



Ministry of Business,
Innovation & Employment

C/AS7

**Acceptable Solution for Buildings
Used for Vehicle Storage and Parking
(Risk Group VP)**

For New Zealand Building Code Clauses
C1-C6 Protection from Fire

ARCHIVED



Using this Acceptable Solution

The Ministry of Business, Innovation and Employment may amend parts of this Acceptable Solution at any time. People using this Acceptable Solution should check on a regular basis whether new versions have been published. The current version can be downloaded from www.dbh.govt.nz/compliance-documents

Users should make themselves familiar with the preface to the New Zealand Building Code Handbook, which describes the status of Acceptable Solutions and explains other ways of achieving compliance.

Defined words (italicised in the text) are explained in the Building Code Clause A2 and in the Definitions section of this Acceptable Solution. Classified uses of buildings are explained in the Building Code Clause A1.

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Status of C/AS7

This Acceptable Solution C/AS7, for buildings used for vehicle storage and parking (Risk Group VP), provides a means of compliance with the New Zealand Building Code Clauses C1-C6 Protection from Fire. It is issued under section 22 of the Building Act 2004 as a compliance document.

This Acceptable Solution is one way that can be used to show compliance with the New Zealand Building Code Clauses C1-C6 Protection from Fire. Other ways of complying with the Building Code are described, in general terms, in the preface of the New Zealand Building Code Handbook.

When can you use C/AS7

The Building Code Clauses C1-C6 Protection from Fire take effect on 10 April 2012. The Building Code Clauses C1-C6 Protection from Fire replace the Building Code Clauses C1-C4 Fire Safety on 9 April 2013.

This Acceptable Solution is effective from 15 February 2013. It can be used to show compliance with the Building Code Clauses C1-C6 Protection from Fire. It does not apply to building consents issued before 15 February 2013.

The Compliance Document for Fire Safety Amendment 9 may be used to show compliance with the Building Code Clauses C1-C4 Fire Safety for building consent applications made before 10 April 2013.

From 10 April 2013, the Compliance Document for Fire Safety Amendment 9 ceases to have effect.

Document History		
	Date	Alterations
New document	Effective from 10 April 2012	C/AS7 is a new publication that can be used to show compliance with the Building Code Clauses C1-C6 Protection from Fire.
Errata 1	Effective from 15 February 2013	p. 11 Definitions p. 19 4.1.2 p. 20 5.6.2

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References

For the purposes of New Zealand Building Code compliance, the New Zealand and other Standards, and other documents referred to in this Acceptable Solution (primary reference documents) shall be the editions, along with their specific amendments, listed below. Where the primary reference documents refer to other Standards or other documents (secondary reference documents), which in turn may also refer to other Standards or other documents, and so on (lower order reference documents), then the applicable version of these secondary and lower order reference documents shall be the version in effect at the date this Acceptable Solution was published.

Standards New Zealand

NZS 4510: 2008 Fire hydrant systems for buildings
Amend: 1

NZS 4512: 2010 Fire detection and alarm systems in buildings

NZS 4541: 2007 Automatic fire sprinkler systems
Amend: 1

Where quoted

Table 2.1

Table 2.1

Table 2.1

Definitions

The full list of definitions for italicised words may be found in the New Zealand Building Code Handbook.

Building has the meaning given to it by sections 8 and 9 of the Building Act 2004.

Comment:

Notwithstanding the definition of *building*, a number of separated *buildings* cannot be taken as a single *firecell* for the purposes of this Acceptable Solution.

Building Act 2004 (the Building Act)

means the principal legislation dealing with building controls in New Zealand.

Comment:

The *Building Act* applies to the construction, alteration, and demolition of new and existing buildings throughout New Zealand.

Building Code means the regulations made under section 400 of the *Building Act 2004*

Construct in relation to a *building*, includes to design, build, erect, prefabricate, and relocate the *building*; and construction has a corresponding meaning.

Dead end That part of an open path where escape is possible in only one direction.

Comment:

A *dead end* ceases to exist where the *escape route* reaches a point in the *open path* which offers alternative directions of travel, or at a *final exit* or an *exitway*.

Early childhood centre (ECC) means premises used regularly for the education or care of 3 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—

- a) by the day or part of a day; but
- b) not for any continuous period of more than seven days.

ECC does not include home based early childhood services.

Escape route A continuous unobstructed route from any *occupied space* in a *building* to a *final exit* to enable occupants to reach a *safe place*, and shall comprise one or more of the following: *open paths* and *safe paths*.

Comment:

Doors are not obstructions in an escape route provided they comply with C/AS1 and D1/AS1.

External wall Any exterior face of a *building* within 30° of vertical, consisting of *primary* and/or *secondary elements* intended to provide protection against the outdoor environment, but which may also contain *unprotected areas*.

Comment:

A roof is an *external wall* if within 30° of the vertical.

Final exit The point at which an *escape route* terminates by giving direct access to a *safe place*.

Comment:

Final exits are commonly the external doors from a ground floor, but this applies only if such doors open directly onto a *safe place*. If a *safe place* can be reached only by passing down an alley, or across a bridge, then the *final exit* is not reached until the end of such an alley or bridge. *Final exits*, therefore, should be seen strictly as a point of arrival, rather than as any particular element of a *building*. They are determined entirely by the definition of *safe place*.

Fire The state of combustion during which flammable materials burn producing heat, toxic gases, or smoke or flame or any combination of these.

Firecell Any space including a group of contiguous spaces on the same or different levels within a *building*, which is enclosed by any combination of *fire separations*, *external walls*, roofs, and floors.

Comment:

Floors, in this context, includes ground floors, and those in which the underside is exposed to the external environment (eg, when cantilevered). Note also that internal floors between *firecells* are *fire separations*.

Fire resistance rating (FRR) The term used to describe the minimum *fire* resistance required of *primary* and *secondary elements* as determined in the *standard test* for *fire* resistance, or in accordance with a specific calculation method verified by experimental data from standard *fire* resistance tests. It comprises three numbers giving the time in minutes for which each of the criteria *structural adequacy*, *integrity* and *insulation* are satisfied, and is presented always in that order.

Comment:

Examples of FRRs are:

- a) 60/60/30 indicating *structural adequacy* 60 minutes, *integrity* 60 minutes, *insulation* 30 minutes.
- b) 30/-/- indicating *structural adequacy* 30 minutes, but no time requirement for *integrity* or *insulation*.
- c) 60/30/x indicating *structural adequacy* of 60 minutes, *integrity* of 30 minutes, and a requirement for *insulation*.

Fire safety systems means the combination of all active and passive protection methods used in a *building* to—

- (a) warn people of an emergency; and
- (b) provide for safe evacuation; and
- (c) provide for access by, and the safety of, firefighters; and
- (d) restrict the spread of *fire*; and
- (e) limit the impact of *fire* on structural stability

Fire separation Any *building element* which separates *firecells* or *firecells* and *safe paths*, and provides a specific *fire resistance rating*.

Foamed plastics *Combustible* foamed plastic polymeric materials of low density (typically less than 100 kg/m³) and are classified as cellular polymers which are manufactured by creating a multitude of fine void (typically 90 to 98%) distributed more or less uniformly throughout the product. Examples of *foamed plastics* are latex foams, polyethylene foams, polyvinyl chloride foams, expanded or extruded polystyrene foams, phenolic foams, ureaformaldehyde foams, polyurethane foams and polychloropene foams.

Comment:

1. *Foamed plastics* may be rigid or flexible, but rigid foams are the most common in *building* products. When burnt they tend to generate high levels of heat energy (kJ/kg) and varying quantities of smoke and other toxic gases depending on the nature and volume of the particular product.
2. Where doubt exists as to whether a *building* material is *foamed plastics*, an opinion should be sought from a *person* or organisation with appropriate skill and experience in *fire* engineering. That opinion should be included with the *building consent* application to the *building consent authority*.

Insulation In the context of *fire* protection, the time in minutes for which a prototype specimen of a *fire separation*, when subjected to the *standard test* for *fire* resistance, has limited the transmission of heat through the specimen.

Integrity In the context of *fire* protection, the time in minutes for which a prototype specimen of a *fire separation*, when subjected to the *standard test* for *fire* resistance, has prevented the passage of flame or hot gases.

Comment:

The precise meaning of *integrity* depends on the type of *building elements* being treated and how it is defined in the *standard test* being used.

Intermediate floor Any upper floor within a *firecell* which because of its configuration provides an opening allowing smoke or *fire* to spread from a lower to an upper level within the *firecell*.

Comment:

1. Upper floors within *household units* need not meet the specific *fire* safety requirements which apply to *intermediate floors* in all other situations.
2. An *intermediate floor* may be open to the *firecell* or enclosed with non-*fire* rated *construction*. If enclosed with *fire* rated walls another *firecell* is created.
3. *Household units* occur only in *risk groups* SM and SH. Life safety provisions are governed by the limitations in permitted *open path* lengths.
4. *Risk groups* SM, SI, CA, WB, WS and VP allow limited area intermediate floors of 20% or 40% of the floor area depending on other fire safety requirements. In other situations C/VM2 is to be used.

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Life rating The *fire resistance rating* to be applied to elements of *construction* that allows movement of people from their location in a *building* to a *safe place*.

Property rating The *fire resistance rating* to be applied to elements of *construction* that allows for protection of *other property*.

Relevant boundary Relevant *boundary* means the *boundary* of an *allotment* that is *other property* in relation to the *building* in question and from which is measured the separation between the *building* and that *other property*; and for the *external wall* of any *building*, the *relevant boundary* is the nearest of—

- (a) a *boundary* of a freehold *allotment*, except that if the *other property* is a *road*, *railway line*, or public *open space*, the *relevant boundary* is the *boundary* on the far side of that *other property*; or
- (b) a *boundary* of a cross-lease or a company lease or a licence, except that if the *other property* is *open space* to which the lessee or licensee of the *building* in question has

an exclusive right of access and occupation or to which 2 or more occupiers of the *building* in question have rights of access and occupation, the *relevant boundary* is the *boundary* on the far side of that *other property*; or

- (c) a *boundary* shown on a unit plan (but excluding a *boundary* between a principal unit and its accessory unit), except that if the *other property* is open space and is common property, the *relevant boundary* is the *boundary* on the far side of that *other property*.

Comment:

1. Where an easement, such as a right of way, occurs within an *allotment*, the *relevant boundary* shall remain the same as if the easement did not exist.
2. *Boundaries* within a cross-lease or company lease or licence are shown on a survey plan. In some cases the *boundary* is the *external wall* or roof of a *building*.
3. The unit title *boundaries* of principal units, accessory units, and common property are shown in the unit plan. A *boundary* is frequently an internal or *external wall*, an upper floor, or the roof of a *building*.
4. A wall along a *boundary* between two *allotments* is called a "party wall" when the *owners* of the *allotments* each have legal rights in respect of that wall registered by way of easements on one or both titles. An internal wall between cross-leases, company leases, or unit titles, or between one of them and common property, is not generally called a party wall but in that case also the lessees, unit title holders, or corporate body concerned each have legal rights in respect of that wall. Such a wall separates areas which are *other property* in relation to each other, but the wall itself is part of each property. The *fire* protection consequence of that legal concept is that such a wall can be regarded as a *fire separation* providing protection against horizontal *fire* spread in each direction. In other words, that wall may provide the appropriate *FRR* instead of each property having its own wall of that *FRR*.

Risk group The classification of a *building* or *firecells* within a *building* according to the use to which it is intended to be put.

Safe path That part of an *exitway* which is protected from the effects of *fire* by *fire separations*, *external walls*, or by distance when exposed to open air.

Stability In the context of *fire* protection is the support provided to a *building element* having a *FRR*, intended to avoid premature failure due to structural collapse as a result of applied load, dead and live loads or as a result of any additional loads caused by *fire*.

Structural adequacy In the context of the standard test for *fire* resistance, is the time in minutes for which a prototype specimen has continued to carry its applied load within defined deflection limits.

Comment:

The *fire* design load should be as specified in B1/VM1.

Part 1: General

CONTENTS

- 1.1 Introduction and scope
- 1.2 Using this Acceptable Solution

1.1 Introduction and scope

This Acceptable Solution can be used for establishing compliance with NZBC C1 to C6 Protection from Fire. It is one of a suite of Acceptable Solutions C/AS1 to C/AS7, each of them corresponding to a *risk group* (summarised in Table 1.1 and defined in Paragraph 1.1.1).

If the uses of a *building*, or part of a *building*, cover more than one *risk group*, one or more of these Acceptable Solutions may need to be followed to demonstrate compliance. Notes shown under 'Comment:', occurring throughout this document, are for guidance purposes only and do not form part of this Acceptable Solution. Words in *italic* are defined at the front of this document. For ease of use, paragraphs, tables and figures containing similar information are allocated the same reference numbers in each of the Acceptable Solutions.

Comment:

It is recommended that the commentary document for Acceptable Solutions C/AS1 to C/AS7 be read in conjunction with this Acceptable Solution.

Table 1.1 Risk groups and Acceptable Solutions			
	Acceptable Solution	Risk group	Applies to
C/AS1	Single household units and small <i>multi-unit dwellings</i>	SH	Houses, townhouses and small <i>multi-unit dwellings</i>
C/AS2	Sleeping (non institutional)	SM	Permanent accommodation eg, apartments Transient accommodation eg, hotels, motels, hostels, backpackers Education accommodation
C/AS3	Care or detention	SI	Institutions, hospitals (excluding special care facilities), residential care, resthomes, medical day treatment (using sedation), detention facilities (excluding prisons)
C/AS4	Public access and educational facilities	CA	Crowds, halls, recreation centres, public libraries (<2.4 m storage height), cinemas, shops, personal services (eg, dentists and doctors except as included above, beautician and hairdressing salons), schools, restaurants and cafes, <i>early childhood centres</i>
C/AS5	Business, commercial and low level storage	WB	Offices (including professional services such as law and accountancy practices), laboratories, workshops, manufacturing (excluding <i>foamed plastics</i>), factories, processing, cool stores (capable of <3.0 m storage height) and other storage <i>buildings</i> capable of <5.0 m storage height, light aircraft hangars
C/AS6	High level storage and other high risks	WS	Warehouses (capable of ≥5.0 m storage height), cool stores (capable of ≥3.0 m storage height), trading and bulk retail (≥3.0 m storage height)
C/AS7	Vehicle storage and parking	VP	Vehicle parking – within a <i>building</i> or a separate <i>building</i>

Scope

1.1.1 The scope of this Acceptable Solution is restricted to *risk group VP*. This includes:

- a) Car parking *buildings*
- b) Vehicle parking or stacking within *buildings*
- c) Goods vehicle parking
- d) Service vehicle and unloading areas (where required by Acceptable Solutions C/AS2 to C/AS6)
- e) Car showrooms
- f) Car storage warehouses, and
- g) Mechanical workshops.

Comment:

Vehicles include, but are not limited to, cars, trucks and boats.

1.2 Using this Acceptable Solution

The requirements for *risk group VP* are the same as those for *risk group WB*, which are contained in Acceptable Solution C/AS5, with the following additions/exceptions:

- a) If the following paragraphs have the same numbering as those in Acceptable Solution C/AS5, the requirements in this Acceptable Solution shall replace those in C/AS5, and
- b) If the following paragraphs have different numbering to those in Acceptable Solution C/AS5, the requirements are unique to this Acceptable Solution and shall apply in addition to those in C/AS5.

Part 2: Firecells, fire safety systems and fire resistance ratings

CONTENTS

- 2.2 Fire safety systems
- 2.3 Fire resistance ratings

2.2 Fire safety systems

2.2.1 The *fire safety systems* for *firecells* required for this *risk group* shall be as follows. Alarm system types shall be as defined in Table 2.1.

For ≤ 10 m escape height:

- a) Type 2 alarm system that need not be connected to the Fire Service, and
- b) Type 18 *building fire* hydrant system, unless the Fire Service hose run distance from Fire Service vehicular access to any point on any floor is less than 75 m.

For > 10 m escape height:

- a) Type 3 alarm system that need not be connected to the Fire Service, and
- b) Type 18 *building fire* hydrant system, unless the Fire Service hose run distance from Fire Service vehicular access to any point on any floor is less than 75 m.

Storage or parking using a vehicle stacking system

- a) Type 6 system, and
- b) Type 18 *building fire* hydrant, unless Fire Service hose run distance from Fire Service vehicular access (see Acceptable Solution C/AS5 Part 6) to any point on any floor is less than 75 m.

If a *risk group* VP is within a *building* that is protected with an automatic *fire* alarm system, the *risk group* VP must have at the minimum a Type 3 automatic heat detection system.

Table 2.1 Fire safety systems specified in this Acceptable Solution		
Type of system	System description	Relevant Standards for installation
2	Alarm system with manual call points	NZS 4512
3	Heat detection system with manual call points	NZS 4512
6	Automatic <i>fire</i> sprinkler system	NZS 4541
18	<i>Building fire</i> hydrant system	NZS 4510

2.3 Fire resistance ratings

FRR values

2.3.1 Unless explicitly stated otherwise in this Acceptable Solution, the *fire resistance ratings (FRRs)* that apply for this *risk group* shall be as follows:

Life rating = 60 minutes – applies to *fire* rating requirements in Part 3: Means of escape and Part 4: Control of internal fire and smoke spread.

Property rating = 60 minutes – applies to *fire* rating requirements in Part 5: Control of external fire spread.

2.3.2 If a *fire* sprinkler system or cross ventilation in accordance with Paragraph 4.1.2 is provided, the *FRRs* shall be:

Life rating = 30 minutes

Property rating = 30 minutes.

2.3.3 If there is more than one *risk group* on one floor in the *building*, the highest required *FRR* shall be applied to common spaces and shared *escape routes* for that floor level.

Part 3: Means of escape

CONTENTS

3.4 Length of escape routes

3.4 Length of escape routes

3.4.1 An *escape route* may be any length, but:

- a) The lengths of *dead ends* and total *open paths* shall not exceed the distances given in Table 3.2, adjusted as necessary for:
 - i) reductions on *intermediate floors* (see Paragraph 3.4.3 of Acceptable Solution C/AS5), and
 - ii) reductions on stairs and ladders (see Paragraph 3.4.4 of Acceptable Solution C/AS5), and
- b) If the distance to the *final exit* exceeds the allowable length for total *open path*, the remainder of the *escape route* shall be a *safe path*. (See Paragraph 3.9.7 of Acceptable Solution C/AS5 for *safe path* length restrictions within a single floor level.)

Table 3.2 Travel distances on escape routes for risk group VP			
	No system and Type 2 system	Type 3 system	Type 6 system
<i>Dead end open path</i>	35 m	45 m	70 m
<i>Total open path</i>	90 m	110 m	180 m

Part 4: Control of internal fire and smoke spread

CONTENTS

4.1 Firecells

4.10 Intermittent activities

4.1. Firecells

4.1.1. Spaces within a *building* to which this Part applies shall be separate *firecells*, with the following requirements:

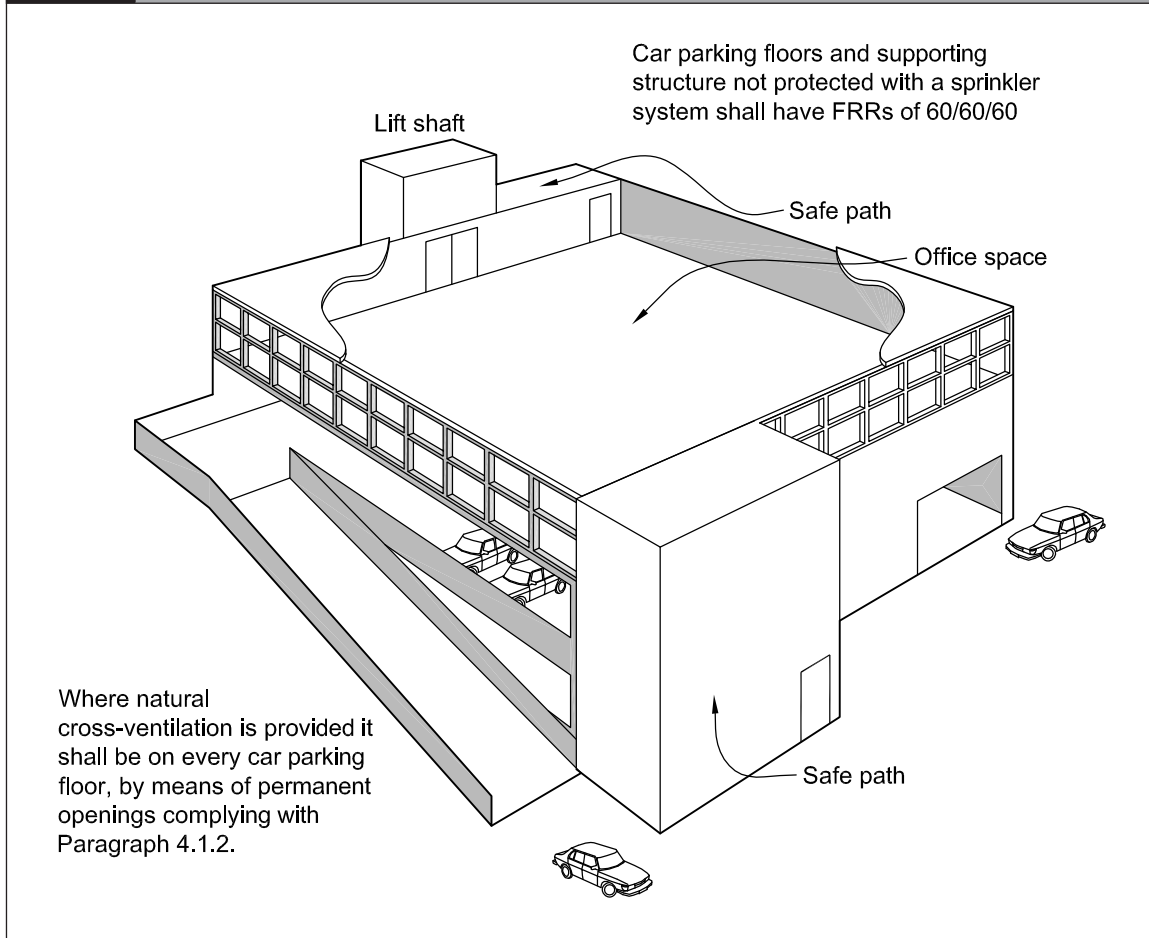
- a) *Firecells* shall be *fire separated* from other *firecells* by either:
 - i) the *life rating* specified in Paragraph 2.3 of this Acceptable Solution if the *firecell* is categorised in *risk group* VP, or
 - ii) the higher of the two *life ratings* if it is categorised in another *risk group* (see Paragraph 2.3 of the relevant Acceptable Solution to determine that rating).
- b) Within the car park *firecell*, all floors (including *intermediate floors*) and their supporting structures shall be *fire* rated to the *life rating*. The *property rating* shall be used where necessary to achieve protection from spread of *fire* to neighbouring property/titles. See Figure 4.18.
- c) Within the car park *firecell*, where the car park spaces and other areas of that *firecell* are unit titled, it is permitted to have the car park spaces and an associated storage area (limited to plan area of 3.0 m² and maximum height 3.0 m) unseparated from adjacent titles, and
- d) Service vehicle and unloading areas may be part of other support activity *firecells*.

Comment:

A car parking *building* may be one *firecell* extending from below the level of the *final exit* to any number of floors above, with each floor (except the lowest) being an *intermediate floor*.

In the absence of *fire separations* on a single floor, the space is treated as a single *firecell* and the *fire safety systems* for the primary *risk group* apply throughout the floor.

Figure 4.18 Car parking
Paragraphs 4.1.1 and 4.1.2



Cross ventilation

4.1.2. Cross ventilation requirements (see Figure 4.18) for every car parking floor shall be as follows:

- a) Where there is parking for more than 10 cars and the *building* is not sprinklered, cross ventilation in accordance with b) is required, and
- b) Effective cross ventilation in a car parking *firecell* is achieved by providing perimeter walls on each floor with permanent openings to the outside environment. The size of those openings shall either be:
 - i) no less than 50% of the wall area in each of any two opposing walls, or
 - ii) no less than 50% of the total perimeter wall area, with those openings distributed uniformly along at least half the total perimeter wall length.

Errata 1
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4.10 Intermittent activities

Solid waste storage

4.10.2 Solid waste storage areas need not be enclosed. Where they are enclosed within any *firecell*, they shall themselves be a separate *firecell* separated from adjacent *firecells* by *fire separations* having an *FRR* of 60 minutes or of 30 minutes if sprinklered (see Paragraph 4.11.5 of Acceptable Solution C/AS5 for waste chutes).

Part 5: Control of external fire spread

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- 5.6 Horizontal fire spread from roofs and open sided buildings
- 5.7 Vertical fire spread

5.6. Horizontal fire spread from roofs and open sided buildings

5.6.1. In *buildings* other than offices and laboratories where the roof of an unsprinklered *firecell* is within 1.0 m of a *relevant boundary*, horizontal *fire* spread shall be resisted by either:

- a) *Fire* rating (for *fire* exposure from below) that part of the roof within 1.0 m of the *relevant boundary*. The *FRR* shall be based on the *property rating* for the *firecell*, except that *insulation* is not required, or
- b) Extending the wall, being a *fire separation* along or adjacent to the *relevant boundary*, no less than 450 mm above the roof to form a parapet.

Comment:

Sprinklered *firecells* within 1.0 m of a *relevant boundary* are not required to have *fire* rated roofs or walls extended to form parapets.

Parapets for vehicle parking

5.6.2. Where vehicles are parked on an area of roof within 1.5 m of a *relevant boundary*, but the conditions of Acceptable Solution C/AS5 Paragraph 5.7.16 (for an adjacent higher wall) do not apply, a parapet shall be *constructed*. The parapet shall extend no less than 1.5 m above the roof level, on the side of the *relevant boundary*. The parapet shall have an *FRR* of no less than 30 minutes.

Errata 1
Feb 2013

5.7 Vertical fire spread

Roof vehicle parking

5.7.19. Where a roof used for vehicle car parking is within 1.5 m of a higher *external wall* and the adjacent *building* above contains sleeping *risk groups*, *external wall* protection above the adjacent lower roof shall be provided by *constructing* the critical part of the wall (that closer to the roof than 3.0 m vertically or 1.5 m horizontally) with an *FRR* of no less than 120/120/120.

5.7.20. Vertical distances shall be measured for vehicle car parking from the *building* roof level. (See Acceptable Solution C/AS5 Paragraph 5.6.1 for parapet protection against horizontal *fire* spread.)

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