

G7 Natural Light

Acceptable Solution G7/AS1

**Natural Light for simple buildings
up to three storeys excluding those
with borrowed daylight**

SECOND EDITION | EFFECTIVE 29 NOVEMBER 2021



Preface

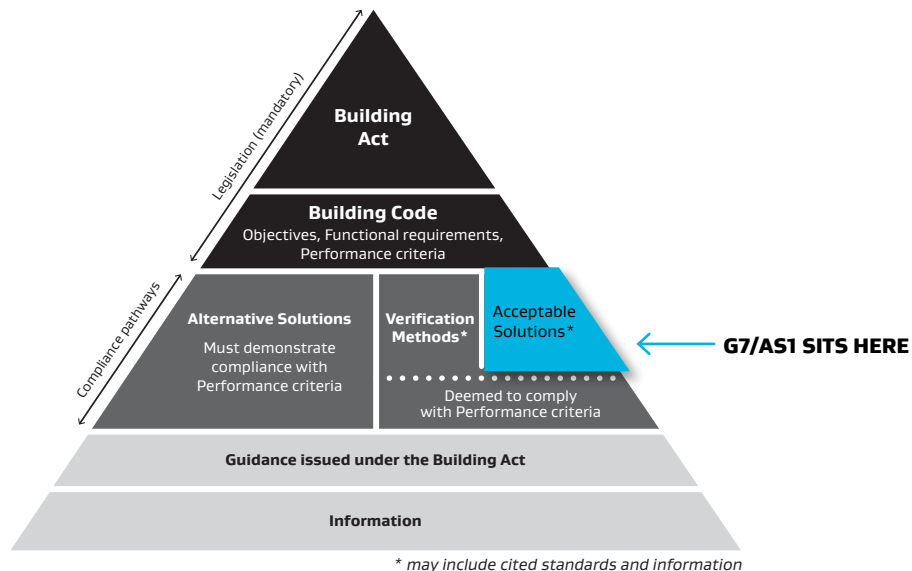
Document status

This document (G7/AS1) is an acceptable solution issued under section 22 (1) of the Building Act 2004 and is effective on 29 November 2021. It does not apply to building consent applications submitted before 29 November 2021. The previous Acceptable Solution G7/AS1 First Edition Amendment 2 can be used to show compliance until 2 November 2022 and can be used for building consent applications submitted before 3 November 2022.

Building Code regulatory system

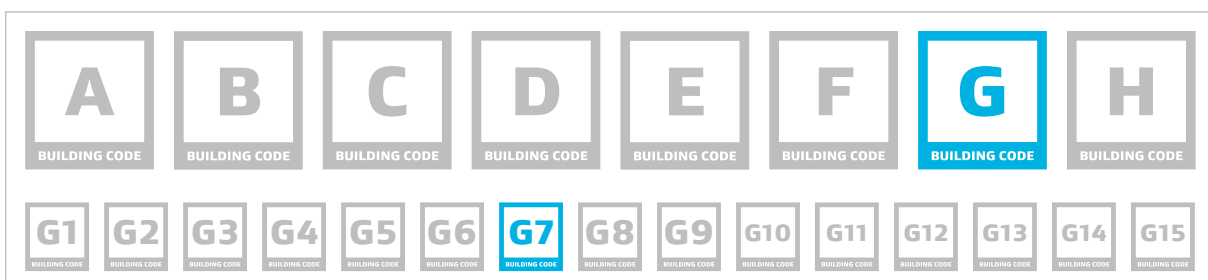
Each acceptable solution outlines the provisions of the Building Code that it relates to. Complying with an acceptable solution or verification method are ways of complying with that part of the Building Code. Other options for establishing compliance are listed in [section 19 of the Building Act](#).

Schematic of the Building Code System



A building design must take into account all parts of the Building Code. The Building Code is located in Schedule 1 of the Building Regulations 1992 and available online at www.legislation.govt.nz.

The part of the Building Code that this acceptable solution relates to is clause G Services and facilities and specifically G7 Natural Light. Further information on the scope of this document is provided in [Part 1. General](#).



Further information about the Building Code, the objectives, functional requirements and performance criteria provisions that it contains, and other acceptable solutions and verification methods are available at www.building.govt.nz.

Main changes in this version and features of this document

Main changes in this version

This acceptable solution is the second edition of G7/AS1. The main changes from the previous version of G7/AS1 are:

- › The scope of G7/AS1 has been reduced to cover only simple buildings up to 3 storeys in low density developments. Requirements applicable for simple and complex high rise buildings and apartments are available in Acceptable Solution G7/AS2 and Verification Method G7/VM1. To reflect the new scope of the documents and the new document layout, a new introduction and scope has been provided in [Part 1. General](#).
- › The scope of G7/AS1 has been reduced and is no longer applicable for awareness of the outside through another space. The applicable requirements can be found in Verification Method G7/VM1.
- › Portions of text have been re-written to enhance clarity in the document and provide consistent language with other acceptable solutions and verification methods.
- › The definitions page has been revised to include all defined terms used in this document in [Appendix B](#).

People using this document should check for amendments on a regular basis. The Ministry of Business, Innovation and Employment may amend any part of any acceptable solution or verification method at any time. Up-to-date versions of acceptable solutions and verification methods are available from www.building.govt.nz.

Features of this document

- › For the purposes of Building Code compliance, the standards and documents referenced in this acceptable solution must be the editions, along with their specific amendments listed in [Appendix A](#).
- › Words in *italic* are defined at the end of this document in [Appendix B](#).
- › Hyperlinks are provided to cross-references within this document and to external websites and appear with a [blue underline](#).
- › Classified uses for buildings, as described in clause A1 of the Building Code, are printed in **bold** in this document.
- › Appendices to this acceptable solution are part of, and have equal status to, the acceptable solution. Figures are informative only and the wording of the paragraphs takes precedence. Text boxes headed 'COMMENT' occur throughout this document and are for guidance purposes only.

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Part 1. General

1.1 Introduction

1.1.1 Scope of this document

1.1.1.1 This acceptable solution applies to **housing**, old people's homes, and *early childhood centres*, up to 3 storeys that are:

- a) Detached; or
- b) Attached side by side multi-unit *buildings* including townhouses.



COMMENT: Old people's homes includes aged care facilities, rest homes and retirement complexes.

1.1.1.2 This acceptable solution applies to *habitable spaces* with external windows and simple façade designs that can be described by a *glazing-to-wall ratio (GWR)*.

1.1.1.3 For *buildings* that do not meet these requirements, refer to the Acceptable Solution G7/AS2 or Verification Method G7/VM1 as a means to demonstrate compliance or use an alternative means to demonstrate compliance.

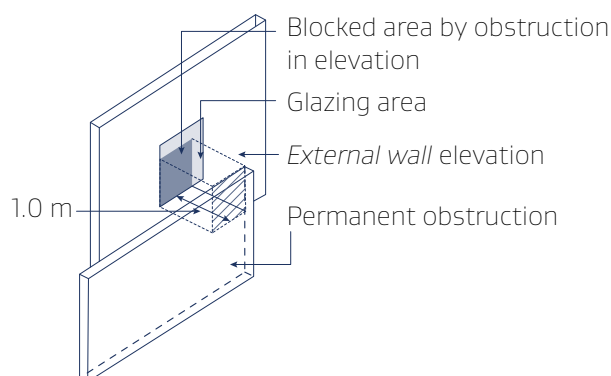
1.1.2 Items outside the scope of this document

1.1.2.1 This acceptable solution does not include solutions for:

- a) *habitable spaces* that rely on daylight borrowed from another space; or
- b) *habitable spaces* that do not have at least one window in an *external wall*; or
- c) *habitable spaces* that include non-standard features such as advanced daylight redirection systems, complex facades, top lighting strategies, internal divisions, internal obstructions, external shading devices or other specialized designs; or
- d) *habitable spaces* with floor-to-ceiling heights of more than 3.0 m; or
- e) *habitable spaces* where more than 50% of the area of glazing are blocked by permanent external obstructions that are less than 1.0 m from the area of glazing (see Figure 1.1.2.1); or
- f) *habitable spaces* where windows are facing a porch, a covered walkway, or are under a balcony.

FIGURE 1.1.2.1: Maximum permitted area blocked by obstruction

Paragraph 1.1.2.1



COMMENT: The distance between the obstruction and the glazing area is measured to the closest point of obstruction.

General

1.1.2.2 For *buildings* that have more complex configuration or internal rooms with borrowed light, Verification Method G7/VM1 or an alternative means may be used as a means to demonstrate compliance.

1.1.3 Compliance pathway

1.1.3.1 This acceptable solution provides a solution for demonstrating compliance with the performance criteria in Building Code clauses G7.3.1 and G7.3.2.

1.1.3.2 Options for demonstrating compliance with G7 Natural Light through the use of acceptable solutions and verification methods are summarised in Table 1.1.3.2. Compliance may also be demonstrated using an alternative solution.

TABLE 1.1.3.2: Demonstrating compliance with G7 Natural Light through acceptable solutions and verification methods

Paragraph 1.1.3.2

Performance clause	Applies to	Relevant acceptable solutions and verification methods
G7.3.1 <i>Illuminance</i> G7.3.2 Awareness of the outside environment	Housing , old people's homes, and <i>early childhood centres</i>	For simple <i>buildings</i> up to 3 storeys in low density developments without borrowed light: G7/AS1 For simple <i>buildings</i> in low, medium and high density developments (including higher rise <i>buildings</i> and apartments) without borrowed light: G7/AS2 For all <i>buildings</i> including complex higher rise <i>buildings</i> , apartments, and those with borrowed light: G7/VM1

1.2 Using this acceptable solution

1.2.1 Determining the classified use

1.2.1.1 Classified uses for *buildings* are described in clause A1 of the Building Code. Where a specific classified use is mentioned within a subheading and/or within the text of a paragraph, this requirement applies only to the specified classified use(s), and does not apply to other classified uses.

1.2.2 Determining the habitable space

1.2.2.1 For the purpose of determining the *habitable space* for compliance with Building Code clause G7 Natural Light; a *habitable space* is one used for activities normally associated with domestic living, but excludes any bathroom, laundry, water-closet, pantry, walk-in wardrobe, corridor, hallway, lobby, clothes-drying room, or other space of a specialised nature occupied neither frequently nor for extended periods. The intent is to ensure occupants within *buildings* are able to have access to *adequate* natural light and to have an awareness of the outside to maintain their health and wellbeing.

Illuminance

Part 2. Illuminance

2.1 Illuminance of habitable spaces

2.1.1 Demonstrating compliance

2.1.1.1 For *habitable spaces* of **housing**, old people's homes, and *early childhood centres*, natural light shall provide an *illuminance* of no less than 30 lux at floor level for 75% of the *standard year*. This is demonstrated through the use of the simple calculation method described in Section 2.1.2.

2.1.2 Calculation of vertical windows in external walls

2.1.2.1 Vertical windows in *external walls* shall have:

- a) An area of glazing of no less than 10% of the floor area, and



COMMENT: An area of glazing of 10% of the floor area equates to approximately 33 lux at floor level for 75% of the *standard year*.

- b) An area of glazing with a *visual light transmittance (VLT)* of no less than 70%, and
 c) A head height of at least:
 i) half the room width for windows on the same side or adjacent sides of a room (see [Figure 2.1.2.1A](#)), or
 ii) one quarter the room width for windows on opposite sides of the room (see [Figure 2.1.2.1B](#)).



COMMENT: Roof windows, skylights and/or clerestory windows could be added in excess of the required area of glazing.

2.1.2.2 High *reflectance* surfaces are required where:

- a) Parts of the floor fall beyond the no-sky line (see [Figure 2.1.2.2](#)), and
 b) where only the minimum area of glazing is provided (see Paragraph 2.1.2.1 a)).

2.1.2.3 Medium *reflectance* surfaces are acceptable in other cases with minimum areas of glazing.

2.1.2.4 *Reflectances* of interior surfaces shall meet the minimum requirements specified in [Table 2.1.2.4](#).

2.1.2.5 For approximate *reflectance* of typical New Zealand *building* finishes, refer to [Table 2.1.2.5](#).

Illuminance

FIGURE 2.1.2.1A: Window head height for a window on one side or adjacent sides of a room
Paragraph 2.1.2.1 c) i)

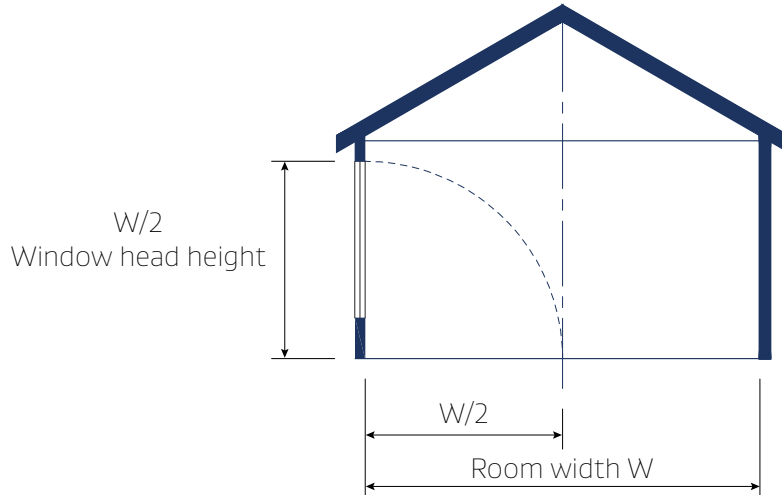
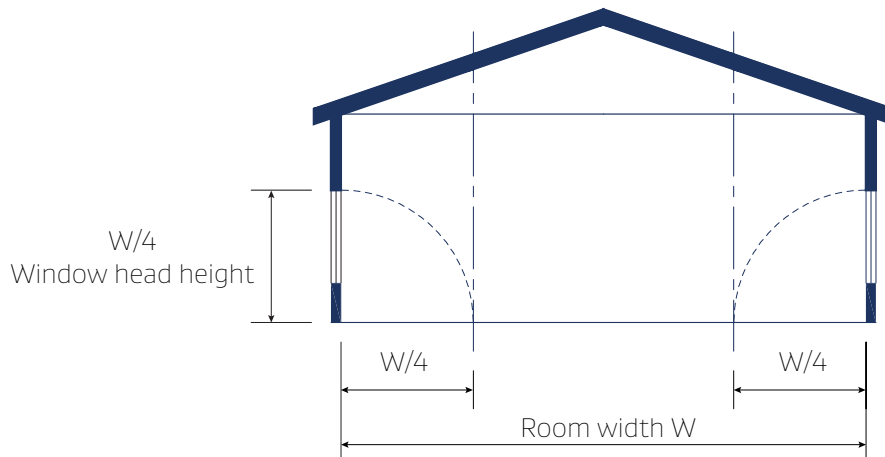


FIGURE 2.1.2.1B: Window head heights for windows on opposite side of a room
Paragraph 2.1.2.1 c) ii)



Illuminance

FIGURE 2.1.2.2: No-sky line condition

Paragraph 2.1.2.2 a)

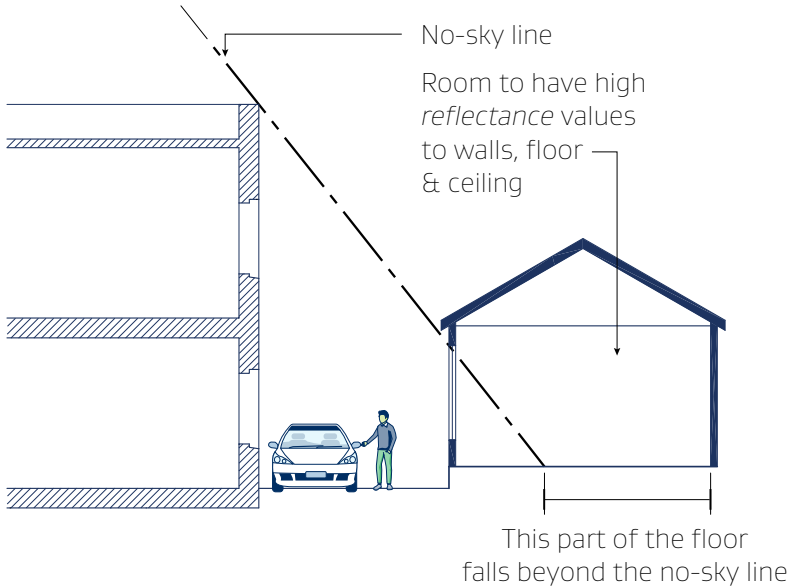


TABLE 2.1.2.4: Acceptable reflectance for interior surface finishes

Paragraph 2.1.2.4

Reflectance level required	Minimum surface reflectance		
	Ceilings	Walls ⁽¹⁾	Floor
Medium <i>reflectance</i>	0.7	0.4	0.2
High <i>reflectance</i>	0.7	0.6	0.4

Note:

(1) Does not include windows.

Illuminance

TABLE 2.1.2.5: Approximate reflectance of typical New Zealand building finishes reproduced from NZS 6703

Paragraph 2.1.2.5

Building finish	Approximate reflectance	Building finish	Approximate reflectance
White emulsion paint on plain plaster surface	0.8	Fibre cement sheet Portland cement (smooth) Natural particle board	0.4
White glazed tiles			
White emulsion paint on acoustic tile	0.7	Natural rimu (dressed) Varnished Pinus radiata ⁽¹⁾	0.3
White emulsion paint on no-fines concrete	0.6	Concrete (light grey) Portland cement (rough) Natural mahogany (dressed) Varnished particle board	0.25
Natural pine plywood	0.55	Varnished rimu (dressed) ⁽¹⁾	0.15
White emulsion paint on wood-wool slab	0.5	Varnished mahogany (dressed) ⁽¹⁾	
Varnished pine plywood ⁽¹⁾ Natural Pinus radiata	0.45	Quarry tiles: Red, heather brown	0.1

Note:

(1) Typical varnishing would be two coats of clear gloss polyurethane varnish.

Part 3. Awareness of the outside environment

3.1 Area of transparent glazing

3.1.1 Demonstrating compliance

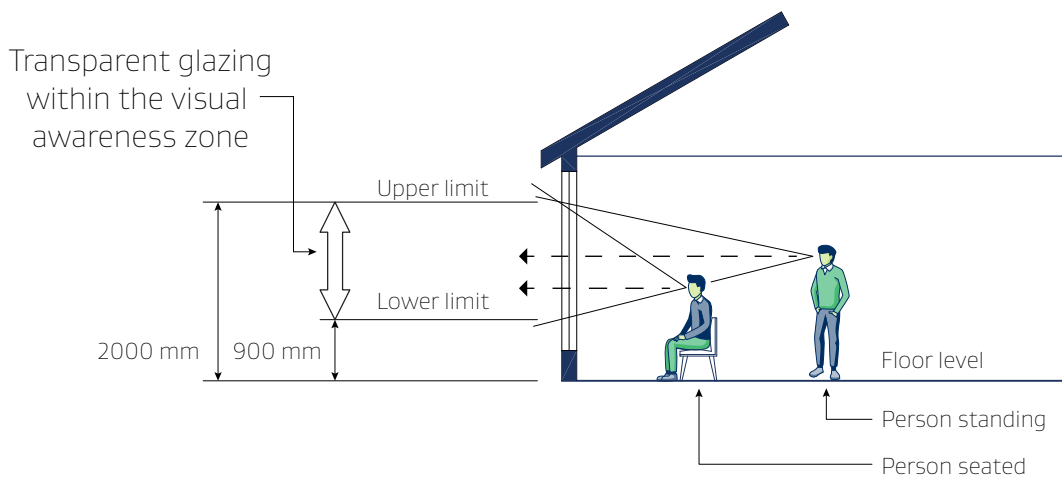
3.1.1.1 For *habitable spaces* of **housing**, old people's homes, and *early childhood centres*, openings to the outside shall have an area of transparent glazing suitable to give awareness of the outside. This is demonstrated through the use of a calculation method described in Subsection 3.1.2.

3.1.2 Calculation of the area of glazing

3.1.2.1 At least 50% of the area of glazing provided for natural light in *habitable spaces* shall be transparent glazing. The transparent glazing shall be located in the zone between the levels 900 mm and 2000 mm from floor level (see Figure 3.1.2.1).

FIGURE 3.1.2.1: Visual awareness zone

Paragraph 3.1.2.1



References and Definitions

Appendix A. References

For purposes of compliance with the Building Code, the standard referenced in this acceptable solution must be the edition, along with the specific amendment, listed below.

Standards New Zealand

NZS 6703: 1984 Code of practise for interior lighting design
Amend C1: 1985

Where quoted

[Table 2.1.2.5](#)

This standard can be accessed from www.standards.govt.nz

Appendix B. Definitions

These definitions are specific to this acceptable solution. Other defined terms found in italics within the definitions are provided in clause A2 of the Building Code.

Adequate	<i>Adequate</i> to achieve the objectives of the Building Code.
Building	Has the meaning given to it by sections 8 and 9 of the Building Act 2004.
Early childhood centre (ECC)	Premises used regularly for the education or care of three or more children (not being children of the persons providing the education or care, or children enrolled at a school being provided with education or care before or after school) under the age of six years old— a) by the day or part of a day; but b) not for any continuous period of more than seven days. <i>ECC</i> does not include home based early childhood services.
External wall	Any vertical exterior face of a <i>building</i> consisting of primary and/or secondary elements intended to provide protection against the outdoor environment.
Glazing-to-wall ratio (GWR)	The percentage of glazing, not including framing and mullions, relative to the area of the <i>external wall</i> containing the vertical window.
Habitable space	A space used for activities normally associated with domestic living, but excludes any bathroom, laundry, water-closet, pantry, walk-in wardrobe, corridor, hallway, lobby, clothes-drying room, or other space of a specialised nature occupied neither frequently nor for extended periods.
Illuminance	The luminous flux falling onto unit area of surface (lumen/m ²).
Reflectance	The ratio of the flux reflected from a surface to the flux incident on it.
Standard year	For the purposes of determining natural lighting, the hours between 8 am and 5 pm each day with an allowance being made for daylight saving.
Visible light transmittance (VLT)	The ratio of luminous flux (light) passing through a translucent surface (e.g. glazing). It is expressed as a percentage of the flux incident upon the surface. A higher value means a greater percentage of visible light passes through the surface.

BUILDING PERFORMANCE

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ISBN (online) 978-1-99-100886-2

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