

Compliance Document for New Zealand Building Code Clauses C1, C2, C3, C4 Fire Safety

Prepared by the Department of Building and Housing

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Status of Compliance Documents

Compliance Documents are prepared by the Department of Building and Housing in accordance with section 22 of the Building Act 2004. A Compliance Document is for use in establishing compliance with the New Zealand Building Code.

A person who complies with a Compliance Document will be treated as having complied with the provisions of the Building Code to which the Compliance Document relates. However, a Compliance Document is only one method of complying with the Building Code. There may be alternative ways to comply.

Users should make themselves familiar with the preface to the New Zealand Building Code Handbook, which describes the status of Compliance Documents and explains alternative methods of achieving compliance.

Defined words (italicised in the text) and classified uses are explained in Clause A1 of the Building Code and in the Definitions at the start of this Compliance Document.

C1, C2, C3 and C4: Document History			
	Date	Alterations	
First published December 2000	Effective from 1 June 2001	This document replaces all previous editions of the individual documents C1, C2, C3 and C4.	
Errata	1 July 2001	p. 2 Document History, Status p. 29 Definitions	p. 43 Table 2.1
Amendment 1	6 January 2002	pp. 4-7 Code Clauses C2, C3	
Amendment 2	24 April 2003	p. 201 A1.3, A2.1.1 Type 1	p. 219 Index
Amendment 3	25 February 2004	pp. 16-17 Contents pp. 19-22 References p. 27 Definitions p. 33 VM1	pp. 193-199 Part 9 pp. 213-214, 221-223, 226-228 Index
Amendment 4 4 July 2005	Effective 1 October 2005	p. 2 Document History, Status p.13 Contents pp. 19-20 References pp. 23-29, 31-32 Definitions p. 43 Table 2.1 p. 58 3.5.4 p. 73 3.15.3 p. 89 3.18.1 p. 98 4.5.8 p. 99 4.5.19-4.5.22 pp. 101-106 Table 4.1 p. 108 5.3.1, 5.3.2 pp. 109-11 5.6.2-5.6.13 p. 116 5.9.4 p. 119 6.2.1	p. 120 6.5-6.6.2 p. 121 6.6.4, 6.6.7, 6.7.2 p. 122 6.7.5, 6.7.6, 6.7.9 p. 123 6.9.2 p. 125 6.10.2 p. 127 6.11.1 p. 131 6.14.3 pp. 133-5 6.16.2-6.16.7 p. 142 6.19.13 p. 145 6.20.16 p. 175 7.9.3 p. 176 7.9.8 pp. 179-180 7.10.2-7.10.8 pp. 210-212 Appendix D pp. 213-215, 217-221, 224, 225, 227, 228, Index
Note: Page numbers relate to the document at the time of Amendment and may not match page numbers in current document.			

Document Status

The most recent version of this document, as detailed in the Document History, is approved by the Chief Executive of the Department of Building and Housing. It is effective from 1 October 2005 and supersedes all previous versions of this document.

People using this Compliance Document should check for amendments on a regular basis. The Department of Building and Housing may amend any part of any Compliance Document at any time. Up-to-date versions of Compliance Documents are available from www.building.dbh.govt.nz

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Amend 4
Oct 2005 |

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References

For the purposes of New Zealand Building Code compliance, acceptable reference documents include only the quoted edition and specific amendments listed below.

		Where quoted (Unless otherwise stated all references apply to C/AS1)
Standards New Zealand		
	NZS 4203: 1992 General structural design and design loadings for buildings <i>Corrigendum: 1</i>	5.9.5 c) Comment 2
	NZS 4232:- Part 2: 1988 Performance criteria for fire resisting closures Fire resisting glazing systems	5.8.3 a), 5.8.4, Figure 5.1
	NZS 4503: 1993 The distribution, installation and maintenance of hand operated fire fighting equipment for use in buildings	A2.1 (Type 14)
	NZS 4510: 1998 Fire hydrant systems for buildings	A2.1 (Type 18)
	NZS 4512: 2003 Fire detection and alarm systems in buildings	6.22.14 b) i), A2.1 (Type 9), C8.1.6
	NZS 4515: 2003 Fire sprinkler systems for residential occupancies	6.6.4 Comment, 6.16.8, 6.18.10, D3.1.1, Table 7.5
Amend 4 Oct 2005	NZS 4541: 2003 Automatic fire sprinkler systems	6.6.4 Comment, 6.16.8, 6.18.10, 6.19.9, 6.22.6, D2.1.1, Table 7.5
Amend 3 Feb 2004	NZS 5261: 2003 Gas installation	9.2.1, 9.2.2
	NZS 6104: 1981 Specification for emergency electricity supply in buildings	6.23.3
Amend 3 Feb 2004	NZS/BS 476:- Part 20: 1987 Fire tests on building materials and structures Method for determination of the fire resistance of elements of construction (general principles) <i>Amend: 6587</i>	C7.1.1
	Part 21: 1987 Methods for determination of the fire resistance of loadbearing elements of construction	C7.1.1
	Part 22: 1987 Methods for determination of the fire resistance of non-loadbearing elements of construction	C7.1.1
Standards Australia		
	AS 1366:- Part 1: 1992 Rigid cellular plastics sheets for thermal insulation Rigid cellular polyurethane (RC/PUR) <i>Amend: 1</i>	Table 6.3

Definitions

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

- Access route** A continuous route that permits people and goods to move between the apron or *construction edge* of the *building* to spaces within a *building*, and between spaces within a *building*.
- Amend 4
Oct 2005 | **Accessible** Having features to permit use by a *person with a disability*.
- Amend 4
Oct 2005 | **Accessible route** An *access route* usable by a *person with a disability*. It shall be a continuous route that can be negotiated unaided by a wheelchair user. The route shall extend from street boundary or car parking area to those spaces within the *building* required to be *accessible* to enable a *person with a disability* to carry out normal activities and processes within the *building*.
- Amend 4
Oct 2005 | **Accessible stairway** A *stairway* having features for use by a *person with a disability*. *Buildings* required to be *accessible* shall have at least one *accessible stairway* leading off an *accessible route* whether or not a lift is provided.
- Amend 4
Oct 2005 | **Adequate** *Adequate* to achieve the objectives of the *building code*.
- Adjacent building** A nearby *building*, including an adjoining *building*, whether or not erected on *other property*.
- Amend 4
Oct 2005 | **Allotment** has the meaning ascribed to it by section 10 of the Building Act 2004.
- Alter**, in relation to a *building*, includes to rebuild, re-erect, repair, enlarge and extend; and **alteration** has a corresponding meaning.
- Appliance hearth** A layer of *non-combustible* material under or near an appliance. It may be either part of the *building* structure or an overlay on a *combustible* floor.
- Backflow** A flowing back or reversal of the normal direction of the flow caused by *back pressure* and includes *back-siphonage*.
- Backflow prevention device** A device that prevents *backflow*.
- Basement** Any *firecell* or part of a *firecell* below the level of the lowest *final exit*.
- COMMENT:**
Because *fire safety precautions* are increased with increases in *escape height*, the precautions for *basements* increase with *basement* depth. Thus a single floor *building* with one *basement* level is treated as a two floor *building*, a single floor *building* with three *basement* levels as a four floor *building*, and the requirements of Table 4.1 shall be applied downwards as opposed to upwards for levels above ground.
- Boundary** means any *boundary* which is shown on a survey plan approved by the Chief Surveyor and which is deposited in the Titles Office whether or not a new title has been issued.
- Building** has the meaning ascribed to it by sections 8 and 9 of the Building Act 2004. Amend 4
Oct 2005
- Building code** means the regulations made under section 400 of the Building Act 2004. Amend 4
Oct 2005
- Building consent** means a consent to carry out *building work* granted by a *building consent authority* under section 49 of the Building Act 2004. Amend 4
Oct 2005
- Building consent authority** has the meaning ascribed to it by section 7 of the Building Act 2004. Amend 4
Oct 2005
- Building element** Any structural and non-structural component or assembly incorporated into or associated with a *building*. Included are *fixtures*, services, *drains*, permanent mechanical installations for access, glazing, partitions, ceilings and temporary supports.
- Building height** The vertical distance between the floor level of the lowest *final exit* from the *building*; and the highest occupied floor level containing or supporting any *purpose group* other than IE, IA or ID, or penthouses used to enclose *stairways*, liftshafts or machinery rooms located on or within the roof.
- Cavity barrier** A *construction* provided to close openings within a *concealed space* against the passage of *fire*, or to restrict the spread of *fire* within such spaces.

Chimney A *non-combustible* structure which encloses one or more *flues*, *fireplaces* or other heating appliances.

Chimney back The *non-combustible* wall forming the back of a *fireplace*.

Chimney breast The front *fireplace* wall construction above the *fireplace* opening.

Chimney jambs The side walls of a *fireplace*.

Code compliance certificate means a certificate issued by a *building consent authority* under section 95 of the Building Act 2004.

Amend 4
Oct 2005

Combustible See *non-combustible*.

Compliance schedule means a *compliance schedule* required under section 100 of the Building Act 2004.

Amend 4
Oct 2005

Concealed space Any part of the space within a *building* that cannot be seen from an *occupied space*.

COMMENT:

This term includes any ceiling space, roof space, space under a raised floor (such as computer rooms, floors, or stages), plenums, spaces under a tiered floor, "left-over spaces" created when some structural element or the like has been covered in; small service or duct spaces within the volume of a *firecell* and the like, but not a *protected shaft*.

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*.

Doorset A complete assembly comprising a door leaf or leaves including any glazed or solid panels adjacent to or over the leaves within the door frame including hardware or other inbuilt features; and a door frame, if any, with its fixings to the wall and, for a sliding or tilting door, all guides and their respective fixings to the lintel, wall or sill.

Drain A pipe normally laid below ground level including fittings and equipment and intended to convey *foul water* or *surface water* to an *outfall*.

Draught diverter A device, without moving parts, fitted in the *flue* of an appliance for isolating the combustion system from the effects of pressure changes in the secondary *flue*.

Early childhood centre A facility used for the education or care of children under the age of six, and required to be licensed under the Education (Early Childhood Centres) Regulations 1998.

Amend 4
Oct 2005

Escape height The height between the floor level in the *firecell* being considered and the floor level of the required *final exit* which is the greatest vertical distance above or below that *firecell*.

COMMENT:

1. It is necessary only to use the greatest height to the exits required for the *firecell* being considered, even though the *building* may have other *final exits* at lower or higher levels.
2. Where the *firecell* contains *intermediate floors*, or upper floors within *household units* the *escape height* shall be measured from the floor having the greatest vertical separation from the *final exit*.

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*, *protected paths* and *safe paths*.

COMMENT:

Doors are not obstructions in an *escape route* provided they comply with C/AS1 Part 3 and D1/AS1.

Exitway All parts of an *escape route* protected by *fire* or *smoke separations*, or by distance when exposed to open air, and terminating at a *final exit*.

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 (e.g. when cantilevered). Note also that internal floors between *firecells* are *fire separations*.

Firecell rating (F) The *fire resistance rating (FRR)* intended to prevent *fire* spread to another *firecell*, for sufficient time to provide for safe evacuation of occupants and protection of adjacent *household units* and sleeping areas in the *building* of *fire* origin and fire fighters engaged in fire fighting and rescue operations.

COMMENT:

1. The purpose of the *firecell rating* is to prevent premature collapse of elements of structure in order to protect:

- a) The occupants, some of whom may have to remain in the *building* for some time while evacuation proceeds, particularly if the *building* is a large one.
- b) Adjacent *household units* and sleeping areas in the *building* of *fire* origin.
- c) Fire fighters engaged on rescue and fire fighting operations (although this is limited because property protection in the *building* of origin is not

a matter covered by the New Zealand Building Code except as required by b) above).

2. The use of the *F rating* to determine the *FRR* of a *primary* or *secondary element* is discussed in C/AS1 Part 5.

Fire damper A device with a specified *FRR* complete with fixings and operating mechanism for automatically closing off an airway where it passes through a *fire separation*.

COMMENT:

An airway may be a duct, plenum, ceiling space, roof space or similar *construction* used for the passage of ventilating air.

Fire door A doorset, single or multi-leaf, having a specific *fire resistance rating*, and in certain situations a smoke control capability, and forming part of a fire separation. The door, in the event of fire, if not already closed, will close automatically and be self latching.

COMMENT:

Requirements for *fire doors* are given in C/AS1 Paragraphs 6.19.1 and 6.19.8 and Appendix C Paragraph C8.1.

Fire hazard means the danger of potential harm and degree of exposure arising from:

- a) the start and spread of *fire*; and
- b) the smoke and gases that are generated by the start and spread of *fire*.

Fire hazard category (FHC) The number (graded 1 to 4 in order of increasing severity), used to classify *purpose groups* or activities having a similar *fire hazard*, and where fully developed *fires* are likely to have similar impact on the structural stability of the *building*.

COMMENT:

Fire hazard categories are identified in C/AS1 Table 2.1.

Fire intensity The release rate of calorific energy in watts, determined either theoretically or empirically, as applicable.

Amend 4
Oct 2005

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Oct 2005

Flame barrier A material or system applied or installed to protect another *building element* from flame contact. The protection shall be effective for no less than 10 minutes exposure in the *standard test* for *fire* resistance.

COMMENT:

1. The principal use of *flame barriers* is to delay ignition of *foamed plastics* materials.
2. Refer to Appendix C Paragraph C10.1 for details of the test requirements for *flame barriers*.

Flammability index (FI) That index number for flammability, which is determined according to the *standard test* method for flammability of thin flexible materials.

Flue The passage through which the products of combustion are conveyed to the outside.

Flue liner Pipes or linings of *fire clay*, metal or *fire brick*, surrounding *flues*.

Flue system A series of interconnecting *flue* pipe casings which form a safe passage (*flue*) for conveying products of combustion from within an appliance to the outside of a *building* or structure.

Amend 3
Feb 2004

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*.

Amend 4
Oct 2005

Group sleeping area A *firecell* containing communal sleeping accommodation for a specified number of people who may or may not be known to one another. Partial subdivision within the *firecell* is permitted with specific limitation including that no *occupied space* is fully enclosed and all *occupied spaces* are open and available to all occupants at any time. A *group sleeping area firecell* may include spaces for associated direct support functions, such as hygiene facilities and tea making (not cooking) activities, for use by the occupants. It does not include spaces, such as waiting rooms, lounges, dining rooms or kitchens, providing a communal service function for all occupants.

COMMENT:

1. Examples of *group sleeping area firecells* are dormitories, hospital wards, *wharehau*, backpacker hostels and ski lodges.
2. The maximum number of people permitted in a *group sleeping area firecell*, and the permitted form of subdivision, will depend on the ability of the occupants to react to the presence of *fire* and escape to a *safe place*.

Handrail A rail to provide support to, or assist with the movement of a *person*.

Hazardous Creating an unreasonable risk to people of bodily injury or deterioration of health.

Hazardous substance has the meaning ascribed to it by the Fire Service Act 1975.

Hearth The insulating floor under the *fire* and in front and at the sides of the *fireplace*.

Hold-open device A device which holds a *smoke control door* or *fire* door open during normal use, but is released by deactivating the device by an automatic *fire* detection system, allowing the door to close automatically under the action of a self-closing device.

Household unit

- a) means any *building* or group of *buildings*, or part of a *building* or group of *buildings*, that is:
- i) used, or intended to be used, only or mainly for residential purposes; and
 - ii) occupied, or intended to be occupied, exclusively as the home or residence of not more than one household; but
- b) does not include a hostel, boarding house or other specialised accommodation.

Amend 4
Oct 2005

HVAC An abbreviation for heating, ventilating and airconditioning.

Insulating material A material that has a thermal conductivity of less than 0.07 W/mK.

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.

Intended use, in relation to a building:

- a) includes any or all of the following:
- i) any reasonably foreseeable occasional use that is not incompatible with the *intended use*;
 - ii) normal maintenance;
 - iii) activities undertaken in response to *fire* or any other reasonably foreseeable emergency; but
- b) does not include any other maintenance and repairs or rebuilding.

Amend 4
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Intermediate floor Any upper floor within a *firecell* and which is not *fire* separated from the floor below. Upper floors within *household units* need not meet the specific *fire* safety requirements which apply to *intermediate floors* in all other situations.

COMMENT:

1. 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.
2. *Household units* occur only in *purpose groups* SR and SH. Life safety provisions are governed by the limitations in permitted *open path* lengths.

Limited area atrium A single *firecell* in which individual *occupied spaces* at different levels open onto a common enclosed space. Limitations are placed on the number of *intermediate floors* (no more than two levels), individual floor areas and permitted *occupant load*, depending on the provisions for smoke detection, smoke control and the *means of escape from fire*.

COMMENT:

Typical *limited area atrium buildings* are small shopping malls, and motel complexes with a central atrium feature open to a number of floors.

Lock-out The safety shut down condition of the control system such that re-start cannot be accomplished without manual resetting.

Means of escape from fire in relation to a *building* that has a floor area,

- a) means continuous unobstructed routes of travel from any part of the floor area of that *building* to a place of safety; and
- b) includes all active and passive protection features required to warn people of *fire* and to assist in protecting people from the effects of *fire* in the course of their escape from the *fire*.

Amend 4
Oct 2005

Multi-unit dwelling Applies to a *building* or use which contains more than one separate household or family.

COMMENT:

For *fire* safety purposes each *household unit* is a separate *firecell*.

Non-combustible Materials shall be classified as *non-combustible* or *combustible* when tested to AS 1530 Part 1.

Notional boundary The *boundary* which for *fire* safety purposes, is assumed to exist between two *buildings* on the same property under a single land title.

COMMENT:

A *notional boundary* may be located anywhere between the two *buildings*, and once chosen determines the *unprotected area* permitted in each *building*. Locating it closer to one *building* than the other, may be an advantage where it is planned for a rear wall without windows to face the front wall of the other *building* requiring windows.

Occupant load The greatest number of people likely to occupy a particular space within a *building*. It is determined by:

- a) multiplying the number of people per m² (occupant density) for the activity being undertaken, by the total floor area, or
- b) for sleeping areas, counting the number of beds, or
- c) for fixed seating areas, counting the number of seats.

Occupied space Any space within a *building* in which a *person* will be present from time to time during the *intended use* of the *building*.

Open path That part of an *escape route* (including *dead ends*) within a *firecell* where occupants may be exposed to *fire* or smoke while making their escape.

Open space includes land on which there is and will be no *buildings* and which has no roof over any part of it other than overhanging eaves.

Other property means any land or *buildings* or part of any land or buildings, that are:

- a) not held under the same *allotment*; or
- b) not held under the same *ownership*; and includes a *road*.

Owner in relation to any land and any *buildings* on that land:

- a) means the *person* who:
 - i) is entitled to the rack rent from the land
 - ii) would be so entitled if the land were let to a tenant at a rack rent; and
- b) includes:
 - i) the *owner* of the fee simple of the land; and
 - ii) any *person* who has agreed in writing, whether conditionally or unconditionally, to purchase the land or any leasehold estate or interest in the land, or to take a lease of the land and is bound by the agreement because the agreement is still in force.

Penetration A pipe, cable or duct passing through an opening in a *fire separation*.

Person with a disability means a *person* who has an impairment or a combination of impairments that limits the extent to which the person can engage in the activities, pursuits, and processes of everyday life, including, without limitation, any of the following:

- a) a physical, sensory, neurological, or intellectual impairment
- b) a mental illness.

Person includes the Crown, a corporation sole, and also a body of *persons*, whether corporate or unincorporated.

Pitch line The line joining the leading edge or *nosings* (if any) of successive stair treads within a single flight of a *stairway*.

Primary element A *building element* providing the basic loadbearing capacity to the structure, and which if affected by *fire* may initiate instability or premature structural collapse.

COMMENT:

Suspended floors in multi-storey *buildings* are *primary elements*.

Amend 4
Oct 2005

Amend 4
Oct 2005

Amend 4
Oct 2005

Smokecell A space within a *building* which is enclosed by an envelope of *smoke separations*, or *external walls*, roofs, and floors.

Smoke control door A *doorset* with closefitting single or multi-leaves which are impermeable to the passage of smoke, fitted with smoke seals and installed within a *smoke separation*. The door, in the event of smoke, if not already closed, will close automatically and be held closed.

COMMENT:

1. A *smoke control door* may be held closed by use of a door closer. The door need not be latched.
2. Requirements for *smoke control doors* are given in C/AS1 Paragraph 6.19.1 and 6.19.8, and Appendix C Paragraph C8.1.

Smoke developed index (SDI) That index number for smoke developed when determined according to the *standard test* method for measuring the properties of lining materials.

Smoke separation Any *building element* able to prevent the passage of smoke between two spaces. *Smoke separations* shall:

- a) consist of rigid *building elements* capable of resisting without collapse:
 - i) a horizontal pressure of 0.25 kPa applied from either side, and
 - ii) self weight plus the intended vertically applied live loads, and
- b) form an imperforate barrier to the spread of smoke, and
- c) be of *non-combustible construction* or a *flame barrier*, or achieve a *FRR* of 10/10/-, except that *non-fire resisting glazing* may be used if it is toughened or laminated safety glass.

COMMENT:

1. The pressure requirement is to ensure *adequate* rigidity and is not a smoke leakage requirement.
2. Walls and floors, whether *constructed* of sheet linings fixed to studs or joists, or of concrete, metal or fired clay, need only be inspected by someone experienced in *building construction* to judge

whether the *construction* is tight enough to inhibit the passage of smoke.

3. Item c) is intended to ensure that the *smoke separation* will continue to perform as an effective barrier when exposed to *fire* or smoke for a short period during *fire* development.
4. There is no requirement for *smoke control doors* or other closures in *smoke separations* to meet the provisions of item c).

Spread of flame index (SFI) That index number for spread of flame which is determined according to the *standard test* method for measuring the properties of lining materials.

Stability In the context of *fire* protection, the time in minutes for which a prototype specimen, of a *primary element* when subject to the *standard test* for *fire* resistance, has continued to carry its *fire* design load without failure.

COMMENT:

The *fire* design load should be as specified in the limit state loadings code NZS 4203.

Stairway A series of steps or stairs with or without landings, including all necessary *handrails* and giving access between two different levels.

Standard test A test method which is recognised as being appropriate for the *fire* protection properties being assessed.

COMMENT:

A list of *standard test* methods is given in Appendix C of C/AS1.

Structural fire endurance rating (S) The *fire resistance rating (FRR)* intended to prevent *fire* spread or structural collapse for the complete burnout of the *firecell*.

Suite A *firecell* providing residential accommodation for the exclusive use of one *person* or of several people known to one another. It comprises one or more rooms for sleeping and may include spaces used for associated domestic activities such as hygiene and cooking.

COMMENT:

1. Bed numbers are limited to six in *purpose groups* SC and SD or 12 in *purpose group* SA in accordance with C/AS1 Paragraphs 6.6.5 and 6.7.6. Examples may be found in hotels, motels and residential care facilities, such as old people's homes or in hospices providing temporary family accommodation.
2. It is assumed that the social cohesion of the occupants by virtue of the personal relationship (as family members, friends or associates) would ensure that any individual, becoming aware of *fire*, would naturally assist others within the *firecell* to escape. The term *suite* does not apply to a group of bedrooms where each room is available to different "key-holders". In some cases a *suite* may be a single bedroom.

Surface finish The combination of a surface coating and substrate material on surfaces of *building elements* exposed to view. It can be an applied decorative coating or the uncoated *building element* itself. For interior surfaces the requirements are evaluated in terms of *SFI* and *SDI*. For exterior surfaces the requirements are evaluated in terms of rate of heat release as determined by Appendix C, paragraph C9.1.

Territorial authority

- a) has the meaning given to it by section 5(1) of the Local Government Act 2002; and
- b) includes any organisation which is authorised to permit structures pursuant to section 12(1)(b) of the Resource Management Act 1991.

Theatre A place of assembly intended for the production and viewing of performing arts, and consisting of an auditorium and stage with provision for raising and suspending stage scenery above and clear of the working area.

Travel distance The length of the *escape route* as a whole or the individual lengths of its parts, namely:

- a) *open paths*
- b) *protected paths* and
- c) *safe paths*.

Unprotected area in relation to an *external wall* of a *building*, means any part of the *external wall* which is not *fire* rated or has less than the required *FRR*.

COMMENT:

Unprotected area includes non-*fire* rated windows, doors, or other openings, and non-*fire* rated *external wall construction*.

Wharenui A communal meeting house having a large open floor area used for both assembly and sleeping in the traditional Maori manner.

Table 2.1: Purpose Groups Paragraphs 1.3.4, 2.1.3, 2.2.1, 2.2.10, 5.6.10 and 5.6.12			
Purpose group	Description of intended use of the building space	Some examples	Fire hazard category
CROWD ACTIVITIES			
CS or CL	For <i>occupied spaces</i> . CS applies to <i>occupant loads</i> up to 100 and CL to <i>occupant loads</i> exceeding 100.	Cinemas when classed as CS, art galleries, auditoria, bowling alleys, churches, clubs (non-residential), community halls, court rooms, dance halls, day care centres, gymnasia, lecture halls, museums, eating places (excluding kitchens), taverns, enclosed grandstands, indoor swimming pools.	1
		Cinemas when classed as CL, schools, colleges and tertiary institutions, libraries (up to 2.4 m high book storage), nightclubs, restaurants and eating places with cooking facilities, <i>early childhood centres</i> , <i>theatre</i> stages, opera houses, television studios (with audience).	2
		Libraries (over 2.4 m high book storage).	3
CO	Spaces for viewing open air activities (does not include spaces below a grandstand).	Open grandstands, roofed but unenclosed grandstand, uncovered fixed seating.	1
CM	Spaces for displaying, or selling retail goods, wares or merchandise.	Exhibition halls, retail shops.	2
		Supermarkets or other stores with bulk storage/display over 3.0 m high.	4
SLEEPING ACTIVITIES			
SC	Spaces in which <i>principal users</i> because of age, mental or physical limitations require special care or treatment.	Hospitals. Care institutions for the aged, children, <i>people with disabilities</i> .	1
SD	Spaces in which <i>principal users</i> are restrained or liberties are restricted.	Care institutions, for the aged or children, with physical restraint or detention.	1
		Hospital with physical restraint, detention quarters in a police station, prison.	
SA	Spaces providing transient accommodation, or where limited assistance or care is provided for <i>principal users</i> .	Motels, hotels, hostels, boarding houses, clubs (residential), boarding schools, dormitories, halls, <i>wharehenui</i> , community care institutions.	1
SR	Attached and multi-unit residential dwellings.	<i>Multi-unit dwellings</i> or flats, apartments, and includes <i>household units</i> attached to the same or other <i>purpose groups</i> , such as caretakers' flats, and residential accommodation above a shop.	1
		<i>Household unit firecells</i> may contain garages which are used exclusively by the occupants of that <i>household unit</i> .	
SH	Detached dwellings where people live as a single household or family.	Dwellings, houses, being <i>household units</i> , or <i>suites</i> in <i>purpose group SA</i> , separated from each other by distance. Detached dwellings may include attached self-contained <i>suites</i> such as granny flats when occupied by a member of the same family, and garages whether detached or part of the same <i>building</i> and are primarily for storage of the occupants' vehicles, tools and garden implements.	1

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Errata
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Sloping floors and ceilings

3.4.8 The *open path* length permitted by Table 3.3 shall be reduced by 50% in any space where all the following conditions apply:

- a) Both the floor and the ceiling slope in the same direction at an angle of more than 4° from the horizontal, and any *escape route* from the space is up the slope, and
- b) The clear ceiling height at any point is less than 4.0 m, and
- c) The *occupant load* in the space is more than 50, and
- d) The space is not protected by a smoke control system (*fire safety precaution* Type 10 or Type 11), or by a sprinkler system.

COMMENT:

People in a space with a sloping floor and ceiling will be exposed to smoke at an earlier stage than people in a space with a flat ceiling. This is potentially a problem when the direction of escape is up the slope. Reduced *travel distances* mean reduced exposure time to the smoke from the *fire*.

3.5 Acceptable Increases in Open Path Lengths

3.5.1 *Dead end* and total *open path* lengths from Table 3.3 may be increased in accordance with Paragraphs 3.5.2 to 3.5.6.

COMMENT:

For *purpose groups* SC and SD, Table 3.3 already includes the permitted increases resulting from the mandatory requirement for smoke detectors and sprinklers, so no further increases are allowed for these *purpose groups*.

Sprinklers

3.5.2 Where the *firecell* is protected by a sprinkler system, (*fire safety precaution* Type 6 or 7), *open path* lengths given in Table 3.3 may be increased by:

- a) 100% for *purpose groups* WL, WM, WH, WF, CS, CL, CM, IA and ID, and
- b) 50% for *purpose groups* SA, SR and SH.

COMMENT:

This applies whatever the reason for use of a sprinkler system. For the purposes of means of escape, sprinklers are not regarded as providing absolute protection, as they operate only after the *fire* has reached a certain intensity, by which time the *fire* can have produced significant quantities of smoke. They are therefore regarded as providing only a *fire* development delay factor, which enables more time for escape.

Heat detectors

3.5.3 Where the *firecell* is protected by heat detectors (*fire safety precaution* Type 3) complying with F7/AS1, *open path* lengths given in Table 3.3 may be increased by:

- a) 20% for *purpose groups* WL, WM, WH, CS, CL, CM, IA and ID, and
- b) 10% for *purpose groups* SA, SR and SH.

COMMENT:

No increase is permitted for WF *purpose group*.

Smoke detectors

3.5.4 Where the *firecell* is protected by smoke detectors (*fire safety precautions* Type 4, 5 or 7) complying with F7/AS1 and subject to *compliance schedule* requirements, *open path* lengths given in Table 3.3 may be increased by:

- a) 100% for *purpose groups* WL, WM, WH, IA and ID, CM, CS and CL (excluding *early childhood centres*), and
- b) 50% for *purpose groups* SA, SR and SH.

COMMENT:

No increase is permitted for SC, SD or WF *purpose groups* or in *early childhood centres*.

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3.5.5 If *open path* length increases for smoke detectors are being applied, where F7/AS1 allows heat detectors to be substituted for smoke detectors, not less than 70% of the *firecell* shall be protected with smoke detectors, including all sleeping areas and *exitways*.

Active purpose groups

3.15.3 Single internal *escape routes* are permitted in *purpose groups* CS, CM, WL, WM, IA and ID where, in addition to the requirements of Paragraph 3.15.1:

- a) The *escape height* is no greater than:
 - i) 4.0 m, (see Figure 3.20 (a)) where the *fire hazard category* on any floor served by the *exitway* is no greater than 3, or
 - ii) 10 m, (see Figure 3.20 (b)) where the *fire hazard category* on any floor served by the *exitway* is no greater than 2 if not sprinklered, or 3 if sprinklered, or
 - iii) 25 m, (see Figure 3.20 (c)) where sprinklered and the *fire hazard category* on any floor served by the *exitway* is no greater than 2, and
- b) In *buildings* with two or more floors, the vertical *safe path* is preceded by a *protected path*, on all floors except the topmost floor.

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3.15.4 Single external *escape routes* (for balconies, bridges and *external stairways*) complying with Paragraph 3.15.7 are permitted in *purpose groups* CS, CM, WL, WM and IA.

Sleeping purpose groups SR and SA

3.15.5 *Household units* in *purpose group* SR and *suites* in *purpose group* SA may have a single *escape route* from the *firecell* (see Figure 3.21) provided that, in addition to the requirements of Paragraph 3.15.1:

- a) The *escape route* within each *firecell* terminates at a *final exit* or opens onto a *safe path* which complies with the requirements of Paragraphs 3.11.4 to 3.11.11, and
- b) The particular requirements for *stairways*, balconies and split level *exitways*, given in Paragraphs 3.9.14 and 3.15.6 to 3.15.8, are satisfied, and

- c) The length of any *safe path* on a floor does not exceed the maximum *dead end* length permitted by Table 3.3.

Panic bolts

3.17.14 Panic bolts are locking devices which shall meet the following requirements:

- a) The actuating portion shall consist of a horizontal bar or panel which shall extend across no less than half the width of the door leaf, and be located between 800 mm and 1200 mm above the floor,
- b) When a horizontal force not exceeding 67 N is applied to the bar or panel, the door lock shall release allowing the door to swing open freely.

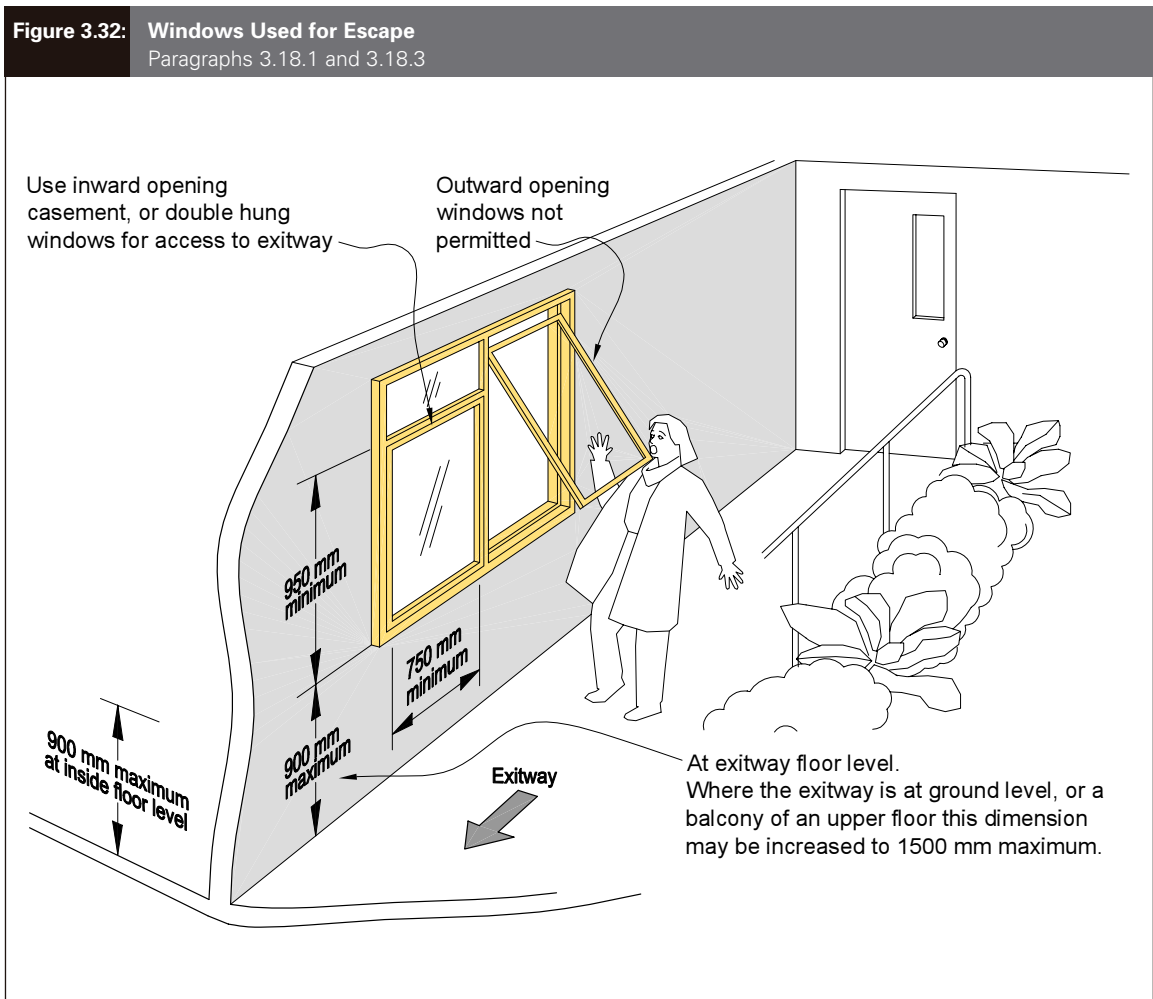
3.18 Windows Used for Escape

Application

3.18.1 A window may provide an alternative *final exit* or direct access to one external alternative *exitway* in *buildings* (see Figure 3.32), where all occupants have normal mobility, *escape height* is no greater than 4.0 m, and *purpose groups* consist only of CS (excluding *early childhood centres*), SA, SR or WL.

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Figure 3.32: Windows Used for Escape
Paragraphs 3.18.1 and 3.18.3



4.5.5 Where *fire separations* are not needed between different *purpose groups* on the same floor level, the *FSPs* adopted for the whole floor level shall be those of the primary *purpose group*, except when a concession is permitted by satisfying Paragraph 5.6.6.

4.5.6 The alarm systems required by Paragraphs 4.5.3 and 4.5.4 shall be interconnected to alert all occupants of that floor level in the event of *fire* (see Paragraphs 4.5.8 to 4.5.18 for other floor levels in the *building*).

F ratings

4.5.7 Where, on one floor in the *building*, *firecells* have different *F ratings* in accordance with Table 4.1, the greatest *firecell F rating* shall be applied to common spaces and shared *escape routes* for that floor level.

COMMENT:

Within each *firecell* the *FRR* for both *primary* and *secondary elements* is based on the *F rating* for that *firecell* (see Paragraph 5.3.2).

Other floors in a building

4.5.8 In a *building* with two or more floor levels:

- a) Selection of appropriate *fire safety precautions* shall take account of the specific requirements of each *purpose group* and its location within the *building*, and
- b) No *firecell*, other than the top floor *firecell* (see Paragraph 4.5.14), shall have a *firecell rating* of less than column 2 from Table 4.1 for that *purpose group* and *FHC*.

4.5.9 Where by Table 4.1 any *firecell* in a *building* requires a Type 2 alarm, all other *firecells* on all floor levels in that *building* shall have no less than a Type 2 alarm.

4.5.10 Where by Table 4.1 any *firecell* in a *building* requires a Type 3, Type 4, Type 6 or Type 7 alarm:

- a) All other *firecells* on all floors in that *building* shall have no less than a Type 3 alarm, except that

- b) Where any *firecell* having an *escape height* greater than 25 m requires a Type 6 or 7 alarm, all lower floor levels in the *building* shall have no less than a Type 6 alarm. In such situations the Type 6 alarm shall replace any Type 2, 3 or 4 alarm otherwise required for lower *firecells*.

4.5.11 Where any upper floor contains a sleeping *purpose group*, all floors below shall have an appropriate alarm system which shall activate alerting devices in all sleeping areas within the *building*. For SC or SD all lower floors shall, regardless of *purpose group* contained, have sprinklers (Type 6 or 7). For SA *purpose group* all lower floors shall, regardless of the *purpose group* contained, have heat or smoke detectors or sprinklers (Types 3, 4 or 6). For SR *purpose group* where any lower floor contains a *purpose group* other than SR, all lower floors shall have heat or smoke detectors or sprinklers (Types 3, 4 or 6).

4.5.12 The alarm systems required in a *building* shall be interconnected to alert all *building* occupants in the event of *fire*.

COMMENT:

Safe evacuation of a *building* in the event of *fire*, particularly for sleeping *purpose groups*, depends largely on providing early warning to the occupants. For the purpose of early warning:

- smoke detectors provide the fastest response
- heat detectors and sprinklers are next
- manual call point systems are considered to have the slowest response, being dependent on human activation.

Same purpose group on different floors

4.5.13 Where *firecells* containing the same *purpose group* occur at different levels in the same *building*, the *FSPs* required by Table 4.1 for the *firecell* (containing that *purpose group*) having the greatest *escape height*, shall be applied to all *firecells* in that *purpose group*.

Top floor firecells

4.5.14 A top floor *firecell* may have a *F rating* of F0, but all other *FSPs* required by Table 4.1 for that *purpose group* and *escape height* shall be applied.

Basements

4.5.15 Apply the *fire safety precautions* for *basement firecells* based on the *occupant load* and the greatest *escape height*.

COMMENT:

Because the *fire safety precautions* in *firecells* are increased with increases in distance from the *final exit* (normally related to *escape height*), the precautions for *basement firecells* increase with *basement* depth and the requirements of Table 4.1 shall be applied downward as opposed to upward for *buildings* above ground. Refer to Paragraph 6.14.4 for *FRR* of floors separating *basement firecells* from *firecells* above ground level.

Intermediate floors

4.5.16 *Intermediate floors* and the supporting elements shall have a *FRR* in accordance with Paragraph 6.14.3. All other *FSPs* required for the *firecell* (at the *firecell escape height*) shall apply to the *intermediate floor*.

COMMENT:

Where the *firecell* requires two or more *final exits* and they are located on different levels, the *escape height* of the *firecell* is measured as the greatest vertical *travel distance* for a *person* escaping, from any floor in the *firecell* to the level of the most distant of the required *final exits* (see definition of *escape height*, comment 2).

4.5.17 Except for limited area *intermediate floors* meeting the provisions of Paragraphs 6.21.5 and 6.21.6, all *firecells* containing *intermediate floors* shall have a smoke control system.

4.5.18 Smoke control requirements for *limited area atrium firecells* are given in Paragraph 6.22. For all other *firecells* containing *intermediate floors*, except where Paragraph 4.5.17 applies, smoke control shall be by specific *fire* engineering design.

Early Childhood Centres

4.5.19 *Firecells* containing an *early childhood centre* and not otherwise protected by a Type 4 or Type 7 alarm, shall include a smoke detector in any sleeping area and in any *escape route* serving that area. The smoke detection and alarm system shall comply with NZS 4512.

COMMENT:

The smoke detectors are supplementary to Type 2 or Type 3 alarm required under Table 4.1 to provide earlier warning and *adequate* escape.

4.5.20 Where the *escape height* of a *firecell* containing an *early childhood centre* is greater than or equal to 4 m, all *firecells* in the building shall be sprinklered.

4.5.21 Where spaces used by children are located on an *intermediate floor* within an *early childhood centre* no less than a Type 4 alarm is required throughout the *firecell*.

Specific requirements

4.5.22 Before finalising *FSPs*, check any specific requirements for particular circumstances and *purpose groups* in other Parts of this acceptable solution.

COMMENT:

There may be significant cost advantages in exceeding Table 4.1 *FSP* requirements to achieve other benefits, and specific requirements may apply to less common circumstances not covered in Table 4.1. Examples are on page 100.

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Table 4.1: Fire Safety Precautions
Key to table references

Part 2	Paragraph 2.4.2
Part 3	Paragraphs 3.1.5, 3.13.1 and 3.19.2
Part 4	Paragraphs 4.3, 4.3.1, 4.3.3, 4.4.1, 4.5.2, 4.5.3, 4.5.4, 4.5.7, 4.5.8, 4.5.9, 4.5.10, 4.5.13, 4.5.14, 4.5.15, 4.5.19
Part 5	Paragraphs 5.5.1, 5.6.5, 5.6.7, 5.9.4 c)
Part 6	Paragraphs 6.2.1, 6.4.1, 6.7.1, 6.8.1, 6.8.5, 6.8.6, 6.10.1, 6.11.1, 6.15.1, 6.19.9, 6.21.2, 6.23.1 d), 6.23.2, 6.23.3
Part 8	Paragraphs 8.2.1, 8.2.2, 8.2.3
Appendix A	Paragraphs A1.1.1 and A1.1.2

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Fire safety precautions		Special applications
Type	Description	
1	Domestic smoke alarm system.	a Not required where:
2	Manual fire alarm system.	i) the <i>escape routes</i> serve an <i>occupant load</i> of no more than 50 in <i>purpose groups</i> CS (excluding <i>early childhood centres</i>), CM, WL, WM, WH and WF, or
3	Automatic fire alarm system with heat detectors and manual call points.	ii) the <i>escape routes</i> are for <i>purpose group</i> SA and serve no more than 10 beds, (or 20 beds for trampers huts, see Paragraph 6.20.6), or
4	Automatic fire alarm system with smoke detectors and manual call points.	iii) exit doors from <i>purpose group</i> SA and SR <i>firecells</i> open directly onto a <i>safe place</i> or an external <i>safe path</i> (see paragraph 3.14).
5	Automatic fire alarm system with modified smoke/heat detection and manual call points.	b Where only a single <i>escape route</i> is available, no less than a Type 4 alarm is required. See Paragraph 3.15.3 for situations where sprinklers are required.
6	Automatic fire sprinkler system with manual call points.	c Required where Fire Service hose run distance, from the Fire Service vehicular access (see Paragraph 8.1.1) to any point on any floor, is greater than 75 m.
7	Automatic fire sprinkler system with smoke detectors and manual call points.	d Emergency lighting extended to <i>open paths</i> throughout the <i>firecell</i> .
8	Voice communication system.	e Type 5 is permitted as an alternative alarm system within <i>firecells</i> containing sleeping accommodation. (See Appendix A for description of Type 5.)
9	Smoke control in air handling system.	f A direct connection to the Fire Service is not required provided a telephone is installed and freely available at all times to enable 111 calls to be made.
10	Natural smoke venting.	
11	Mechanical smoke extract.	
12	No Type 12 currently specified.	
13	Pressurisation of safe paths.	
14	Fire hose reels.	
15	Fire Service lift control.	
16	Emergency lighting in exitways.	
17	Emergency electrical power supply.	
18	Fire hydrant system.	
19	Refuge areas.	
20.	Fire systems centre.	

Note:

The numbered references are more fully explained in Appendix A.
 Throughout Table 4.1 dark shading identifies where sprinklers are required.

Table 4.1/1: Fire safety precautions for active purpose group firecells
Occupant load 100

Purpose group	FHC	Escape height							
		0 m (or single floor)	<4 m (or two floors)	4 m to <10 m	10 m to <25 m	25 m to <34 m	34 m to <46 m	46 m to <58 m	over 58 m
CS	1	F0	F45	F45	F45	F30	F45	F45	F60
	2	F0	F60	F60	F60	F45	F45	F60	F90
	3	F0	F60	F60	F90	F45	F60	F60	F90
		2af	2af	3b	4	6	7	7	7
		18c	18c	9	9	9	9	9	9
				16	16	13	13	13	13
				18c	18	15	15	15	15
						16	16	16	16
						18	18	18	17
									18
								19	
								20	
CM (Note 5)	2	F0	F60	F60	F60	F45	F45	F60	F90
	4	F0	F30	F30	F45	F45	F60	F60	F90
		2af	2af	6	3b	6	3b	6	6
		18c	18c	18c	9	9	9	9	9
					16	16	15	15	13
					18c	18c	16	16	15
							18	18	16
									15
									18
									20
WL	1	F0	F45	F45	F45	F30	F45	F45	F60
WM	2	F0	F60	F60	F60	F45	F45	F60	F90
WH	3	F0	F60	F60	F90	F45	F60	F60	F90
(Note 5)	4	F0	F30	F30	F45	F45	F60	F60	F90
		2af	2af	6	3b	6	3b	6	6
		18c	18c	18c	16	16	15	15	15
					18c	18c	16	16	16
							18	18	16
									15
									18
									16
									18
									19
								20	
WF	4	F0	F30	F30	F45	F45	F60	F60	F90
		3af	6	6	6	6	6	7	7
		18c	18c	16	15	15	9	9	9
				18c	16	16	13	13	13
						18	15	15	15
							16	16	16
							18	18	18
									19
									20
	Column		1	2	3	4	5	6	7

Notes:

- Use of table:** Refer to Paragraph 4.4 for instructions on using this table to determine the *fire safety precautions* in *firecells*.
- Adjoining firecells having a F0 rating:** Paragraph 6.2.1 requires adjoining *firecells* to be separated by *fire separations* with *FRR* no less than 30/30/30.
- Intermediate floors:** Where a *firecell* contains *intermediate floors* a *FRR* shall apply to the *intermediate floors* and supporting elements, and smoke control systems Type 9 and either Type 10 or Type 11, are required (see Paragraphs 4.5.16 to 4.5.18, 6.14.3 and 6.21.5 to 6.22.14).
- Car parking:** Refer to Paragraphs 6.10.3 to 6.10.6 for car parking provisions within *buildings*.
- Sprinklers:** Refer to Paragraph 5.6.11 for concessions for *FHC* 4.

**Table 4.1/2: Fire safety precautions for active purpose group firecells
Occupant load 101 to 500**

Purpose group	FHC	Escape height							
		0 m (or single floor)	<4 m (or two floors)	4 m to <10 m	10 m to <25 m	25 m to <34 m	34 m to <46 m	46 m to <58 m	over 58 m
CS (Notes 6,7)	1	F0	F45	F45	F45	F30	F45	F45	F60
	2	F0	F60	F60	F60	F45	F45	F60	F90
	3	F0	F60	F60	F90	F45	F60	F60	F90
		3f 16 18c	3f 16 18c	3b 9 16 18c	4 9 16 18	6 9 13 15 16 18	7 9 13 15 16 18	7 9 13 15 16 18	7 9 13 15 16 17 18 19 20
CM (Note 5)	2	F0	F60	F60	F60	F45	F45	F60	F90
	4	F0	F30	F30	F45	F45	F60	F60	F90
		3f 16 18c	3f 16 18c	6 9 16 18c	3b 9 16 18c	6 9 15 16 18	3b 9 15 16 18	6 9 13 15 16 18 20	7 9 13 15 16 17 18 19 20
		3f 16 18c	3f 16 18c	6 9 16 18c	3b 9 16 18c	6 9 15 16 18	3b 9 15 16 18	6 9 13 15 16 18 20	7 9 13 15 16 17 18 19 20
WL	1	F0	F45	F45	F45	F30	F45	F45	F60
WM	2	F0	F60	F60	F60	F45	F45	F60	F90
WH	3	F0	F60	F60	F90	F45	F60	F60	F90
(Note 5)	4	F0	F30	F30	F45	F45	F60	F60	F90
		3f 16 18c	3f 16 18c	6 9 16 18c	3b 9 16 18c	6 9 15 16 18	3b 9 15 16 18	6 9 15 16 18	7 9 13 15 16 18 19 20
WF	4	F0	F30	F30	F45	F45	F60	F60	F90
		3f 16 18c	6 16 18c	6 16 18c	6 15 16 18	6 15 16 18	6 9 13 15 16 18	7 9 13 15 16 18	7 9 13 15 16 18 19 20
Column		1	2	3	4	5	6	7	8

Notes:

- Use of table:** Refer to Paragraph 4.4 for instructions on using this table to determine the fire safety precautions in firecells.
- Adjoining firecells having a F0 rating:** Paragraph 6.2.1 requires adjoining firecells to be separated by fire separations with FRR no less than 30/30/30.
- Intermediate floors:** Where a firecell contains intermediate floors a FRR shall apply to the intermediate floors and supporting elements, and smoke control systems Type 9 and either Type 10 or Type 11, are required (see Paragraphs 4.5.16 to 4.5.18, 6.14.3 and 6.21.5 to 6.22.14).
- Car parking:** Refer to Paragraphs 6.10.3 to 6.10.6 for car parking provisions within buildings.
- Sprinklers:** Refer to Paragraph 5.6.11 for concessions for FHC 4.
- CL cinemas and theatres:** Type 16d is required for all escape heights.
- CL:** For firecells, which are not cinemas or theatres, with escape height less than 4.0 m and occupant load not greater than 250, Type 2f is a permitted alternative to Type 3f.

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Table 4.1/3: Fire safety precautions for active purpose group firecells
Occupant load 501 to 1000

Purpose group	FHC	Escape height							
		0 m (or single floor)	<4 m (or two floors)	4 m to <10 m	10 m to <25 m	25 m to <34 m	34 m to <46 m	46 m to <58 m	over 58 m
CS (Note 6)	1	F0	F45	F45	F30	F30	F45	F45	F60
	2	F0	F60	F60	F30	F45	F45	F60	F90
	3	F0	F60	F60	F45	F45	F60	F60	F90
		4	4	4	7	7	7	7	7
		16	16	9	9	9	9	9	9
		18c	18c	16	16	13	13	13	13
				18c	18	15	15	15	15
					16	16	16	16	16
					18	18	18	18	17
									18
								19	
								20	
CM (Note 5)	2	F0	F60	F60	F30	F45	F45	F60	F90
	4	F0	F30	F30	F45	F45	F60	F60	F90
		4	4	6	4	6	7	7	7
		16	16	16	9	9	9	9	9
		18c	18c	18c	16	16	15	13	13
					16	16	15	15	15
					18c	18c	18	16	16
							18	16	17
							20	18	18
								20	19
								20	
WL	1	F0	F45	F45	F30	F30	F45	F45	F60
WM	2	F0	F60	F60	F30	F45	F45	F60	F90
WH	3	F0	F60	F60	F45	F45	F60	F60	F90
(Note 5) WF	4	F0	F30	F30	F45	F45	F60	F60	F90
		4	4	6	4	6	7	7	7
		16	16	16	16	16	15	15	9
		18c	18c	18c	18c	18c	16	16	9
							16	16	13
							18	18	13
								15	15
								16	16
								18	18
									18
								19	
								20	
Column		1	2	3	4	5	6	7	8

Notes:

- Use of table:** Refer to Paragraph 4.4 for instructions on using this table to determine the *fire safety precautions* in *firecells*.
- Adjoining firecells having a F0 rating:** Paragraph 6.2.1 requires adjoining *firecells* to be separated by *fire separations* with *FRR* no less than 30/30/30.
- Intermediate floors:** Where a *firecell* contains *intermediate floors* an *FRR* shall apply to the *intermediate floors* and supporting elements, and smoke control systems Type 9 and either Type 10 or Type 11, are required (see Paragraphs 4.5.16 to 4.5.18, 6.14.3 and 6.21.5 to 6.22.14).
- Car parking:** Refer to Paragraphs 6.10.3 to 6.10.6 for car parking provisions within *buildings*.
- Sprinklers:** Refer to Paragraph 5.6.11 for concessions for *FHC* 4.
- CL cinemas and theatres:** Type 16d is required for all *escape heights*.

**Table 4.1/4: Fire safety precautions for active purpose group firecells
Occupant load over 1000**

Purpose group	FHC	Escape height							
		0 m (or single floor)	<4 m (or two floors)	4 m to <10 m	10 m to <25 m	25 m to <34 m	34 m to <46 m	46 m to <58 m	over 58 m
CL (Note 6)	1	F0	F30	F30	F30	F30	F45	F45	F60
	2	F0	F30	F30	F30	F45	F60	F60	F90
	3	F0	F30	F30	F45	F45	F60	F60	F90
		7 16d 18c	7 16d 18c	7 9 16d 18c	7 9 16d 18	7 9 13 15 16d 18	7 9 13 15 16d 18	7 9 13 15 16d 18	7 9 13 15 16d 17 18 19 20
CM (Note 5)	2	F0	F30	F30	F30	F45	F45	F60	F90
	4	F0	F30	F30	F45	F45	F60	F60	F90
		7 16d 18c	7 16d 18c	7 9 16d 18c	7 9 15 16d 18	7 9 13 15 16d 18	7 9 13 15 16d 18 20	7 9 13 15 16d 18 20	7 9 13 15 16d 17 18 19 20
		7 16 18c	7 16 18c	7 16 18c	7 15 16 18	7 15 16 18	7 9 15 16 18	7 9 13 15 16 18	7 9 13 15 16 18 19 20
WL	1	F0	F30	F30	F30	F30	F45	F45	F60
WM	2	F0	F30	F30	F30	F45	F45	F60	F90
WH	3	F0	F30	F30	F30	F45	F60	F60	F90
(Note 5)	4	F0	F30	F30	F30	F45	F60	F60	F90
		7 16 18c	7 16 18c	7 16 18c	7 15 16 18	7 15 16 18	7 9 15 16 18	7 9 13 15 16 18	7 9 13 15 16 18 19 20
		7 16 18c	7 16 18c	7 16 18c	7 15 16 18	7 15 16 18	7 9 13 15 16 18	7 9 13 15 16 18	7 9 13 15 16 18 19 20
		7 16 18c	7 16 18c	7 16 18c	7 15 16 18	7 15 16 18	7 9 13 15 16 18	7 9 13 15 16 18	7 9 13 15 16 18 19 20
WF	4	F0	F30	F30	F45	F45	F60	F60	F90
	7 16 18c	7 16 18c	7 16 18c	7 15 16 18	7 15 16 18	7 9 13 15 16 18	7 9 13 15 16 18	7 9 13 15 16 18 19 20	
Column		1	2	3	4	5	6	7	8

Notes:

- Use of table:** Refer to Paragraph 4.4 for instructions on using this table to determine the *fire safety precautions* in *firecells*.
- Adjoining firecells having a F0 rating:** Paragraph 6.2.1 requires adjoining *firecells* to be separated by *fire separations* with *FRR* no less than 30/30/30.
- Intermediate floors:** Where a *firecell* contains *intermediate floors* a *FRR* shall apply to the *intermediate floors* and supporting elements, and smoke control systems Type 9 and either Type 10 or Type 11, are required (see Paragraphs 4.5.16 to 4.5.18, 6.14.3 and 6.21.5 to 6.22.14).
- Car parking:** Refer to Paragraphs 6.10.3 to 6.10.6 for car parking provisions within *buildings*.
- Sprinklers:** Refer to Paragraph 5.6.11 for concessions for *FHC* 4.

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Table 4.1/5: Fire safety precautions for sleeping purpose group firecells
Occupant load 40 maximum

Purpose Group	FHC	Escape height							
		0 m (or single floor)	<4 m (or two floors)	4 m to <10 m	10 m to <25 m	25 m to <34 m	34 m to <46 m	46 m to <58 m	over 58 m
SC SD	1	F0	F30	F30	F30	F30	F45	F45	F60
		7	7	7	7	7	7	7	7
		16d	16d	16d	9	8	8	8	8
		18c	18c	18c	15	9	9	9	9
					16d	13	13	13	13
					18	15	15	15	15
						16d	16d	16d	16d
						18	18	18	17
						20	20	20	18
									19
								20	
SA (Note 5)	1	F0	F45	F45	F45	F30	F45	F45	F60
		4aef	4ef	4e	4e	7e	7e	7e	7e
		16a	16a	14	14	8	8	8	8
		18c	18c	16a	15	9	9	9	9
				18c	16	15	13	13	13
					18	16	15	15	15
						18	16	16	16
							18	18	17
							20	20	18
									20
SR (Note 7)	1	F0	F45	F45	F45	F30	F45	F45	F60
			2a	2f	4e	7e	7e	7e	7e
				16a	14	15	15	15	13
					16	16	16	16	15
					18	18	18	18	16
								20	18
								20	
Column		1	2	3	4	5	6	7	8

Notes:

- Use of table:** Refer to Paragraph 4.4 for instructions on using this table to determine the *fire safety precautions* in *firecells*.
- Adjoining firecells having a F0 rating:** Paragraph 6.2.1 requires adjoining *firecells* to be separated by *fire separations* with *FRR* no less than 30/30/30.
- Intermediate floors:** Where a *firecell* contains *intermediate floors* a *FRR* shall apply to the *intermediate floors* and supporting elements, and smoke control systems Type 9 and either Type 10 or Type 11, are required (see Paragraphs 4.5.16 to 4.5.18, 6.14.3 and 6.21.5 to 6.22.14).
- Car parking:** Refer to paragraphs 6.10.3 to 6.10.6 for car parking provisions within *buildings*.
- Sprinklers:** *Purpose group* SA may have an *occupant load* up to 160 beds in *firecells* with a Type 7 alarm (see Paragraph 6.7.2).
- Occupant load in SC and SD firecells:** The *occupant load* in a *group sleeping area firecell* is limited to 12 or 20 beds and in a *suite* to six beds (see Paragraphs 6.6.3 to 6.6.5). For *firecells* (such as an operating theatre) required to remain occupied during a *fire*, see Paragraphs 5.6.8 and 5.6.9.
- SR household units:** See Paragraph 6.8.6 which describes where *household units* containing upper floors may be treated as single floor *firecells*.

5.3 Application of F and S Ratings

F ratings

5.3.1 *F ratings* apply to *primary* and *secondary elements* within a *firecell*, including walls and floors which are *fire separations*, together with their supporting elements within the same *firecell*.

S ratings

5.3.2 *S ratings* apply to:

- a) *Primary elements* which, within a *firecell*, provide *stability* to an *external wall* not permitted to have 100% *unprotected area* due to:
 - i) proximity of the *building* to a *relevant boundary*, or
 - ii) the configuration of the *building* or siting of *adjacent buildings*, where there is a threat of *fire* spread to sleeping *purpose groups*.

COMMENT:

External wall FRRs are based on either the *F* or *S rating* depending on their relative values and function of the *building element*, as described in Paragraph 7.10.2.

- b) *Secondary elements* forming parts of an *external wall* which are not permitted to be *unprotected areas*.

- c) All *primary elements*, in any *building* with an *escape height* exceeding 25 m (see also Paragraph 5.7.7).
- d) *Fire separations* between *firecells* containing *other property*.
- e) *Fire separations* in *firecells* which require subdivision due to restrictions on floor areas (see Paragraph 4.2.3).
- f) *Buildings* containing car parking (see Paragraph 6.10.3).

5.4 Essential Data for Determining F and S Ratings

5.4.1 *F* and *S ratings* may be obtained from tables once essential data on the *building* and its proposed occupancy are known. It is therefore necessary to determine:

- a) *Escape height* and number of floors.
- b) The number of *firecells* at each floor level. (In most cases each full floor level will be a separate *firecell*.)
- c) Floor area (A_f) of each *firecell*, which will be the sum of the areas of any *intermediate floors* and the lowest floor in the *firecell*.
- d) *Purpose groups* and the floor areas they occupy in each *firecell*.
- e) *Occupant load* in each *firecell*.
- f) *Fire hazard category* in each *firecell*.
- g) Distance between each *external wall* and the *relevant boundary*.
- h) Total area of vertical openings (A_v) in all *external walls* of each *firecell*.
- i) Area of horizontal openings (A_h) in the roof of each *firecell* where relevant.
- j) Whether the *firecell* floor areas comply with the maximum permitted (by Paragraph 4.2.3) for the *fire hazard category* contained.

COMMENT:

See Table 5.1 Note 4 for a description of what comprises effective openings when determining the values of A_v and A_h .

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5.5 Determining F and S Ratings

F ratings

5.5.1 *F ratings* are determined directly from Table 4.1.

S Ratings for firecells with FHC 1, 2 and 3

5.5.2 *S ratings* are determined from Table 5.1 using the following process.

5.5.3 For each *firecell* determine the ratios:

$$A_v/A_f \text{ and } A_h/A_f$$

Where:

A_f = area of floor.

A_v = total area of vertical openings in the walls.

A_h = area of horizontal openings in the roof.

The *S rating* is calculated from the formula:

$$S = kt_e$$

Where:

t_e (equivalent time of *fire* exposure in minutes) is determined from Table 5.1, and k is a variable having the following values:

k = 1.0 for unsprinklered *firecells*, or
= 0.5 for sprinklered *firecells*.

COMMENT:

1. Table 5.1 has been based on unpublished overseas information used to develop a series of Eurocodes for structural *fire* safety design.
2. In contrast to the traditional method of expressing *fire* rating requirements in 30 minute intervals, use of Table 5.1 allows the allocation of a t_e value (and consequentially an *S rating*) ranging anywhere between 30 and 240 minutes in 10 minute intervals.
3. This has the advantage of permitting *fire* resisting *building elements* to be used to their full potential as determined by *standard tests* or calculation methods based on those tests.

For example: A *primary element* tested satisfactorily to 40 minutes for *stability*, would traditionally be rated at 30 minutes, being the next lowest value in the 30 minute interval system. Using Table 5.1 it is possible to adjust the ventilation configuration, if desired, to take advantage of the full 40 minutes.

4. Standard *fire* tests give values for all three criteria of *stability*, *integrity* and *insulation*, and depending on the requirements of a particular *building element*, a low value for one criterion, for example, *insulation*, might not permit higher values for *stability* or *integrity* being utilised.
5. Specific *fire* engineering design may be used as an alternative method for determining *S ratings*, and in some cases may give less conservative results than provided by Table 5.1. A list of relevant Eurocode references is given in the reference section of this Approved Document.

5.6 Determining the FRR

5.6.1 Having determined the *F* and *S ratings*, choosing the appropriate numbers for the *FRR* involves:

- a) Identifying the functions of the *building element* in question (e.g. *primary* or *secondary element*, or part of an *external wall* not permitted to be *unprotected area*).
- b) Deciding whether or not *insulation* is required (see Paragraph 5.6.3).
- c) Checking whether specific requirements are imposed elsewhere in this acceptable solution for a particular *purpose group* or *building function* (see Paragraphs 5.6.8, 6.3 to 6.11 and Part 7).

5.6.2 Following this analysis an appropriate *FRR* may be assigned to each *building element* (see examples given in Paragraph 5.2.1). If an *F rating* and an *S rating* apply to a *building element*, use the higher of the two.

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Applying insulation component in FRR

5.6.3 Where the *building element* is a *fire separation*, the *FRR* of that *fire separation* shall be no less than the *FRR* required by the adjacent *firecell*.

5.6.4 *Insulation* ratings shall apply to:

- a) All *fire separations*, except as noted in Paragraph 5.6.4 c) and d).
- b) Parts of *external walls* which are not permitted to be *unprotected areas*.
- c) Parts of *external walls* which are within 2.0 m of an *external exitway*.
- d) *Intermediate floors*.

5.6.5 Where required by Paragraph 5.6.3, the *insulation* value shall be no less than the *F rating*, or the *S rating* if under Paragraph 5.3.3 the *S rating* applies to the *building element*, except that:

- a) For any part of an *external wall* not permitted to be an *unprotected area*, the value shall be no less than the rating as determined from Paragraph 7.10.2.
- b) *Intermediate floors* shall have an *insulation* value as required by Paragraph 6.14.3.
- c) *Insulation* values for closures in *fire separations* are as specified in Table 6.1.
- d) No *insulation* value is required for glazing installed in accordance with Paragraph 5.8.2.

FRR reductions for sprinklered firecells

5.6.6 Where sprinklers are installed in a *firecell*, but such installation is not a requirement under Table 4.1, the *FRR* of *building elements* may be reduced. Any permitted reduction shall be no greater than 50%.

COMMENT:

1. For example: a *FRR* of 60/60/60 may be reduced to 30/30/30, a *FRR* of 60/-/- to 30/-/-.
2. The calculation for *S ratings* automatically takes account of sprinkler installation and no further reductions are permitted.

Concessions for multiple purpose groups

5.6.7 When a single *firecell* contains *purpose groups* with different *FRR* requirements for *fire separations*, use either:

- a) The highest *FRR* throughout the *firecell*, or
- b) The second highest *FRR* throughout the *firecell*, if the percentage given by:

$$\frac{\text{floor area with highest FRR} \times 100}{\text{total firecell floor area}}$$

is no more than:

- i) 20%, or
- ii) 40% if the *firecell* is sprinklered.

5.6.8 The concession permits the use of the second highest *FRR*. This rating may be applied throughout the *firecell*, except that, if not sprinklered, the rating of the floor above shall be no less than that of the *purpose group* with the highest *FRR*. The alarm type and *fire safety precautions* from Table 4.1 shall be those for the *purpose group* requiring the highest degree of protection (see Paragraph 5.6.10 for *FHC 4* concessions).

Special requirements for buildings remaining occupied during fire

5.6.9 Where a *building* evacuation is not possible or desirable although there is a *fire* in one of the *firecells* (e.g. in a hospital operating theatre, civil defence *building* or police station), or in any other situation where security from structural collapse is not related to distance from a *relevant boundary*, the risks shall be evaluated by a *fire* engineer who shall decide whether:

- a) The higher of the *F* or *S ratings* and associated *fire safety precautions* and subdivision into smaller *firecells* are appropriate, or
- b) The requirements for active and passive *fire* protection are to be determined by *fire* engineering design.

5.6.10 In such situations the accommodation concerned, the services to it, and the means of escape, shall remain safe for the duration of a fully developed *fire* in an adjacent *firecell*.

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Firecells with FHC 4

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5.6.11 Where *fire hazard category 4* applies to a given *purpose group* (see Table 2.1), the *S rating* associated with the *firecell* shall be determined by *fire engineering design*, except that where there are multiple *purpose groups* on that floor, only one of which is in *fire hazard category 4*, the concession available from Paragraph 5.6.11 may apply.

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5.6.12 In a *firecell*, where an area of *FHC 4* is present not exceeding 5% or 20 m², whichever is the lesser of the *firecell* floor area, the overall *FHC* of the *firecell* will remain unchanged as if the *FHC 4* is not present.

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5.6.13 *Firecells* containing *fire hazard category 4*, in *buildings* with two or more floors shall be sprinklered where the concession permitted by Paragraph 5.6.12 does not apply.

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COMMENT:

1. A *purpose group* may be in *fire hazard category 4* for one or both of the following reasons:
 - a) The energy density of the *fire load* exceeds that associated with *fire hazard category 3* (an upper limit of around 1500 MJ/m²).
 - b) The *combustible* material in the *firecell* exhibits an overall rate of *fire growth* appreciably greater than that of predominantly cellulose-based products, in particular, materials which have a heat release rate (hrr) of 1 MW or more in less than 75 seconds. Examples of such materials and heat release rates may be obtained from NFPA 92B, Smoke-management systems in malls, atria and large areas.
2. Both reasons will apply to the uses listed under *fire hazard category 4* for *purpose groups* CM, WH and WF in Table 2.1.
3. Specific *fire engineering design* for *fire hazard category 4* will typically commence with the design of an active protection system. This system must be purpose designed to meet the design *fire hazard* for the particular application and to control a developing *fire*.

5.7 Applying FRRs to Building Elements

General requirements

5.7.1 *FRRs* apply to the sides of *primary* and *secondary elements* which are exposed to *fire*.

5.7.2 When different *FRRs* apply on each side of a *fire separation*, being a wall, the higher rating shall apply to both sides.

5.7.3 Floors shall be rated on the underside (see Paragraph 6.14.2).

5.7.4 The *FRR* of a *primary element* integral with a *fire separation* shall be no less than that of the *fire separation*.

5.7.5 Except as required by Paragraph 5.7.6, areas of *external wall* not permitted to be *unprotected areas* need be rated only for the threat of *fire* from within a *firecell*.

5.7.6 Areas of *external wall* not permitted to be *unprotected areas* shall be rated for *fire* exposure on both sides equally where:

- a) Walls are within 1.0 m of the *relevant boundary*, or
- b) *Purpose groups* SC, SD and SA are on one or more floor levels above their *final exit*, or SR is on two or more floor levels above their *final exit*, or
- c) The *building height* is more than 10 m.

COMMENT:

Refer also to Paragraphs 7.9.10 and 7.9.11 for additional *external wall* requirements for the *purpose groups* referred to in b).

5.7.7 When providing *stability* to *fire* rated elements in an adjacent (above or beside) *firecell*, *primary elements* need be rated only as required for the *firecell* in which they are located, regardless of any higher ratings which may apply to the adjacent *firecell*.

3. Except with timber members, yield strength generally reduces with temperature increase, so that strength reduction is related to the time for which the *primary element* is exposed to *fire*. Factors which need to be taken into account include the maximum temperature attained, the capacity of the element to absorb heat, potential loss of section, the degree of exposure, whether any applied coating is used to protect the element from the effects of *fire*, and the degree of restraint provided by the surrounding structure.

5.9.3 Factors influencing the necessary level of *fire* resistance include:

- a) *Fire* severity
- b) *Building* height
- c) Total *fire* load
- d) *Purpose* group
- e) *Occupant* load
- f) Capability of a local Fire Service
- g) Availability of a water supply
- h) Level of *fire safety precautions* installed in the *building*.

Unrated primary elements

5.9.4 In nearly all cases (see Paragraph 5.1) *primary elements* are rated for *stability*, and sometimes for *integrity* and *insulation*. However, *primary elements* need not be rated where any of the following circumstances exist:

- a) They are located outside an *external wall* which is 2.0 m or more from the *relevant boundary*, and are shielded from the effects of *fire* by protected areas of the wall (see Figure 5.2), or can be shown by *fire* engineering design to retain *stability* when subjected to thermal radiation and/or flame impingement as appropriate.

COMMENT:

To be shielded from the effects of an internal *fire* by protected areas of the *external wall*, *primary elements* should be placed within a 45° triangle formed in plan by lines drawn from the edges of *unprotected areas* on each side of the element. An alternative approach is to apply a method for determining the *stability* of *primary elements* outside the *external wall* contained in "Fire-safe structural steel – A design guide" – American Iron and Steel Institute. This approach is applicable to *primary elements* of any material.

- b) They are added to strengthen an existing *building* and are required only to carry horizontal loads induced by wind or earthquake.

COMMENT:

1. Usually frame action provides *stability* for the vertical and horizontal loads, and the two are therefore inseparable, but, when strengthening earthquake risk *buildings* for example, structural elements may be required only to withstand horizontal loading.
2. It is assumed that an earthquake will not occur during a *fire*.
- c) They are part of a *building* which is more than 1.0 m from the *relevant boundary* and contains only *purpose* group SH.

COMMENT:

Table 4.1 allows zero *F* rating for single floor *firecells*, provided other *fire safety precautions* are adopted. However, Paragraph 6.2.1 requires those *firecells* to be separated from each other by *fire separations* with a *FRR* of no less than 30/30/30.

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Acceptable Solution C/AS1

Part 6: Control of Internal Fire and Smoke Spread

6.1 General

6.1.1 The extent to which internal *fire* and smoke spread shall be controlled, and the methods adopted, depend mainly on the *purpose groups* and activities within the *building*. Control is generally required only for the time required for occupants to escape to a *safe place*. However, the Act Clause 6(1)(b) requires the provision of protection to limit the extent and effects of the spread of *fire* to *household units*, other residential units and *other property*.

6.1.2 Control is achieved by using one or more of the following:

- a) Subdividing *firecells* into smaller *firecells* or *smokecells*.
- b) Separating high risk activities from other activities, especially from sleeping *purpose groups*.
- c) Ensuring the *integrity* of *construction* joints and closures in *fire separations* and *smoke separations*.
- d) Preventing the movement of *fire* and smoke through *concealed spaces* and services ducts.
- e) Using appropriate materials and *surface finishes*.
- f) Installing equipment which, when *fire* occurs, activates automatically to suppress *fire* and smoke spread.

6.2 Firecells Rated F0

6.2.1 Where adjacent *firecells* on the same floor level are permitted by Table 4.1 to have a *F rating* of F0, they shall be *fire separated* from one another. The *fire separations* shall have a *FRR* of no less than that required by Part 6 or Part 7 (for a specific *purpose group* or situation), or 30/30/30, whichever is the greater.

COMMENT:

1. Although Table 4.1 provides a *firecell rating* of F0 for all single floor *firecells*, by definition *firecells* must be *fire separated* from one another. The main reason for having separate *firecells* is to provide for *purpose groups* having different *fire safety precautions*. Also, within sleeping *purpose groups*, Paragraphs 6.6 to 6.8 have requirements for certain activities to be *fire separated* and, for *fire separations* to limit the number of occupants in a *firecell*. Within active *purpose groups*, Table 4.1 has different *fire safety precautions* within a *firecell* depending on the *occupant load*.
2. In the absence of *fire separations* on a single floor, the space must be treated as a single *firecell* and the *fire safety precautions* for the primary *purpose group* (see Paragraph 2.2.2) must apply throughout the floor.

6.3 Purpose Groups CS and CL

Theatres

6.3.1 In every *theatre* where the *occupant load* in the auditorium is greater than 500, the stage area (including workshops, storerooms, scenery docks, property, wardrobe or painting rooms used in connection with the *theatre*), shall be separated from the auditorium by a proscenium wall meeting the requirements of a *fire separation* having an *FRR* of no less than 30/30/30. Where the stage and supporting areas are sprinklered as required by Paragraph 6.3.2, the proscenium wall and curtain may be a *smoke separation*. The openings in *fire rated* proscenium walls shall be protected as required by Paragraph 6.19.9.

COMMENT:

In determining the number of occupants on the floor, *occupied spaces* providing support functions need not be included.

Theatre stages

6.3.2 *Theatres* with an *occupant load* of greater than 1000, shall satisfy all the following requirements:

- a) Where the stage area is greater than 50 m², a sprinkler system shall be installed at the ceiling above the stage, and in all spaces used for support activities.
- b) Have roof vents of no less than 5% of the stage floor area, located at the highest point above centre stage.
- c) The vents shall have a positive device to keep them closed, and may be of the counterbalanced shutter type, inclined falling type, centre pivot sash type or counterbalanced skylight type.
- d) The vents shall be held normally in a closed position by a heat sensing device installed below the vent opening and its controls, but above the discharge of any sprinkler head in the vicinity.
- e) Vents shall be capable of being operated by a manual control located near the stage safety curtain release.
- f) The heat sensing device required by d) above, shall be interlocked with any heating or ventilating system, so that when activated, it closes all *fire dampers* in all ducts passing through the proscenium wall.

6.4 Purpose Group CM

6.4.1 When the *occupant load* on a sales, exhibition or trade fair floor is greater than 500, adjacent storage areas in which goods are received, unpacked, stored, packed for despatch, or areas used for workshops, and display material storage etc. shall be *smokecells* separated from the display and sales areas.

COMMENT:

1. This applies particularly to exhibition and trade fair halls.
2. Sprinkler requirements for *purpose group* CM are obtained from Table 4.1.

6.5 Purpose Group CO, CS and CL

6.5.1 If not sprinklered any enclosed useable space beneath tiered seating shall be a *firecell* with a rating of *F 45* for *FHC 1* and *F 60* for *FHC 2*.

6.5.2 If any enclosed useable space beneath tiered seating is sprinklered, it need not be a separate *firecell*, but supporting structure of the tiered seating shall have an *FRR* of 30/30/30.

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6.6 Purpose Groups SC and SD

6.6.1 *Firecells* containing *purpose groups* SC and SD shall be separated from *firecells* containing other *purpose groups*, by *fire separations* having a *FRR* of no less than 60/60/60 or 30/30/30 if the adjacent *firecell* is sprinklered.

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6.6.2 Sleeping areas in *purpose group* SC or SD shall be separate *firecells* but may include direct support functions (see Paragraph 6.6.7). *Fire separations* between non-sleeping areas and sleeping areas, and between adjacent sleeping areas, shall have an *FRR* of no less than 30/30/30.

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Group sleeping areas

6.6.3 Where SC or SD *purpose group* sleeping accommodation is contained within only a single *group sleeping area firecell*, the number of beds shall not exceed 12. Where the sleeping accommodation is distributed over two or more *group sleeping area firecells*, each *firecell* shall:

- a) Contain no more than 20 beds, and
- b) Have sufficient space to accommodate, in an emergency, the beds from an adjacent *firecell* of any occupants unable to walk.

Comment:

1. In this acceptable solution the term "beds" is used to denote the number of people expected to be sleeping in the *firecell*. Therefore, a double bed counts as two beds, and a tier of three single bunks (one above another) counts as three beds.
2. When it is not possible or desirable to evacuate occupants from sleeping areas and operating theatres, special considerations may be required. Refer to Paragraph 5.6.8.

6.6.4 A *group sleeping area firecell* in *purpose group* SC or SD may be subdivided by either:

- a) Non-*fire* rated partitions having a gap of no less than 400 mm between the top of the partitions and the underside of the roof or ceiling, or

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- b) Full height *smoke separations* including *smoke control doors* which need not be fitted with self-closers.

Suites

6.6.5 Where sleeping areas in SC and SD *purpose groups* are subdivided to create *suites*, each *suite* shall contain no more than 6 beds. Each *suite* shall be a separate *firecell* with *fire separations* having a *FRR* of 15/15/15. *Suites* may be subdivided with non-*fire* rated *construction* to provide separate spaces for sleeping, sanitary facilities and other activities. Where sanitary facilities are shared, those facilities may be contained within one of the *suites*, but entry from other *suites* must be through *fire separations*.

Special care facilities

6.6.6 Hospital operating theatres, delivery and recovery rooms, and intensive care units shall be:

- a) Contained in separate *firecells* having *fire separations* with a *FRR* of no less than 30/30/30, or
- b) Grouped together within a *firecell* which is separated from other activities in the *purpose group* by *fire separations* with a *FRR* of no less than 30/30/30. Within that *firecell*, each space shall be separated from adjacent spaces by *smoke separations*.

Support and service functions

6.6.7 Intermittently *occupied spaces* used for direct support functions to SC and SD *group sleeping areas* may be included in those *firecells*, except that, where direct support functions have a *FHC* greater than 1, these spaces shall be separate *firecells* having *fire separations* with a *FRR* of no less than 30/30/30.

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COMMENT:

Direct support functions include treatment rooms, tea bays, and sanitary facilities essential to the operation of the sleeping area.

6.6.8 Spaces providing communal service functions to adjacent SC and SD sleeping areas in the same *building*, shall be sprinklered and *fire* separated from the sleeping areas with *fire separations* complying with Paragraph 6.6.2.

COMMENT:

Communal service functions include nurses stations, waiting rooms, lounges, dining rooms and staffed kitchens supporting the operation of sleeping areas.

6.6.9 Service vehicle loading and unloading areas within the perimeter walls of a *building* shall meet the requirements of Paragraphs 6.10.3 to 6.10.5.

6.7 Purpose Group SA

6.7.1 *Firecells* containing *purpose group SA* shall be separated from *firecells* in other *purpose groups* by *fire separations* having a *FRR* derived from the *F rating* (given in Table 4.1/5), or 30/30/30 whichever is the greater. (See Paragraph 5.6.5 for *FRR* reductions where sprinklers are installed.)

Group sleeping areas

6.7.2 *Group sleeping areas* in *SA purpose group* shall be *fire* separated from each other and from non-sleeping areas. *Fire separations* between *group sleeping areas* and non-sleeping areas, and between adjacent *group sleeping areas*, shall have a *FRR* of not less than 30/30/30. Each *group sleeping area firecell* shall contain no more than 40 beds if unsprinklered, or 160 beds in *firecells* with *FSP* Type 7 installed.

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COMMENT:

1. In this acceptable solution the term “beds” is used to denote the number of people expected to be sleeping in the *firecell*. Therefore, a double bed counts as two beds and a tier of three separate bunks (one above another) counts as three beds.
2. *Group sleeping areas* of up to 40 beds might include accommodation such as ski lodges or school dormitories. Larger bed numbers, up to the 160 maximum, would apply to group gatherings in a *wharehenui* or a sleep-over for students in a school hall.

6.7.3 A *group sleeping area firecell* in *purpose group SA* may be subdivided provided that:

- a) The *firecell* contains no more than 40 beds, whether or not sprinklers are installed, and
- b) There is a gap of no less than 400 mm between the top of all partitions and the underside of the roof or ceiling. The partitions need not be *fire* rated.

6.7.4 Intermittently *occupied spaces*, such as tea bays and sanitary facilities, which provide direct support functions to the sleeping area, may be included in a *SA group sleeping area firecell*.

6.7.5 Spaces such as storerooms, laundry facilities, communal kitchens, dining rooms and lounges shall be separated from sleeping areas with *fire separations* having a *FRR* of no less than 45/45/45. It is acceptable for these non-sleeping activities to share a common *firecell*. (See Paragraph 5.6.5 for *FRR* reductions where sprinklers are installed.)

Suites

6.7.6 A sleeping area in *purpose group SA* may be subdivided into separate *suites* (such as a motel unit or hotel room with or without en-suite facilities). Each *suite* shall be a separate *firecell* and contain no more than 12 beds. *Fire separations* between adjacent *suites* on the same floor level shall have a *FRR* of no less than 30/30/30.

COMMENT:

1. It is implicit that within a *suite* containing *SA purpose group*, there is a substantial degree of responsible self regulation by the occupants. Where there are two or more occupants it is expected that the social cohesion of the group would result in a mutual responsibility for warning each other of a *fire* within a *suite*.
2. See Paragraph 2.2.9 for situations where *SA* may be treated as *SR* or *SH*.

6.7.7 Where *SA firecells* are located on an upper floor, *firecells* on lower floors shall have alarm systems in accordance with Paragraphs 4.5.10 to 4.5.12.

6.7.8 Service vehicle and unloading areas within the perimeter walls of a *building* containing *purpose group SA*, shall meet the requirements of Paragraphs 6.10.3 to 6.10.5.

COMMENT:

Service vehicles include commercial vehicles such as delivery vans, refuse pick-up vehicles and the like.

Halls and wharenuī

6.7.9 A hall or *wharenuī* used for sleeping, even if only occasionally, shall be classified as a *group sleeping area purpose group SA*.

COMMENT:

1. See Paragraph 3.3.2 h) which requires wider *escape routes* and Paragraph 3.4.2 e) which requires shorter *open path* lengths in *wharenuī* with specific *surface finishes*.
2. Paragraph 6.7.2 limits the maximum numbers permitted to sleep in a *group sleeping area* such as a *wharenuī*.

6.8 Purpose Groups SR and SH

6.8.1 Every *household unit* in *purpose group SR* shall be a single *firecell* separated from every other *firecell* by *fire separations* having a *FRR* derived from the *F rating* in Table 4.1/5, or 30/30/30, whichever is the greater.

6.8.2 An individual *SH* or *SR household unit* may contain one or more upper floors provided that the *open path* length provisions of Table 3.3 are satisfied.

COMMENT:

1. For *purpose groups SR* and *SH*, Table 3.3 permits maximum lengths of 24 m for the *dead end*, and 60 m for the total *open path* where no *FSPs* are installed.
2. See Paragraphs 1.3.3 and 1.3.4 for other *purpose group SH* requirements.

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6.8.3 Service vehicle loading and unloading areas within the perimeter walls of a *building* containing *purpose group* SR, shall meet the requirements of Paragraphs 6.10.3 to 6.10.5.

COMMENT:

Service vehicles include commercial vehicles such as delivery vans, refuse pick-up vehicles and the like.

6.8.4 Where a car parking garage is provided solely for the use of the occupants of an individual *household unit* in *purpose group* SR, it is acceptable for that garage to be included within the *household unit firecell*. However, where garaging is provided for vehicles of occupants of more than one *household unit*, that space shall be a separate *firecell* complying with the requirements of Paragraphs 6.10.3 to 6.10.5.

6.8.5 For *purpose group* SR, Table 4.1/5 describes the required *fire safety precautions*, and Paragraphs 7.10.7 to 7.10.9 describe the *fire* rating requirements for *external walls*.

6.8.6 Each *household unit* in *purpose group* SR, whether or not containing upper floors, shall be treated as a single floor *firecell* when applying Table 4.1/5 to determine the required *fire safety precautions*.

COMMENT:

1. This means that for individual SR *household units* located only side by side at ground level, the only *fire* safety requirement is for *fire separations* (*FRR* no less than 30/30/30) between adjoining units. See Paragraph 6.2.1 concerning F0 rated *firecells*.
2. For three or more *household units* vertically one above the other, the provisions of Table 4.1/5 apply to all units in the *building*.

6.9 Purpose Group IE

6.9.1 *Exitways* unless external and separated by distance, shall comprise *protected paths* which are *smokecells*, and/or *safe paths* which are *firecells*. Restrictions on the length of *protected paths* are given in Paragraph 3.4.

6.9.2 The *safe path* shall be separated from all adjoining *firecells* by *fire separations* having the same *FRR* throughout its length. The *FRR* shall be the greater of F 30 or the F rating of the highest rated adjoining *firecell* as determined by Table 4.1.

6.9.3 *Safe paths* which are stairs leading from lower floors or *basements* and which continue to floors above the level of the *final exit*, shall have the lower levels *fire* separated from the *final exit* level. The *fire separation* shall have a *FRR* of 30/30/30, or that required for the lower level, whichever is the greater.

6.9.4 *Safe paths* which are long corridors shall be subdivided by *smoke separations* in accordance with Paragraph 6.13.

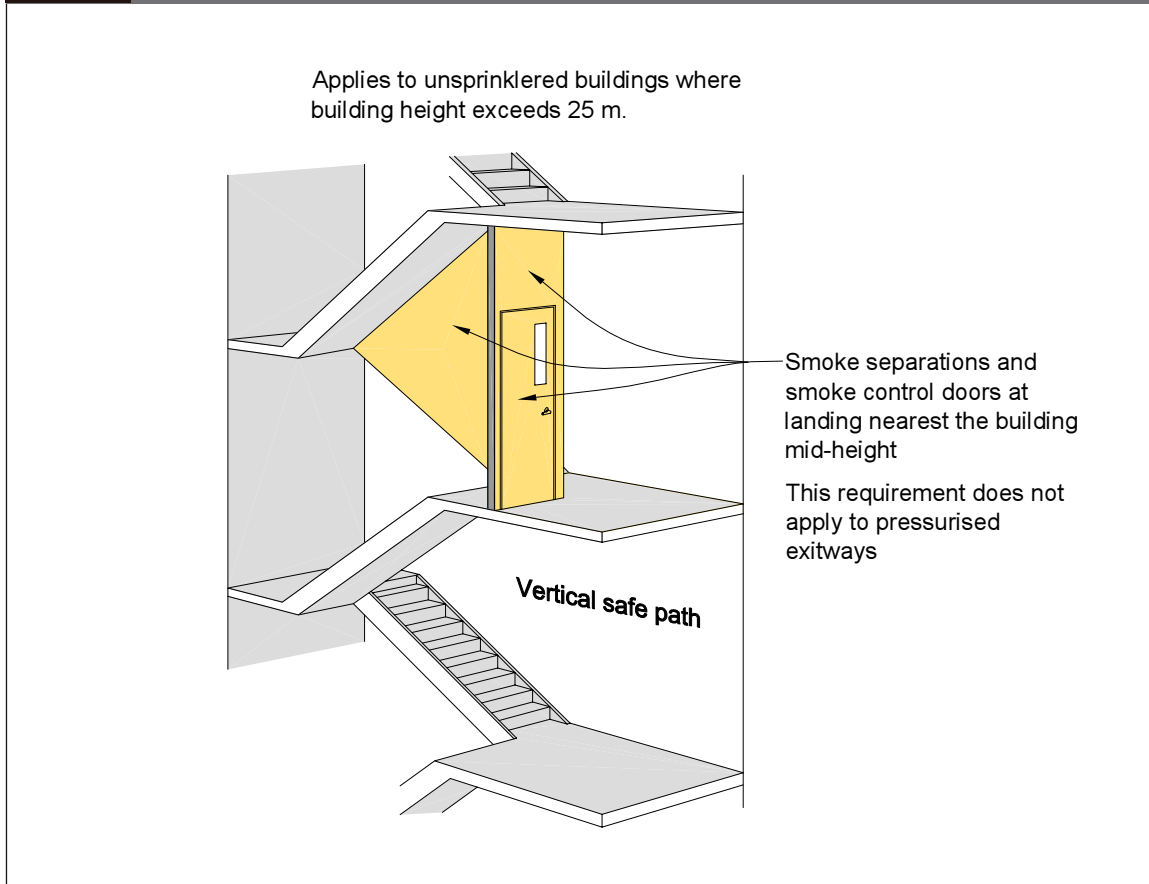
6.9.5 Air ducts passing through *exitways* shall not include *combustible* materials.

Ventilation in enclosed exitways for purpose groups SC, SD, SR and SA

6.9.6 Where pressurisation complying with AS/NZS 1668: Part 1 is not provided, for *purpose groups* SC, SD, SR and SA, *exitways* serving two or more *suites* or *household units* shall be ventilated in accordance with Paragraphs 6.9.7 and 6.9.8 except that, no ventilation is required when any of the following conditions occur:

- a) The *suite* or *household unit* opens directly into a *safe path* or *protected path*, not shared by any other *suite* or *household unit*, before reaching a shared *exitway*, or
- b) The *escape height* is no greater than 4.0 m, or
- c) Upon leaving the *suite* or *household unit*, there is more than one direction of escape, or

Figure 6.1: Vertical Safe Path Smoke Control
 Paragraphs 3.17.12 a) and 6.9.11



Solid waste storage

6.10.2 Enclosed solid waste storage areas within any *firecell* shall themselves be a separate *firecell* separated from adjacent *firecells* by *fire separations* having a *FRR* of no less than 60/60/60 (see Paragraph 6.16.6 for waste chutes).

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Car parking

6.10.3 Car parking spaces within a *building* (see Figure 6.2) shall be separate *firecells*. Within the car park *firecell*, all floors (including *intermediate floors*) and their supporting structures shall be *fire* rated.

COMMENT:
 A car park 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*.

6.10.5 *FRRs for building elements in car parking spaces shall be based on the S rating as derived from the formula:*

$$S = Ct_e$$

Where:

t_e (equivalent time of *fire exposure in minutes*) is derived from Table 5.1, and C is a variable having the following values:

For *fire separations between firecells*:

C = 1.0 if unsprinklered, or
= 0.5 if sprinklered.

For floors and supporting elements within the car park *firecell*:

C = 0.5 if unsprinklered, or
= 0.25 if sprinklered.

6.10.6 Where smoke control in a car parking *firecell* is by natural cross-ventilation, perimeter walls on each floor shall have permanent openings to the outside environment. The size of those openings shall be:

- a) No less than 50% of the wall area in each of any two opposing walls, or
- b) No less than 50% of the total perimeter wall area with those openings distributed uniformly along no less than half the total perimeter wall length.

6.11 Purpose Group ID

6.11.1 *Firecells in which ID is the primary purpose group, shall meet the same fire safety precautions as specified in Table 4.1 for purpose group WM, and shall be separated from adjacent firecells by fire separations having a FRR of no less than 60/60/60.*

6.11.2 Where *purpose group ID provides only support functions to another purpose group, and meets the requirements of Paragraphs 5.6.6 and 5.6.7 the ID function need not be individually fire separated and may be included with the primary purpose group.*

Plant, boiler and incinerator rooms

6.11.3 Within a *building* any space (see Figure 6.3) containing an incinerator, plant, boiler or machinery which uses solid fuel, gas or petroleum products as the energy source, (but excluding space heating appliances), shall be a separate *firecell* with a rating of F60, or F90 if the adjacent *firecells* contain SC and SD *purpose groups*, and shall have:

- a) At least one wall an *external wall*,
- b) Access direct from the outside. If internal access is also provided, it shall be through a *protected path* equipped with a heat detector which activates a warning alarm in frequently *occupied spaces* within the *building*, and
- c) Its floor level no lower than the ground level outside the *external wall* if gas is the energy source.

6.11.4 Where plant is contained in a *building* separated by 3.0 m or more from any adjacent *building*, only Paragraph 6.11.3 c) shall apply.

6.12 Firecell Construction

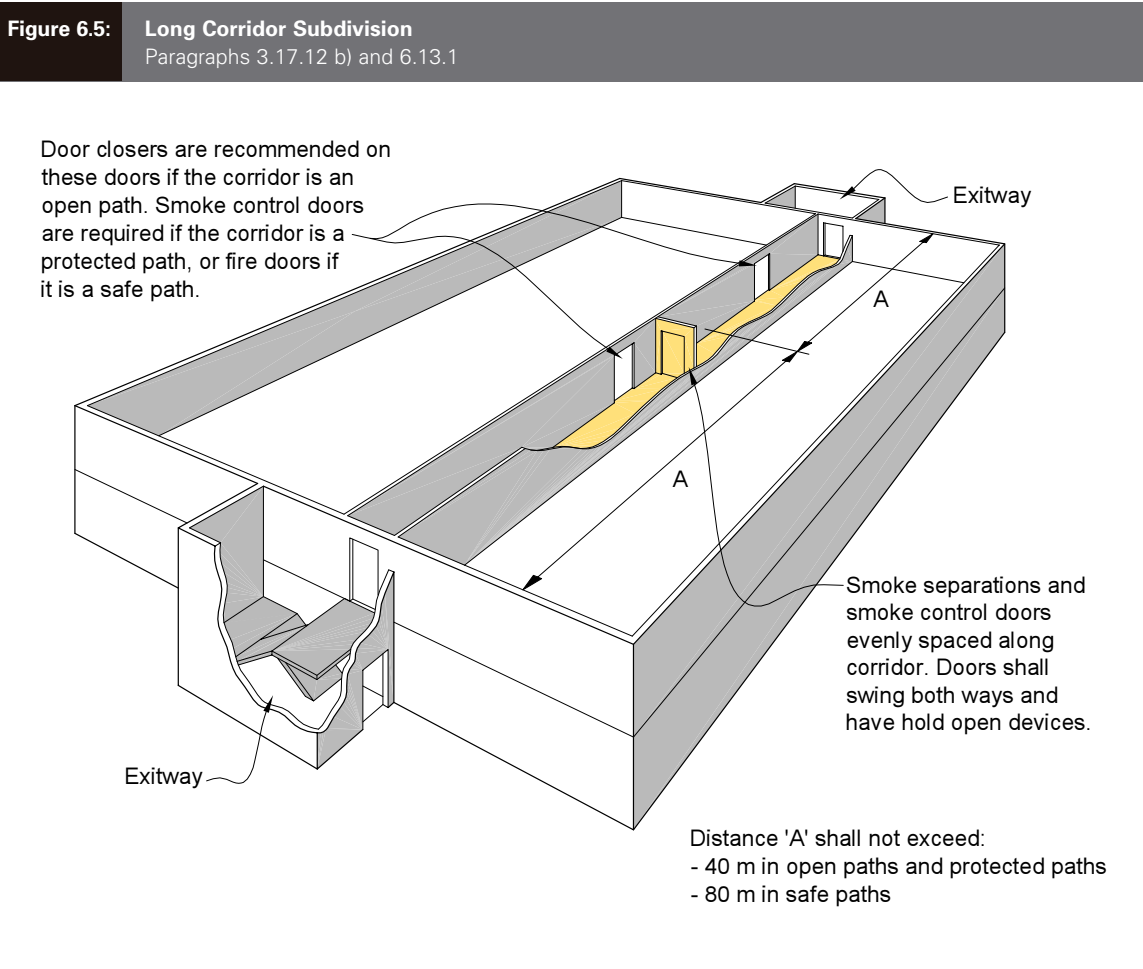
6.12.1 Each of the *building elements* enclosing a *firecell* may have different *FRRs* depending on the characteristics of the *firecell*, the reason for the *FRR*, and the *purpose groups* contained on either side of any *fire separation*. A zero rating may apply to some walls and most roofs.

6.12.2 Except as provided for in Paragraph 6.14.1 each floor in a multi-storey *building* shall be a *fire separation*.

6.12.3 *Fire and smoke separations* shall have no openings other than:

- a) For closures such as *doorsets*, and for *penetrations*, satisfying the provisions of Paragraphs 6.17 and 6.19, and
- b) Glazing permitted by Paragraph 5.8.

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6.14 Floors

6.14.1 Floors in buildings shall be fire separations (see Figure 6.4) except where any of the following conditions are satisfied:

- a) The floor is an intermediate floor within a firecell (see Paragraph 6.14.3 for FRR requirement).
- b) The floor is the lowest floor above an unoccupied sub-floor space, and complies with Paragraph 6.15.1.

6.14.2 Floors need to be rated only on the underside (see Figure 6.4). The FRR of a floor shall be that rating applicable to the firecell directly below the floor.

COMMENT:

The main threat to a floor is a fire beneath that floor.

Intermediate floors

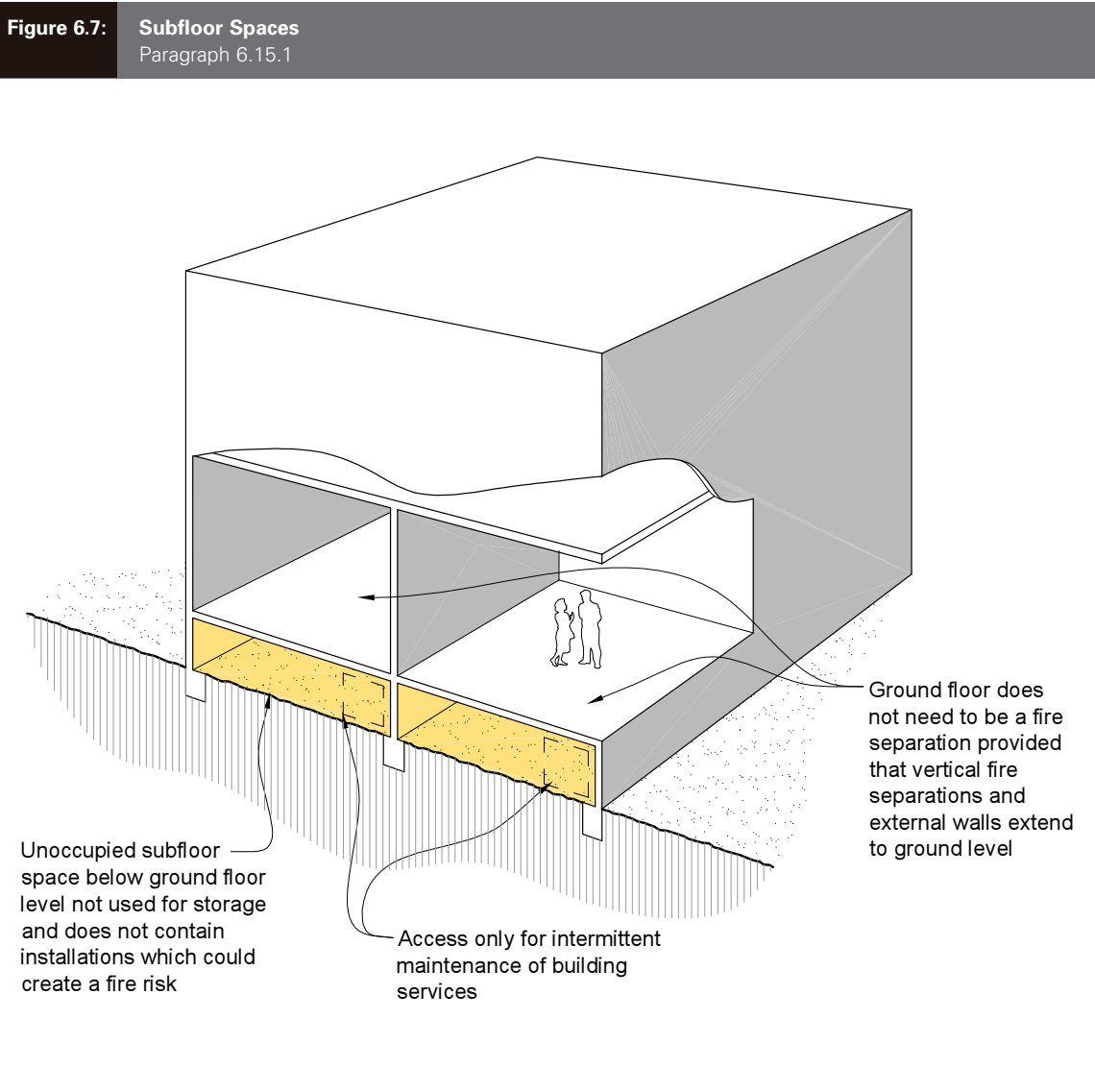
6.14.3 Intermediate floors and their supporting primary elements within the firecell (see Figure 6.6) shall have FRRs of no less than 15/15/15 except where the area under the intermediate floor is enclosed the FRR shall be 30/30/30. The provision does not apply to purpose group SH or to household units in purpose group SR, and suites in purpose group SA.

COMMENT:

The provisions for shorter open path length on intermediate floors, and for alarms and smoke control, allow occupants adequate time to escape to a safe place. On this basis there is no need to rate intermediate floors higher than 15/15/15 where the area under the intermediate floor is not enclosed. See Paragraphs 6.21.3 to 6.21.6 for other requirements of intermediate floors.

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6.16 Protected Shafts

Lifts, conveyors and services

6.16.1 Lifts, conveyors and services which pass from one *firecell* to another shall be enclosed within *protected shafts*. (Refer to Paragraph 6.19.13 for *doorsets* in lifts.)

COMMENT:

Paragraph 3.12.3 describes the requirements for the installation of a passenger lift in a vertical *safe path* containing a *stairway*. In those circumstances the vertical *safe path* must be a single *firecell*.

Fire separation

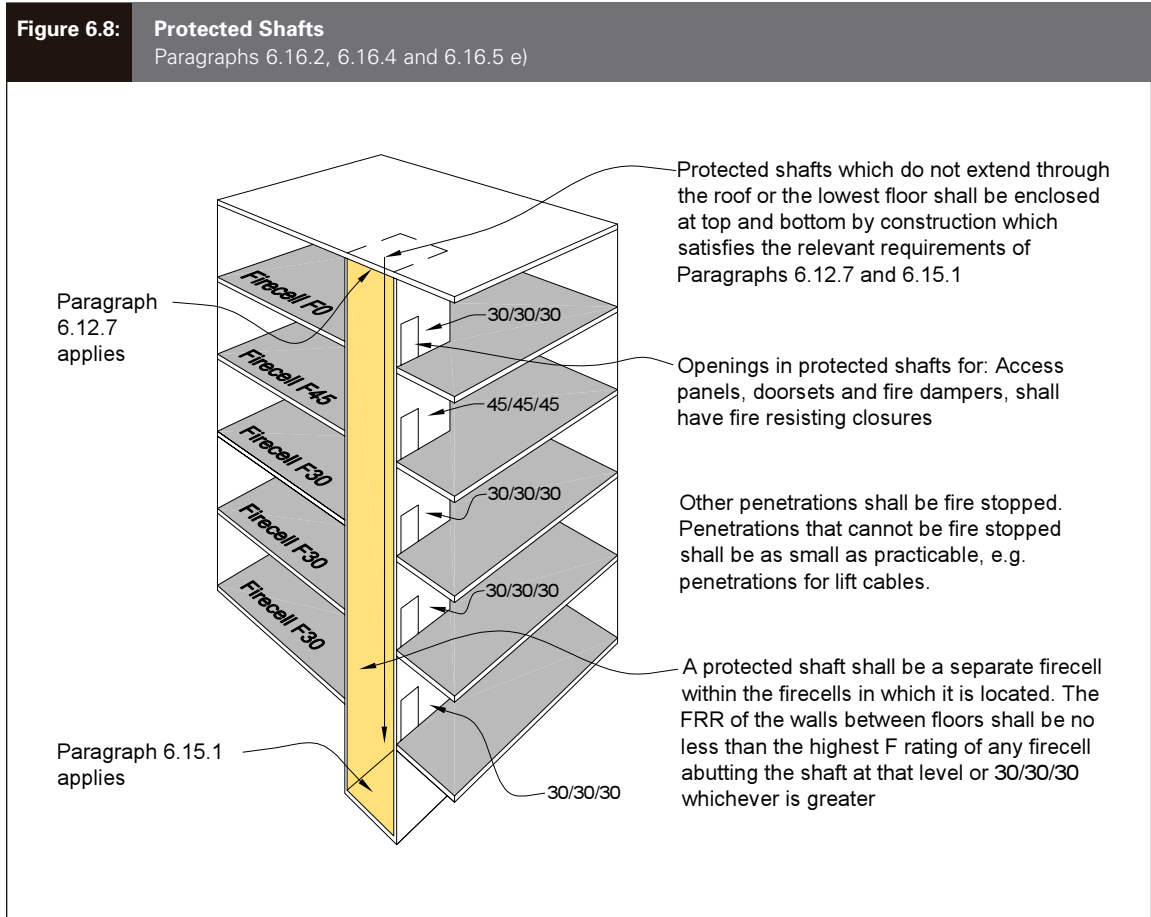
6.16.2 Every *protected shaft* shall be a separate *firecell* within the *firecell* or *firecells* in which it is located (see Figure 6.8). The shaft walls between each floor shall have a *FRR* based on no less than the highest *F rating* of any *firecell* abutting the *protected shaft* at that level, or 30/30/30, whichever is the greater.

COMMENT:

The *FRR* of the shaft wall shall apply to both sides equally, except in the case of lift landing doors (see 6.19.13).

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6.16.3 Protected shafts which do not extend through the roof or lowest floor shall be enclosed at top and bottom by construction which satisfies the relevant requirements of Paragraphs 6.12.7 for fire stopping, and 6.15.1 for enclosure (see Figure 6.8).

Openings in protected shafts

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6.16.4 There shall be no openings in protected shafts except for:

- a) Access panels complying with Paragraph 6.19.12 for fire resisting closures,
- b) Doorsets providing access to lifts and complying with Paragraph 6.19.13 for smoke control,

- c) Openings for lift ropes passing into a lift motor room, which shall be as small as practicable,
- d) Fire dampers serving a ventilation duct and complying with Paragraph 6.19.14 for fire resisting closures,
- e) The passage of penetrations which satisfy Paragraph 6.17 for fire stopping (see Figure 6.8), or
- f) Fittings which have an approved fire rating providing a FRR of no less than that required for the fire separation within which they are installed.

COMMENT:

While not strictly an opening, a cabinet to house, say, a hosereel, and let into a wall would not reduce the FRR of the wall provided the cabinet has an approved FRR of no less than that of the wall.

Solid waste and linen chutes

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6.16.5 Solid waste and linen chutes which pass from one *firecell* to another shall be *protected shafts* or contained within a *protected shaft*. For *purpose groups* SA and SR, if the *building* is not sprinklered, each chute shall be equipped with automatic sprinkler heads connected to any water supply pipe of 19 mm diameter or greater. Those sprinklers shall be installed at the top of each chute and in the space into which the chute discharges. The minimum residual pressure in the water supply pipe shall be 35 kPa with two sprinkler heads operating.

COMMENT:

The minimum residual pressure requirement for any operating sprinkler is to ensure sufficient flow rate and area coverage to control a *fire*.

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6.16.6 Solid waste and linen chutes shall have no inlet or discharge openings within an *exitway*.

COMMENT:

See Paragraph 6.10.2 for requirements of solid waste storage areas.

Sprinklers in protected shafts

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6.16.7 Where sprinklers are installed in vertical *protected shafts* which contain *building services*, in order to ensure water *penetration* to all points of the shaft, coverage shall comply with NZS 4541 or NZS 4515, and sprinklers shall be located to deliver water in sufficient quantities to extinguish a *fire* in any location within the shaft.

6.17 Fire Stopping

Introduction

6.17.1 The continuity and effectiveness of *fire separations* shall be maintained around *penetrations*, and in gaps between or within *building elements*, by the use of *fire stops*.

Fire stops

6.17.2 *Fire stops* shall have a *FRR* of no less than that required for the *fire separation* within which they are installed, and shall be tested in accordance with Paragraph C7.1 of Appendix C.

6.17.3 *Fire stops* and methods of installation shall be identical with those of the prototype used in tests to establish their *FRR*.

6.17.4 The material selected shall be approved as appropriate for the type and size of the gap or *penetration*, and for type of material and *construction* used in the *fire separation*.

COMMENT:

There are many types of *fire stops* (e.g. mastics, collars, pillows etc.), each designed to suit specific situations. Whether a *fire stop* is appropriate for a particular application may be judged on evidence that it passed the test criteria when installed as proposed.

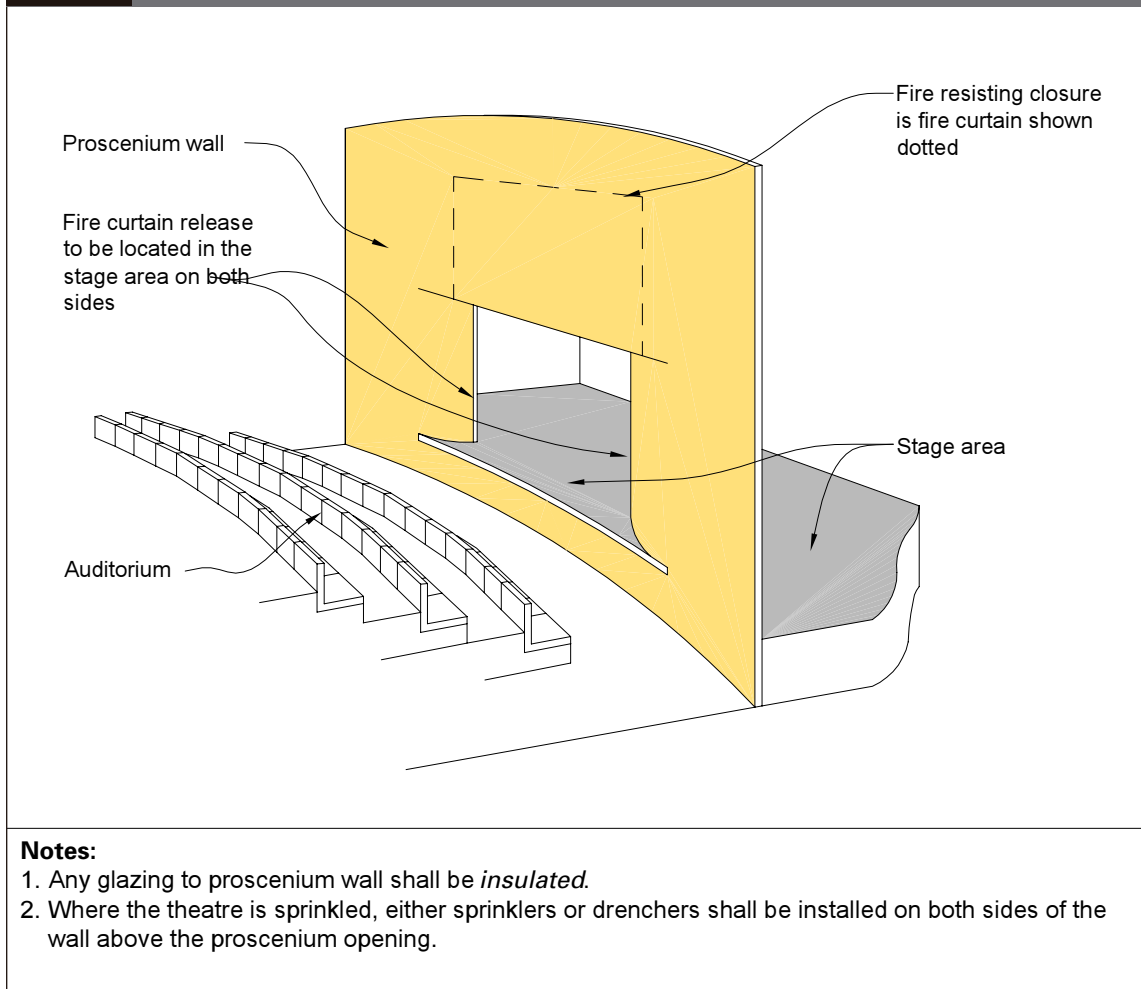
Installation

6.17.5 Hollow construction: Where used around *penetrations* passing through hollow *construction*, the *fire stop* shall protect the *penetration* over its full length within the *fire separation*. It shall also be restrained from moving or parting from the surfaces of both the *penetration* and *fire separation*.

Service outlets

6.17.6 Where service outlets such as electrical sockets and switches emerge from a hollow *fire separation*, the cavity in the separation shall be suitably protected with an approved *fire stop* material for the full size of the opening (see Figure 6.9).

Figure 6.13: Theatre Proscenium Walls
Paragraph 6.19.9



6.19.10 The *fire* curtain when released shall free fall, and overlap the opening to inhibit the passage of smoke and flames. An emergency curtain release device shall be located in the stage area on both sides of the opening.

6.19.11 Uninsulated glazing is not permitted in proscenium walls.

Protected shaft access panels

6.19.12 Access panels to *protected shafts* shall have the *fire* resistance and smoke control performance appropriate to their location as required by Table 6.1. They shall be capable of being opened only with a special tool.

Lift landing doors

6.19.13 *Doorsets* (lift landing doors) opening into lift shafts which are *protected shafts* shall be *fire doors* complying with Table 6.1. The *FRR* is based on the rating for the *protected shaft*. Table 6.1 describes how this is applied and the requirements for *insulation* and smoke control. Lift landing doors need not be *fire* rated from the shaft side.

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COMMENT:

This requirement does not apply to lifts meeting the provisions of Paragraph 3.12.3 for a passenger lift within a vertical *safe path*.

Flame barriers

6.20.13 Where *flame barriers* are required by Table 6.3 they shall:

- a) Completely enclose the *foamed plastics* at sides, edges, openings, *penetration* locations and panel joints, and
- b) Comply with the *surface finish* requirements of Paragraphs 6.20.1 to 6.20.3, and
- c) When used in an *external wall* cladding assembly, be located between the interior *occupied space* and the *foamed plastics building* material.

COMMENT:

Care during *construction* is essential to ensure maintenance of the *integrity of flame barriers* particularly around *penetrations*.

Wood and wood products in floors

6.20.14 In any *firecell* which has a *firecell* below, the flooring may be of:

- a) Wood products provided it has a thickness of no less than 20 mm, or
- b) Another *combustible* material which complies with the requirements for a *flame barrier* as described in Appendix C Paragraph C10.1.

COMMENT:

Wood products include boards manufactured from wood fibres or chips bound by an adhesive.

Wood and wood products in walls and ceilings

6.20.15 In any *firecell*, when the required *F* or *S* rating is:

- a) 60 minutes or more, and the internal walls and ceilings are lined with wood or wood products thicker than 1.0 mm, unless the *firecell* is sprinklered the *S* rating shall be increased by applying the requirements of the next higher *fire hazard category* of Table 5.1.

- b) Less than 60 minutes, linings of wood products may be of any thickness provided they comply with the *surface finish* requirements for linings in Paragraphs 6.20.1 to 6.20.7.

COMMENT:

Wood includes any type of solid sawn timber or glue laminated timber.

Suspended flexible fabrics

6.20.16 The requirements of Table 6.2 apply not only to curtains, drapes and similar ornamental fabrics which hang vertically, but also to flexible canopies which may lie at or near the horizontal.

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Membrane structures

6.20.17 The fabric of structures such as tents, marquees or canopies used for *purpose groups* CM, CS and CL, shall pass the *standard test* for flammability for membrane structures.

Air-supported structures

6.20.18 In addition to the requirements of Paragraph 6.20.17, air-supported membrane structures shall satisfy all the following provisions:

- a) *Final exits* shall be *constructed* with frames which enable the *escape route* to remain operable should loss of pressure allow the membrane to collapse.
- b) Two air blowers shall be installed, each with the capacity to ensure full inflation under normal air leakage.
- c) The air blowers shall be electrically interlocked so that if one fails to operate, the other automatically starts.
- d) For *purpose group* CL, air blowers shall have power supplied from an automatic generator set, or alternatively, the structure shall have a supplementary blower powered by an automatic start internal combustion engine, either equipment being capable of maintaining full inflation pressure under normal leakage for 30 minutes.

7.8.10 For an open sided *building* located closer to a *relevant boundary* than the distances allowed in Paragraphs 7.8.9 c) and d), the following additional requirements shall be met:

- a) The roof cladding shall satisfy the rate of heat release requirements of Table 7.5 except that no less than 15% of the roof area shall be *constructed* to be self venting (by opening or melting rapidly) in the event of a *fire* occurring below. No self venting area shall be located closer than 1.0 m to any attached *building*, *sleeping purpose group*, *other property* or *relevant boundary*, and
- b) If the open sided *building* is detached, the *primary elements* supporting the roof adjacent to the *relevant boundary* shall have a *FRR* of no less than 15/-/, or
- c) If the open sided *building* is attached to another *building*, a wall shall be provided adjacent to the *relevant boundary*. The wall shall have no *unprotected areas* and shall be rated from both sides with a *FRR* of no less than 15/15/15.

COMMENT:
 Examples of open sided *buildings* having a roof area exceeding 40 m² are canopies over forecourt areas at service stations, while those with roof areas of less than 40 m² would be structures such as carports associated with detached dwellings.

7.9 Vertical Fire Spread

Roofs

7.9.1 *Sleeping purpose groups*, *other property* and external *exitways* shall be protected against vertical *fire* spread from roofs.

7.9.2 Protection against *fire* spread shall be achieved using one or more of the following methods as described in Paragraphs 7.9.3 to 7.9.19:

- a) Separation by distance.
- b) Providing *fire separation* by use of parapets.
- c) *Fire* rating the adjoining *external wall*.
- d) *Fire* rating all or part of the roof against the threat of *fire* from the underside.
- e) Installing sprinklers in the *firecell* below the roof.

External exitways over roofs

7.9.3 Subject to Paragraph 3.14.3, when an external *exitway* crosses a roof, or is above or adjacent to a roof on the same or another *building*, the roof within 3.0 m of any part of the *exitway*, and all supporting elements, shall have a *FRR* of 60/60/60 or 30/30/30 if the *firecell* below is sprinklered.

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Primary elements

7.9.4 *Primary elements* providing support to an area of *fire* rated roof shall have a *FRR* of no less than that of the roof.

7.9.5 When supporting an unrated roof:

- a) *Primary elements* such as columns or walls which are required to be *fire* rated shall be rated from floor level to the underside of the roof framing members.
- b) Any roof framing members connected to these *fire* rated columns or walls, shall also be rated if their collapse in *fire* would cause the consequential collapse of the rated columns or walls.

Fire spread from an adjacent lower roof

7.9.6 *Fire* spread from a roof close to and lower than an *external wall* shall be avoided by compliance with Paragraph 7.9.7 where *firecells* behind the wall contain:

- a) *Purpose groups* SC, SD, SA, SR, or IE, and are located in the same *building* (as the lower roof), or in an *adjacent building* on the same title, or
- b) Any *purpose group* in an *adjacent building* on *other property*.

7.9.7 Where the distance between any part of an *external wall* and a lower roof is less than 9.0 m vertically or 5.0 m horizontally (see Figure 7.11), protective measures shall be applied either to the roof as in Paragraph 7.9.8, or to the wall as in Paragraph 7.9.9.

7.9.8 Roof protection shall be provided by:

- a) Installation of sprinklers in the *firecell* below the roof, or
- b) *Constructing* that part of the roof within 5.0 m horizontally of the wall, with a *FRR* derived from the *S rating* of the *firecell* below the roof.

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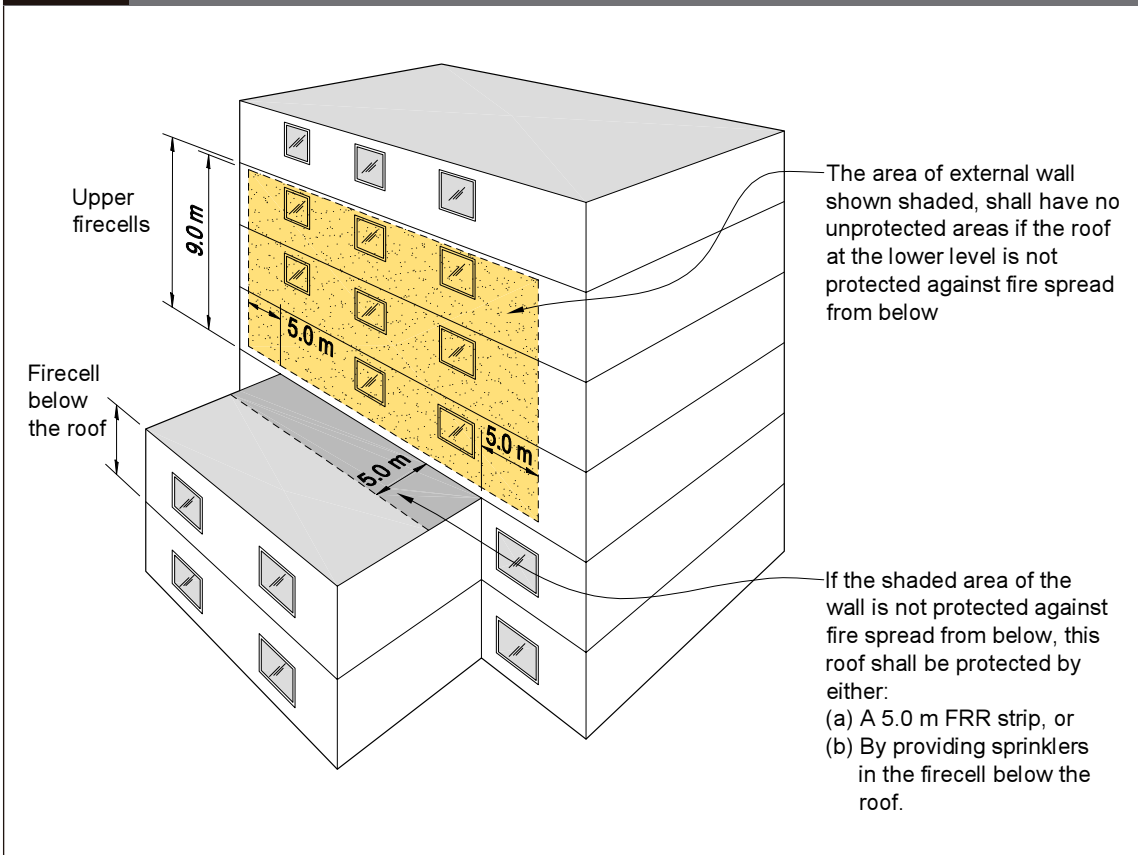
7.9.9 *External wall* protection above an adjacent lower roof shall be provided by *constructing* the critical part of the wall (closer to the roof than 9.0 m vertically or 5.0 m horizontally) with a *FRR* of no less than required in Paragraph 7.9.8 b).

External fire spread between different levels of the same building

7.9.10 Except where *firecells* are sprinklered, *unprotected areas* in *external walls* shall be protected against vertical *fire* spread where any of the following conditions occur:

- a) *Firecells* containing *purpose groups* SC, SD, SA or IE have an *escape height* of 4.0 m or more, or
- b) *Firecells* containing *purpose group* CM have an *escape height* of 7.0 m or more, or
- c) *Firecells* containing *purpose group* SR (except where sub-paragraph d) applies) have an *escape height* of 10 m or more, or
- d) *Firecells* containing *other property* are located one above the other.

Figure 7.11: External Walls and Roof, Vertical Fire Spread
Paragraph 7.9.7 and Figure 7.1



7.9.19 Paragraph 7.9.18 applies where the floors are *fire separations* between *firecells*. It does not apply within *household units of purpose groups SH and SR* or to any *external wall* satisfying the test requirements of Paragraph 7.11.2 b).

COMMENT:

1. Horizontal *fire stop* barriers are needed to prevent progressive involvement of insulants in *fire* by restricting hot gases or flames from travelling upwards within the insulation layer. In practice it may be necessary to specify movement joints to control cracking of the render or surface coating, and these may be conveniently incorporated within barriers. Further guidance and suitable *fire barrier* details may be found in BRE Defect Action Sheet DAS 131 dated May 1989 with additional information provided in BRE Report "Fire performance of external thermal insulation for walls in multi-storey buildings", 1988.
2. *Combustible* insulants may include expanded polystyrene (EPS), polyisocyanurate, or polyurethane. The insulants may be covered on the exterior side with a sheet material or with a thin rendered cementitious or polymeric coating.

7.10 FRRs of External Walls

7.10.1 *Building elements* which are part of an *external wall* shall be *fire rated* as required by Paragraphs 5.7.5 and 5.7.6.

7.10.2 Except as provided for in Paragraphs 7.10.6 to 7.10.8, any part of an *external wall* enclosing a *firecell* and not permitted to be an *unprotected area*, shall have a rating based on the higher of the *F* or *S rating* applicable to that *firecell*.

7.10.3 When the *unprotected area* of an *external wall* is permitted to be 100%, but the *primary elements* in the line of that wall are required to be *fire rated*, the rating of those *primary elements* shall be based on no less than the *F rating*.

COMMENT:

Primary elements are required to be *fire rated* in *buildings* with an *escape height* of greater than 25 m, and where they support, or are an integral part of, other *fire rated building elements*. See Paragraphs 5.3, 5.9, 7.9.4 and 7.9.5.

Return walls and wing walls

7.10.4 Return walls and wing walls shall be rated as for *external walls* (see Paragraphs 5.7.5 and 5.7.6).

Fire resistance ratings shall be no less than required for the *fire separations* of the *firecell*, or for the *primary elements*, whichever is the greater.

COMMENT:

Fire rating of external walls on both sides equally is required by Paragraph 5.7.6 where:

- Walls are within 1.0 m of a *relevant boundary*, or
- The *firecell* contains *purpose groups SC, SD or SA* with one or more floor levels above their *final exit* or *SR* with two or more levels above the *final exit*, or
- The *building height* is greater than 10 m.

Small buildings

7.10.5 An *S rating* need not be applied to single floor small *buildings* where:

- a) The *FHC* is no greater than 1, and
- b) The floor area is no greater than 40 m², and
- c) It does not contain a sleeping *purpose group*.

However, a *FRR* of no less than 30/30/30 shall apply to any *external wall* less than 1.0 m from the *relevant boundary*.

COMMENT:

This paragraph is intended to apply to garages, sheds and similar *buildings*, not to sleeping accommodation such as granny flats.

It is considered that *other property* is adequately protected for such *buildings* by providing a simple *FRR* to the wall.

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Amend 4
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Purpose groups SH and SR

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7.10.6 For detached dwellings (*purpose group* SH), in which the *household unit firecell* contains no more than three floor levels, the *external walls* are required to be *fire rated* only if less than 1.0 m from the *relevant boundary*. In that case the *external wall* shall have a *FRR* of no less than 30/30/30. The same provisions apply to *multi-unit dwellings* (*purpose group* SR), provided that adjacent *household unit firecells* are located only at ground level and are not one above another.

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7.10.7 Where a *building* contains *purpose group* SR with no more than two household units located vertically one above the other, and with no more than two floor levels in each, parts of the *external wall* not permitted to be *unprotected areas* shall have a *FRR* of no less than 30/30/30.

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7.10.8 For all SH and SR *buildings* not described in Paragraphs 7.10.7 and 7.10.8, *external walls* not permitted to be *unprotected areas* shall have a *FRR* derived from the *S rating*.

7.11 Exterior Surface Finishes

Roofs

7.11.1 For roofs in *purpose groups* SC and SD, *combustible* materials shall not be used as an external cladding except that, a *combustible* surfacing which is in close contact with and adhered to, either a *non-combustible* substrate or timber no less than 18 mm thick, is acceptable.

External walls

7.11.2 The peak rate of heat release and the total heat released from the *external wall* cladding system, as determined in accordance with Paragraph C9.1, shall not exceed the limits given in Table 7.5. These requirements do not apply where:

- a) *Surface finishes* are no more than 1.0 mm in thickness and applied directly to a *non-combustible* substrate, or
- b) The entire wall assembly has been tested at full scale in accordance with NFPA 285 and passed the test criteria.

COMMENT:

Other full scale facade test methods may also be acceptable to the *territorial authority*.

7.11.3 Where a *building* has *firecells* containing different *purpose groups*, the acceptable peak rate of heat release and total heat released (as specified in Table 7.5) of an *external wall* cladding system may have different values provided that:

- a) For each *purpose group* the value is no greater than required by Table 7.5 for the *building height* (not just the height of the *firecell*), and
- b) The value applied to a *firecell* is no greater than required by any *firecells* at a higher level on that wall.

COMMENT:

1. This means that where any *purpose group* requires a Type B performance, all lower floors shall have either a Type B or Type A performance in terms of Table 7.5. Should any *purpose group* require a Type A performance, all floors below shall have a Type A performance.

Appendix D: Fire Sprinkler Systems

D1.1 Introduction

D1.1.1 Wherever sprinklers are required by this acceptable solution, they shall comply with the relevant New Zealand Standard, amended as shown in Paragraphs D2.1 and D3.1.

D2.1 Automatic Fire Sprinkler Systems

D2.1.1 NZS 4541: 2003 is amended as follows:

Clause 1203 ROUTINE SURVEYS

Clause 1203.1 It is important that a sprinkler system at all times complies with this Standard as amended by Paragraph D2.1 of Appendix D to C/AS1 in all respects. To ensure that *building alterations*, changes in process or storage patterns or progressive deterioration of system components do not prejudice system compliance, a comprehensive survey shall be carried out biennially at intervals not exceeding 28 months. Such surveys shall be carried out by an independent qualified *person*.

Clause 103 DEFINITIONS

Sprinkler system A system including:

- (a) to (j) No change.
- (k) Delete.
- (m) Delete.

Clause 109 Delete entire clause.

Clause 205 Delete entire clause.

Clause 208 Delete entire clause.

Clause 601.2 Sprinkler systems shall have a water supply complying with no less than the requirements for Class C water supplies. Where additional water supplies are provided they shall comply with the requirements for Class A, Class B1 or Class B2 as applicable.

Clause 601.4 Delete.

Clause 601.5 Delete.

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D3.1 Residential fire sprinkler systems

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D3.1.1 NZS 4515: 2003 is amended as follows:

Clause 1.3 Definitions

Sprinkler system A system including:

(a) to (g) No change.

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(h) Delete.

Amend 4
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Clause 1.9 Delete entire clause.

Clause 2.1.2 Delete.

Clause 2.1.3 Delete.

Amend 4
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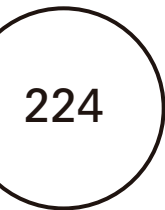
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