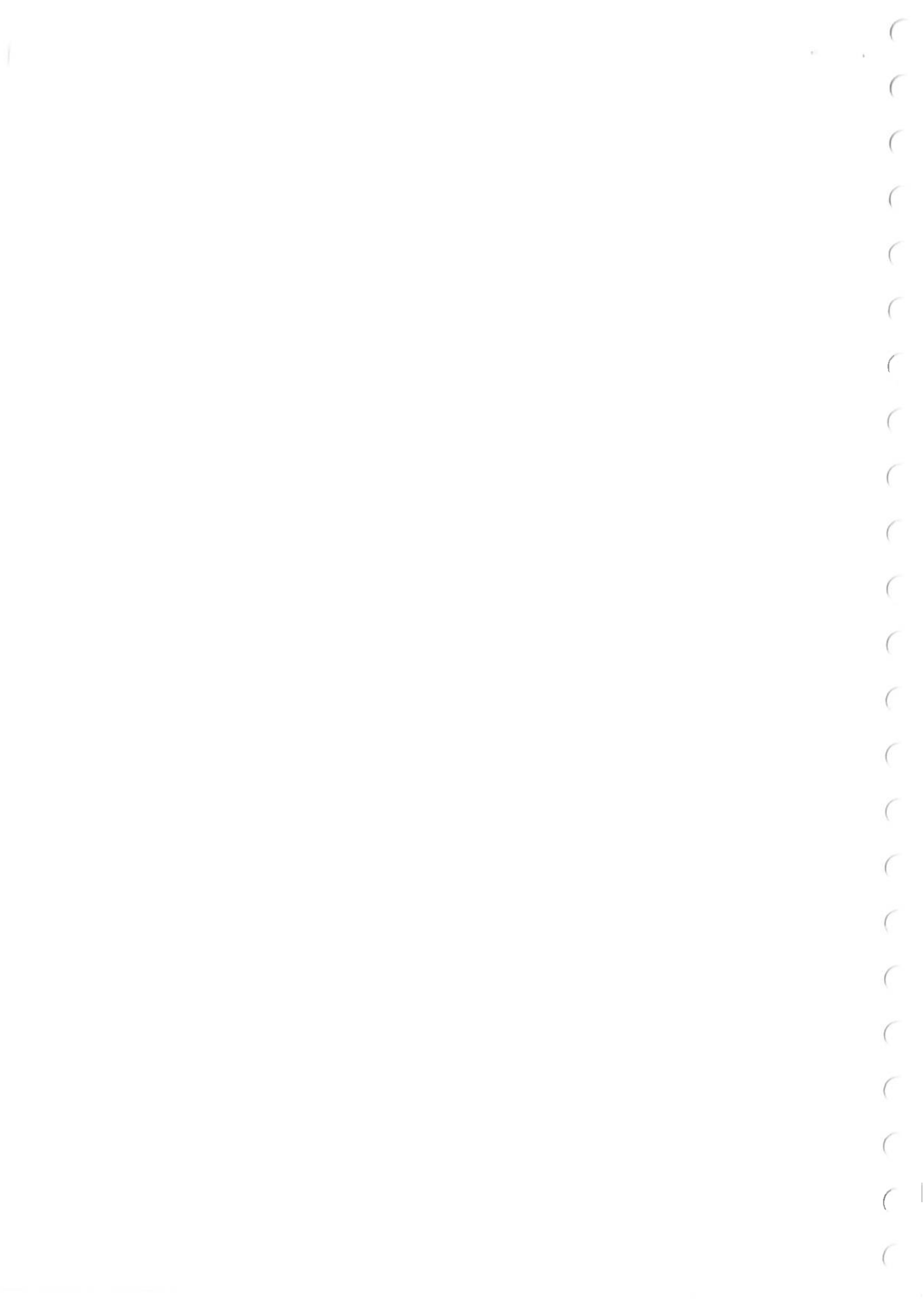


Table 55: APSH Results...

| Floor Ref. | Room Ref. | Window Ref. | Window Orientation   | Annual | Pr/Ex  | Meets BRE Criteria | Winter         | Pr/Ex  | Meets BRE Criteria |
|------------|-----------|-------------|----------------------|--------|--------|--------------------|----------------|--------|--------------------|
| BLOCK 3    |           |             |                      |        |        |                    |                |        |                    |
| Seventh    | R1        | W1          | Existing<br>Proposed | 275°N  | *North | *North             | *North         | *North | *North             |
|            |           |             |                      |        |        |                    |                |        |                    |
|            | R2        | W2          | Existing<br>Proposed | 275°N  | *North | *North             | 12.90<br>10.49 | *North | *North             |
|            |           | W3          | Existing<br>Proposed |        | 185°   | YES                | 23.00<br>20.82 | 0.91   | YES                |



Table 56: APSH Results...

| Floor Ref. | Room Ref. | Window Ref. | Pr/Ex                | Window Orientation | Annual | Pr/Ex  | Meets BRE Criteria | Winter | Pr/Ex  | Meets BRE Criteria |
|------------|-----------|-------------|----------------------|--------------------|--------|--------|--------------------|--------|--------|--------------------|
| BLOCK 8    |           |             |                      |                    |        |        |                    |        |        |                    |
| Ground     | R1        | W1          | Existing<br>Proposed | 1.00               | 275°N  | *North | *North             | *North | *North | *North             |
|            | R2        | W2          | Existing<br>Proposed | 1.00               | 275°N  | *North | *North             | *North | *North | *North             |
|            | R3        | W3          | Existing<br>Proposed | 1.00               | 275°N  | *North | *North             | *North | *North | *North             |
|            | R4        | W4          | Existing<br>Proposed | 1.00               | 275°N  | *North | *North             | *North | *North | *North             |
|            | R5        | W5          | Existing<br>Proposed | 1.00               | 275°N  | *North | *North             | *North | *North | *North             |
|            | R6        | W6          | Existing<br>Proposed | 1.00               | 275°N  | *North | *North             | *North | *North | *North             |
|            | R7        | W7          | Existing<br>Proposed | 1.00               | 275°N  | *North | *North             | *North | *North | *North             |

Table 57: APSH Results...

| BLOCK 8    |           |             |                      |                    |                |        |                    |
|------------|-----------|-------------|----------------------|--------------------|----------------|--------|--------------------|
| Floor Ref. | Room Ref. | Window Ref. | Pr/Ex                | Window Orientation | Annual         | Pr/Ex  | Meets BRE Criteria |
| Ground     | R8        | W8          | Existing<br>Proposed | 275°N              |                | *North | *North             |
|            |           | W9          | Existing<br>Proposed | 275°N              |                | *North | *North             |
|            | R9        | W10         | Existing<br>Proposed | 185°               | 46.15<br>30.61 | 0.66   | YES                |
|            |           | W11         | Existing<br>Proposed | 95°                | 22.77<br>22.77 | 1.00   | YES                |
|            | R10       | W12         | Existing<br>Proposed | 95°                | 25.25<br>25.25 | 1.00   | YES                |
|            | R11       | W13         | Existing<br>Proposed | 95°                | 1.71<br>1.71   | 1.00   | YES                |
|            | R12       | W14         | Existing<br>Proposed | 95°                | 2.02<br>2.02   | 1.00   | YES                |
|            | R13       | W15         | Existing<br>Proposed | 95°                | 0.78<br>0.78   | 1.00   | YES                |
|            |           |             |                      |                    | 7.61<br>6.06   | 0.80   | YES                |
|            |           |             |                      |                    | 3.34<br>3.34   | 1.00   | YES                |
|            |           |             |                      |                    | 4.04<br>4.04   | 1.00   | YES                |
|            |           |             |                      |                    | 1.71<br>1.71   | 1.00   | YES                |
|            |           |             |                      |                    | 0.00<br>0.00   | 1.00   | YES                |
|            |           |             |                      |                    | 0.00<br>0.00   | 1.00   | YES                |
|            |           |             |                      |                    | 0.00<br>0.00   | 1.00   | YES                |



Table 58: APSH Results...

| Floor Ref. | Room Ref. | Window Ref. | Pr/Ex                | Window Orientation | Annual | Pr/Ex          | Meets BRE Criteria | Winter | Pr/Ex        | Meets BRE Criteria |     |
|------------|-----------|-------------|----------------------|--------------------|--------|----------------|--------------------|--------|--------------|--------------------|-----|
| BLOCK 8    |           |             |                      |                    |        |                |                    |        |              |                    |     |
| Ground     | R14       | W16         | Existing<br>Proposed | 1.00               | 95°    | 11.58<br>11.58 | 1.00               | YES    | 1.94<br>1.94 | 1.00               | YES |
|            | R15       | W17         | Existing<br>Proposed | 1.00               | 95°    | 9.09<br>9.09   | 1.00               | YES    | 1.79<br>1.79 | 1.00               | YES |
|            | R16       | W18         | Existing<br>Proposed | 1.00               | 95°    | 2.10<br>2.10   | 1.00               | YES    | 0.00<br>0.00 | 1.00               | YES |
|            | R17       | W19         | Existing<br>Proposed | 1.00               | 95°    | 1.09<br>1.09   | 1.00               | YES    | 0.08<br>0.08 | 1.00               | YES |
|            | R18       | W20         | Existing<br>Proposed | 1.00               | 95°    | 0.00<br>0.00   | 1.00               | YES    | 0.00<br>0.00 | 1.00               | YES |

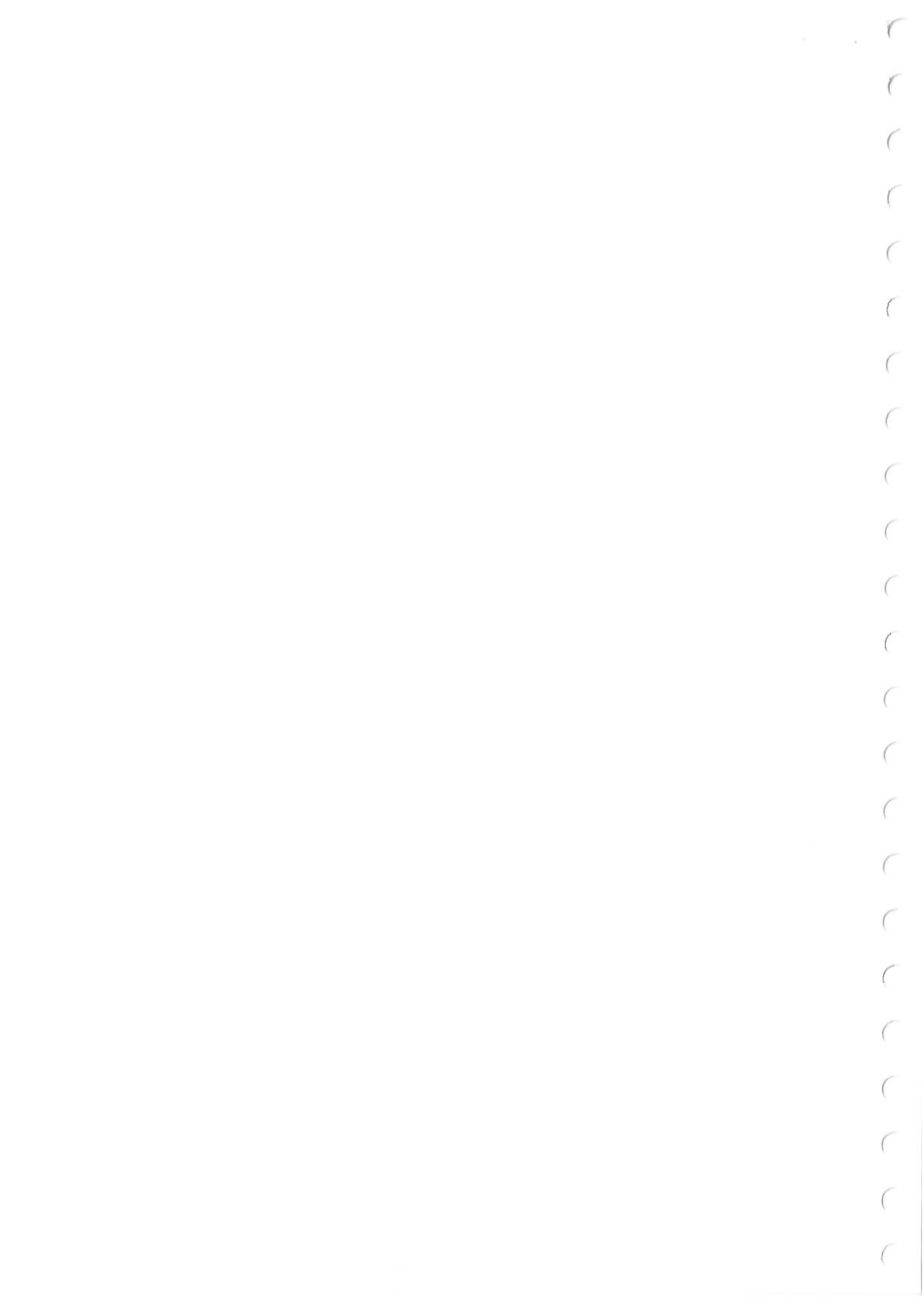


Table 59: APSH Results...

| Floor Ref. | Room Ref. | Window Ref. | Pr/Ex                | Window Orientation | Annual         | Pr/Ex  | Meets BRE Criteria | Winter       | Pr/Ex  | Meets BRE Criteria |
|------------|-----------|-------------|----------------------|--------------------|----------------|--------|--------------------|--------------|--------|--------------------|
| BLOCK 8    |           |             |                      |                    |                |        |                    |              |        |                    |
| First      | R1        | W1          | Existing<br>Proposed | 275°N              |                | *North | *North             |              | *North | *North             |
|            | R2        | W2          | Existing<br>Proposed | 275°N              |                | *North | *North             |              | *North | *North             |
|            | R3        | W3          | Existing<br>Proposed | 275°N              |                | *North | *North             |              | *North | *North             |
|            | R4        | W4          | Existing<br>Proposed | 275°N              | 31.62<br>23.54 | *North | *North             | 4.43<br>0.62 | *North | *North             |
|            |           | W5          | Existing<br>Proposed | 185°               | 15.46<br>8.94  | 0.58   | NO                 | 1.86<br>0.00 | 0.00   | NO                 |
|            |           | W6          | Existing<br>Proposed | 275°N              | 6.37<br>3.96   | *North | *North             | 0.31<br>0.00 | *North | *North             |
|            | R5        | W7          | Existing<br>Proposed | 275°N              |                | *North | *North             |              | *North | *North             |
|            | R6        | W8          | Existing<br>Proposed | 275°N              |                | *North | *North             |              | *North | *North             |



Table 60: APSH Results...

| Floor Ref. |     | Room Ref. | Window Ref.          | Pr/Ex | Window Orientation | Annual                           | Pr/Ex  | Meets BRE Criteria | Winter                       | Pr/Ex  | Meets BRE Criteria |
|------------|-----|-----------|----------------------|-------|--------------------|----------------------------------|--------|--------------------|------------------------------|--------|--------------------|
| BLOCK 8    |     |           |                      |       |                    |                                  |        |                    |                              |        |                    |
| First      | R7  | W9        | Existing<br>Proposed | 1.00  | 275°N              |                                  | *North | *North             |                              | *North | *North             |
|            | R8  | W10       | Existing<br>Proposed | 1.00  | 275°N              |                                  | *North | *North             |                              | *North | *North             |
|            |     | W11       | Existing<br>Proposed | 1.00  | 275°N              |                                  | *North | *North             |                              | *North | *North             |
|            | R9  | W12       | Existing<br>Proposed | 1.00  | 185°               | 52.14<br>34.89<br>25.25<br>25.25 | 0.67   | YES                | 8.39<br>6.60<br>3.50<br>3.50 | 0.79   | YES                |
|            |     | W13       | Existing<br>Proposed | 1.00  | 95°                |                                  | 1.00   | YES                |                              | 1.00   | YES                |
|            | R10 | W14       | Existing<br>Proposed | 1.00  | 95°                | 26.57<br>26.57                   | 1.00   | YES                | 4.12<br>4.12                 | 1.00   | YES                |
|            | R11 | W15       | Existing<br>Proposed | 1.00  | 95°                | 4.58<br>4.58                     | 1.00   | YES                | 2.02<br>2.02                 | 1.00   | YES                |
|            | R12 | W16       | Existing<br>Proposed | 1.00  | 95°                | 7.61<br>7.61                     | 1.00   | YES                | 0.62<br>0.62                 | 1.00   | YES                |
|            |     |           |                      |       |                    |                                  |        |                    |                              |        |                    |
|            |     |           |                      |       |                    |                                  |        |                    |                              |        |                    |
|            |     |           |                      |       |                    |                                  |        |                    |                              |        |                    |

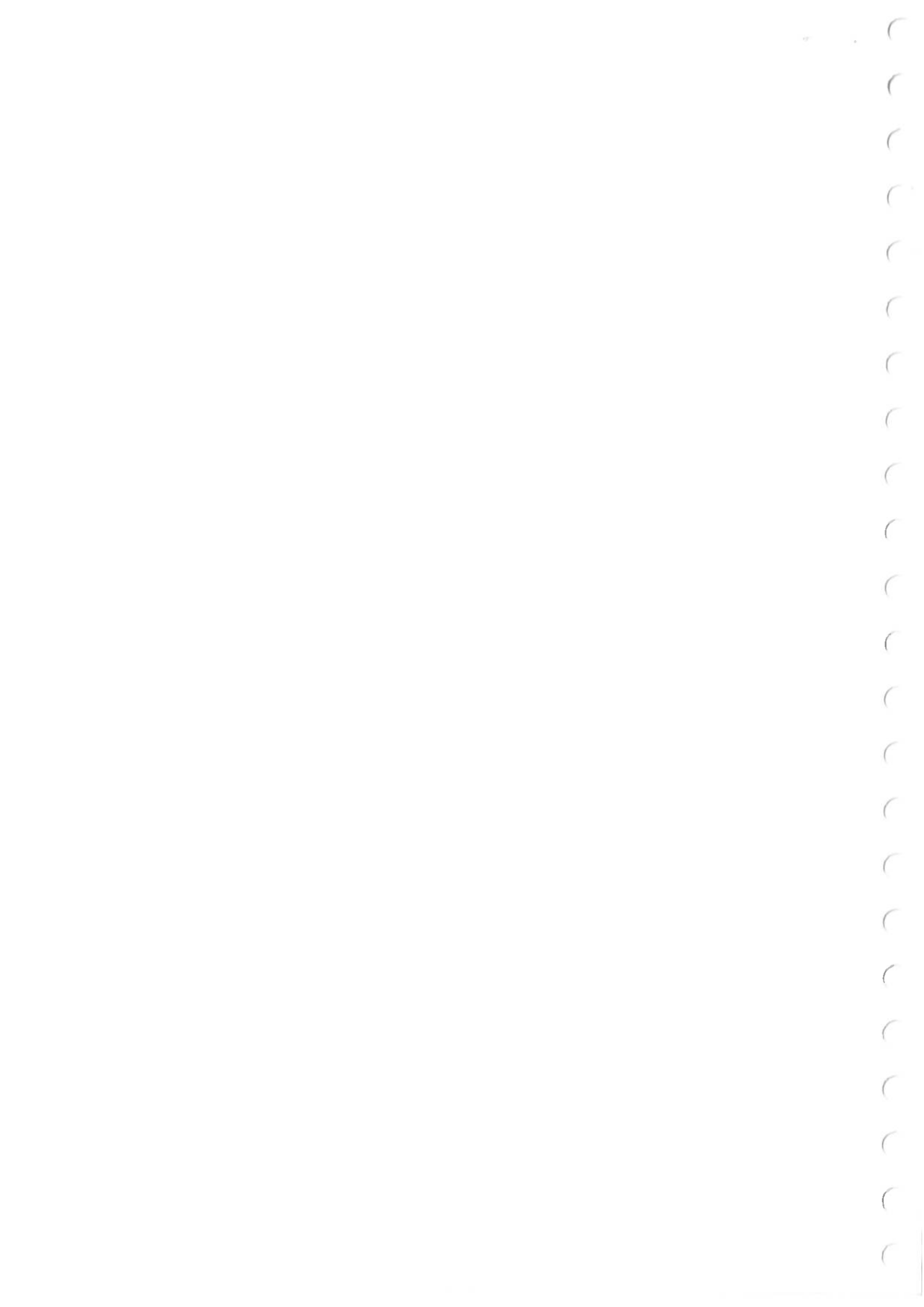


Table 61: APSH Results...

| BLOCK 8    |           |             |                      |                    |                |       |                    |              |       |                    |
|------------|-----------|-------------|----------------------|--------------------|----------------|-------|--------------------|--------------|-------|--------------------|
| Floor Ref. | Room Ref. | Window Ref. | Pr/Ex                | Window Orientation | Annual         | Pr/Ex | Meets BRE Criteria | Winter       | Pr/Ex | Meets BRE Criteria |
| First      | R13       | W17         | Existing<br>Proposed | 95°                | 6.14<br>6.14   | 1.00  | YES                | 0.62<br>0.62 | 1.00  | YES                |
|            | R14       | W18         | Existing<br>Proposed | 95°                | 12.82<br>12.82 | 1.00  | YES                | 2.87<br>2.87 | 1.00  | YES                |
|            | R15       | W19         | Existing<br>Proposed | 95°                | 11.58<br>11.58 | 1.00  | YES                | 2.10<br>2.10 | 1.00  | YES                |
|            | R16       | W20         | Existing<br>Proposed | 95°                | 5.21<br>5.21   | 1.00  | YES                | 0.08<br>0.08 | 1.00  | YES                |
|            | R17       | W21         | Existing<br>Proposed | 95°                | 8.08<br>8.08   | 1.00  | YES                | 0.93<br>0.93 | 1.00  | YES                |
|            | R18       | W22         | Existing<br>Proposed | 95°                | 2.25<br>2.25   | 1.00  | YES                | 0.00<br>0.00 | 1.00  | YES                |



Table 62: APSH Results...

| Floor Ref. |    | Room Ref. | Window Ref. | Pr/Ex | Window Orientation | Annual | Pr/Ex  | Meets BRE Criteria | Winter | Pr/Ex  | Meets BRE Criteria |
|------------|----|-----------|-------------|-------|--------------------|--------|--------|--------------------|--------|--------|--------------------|
| BLOCK 8    |    |           |             |       |                    |        |        |                    |        |        |                    |
| Second     | R1 | W1        | Existing    | 1.00  | 275°N              | 11.66  | *North | *North             | 2.95   | *North | *North             |
|            |    |           | Proposed    | 1.00  | 95°                | 8.00   | 1.00   | YES                | 0.16   | 1.00   | YES                |
|            |    |           | Existing    | 1.00  | 95°                | 0.16   | 1.00   | YES                | 0.16   | 1.00   | YES                |
|            |    |           | Proposed    | 1.00  | 95°                | 0.00   | 1.00   | YES                | 0.00   | 1.00   | YES                |
|            | R2 | W2        | Existing    | 1.00  | 275°N              | 11.73  | *North | *North             | 2.87   | *North | *North             |
|            |    |           | Proposed    | 1.00  | 95°                | 8.00   | 1.00   | YES                | 0.16   | 1.00   | YES                |
|            |    |           | Existing    | 1.00  | 95°                | 1.55   | 1.00   | YES                | 0.16   | 1.00   | YES                |
|            |    |           | Proposed    | 1.00  | 95°                | 2.02   | 1.00   | YES                | 0.23   | 1.00   | YES                |
|            | R3 | W3        | Existing    | 1.00  | 275°N              | 10.18  | *North | *North             | 1.48   | *North | *North             |
|            |    |           | Proposed    | 1.00  | 95°                | 7.38   | 1.00   | YES                | 0.00   | 1.00   | YES                |
|            |    |           | Existing    | 1.00  | 95°                | 2.64   | 1.00   | YES                | 0.00   | 1.00   | YES                |
|            |    |           | Proposed    | 1.00  | 95°                | 2.87   | 1.00   | YES                | 0.08   | 1.00   | YES                |
|            | R4 | W4        | Existing    | 1.00  | 275°N              | 11.73  | *North | *North             | 2.87   | *North | *North             |
|            |    |           | Proposed    | 1.00  | 95°                | 8.00   | 1.00   | YES                | 0.16   | 1.00   | YES                |
|            |    |           | Existing    | 1.00  | 95°                | 1.55   | 1.00   | YES                | 0.16   | 1.00   | YES                |
|            |    |           | Proposed    | 1.00  | 95°                | 2.02   | 1.00   | YES                | 0.23   | 1.00   | YES                |

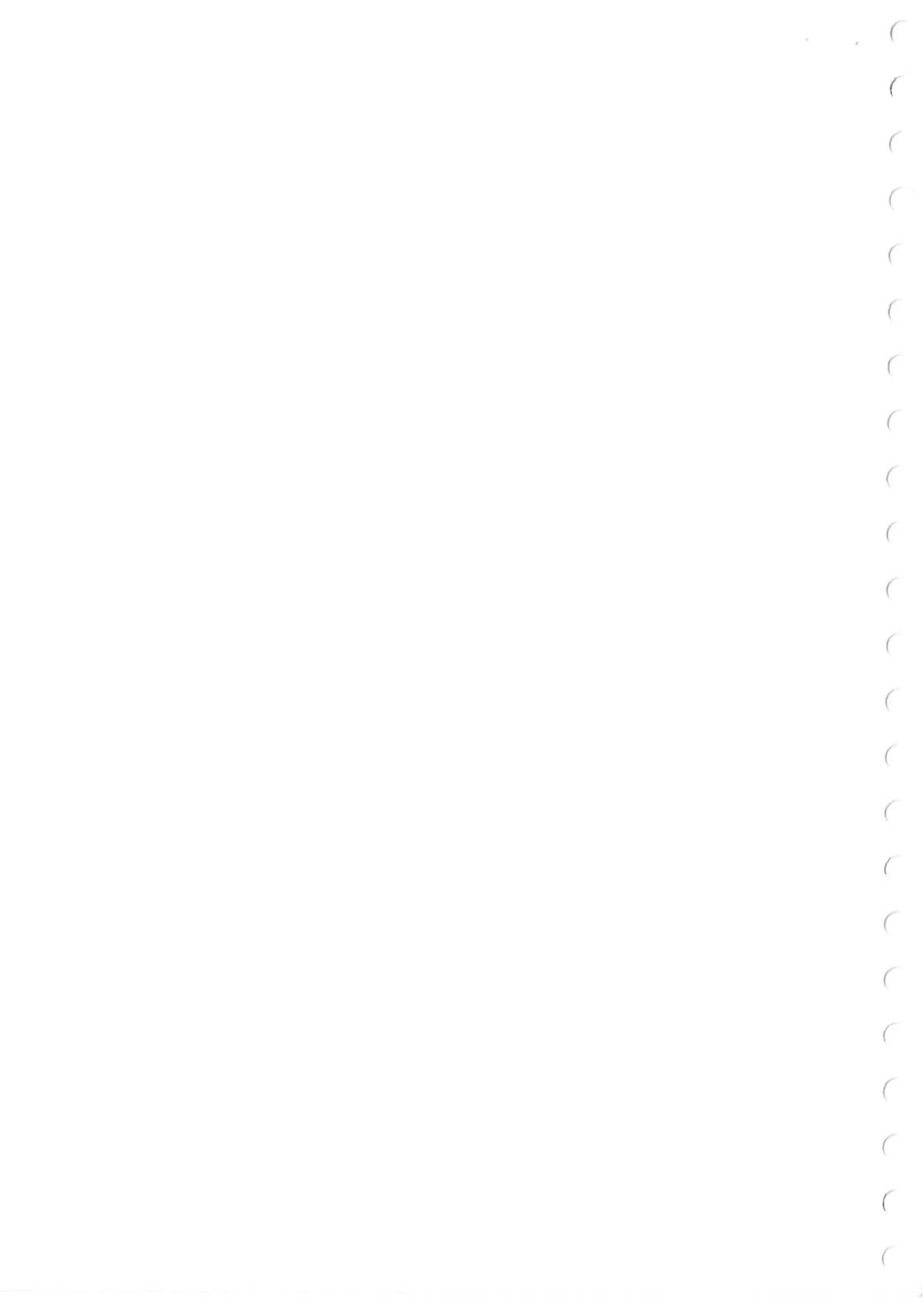


Table 63: APSH Results...

| Floor Ref. | Room Ref. | Window Ref. | Pr/Ex    | Window Orientation | Annual | Pr/Ex | Meets BRE Criteria | Winter | Pr/Ex | Meets BRE Criteria |        |
|------------|-----------|-------------|----------|--------------------|--------|-------|--------------------|--------|-------|--------------------|--------|
| BLOCK 8    |           |             |          |                    |        |       |                    |        |       |                    |        |
| Second     | R4        | W4          | Existing | 1.00               | 275°N  | 34.65 | *North             | *North | 5.91  | *North             | *North |
|            |           |             | Proposed |                    |        | 25.95 |                    |        | 1.24  |                    |        |
|            |           | W5          | Existing | 1.00               | 185°   | 19.50 | 0.62               | NO     | 2.95  | 0.00               | NO     |
|            |           |             | Proposed |                    |        | 12.04 |                    |        | 0.00  |                    |        |
|            |           | W6          | Existing | 1.00               | 275°N  | 11.73 | *North             | *North | 0.78  | *North             | *North |
|            |           |             | Proposed |                    |        | 8.16  |                    |        | 0.00  |                    |        |
|            | R5        | W7          | Existing | 1.00               | 275°N  | 10.18 | *North             | *North | 1.40  | *North             | *North |
|            |           |             | Proposed |                    |        | 5.52  |                    |        | 0.00  |                    |        |
|            |           | W21         | Existing | 1.00               | 95°    | 2.41  | 1.00               | YES    | 0.16  | 1.00               | YES    |
|            |           |             | Proposed |                    |        | 2.41  |                    |        | 0.16  |                    |        |
|            |           | W22         | Existing | 1.00               | 95°    | 1.79  | 1.00               | YES    | 0.16  | 1.00               | YES    |
|            |           |             | Proposed |                    |        | 1.79  |                    |        | 0.16  |                    |        |
|            | R6        | W23         | Existing | 1.00               | 95°    | 4.58  | 1.00               | YES    | 0.16  | 1.00               | YES    |
|            |           |             | Proposed |                    |        | 4.58  |                    |        | 0.16  |                    |        |
|            |           | W8          | Existing | 1.00               | 275°N  | 11.19 | *North             | *North | 1.24  | *North             | *North |
|            |           |             | Proposed |                    |        | 4.90  |                    |        | 0.00  |                    |        |
| R6         | W18       | Existing    | 1.00     | 95°                | 0.93   | 1.00  | YES                | 0.00   | 1.00  | YES                |        |
|            |           | Proposed    |          |                    | 0.93   |       |                    | 0.00   |       |                    |        |
|            | W19       | Existing    | 1.00     | 95°                | 1.71   | 1.00  | YES                | 0.00   | 1.00  | YES                |        |
|            |           | Proposed    |          |                    | 1.71   |       |                    | 0.00   |       |                    |        |
| R6         | W20       | Existing    | 1.00     | 95°                | 5.36   | 1.00  | YES                | 0.00   | 1.00  | YES                |        |
|            |           | Proposed    |          |                    | 5.36   |       |                    | 0.00   |       |                    |        |



Table 64: APSH Results...

| Floor Ref. | Room Ref. | Window Ref. | Pr/Ex    | Window Orientation | Annual | Pr/Ex | Meets BRE Criteria | Winter | Pr/Ex | Meets BRE Criteria |
|------------|-----------|-------------|----------|--------------------|--------|-------|--------------------|--------|-------|--------------------|
| BLOCK 8    |           |             |          |                    |        |       |                    |        |       |                    |
| Second     | R7        | W9          | Existing | 1.00               | 275°N  | 10.49 | *North             | *North | 0.47  | *North             |
|            |           |             | Proposed |                    |        | 4.58  |                    |        | 0.00  |                    |
|            |           | W15         | Existing | 1.00               | 95°    | 0.00  | 1.00               | YES    | 0.00  | 1.00               |
|            |           |             | Proposed |                    |        | 0.00  |                    |        | 0.00  |                    |
|            | W16       | Existing    | 1.00     | 95°                | 1.48   | 1.00  | YES                | 1.48   | 1.00  | YES                |
|            |           | Proposed    |          |                    | 1.48   |       |                    | 1.48   |       |                    |
|            |           | Existing    | 1.00     | 95°                | 1.48   | 1.00  | YES                | 1.09   | 1.00  | YES                |
|            |           | Proposed    |          |                    | 1.48   |       |                    | 1.09   |       |                    |
|            | R8        | W10         | Existing | 1.00               | 275°N  |       | *North             | *North |       | *North             |
|            |           |             | Proposed |                    |        |       |                    |        |       |                    |
|            |           | W11         | Existing | 1.00               | 275°N  |       | *North             | *North |       | *North             |
|            |           |             | Proposed |                    |        |       |                    |        |       |                    |
|            | R9        | W12         | Existing | 1.00               | 185°   | 56.95 | 0.71               | YES    | 9.48  | 0.84               |
|            |           |             | Proposed |                    |        | 40.33 |                    |        | 7.93  |                    |
|            |           | W13         | Existing | 1.00               | 95°    | 27.58 | 1.00               | YES    | 3.73  | 1.00               |
|            |           |             | Proposed |                    |        | 27.58 |                    |        | 3.73  |                    |



Table 65: APSH Results...

| Floor Ref. | Room Ref. | Window Ref. | Pr/Ex                | Window Orientation | Annual         | Pr/Ex | Meets BRE Criteria | Winter       | Pr/Ex | Meets BRE Criteria |
|------------|-----------|-------------|----------------------|--------------------|----------------|-------|--------------------|--------------|-------|--------------------|
| BLOCK 8    |           |             |                      |                    |                |       |                    |              |       |                    |
| Second     | R10       | W14         | Existing<br>Proposed | 95°                | 28.13<br>28.13 | 1.00  | YES                | 4.35<br>4.35 | 1.00  | YES                |
|            | R11       | W24         | Existing<br>Proposed | 95°                | 16.71<br>16.71 | 1.00  | YES                | 3.11<br>3.11 | 1.00  | YES                |
|            | R12       | W25         | Existing<br>Proposed | 95°                | 13.36<br>13.36 | 1.00  | YES                | 2.33<br>2.33 | 1.00  | YES                |

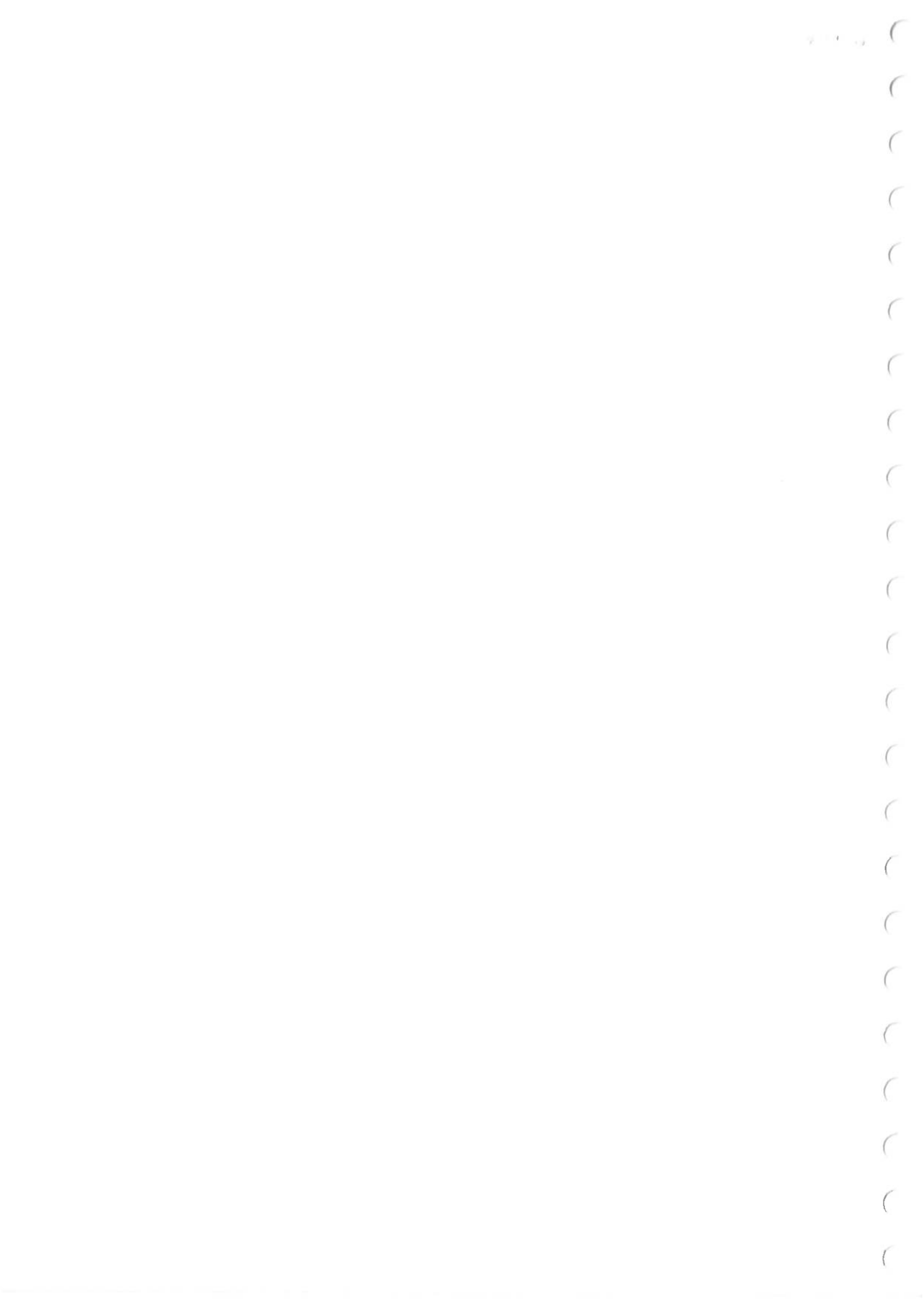


Table 66: APSH Results...

| Floor Ref. |    | Room Ref. | Window Ref. | Pr/Ex                | Window Orientation | Annual | Pr/Ex          | Meets BRE Criteria | Winter       | Pr/Ex  | Meets BRE Criteria |
|------------|----|-----------|-------------|----------------------|--------------------|--------|----------------|--------------------|--------------|--------|--------------------|
| BLOCK 8    |    |           |             |                      |                    |        |                |                    |              |        |                    |
| Third      | R1 |           | W1          | Existing<br>Proposed | 1.00               | 275°N  |                | *North             | *North       | *North | *North             |
|            | R2 |           | W2          | Existing<br>Proposed | 1.00               | 275°N  |                | *North             | *North       | *North | *North             |
|            | R3 |           | W3          | Existing<br>Proposed | 1.00               | 275°N  |                | *North             | *North       | *North | *North             |
|            | R4 |           | W4          | Existing<br>Proposed | 1.00               | 275°N  | 41.18<br>29.84 | *North             | *North       | *North | *North             |
|            |    |           | W5          | Existing<br>Proposed | 1.00               | 185°   | 21.52<br>12.12 | 0.56               | 5.13<br>0.00 | 0.00   | NO                 |
|            |    |           | W6          | Existing<br>Proposed | 1.00               | 275°N  | 14.06<br>7.85  | *North             | *North       | *North | *North             |
|            | R5 |           | W7          | Existing<br>Proposed | 1.00               | 275°N  |                | *North             | *North       | *North | *North             |
|            | R6 |           | W8          | Existing<br>Proposed | 1.00               | 275°N  |                | *North             | *North       | *North | *North             |



Table 67: APSH Results...

| BLOCK 8    |           |             |                      |                    |                |        |                    |                |        |                    |
|------------|-----------|-------------|----------------------|--------------------|----------------|--------|--------------------|----------------|--------|--------------------|
| Floor Ref. | Room Ref. | Window Ref. | Pr/Ex                | Window Orientation | Annual         | Pr/Ex  | Meets BRE Criteria | Winter         | Pr/Ex  | Meets BRE Criteria |
| Third      | R7        | W9          | Existing<br>Proposed | 275°N              |                | *North | *North             |                | *North | *North             |
|            | R8        | W10         | Existing<br>Proposed | 275°N              |                | *North | *North             |                | *North | *North             |
|            |           | W11         | Existing<br>Proposed | 275°N              |                | *North | *North             |                | *North | *North             |
|            | R9        | W12         | Existing<br>Proposed | 185°               | 63.48<br>47.86 | 0.75   | YES                | 12.35<br>10.41 | 0.84   | YES                |
|            |           | W13         | Existing<br>Proposed | 95°                | 30.54<br>30.54 | 1.00   | YES                | 4.58<br>4.58   | 1.00   | YES                |
|            | R10       | W14         | Existing<br>Proposed | 95°                | 30.15<br>30.15 | 1.00   | YES                | 5.05<br>5.05   | 1.00   | YES                |
|            | R11       | W15         | Existing<br>Proposed | 95°                | 1.79<br>1.79   | 1.00   | YES                | 1.79<br>1.79   | 1.00   | YES                |
|            |           |             |                      |                    |                |        |                    |                |        |                    |
|            |           |             |                      |                    |                |        |                    |                |        |                    |
|            |           |             |                      |                    |                |        |                    |                |        |                    |

23.9

(

5

5

1

1

1

(

(

(

(

(

(

(

1

1

Table 68: APSH Results...

| BLOCK 8    |           |             |                      |                    |                |       |                    |              |       |                    |
|------------|-----------|-------------|----------------------|--------------------|----------------|-------|--------------------|--------------|-------|--------------------|
| Floor Ref. | Room Ref. | Window Ref. | Pr/Ex                | Window Orientation | Annual         | Pr/Ex | Meets BRE Criteria | Winter       | Pr/Ex | Meets BRE Criteria |
| Third      | R12       | W16         | Existing<br>Proposed | 95°                | 2.87<br>2.87   | 1.00  | YES                | 0.00<br>0.00 | 1.00  | YES                |
|            | R13       | W17         | Existing<br>Proposed | 95°                | 1.94<br>1.94   | 1.00  | YES                | 0.16<br>0.16 | 1.00  | YES                |
|            | R14       | W18         | Existing<br>Proposed | 95°                | 20.28<br>20.28 | 1.00  | YES                | 4.20<br>4.20 | 1.00  | YES                |
|            | R15       | W19         | Existing<br>Proposed | 95°                | 15.85<br>15.85 | 1.00  | YES                | 3.26<br>3.26 | 1.00  | YES                |
|            | R16       | W20         | Existing<br>Proposed | 95°                | 3.42<br>3.42   | 1.00  | YES                | 0.08<br>0.08 | 1.00  | YES                |
|            | R17       | W21         | Existing<br>Proposed | 95°                | 2.33<br>2.33   | 1.00  | YES                | 0.23<br>0.23 | 1.00  | YES                |
|            | R18       | W22         | Existing<br>Proposed | 95°                | 0.00<br>0.00   | 1.00  | YES                | 0.00<br>0.00 | 1.00  | YES                |
|            |           |             |                      |                    |                |       |                    |              |       |                    |

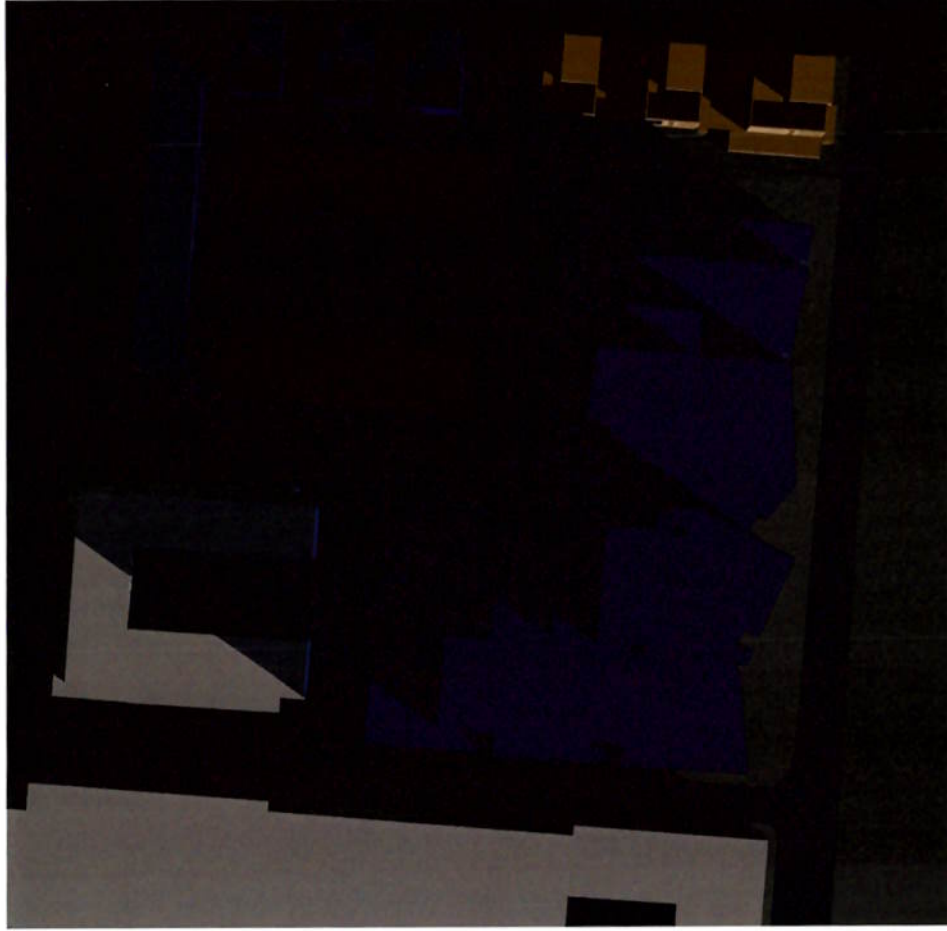


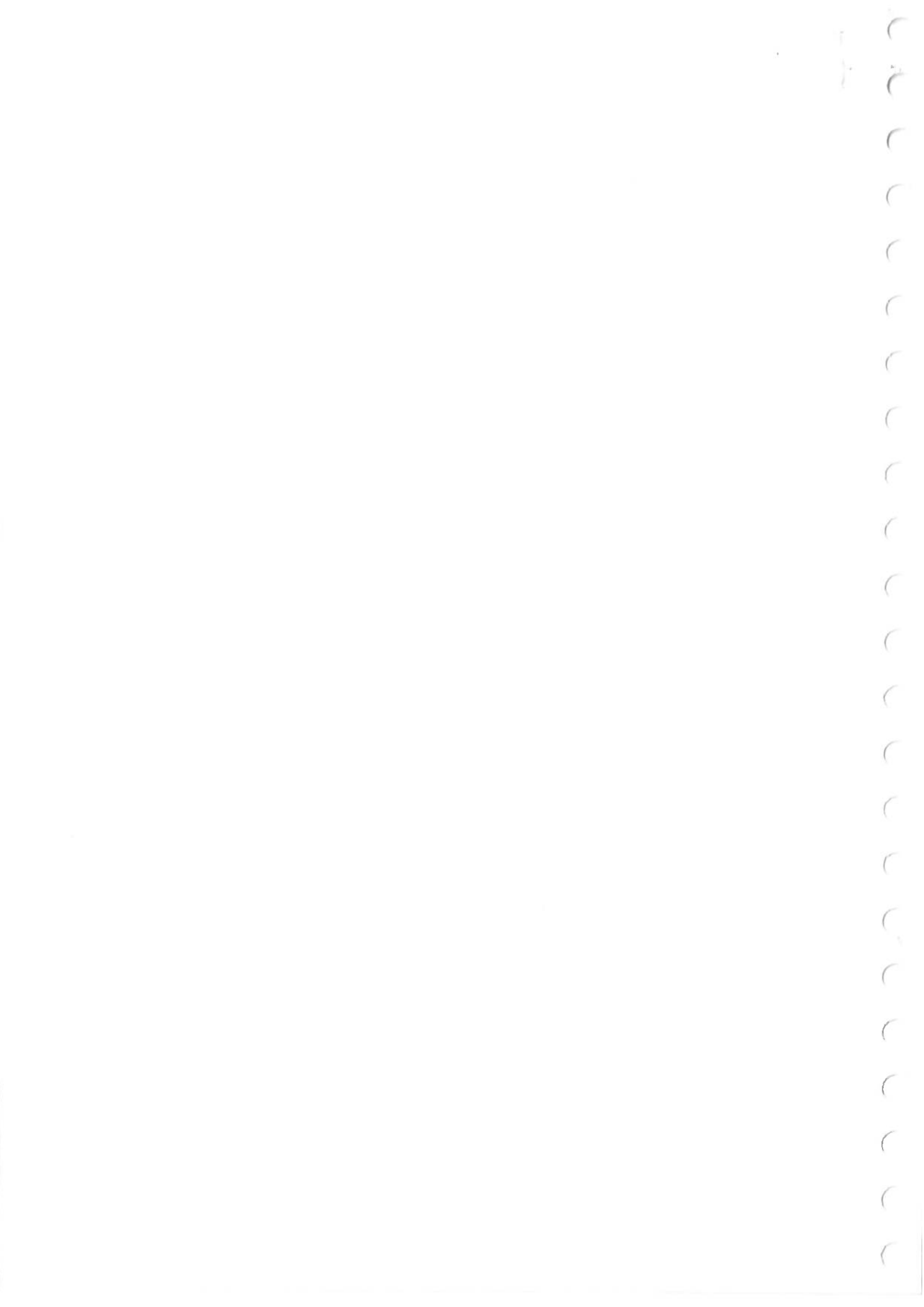
20340-1NWQ-BPC-XX-ZZ-M3-P13-01  
EXISTING-21-Dec 15:00



December 21st - 15:00

20340-1NWQ-BPC-XX-ZZ-M3-P13-01  
PROPOSED-21-Dec 15:00





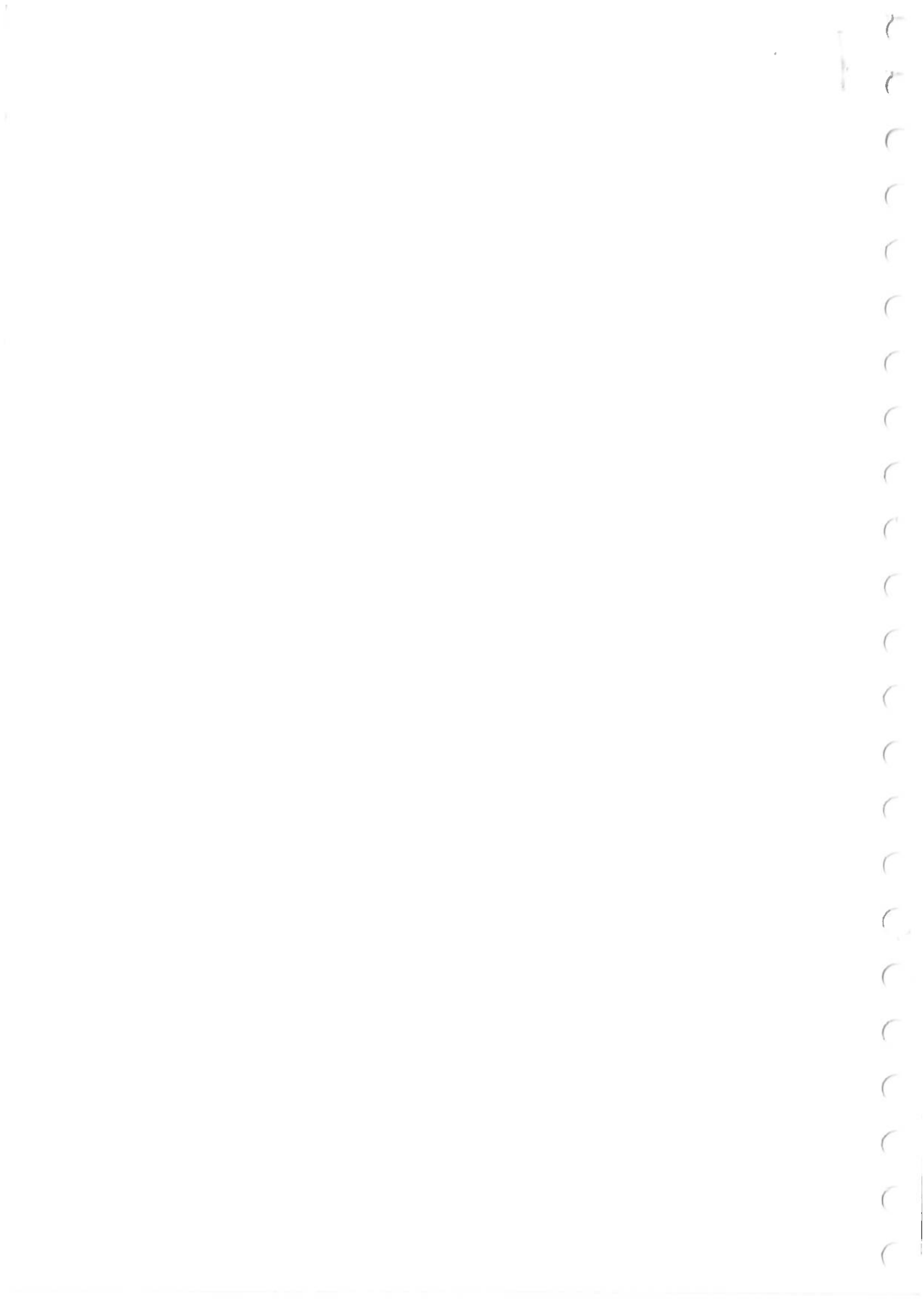
## 7 Bibliography

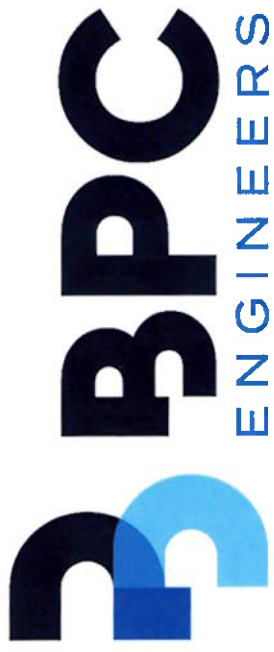
BRE Building Technology Group. (2022). *Site layout planning for daylight and sunlight. A guide to good practice*. London: BRE.

CEN. (2019). *BS EN 17037:2018 Daylight in buildings*. BSI Standards Limited 2019.

CIE. (2020). *CIE S 017:2020 ILV: International Lighting Vocabulary, 2nd edition*. CIE.

Illuminating Engineering Society. (2022). <https://www.ies.org/standards/definitions/>. Retrieved from <https://www.ies.org>





[www.bpcengineers.com](http://www.bpcengineers.com)

**BUILDING PERFORMANCE CONSULTING**

---



**APPENDIX 8: RESPONSE TO 1 NORTH WALL QUAY REFUSAL PREPARED BY BPC ENGINEERS**

# BUILDING PERFORMANCE CONSULTING

---

1 North Wall Quay

Response to 1 North Wall  
Quay Refusal

Project Ref: 20354

Client: Ronan Group Real Estate

Date: 10/05/2024

| Rev   | Description                     | Date Issued: | Written By | Approved By: |
|-------|---------------------------------|--------------|------------|--------------|
| P1-07 | Final Draft: Issue for comment. | 09/05/2024   | GB         | JG           |
| P1-08 | Final Report.                   | 10/05/2024   | GB         | JG           |

## Executive Summary

This report has been prepared to respond to the planner's report on reasons to refuse permission for the proposed building at 1 North Wall Quay and specifically relates to items raised regarding the demolition of the existing building and the associated embodied carbon effects.

Although we understand the reasoning behind Policy CA6 and Section 15.7.1 of the Dublin City Development Plan 2022-2028, which aims to promote and support the retrofitting and reuse of existing buildings, however, there are instances where retention and/or adaptation and reuse is not the best option.

In the case of 1 North Wall Quay, the upgrades required would be extensive, very costly in both financial and carbon expenditure terms, and would not, we believe, deliver an optimum operational low carbon building. Extensive structural intervention is required to ensure the revamped structure and fabric meet current regulatory and workplace codes, as well as market requirements.

Preliminary embodied carbon assessments and whole life carbon assessments (including operational carbon) was completed for two options:

- The proposed New Build (NB), and
- A Refurbish and Extend (R&E) option.

The floor area and basement area of both options are identical.

The R&E option has been assessed in consideration of climate action policy CA6 of the Dublin City Development Plan 2022-2028. CA6 is:

*"Retrofitting and Reuse of Existing Buildings*

*To promote and support the retrofitting and reuse of existing buildings rather than their demolition and reconstruction, where possible. [...]"*

The results of the embodied carbon analysis are presented on the following tables.

*Table 1 Embodied Carbon LCA analysis results*

| Building                            | Total embodied carbon emission<br>(TonsCO <sub>2</sub> e) | Total embodied carbon emission<br>(kgCO <sub>2</sub> e/m <sup>2</sup> ) |
|-------------------------------------|-----------------------------------------------------------|-------------------------------------------------------------------------|
| One North Wall Quay – New building  | 62,563                                                    | 717                                                                     |
| One North Wall Quay – Refurbishment | 53,430                                                    | 612                                                                     |

*Table 2: Embodied Carbon breakdown by LCA Stages*

| EN15978 LCA Stages                 | Carbon Emissions<br>(KgCO <sub>2</sub> e) | Intensity (kgCO <sub>2</sub> e/m <sup>2</sup> ) | Breakdown % |
|------------------------------------|-------------------------------------------|-------------------------------------------------|-------------|
| One North Wall Quay – New building |                                           |                                                 |             |
| A1-A3 Materials                    | 40,008,434                                | 459                                             | 64%         |
| A1-A5 A4 Transport                 | 984,770                                   | 11                                              | 2%          |
| A5 Construction                    | 1,760,195                                 | 20                                              | 3%          |
| Total                              | 42,753,399                                | 490                                             | 68%         |
| B4-B5 Replacement                  | 18,513,639                                | 212                                             | 30%         |
| C1-C4 End of Life                  | 1,296,633                                 | 15                                              | 2%          |

|                                     |                 |            |     |      |
|-------------------------------------|-----------------|------------|-----|------|
| Total                               |                 | 62,563,671 | 717 | 100% |
| One North Wall Quay – Refurbishment |                 |            |     |      |
| A1-A5                               | A1-A3 Materials | 31,647,646 | 363 | 59%  |
|                                     | A4 Transport    | 558,945    | 6   | 1%   |
|                                     | A5 Construction | 1,413,159  | 16  | 3%   |
|                                     | Total           | 33,619,750 | 385 | 63%  |
| B4-B5 Replacement                   |                 | 18,513,639 | 212 | 35%  |
| C1-C4 End of Life                   |                 | 1,296,919  | 15  | 2%   |
| Total                               |                 | 53,430,308 | 612 | 100% |

Alternative smaller scaled buildings were not considered as we believe the location and accessibility of the site supports higher density development, in line with National Policy Objective 11.

The location is well served by DART, rail and bus routes, and is within walking distance at Tara Street Station to the southwest, which may in the future have an interchange with the proposed MetroLink. This can contribute positively to the evolving urban form and structure of the city and help achieve sustainable land use and movement patterns.

The increased site density of the new build option will increase the usage of public transport, cycling and walking which would result in lower environmental impact per person.

It is important to bear in mind that carbon is only one of many considerations that need to be taken into account when assessing the merits of a new build versus a refurbishment. The following are some of the key benefits of the proposed new building at 1 NWQ:

- Density: One potentially limiting factor in refurbishing the existing building is the density that can be achieved in terms of floor area. The WLCA assumes that the R&E option can achieve the same floor area as the new build option but this may not be possible due to limitations imposed by the existing structure.
- Space utilisation: Compared to a refurbishment of the existing building, a well-designed new-build should use the same amount of space more efficiently over its lifetime. The impact of this on resource use can be significant. For example, if the average lifetime utilisation is improved by 10%, then this should offset some of the additional embodied carbon on a per person basis, as 10% less space would be needed to accommodate the same number of number of people. (This is space that may otherwise be built elsewhere in less central locations or a greenfield site away from existing infrastructure such as that which is present in NWQ.)
- Adaptability: The end of life and adaptability of the building needs to be considered when assessing the merits of a new-build versus a refurbishment. "Adaptability refers to the capacity of buildings to accommodate substantial change. Over the course of a building's lifetime, change is inevitable, both in the social, economic and physical surroundings, and in the needs and expectations of occupants. All other things being equal, a building that is more adaptable will be utilized more efficiently, and stay in service longer, because it can respond to changes at a lower cost. A longer and more efficient service life for the building may, in turn, translate into improved environmental performance over the lifecycle. The concept of adaptability can be broken down into a number of simple strategies that are familiar to most designers:
  - Flexibility, or enabling minor shifts in space planning;
  - Convertibility, or allowing for changes in use within the building; and
  - Expandability, (alternatively shrinkability) or facilitating additions to the quantity of space in a building" (Russell & Moffatt, 2001)

In this case, a new building can offer better opportunity for adaptability because it can be designed with adaptability in mind. Traditionally, buildings have been designed based on the assumption that they will not experience significant change. A risk with refurbishing the existing building is that it will be incapable of responding to changing circumstances, making it vulnerable to becoming poorly utilized, prematurely obsolete and unable to accommodate new, more efficient technologies. The combined impact of such failures could ultimately increase resource use within the building.

- Efficiency Standards: The proposed new building will be designed to exceed the latest energy efficiency standards, incorporating advanced technologies and materials to reduce energy and carbon consumption. This can result with a building which will be best in class in operational carbon emissions over the building's lifespan.
- Sustainable Design: A new building allows for the incorporation of sustainable and green design principles from the start, such as passive heating and cooling, green roofs, and renewable energy systems. These features will contribute to a lower carbon footprint.

One of the reasons the current occupier of 1 NWQ wished to move their HQ from the current building was that it could not achieve their corporate Environmental Social and Governance (ESG) commitments. RGRE recognise the importance of developing buildings that enable tenants to achieve their ESG targets. They have a proven track record of obtaining the highest achievable sustainability certifications for commercial office spaces. Buildings built before 2000 such as the subject building were not built with sustainability in mind and a refurbishment will make meeting best-in-class ESG requirements more difficult.

The proposed new build option will exceed the energy efficiency targets in Part L of the Ireland Building Regulations which incorporate Nearly Zero Energy measures and will be targeting LEED Platinum sustainability certification. These certifications demonstrate a commitment to environmental responsibility, resource efficiency, and occupant well-being. The following are a summary of the benefits of RGRE's approach to ESG which could be achieved with a new build option on this site and provide a rationale and justification for the proposed building:

1. **Marketability and Tenant Attraction:**
  - **Competitive Advantage**: Sustainability certifications, such as LEED differentiate a commercial office space in a competitive real estate market. Many businesses and tenants prioritize sustainability, and a certified building will attract national and international environmentally conscious tenants.
2. **Cost Savings:**
  - **Operational Efficiency**: Sustainable buildings incorporate energy-efficient systems, water-saving features, and other measures that contribute to lower operational costs over time. This can result in reduced utility bills and operational expenses for the tenants.
3. **Corporate Social Responsibility (CSR):**
  - **Positive Image**: Sustainability certifications align with corporate social responsibility goals. Businesses are increasingly aware of their environmental impact, and occupying a certified office space helps enhance their image as socially responsible and environmentally conscious organizations.
4. **Occupant Health and Productivity:**
  - **Indoor Environmental Quality**: Certification programs focus on indoor environmental quality, including factors such as air quality, lighting, and thermal comfort. A healthy and comfortable workspace can contribute to increased employee satisfaction, well-being, and productivity.
  - **Transportation**: The new build option increases site density and therefore will increase the usage of public transport, cycling and walking which would result in lower environmental impact per person.

5. Regulatory Compliance:
  - Meeting Standards: RGRE have a track record of delivering commercial office buildings which exceed the national regulatory standards.
6. Long-Term Resilience:
  - Future-Proofing: Sustainable features and certifications demonstrate a commitment to long-term resilience and adaptability.
7. Environmental Impact:
  - Resource Conservation: Sustainability certifications require the use of environmentally friendly materials, energy-efficient technologies, and waste reduction strategies, contributing to overall resource conservation and a reduced environmental footprint.
8. Innovation and Technology Adoption:
  - Encouraging Innovation: RGRE encourages the adoption of innovative technologies and construction practices, promoting advancements in the industry.

As the demand for sustainable buildings continues to grow, the type of building proposed at 1 NWQ will be key to attracting the best companies to invest in Ireland.

## Contents

|                                             |    |
|---------------------------------------------|----|
| Executive Summary .....                     | ii |
| 1 Response to reason for Refusal No. 3..... | 7  |
| 2 Justification for Demolition.....         | 8  |
| 2.1 Point 1.....                            | 8  |
| 2.2 Point 2.....                            | 8  |
| 2.3 Point 3.....                            | 9  |
| Appendix A OneClick software details .....  | 10 |

## 1 Response to reason for Refusal No. 3

"Having regard to the condition of the existing building and in the absence of a comprehensive justification for demolition where not all options were investigated, the proposed wholesale demolition would be considered premature and contrary to Policy CA6 and Section 15.7.1 of the Dublin City Development Plan 2022-2028 which seeks to promote and support the retrofitting and reuse of existing buildings rather than their demolition and reconstruction. The proposed development would set an undesirable therefore be contrary to the proper planning and sustainable development of the area."

Although we understand the reasoning behind Policy CA6 and Section 15.7.1 of the Dublin City Development Plan 2022-2028, which aims to promote and support the retrofitting and reuse of existing buildings, however, there are instances where retention and/or adaptation and reuse is not the best option.

In the case of 1 North Wall Quay, the upgrades required would be extensive, very costly in both financial and carbon expenditure terms, and would not, we believe, deliver an optimum operational low carbon building. Extensive structural intervention is required to ensure the revamped structure and fabric meet current regulatory and workplace codes, as well as market requirements. For example, the replacement of the existing facades is necessary and significant intervention to the remaining concrete frame are required to provide adequate lobbies, circulation and disabled refuge space, additional and/or enlarged stairwells and provision for new plant areas.

Figure 1 shows the areas of a generic plan of the existing building that must be demolished to allow the complex integration between the existing structure and the new building. The existing structure that can be retained is less than 40%.



Figure 1 Demolition plan in the R&E option

To achieve an optimum operational low carbon building, the development a new building is a more feasible option. While the construction of a new building requires additional materials, modern construction methods and materials can be chosen with an emphasis on sustainability, recycling, and reduced environmental impact. Additionally, new buildings built under the latest standards have a longer operational life partially due to being designed with future adaptability and upgrades in mind. This can result with a building which will be best in class in operational carbon emissions over the building's lifespan.

The new building at 1 NWQ is designed to exceed the latest energy efficiency standards, incorporating advanced technologies and high-performance materials to reduce energy and carbon consumption. Also, the new building will incorporate sustainable and green design principles from the start, such as passive heating and cooling, geothermal piles, green roofs, photovoltaic panels and renewable energy systems. Additionally, the new building will be designed with a focus on long-term sustainability, ensuring that they remain efficient and environmentally friendly for many years through smart data collection and analysis providing useful engagement tool for occupiers to make positive changes to support our buildings operating at net zero carbon.

## 2 Justification for Demolition

### 2.1 Point 1

The Planner's Report (PR) firstly assesses the principle of demolition of the existing building. They note that the only other alternative development considered is to retain the existing structure and extend it to the same extent and the proposed development. The PR notes that additional structural columns would be required to provide for the alternative R&E option and these were not considered as part of the WLCA and neither was the longer construction timeline. The PR queries whether the same number of additional structural columns would be necessary if a reduced R&E was proposed.

Alternative smaller scaled buildings were not considered as we believe the location and accessibility of the site supports higher density development, in line with National Policy Objective 11. A like for like comparison was undertaken in terms of building scale.

The location is well served by DART, rail and bus routes, and is within walking distance at Tara Street Station to the southwest, which may in the future have an interchange with the proposed MetroLink. This can contribute positively to the evolving urban form and structure of the city and help achieve sustainable land use and movement patterns.

The increased site density of the new build option will increase the usage of public transport, cycling and walking which would result in lower environmental impact per person.

### 2.2 Point 2

The PR notes that "there is limited information provided on the carbon associated with waste disposal as a result of the removal of the existing building (estimated to be 1,239.6 tonnes) in addition to the excavation of c. 120,000 cubic metres of material (for the proposed double basement) required to facilitate the development.

According to the Whole Life Carbon Assessment for the Built Environment, published by the Royal Institution of Chartered Surveyors (RICS) in 2017, new build projects are considered to commence their development on a cleared, flat site for consistency purposes. This means that demolition works are often decoupled from new construction projects. As a result, the carbon emissions associated with the demolition of the existing building are not included in the life carbon assessment on the new building.

To analyse the carbon emissions resulting from the demolition of existing buildings, OneClick LCA software can be used. The analysis is based on the following assumptions:

- The existing building is estimated to be 1,239.6 tonnes (as assumed in the note),
- 1,239.6 tonnes of material must be disposed,
- Dumper trucks used for the disposal are assumed to have a maximum capacity of 19 tonnes.

The total carbon emission due to the demolition is calculated to be 12,878 kgCO<sub>2</sub>, which is a negligible when compared to the total carbon emissions for the building construction.

We believe that the additional volume required for the new building's basement is around 40,000 m<sup>3</sup>. The additional carbon emission due to the excavation and disposal of the material is 322,225 kgCO<sub>2</sub>, which is taken into account into the difference between the emissions associated with the A5 LCA stages for the new building and the refurbished.

## 2.3 Point 3

The PR queries whether the demolition and structural intervention required in the two options explored would be reduced if a smaller scaled development was proposed. DCC is also not satisfied that alternatives other than the wholesale demolition of the building were considered by the application.

Alternative smaller scaled buildings were not considered as we believe the location and accessibility support higher density development and the intensification of the utilisation of the site, in line with National Policy Objective 11.

## Appendix A OneClick software details

The software holds 11 third party certifications and complies with over 30 certifications and standards for Life Cycle Assessment and Life Cycle Costing, including all versions of LEED and BREEAM. The software includes curated and verified global and local databases. The up-to-date list of integrated databases can be found here: <https://www.oneclicklca.com/support/faq-and-guidance/documentation/database/>.

One Click LCA has been third party verified by ITB for compliance with the following LCA standards: EN 15978, ISO 21931-1 and ISO 21929, and data requirements of ISO 14040 and EN 15804. The full compliancy documentation is available at <https://www.oneclicklca.com/support/faq-and-guidance/documentation/compliance-and-certifications/>.

All of the datasets in the tool comply with ISO 14040/14044 and most part also EN 15804 standard.

All building Life Cycle Assessments delivered by the One Click LCA platform comply with the following International Standards:

|           |                                                                                                                                                    |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| ISO 14040 | Environmental management. Life cycle assessment. Principles and framework                                                                          |
| ISO 14044 | Environmental management -- Life cycle assessment -- Requirements and guidelines                                                                   |
| ISO 21930 | Sustainability in buildings and civil engineering works -- Core rules for environmental product declarations of construction products and services |

One Click LCA platform tools used in European context comply with following European Standards:

|              |                                                                                                                                                                          |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EN 15978     | Sustainability of construction works Assessment of environmental performance of buildings – Calculation method                                                           |
| EN 15804 +A1 | Sustainability of construction works. Environmental product declarations. Core rules for the product category of construction products                                   |
| LEED v4      | ASHRAE (American Society of Heating, Refrigerating and Air Conditioning Engineers) 90.1-2010 defines the baseline energy model using the performance rated method (PRM). |

**BUILDING PERFORMANCE CONSULTING**



