Net Zero Carbon Future

FIJI NATIONAL BUILDING CODE

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ACKNOWLEDGMENTS

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Inception

THIS SECTION APPLIES TO ALL BUILDINGS

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A1 INTRODUCTION

ABOUT THE CODE

The Fiji National Building Code (FNBC) is a forward-thinking document that provides standards for strength, resilience, fire safety, health, amenity and sustainability for all building types. The requirements in this Code are intended to protect the public interest, be cost effective, straightforward to implement, easily understood, and promote a sustainable and healthy built environment.

WHAT IS IN THE CODE?

The FNBC has the following eight components:

Objectives are mandatory, over-arching principles that apply generally to all buildings and structures. Objectives are located at the beginning of each section to identify benchmarks that performance requirements, deemed-to-satisfy provisions, acceptable solutions, and alternative solutions must comply with.

Performance Requirements are mandatory, and state the level of performance that deemed-to-satisfy, acceptable and alternative solutions must achieve to meet the objectives

Deemed-to-Satisfy Provisions (DTS) describe methods, outcomes, materials and measurements that, if followed, will satisfy some or all of the Performance Requirements

Specifications are mandatory, detailed descriptions of materials, workmanship or products that achieve the performance requirements

Acceptable Solutions are standards for a product or material created by approval and testing agencies that, if followed, will satisfy some or all of the Performance Requirements

Alternative Solutions are design solutions that demonstrate compliance with performance requirements that differ from deemed-to-satisfy provisions

Diagrams are descriptive elements in the FNBC that graphically illustrate standards to be followed or an acceptable method of achieving a standard or an example

Verification Methods are tests and calculations that demonstrate compliance with performance requirements

LAYOUT OF THE CODE

The original 1992 Code was based on the structure of the Australian Building Code, and this update does the same. The numbering of sections and parts relates to the section numbers in the NCC (National Construction Code of Australia) with some modifications.

The FNBC is laid out in the following 10 Sections:

A Inception
B Structure
C Fire Protection
D Access
E Electrical
F Health and Amenity
G Energy Efficiency
H Hazardous Substances
I Auxiliary Buildings
J Specialty Buildings

Five appendices provide supporting information that will assist building practitioners to design and construct buildings that comply with the Code, and for plan reviewers to evaluate compliance:

Appendix A: Standards Referenced in FNBC
Appendix B: Glazing Table Summary Charts
Appendix C: Structural Engineering Tables
Appendix D: Energy Saving Techniques
Appendix E: Expected Sea Level Rise Table

The following specifications are included at the end of each section listed below.

Section B: Structure
Part 3.10.6 Attachment of Decks and Balconies to External Walls of Buildings

Section C: Fire Protection
Specification C1.1 Fire-Resisting Construction
Specification C1.8 Structural Tests for Lightweight Construction
Specification C1.10 Fire Hazard Properties
Specification C1.11 Performance of External Walls in Fire
Specification C1.13 Cavity Barriers for Fire-Protected Timber
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Specification C2.5 Smoke-Proof Walls in Health-Care and Residential-Care Buildings
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Specification C3.15 Penetration of Walls, Floors and Ceilings by Services
Specification E1.5 Fire Sprinkler Systems
Specification E1.5a Class 2 and 3 Buildings not more than 25 m in Effective Height
Specification E1.8 Fire Control Centres
Specification E2.2a Smoke Detection and Alarm Systems
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Specification E2.2d Residential Fire Safety Systems
Specification E2.4 Air-handling Systems
Specification G3.8 Fire and Smoke Control Systems in Buildings Containing an Atrium
Schedule 5 Fire Resistance of Building Elements
Part E4 Visibility in an Emergency, Exit Signs and Warning Systems

Section D Access
Specification D1.12 Non-required Stairways, Ramps and Escalators
Specification D3.6 Braille and Tactile Signs
Specification D3.10 Accessible Water Entry / Exit for Swimming Pools
Specification E3.1 Lift Installations
Specification E4 .8 Photoluminescent Exit Signs

Section F Health and Amenity
Specification F2.1 Sanitation Systems
Specification F2.9 Accessible Adult Change Facilities
Specification F5.2 Sound Insulation for Building Elements
Specification F5.5 Impact Sound – Test of Equivalence
Specification F5.5A Rainwater Storage
Specification F7.2 Sizing of Gutters and Downpipes

Section G Energy Efficiency
Specification G2.2 Installation of Boilers and Pressure Vessels

ADMINISTRATIVE AUTHORITY

Building Act

This Code is brought into effect as a Regulation of the Building Act which empowers the Government of Fiji to regulate the construction, renovation and demolition of buildings. It contains the necessary administrative provisions to enable the building permit and occupancy permit approval processes.

The Building Act enables the Government of Fiji to regulate the design and construction of the following aspects of the building process:

(a) Structural sufficiency
(b) Building siting
(c) Fire Protection
(d) Access for people of all abilities
(e) Servicing (electrical, plumbing, water supply, waste removal)
(f) Energy efficiency
(g) Safety when hazardous substances are used

The Building Act and the FNBC **do not regulate** the use of buildings after they have been approved for occupancy unless there has been a warrantee or other caveat placed on the building permit as part of the building and/or occupancy approval processes. However, if a building is altered whereby there is a change of use, change in building classification, addition or other significant modification to the stability or safety of the building, the proposed change will need to comply with the FNBC and a building permit attained in order to proceed.

The Building Act establishes the Building Committee as a quasi-judicial body whose mandate is to approve updates to the Code, handle disputes in reference to the issuance of building and occupancy permits, and administer the fast-track building permit approval process. The Building Committee replaces the Building Permit Evaluation Committee established under the Building Permit Regulations Act, 2017 which was rescinded when the Building Act was approved by the Government of Fiji.

Building Regulations

Similar to the FNBC, the Building Regulations is a regulation of the Building Act. The Building Regulations set out technical and administrative requirements of the Building Act including procedures for the building permit and occupancy permit approval processes, site inspections, and keeping of records. The Building Regulations also has procedures for imposing fines and other punitive measures for non-compliance with the Code.

Other Legislation

Other Acts of Parliament that directly impact the enactment of the FNBC include:

Constitution of the Republic of Fiji – establishes that all citizens have the right to housing, sanitation, safe and adequate food, and supply of water

Public Health Act, 1935 – empowers the Chief Medical Officer of Health to inspect buildings and sites and require a landowner to undertake remediation and/or alternation of buildings or sites if there is non-compliance with the following health aspects of the Act:

(i) Access
(ii) Drainage
(iii) Refuse
(iv) Demolition
(v) Safe drinking water
(vi) Sanitary and waste disposal
(vii) Health and safety for specified building site

Specific health and sanitary standards are provided for premises for the production, manufacture, preparation, storage, distribution, sale or consumption of food regarding painting, washing and sleeping places, as well as hairdresser shops, common lodge houses including occupancy standards, and laundries

Towns (Building) Regulation, 1985 – a regulation of the Public Health Act, has standards for building materials, room dimensions, siting, health and amenity, used to evaluate development consent applications, plans of subdivision and zoning amendments

Public Health (Building) Regulation, 2016 (amended) – a regulation of the Public Health Act, has standards for building material, room dimensions, siting, health and amenity, used to evaluate development consent applications, plans of subdivision, and zoning amendments

Climate Change Act, 2021 - requires the FNBC to be updated to include standards that increase the climate resilience of Fiji's buildings

National Development Plan, 2017 – a climate resilience strategy for Fiji which has an objective of a 30% emissions reduction by 2031 as a step toward the goal of achieving net zero emissions by 2050 as required by the Climate Change Act

Drainage Act, 1985 - establishes the powers of the Drainage Board and requires developments to not interfere with public drains

Health and Safety at Work Act, 1996 - requires places of employment to have a healthy and safe work environment, implying that buildings must be constructed to provide these conditions

Environmental Management Act, 2005 – standards for preservation of natural features, and streams by employing sound construction practices and sets up protocol and procedures for Environmental Impact Assessments

Additional relevant legislation that must be considered when interpreting the FNBC include:

- Land Conservation and Improvement Act, 1985
- Land Development Act, 1961
- Natural Disaster Management Act, 1998
- Rights of Persons with a Disability Act, 2018
- Subdivision of Land Act, 1937
- Town Planning Act, 1973
- Water Authority of Fiji Act, 2007

APPLICABILITY

The FNBC applies to the construction of new buildings, sites and site servicing, and additions within urban, peri-urban and rural areas throughout the country. An exemption is made for traditional iTaukei buildings that are constructed for domestic, non-commercial purposes and use traditional methods of construction.

Buildings, siteworks and site servicing that exist prior to the enactment of the FNBC that do not comply with FNBC standards are not required to comply with the FNBC unless continued non-compliance is a health and safety risk and the Government of Fiji determines that compliance is necessary to protect the public interest.

However, if an application is made to alter, renovate, add, change or demolish the structure or site in any way, the proposed changes will be subject to all applicable standards in the FNBC. Additional works outside of the proposed alteration may also be required if deemed necessary to bring the alteration to an acceptable health and safety standard, at the discretion of the approval authorities.

MANDATORY PROVISIONS

The following provisions of the FNBC are mandatory:

a) Section A: General Provisions

b) Objectives listed at the beginning of Section B to Section J

c) Performance Requirements listed at the beginning of each subsection in Sections B to J

d) Specifications

Performance Requirements, Specifications and Deemed-To-Satisfy solutions in the FNBC take precedence regarding any difference between them and any Acceptable Solution or Alternative Solution, rule, or other provision listed in this document.

DISCRETIONARY PROVISIONS

Deemed to Satisfy Provisions

The Deemed-to-Satisfy provisions list techniques and standards that, if followed, will satisfy one, some or all of the performance requirements for the subsection. It is not necessary to comply with the Deemed-to-Satisfy provisions if an acceptable Alternative Solution is used or if an Acceptable Solution listed as applicable is used. The applicant must list the deemed-to-satisfy provisions that apply, and demonstrate how they are fulfilled to demonstrate compliance with the performance requirements.

ADMINISTRATIVE DISCRETION

The Code is drafted using appropriate language and terminology to achieve the intent of the objectives and performance requirements which building work must meet. However, in many cases, it is not possible to draft a standard in technical terms without the need for an informed judgement or interpretation of the wording. Approval authorities may at their discretion make informed decisions on how Building Code standards should be applied, and such informed decisions are open to appeal.

INTERPRETATION

The standards in the Code are written such that all parts of a standard must be complied with unless it is preceded by "or". For example:

In the following standard, parts (a), (b) and (c) must all be complied with:

1. The following measures must be carried out:
    a) The subsoil must be adequately drained
    b) The ground must be regraded or filled
    c) The surface must be covered with a damp-resisting material

In the following standard, part (a) must be complied with, and part (b) or part (c)

1. The following measures must be carried out:
    a) The subsoil must be adequately drained
    b) The ground must be regraded or filled, **or**
    c) The surface must be covered with a damp-resisting material.

A2 TERMINOLOGY

BUILDING DEFINITIONS

The FNBC applies to habitable and non-habitable buildings, structures and selected site and landscape work as defined here:

BUILDING any structure supported by walls, pillars, posts or columns and covered by a roof used primarily for human occupation or shelter including all uses listed in Section A2.2 Building Types. A building can include a non-habitable structure such as fire and life-safety systems, exterior storage buildings**,** tanks, and equipment dealing with flammable and combustible substances and hazardous substances exterior to the building, minor structures and temporary structures.

SITE land currently occupied or that will be occupied by a building including all land containing associated activities, features or characteristics necessary for the occupancy of the building.

SITEWORK earthworks and other activities associated with the construction, alternation, demolition or removal of a building, activities or uses on the site, or site servicing.

SITE SERVICING mechanical or electrical system in a building or site that consists of one or a combination of plumbing (water supply and wastewater removal/treatment), electrical, stormwater management, telecommunications, and electrical.

BUILDING TYPES

Aged-Care Building a place where the primary purpose is accommodation of aged persons who are provided with personal care services and 24-hour staff assistance to evacuate in case of an emergency

Assembly Building a place where people assemble for:

(a) Civic, theatrical, social, political or religious purposes, including a cinema
(b) Entertainment, recreational or sporting purposes
(c) Transit purposes other than a roadside bus stop such as an airport and transit terminal

Boarding House means a residential building in which board and lodging is provided or is intended to be provided for 4 or more boarders or lodgers for reward or payment, and includes a private hotel, a residential club or a hostel

Carpark structure used for the parking of motor vehicles but is neither a private garage nor used for the servicing of vehicles other than washing, cleaning or polishing

Open-deck Carpark a carpark in which every storey is cross-ventilated by permanent unobstructed openings in not fewer than two opposite or approximately opposite sides, and:

(a) Where each side that provides ventilation is not less than 1/6 of the area of any other side
(b) The openings are not less than 1/2 of the wall area

Open Garage a carport or garage with two or more sides substantially open

Commercial Building a place where any natural resource, goods, services or money are developed, sold, exchanged or stored, including an amusement park, auction room, bank, carpark, catering facility, coffee bar, computer centre, funeral parlour, hairdresser, post office, public buildings (police station, fire station, library, government office), public laundry, radio station, restaurant, service station, shop, showroom, television station, transport terminal, and tourist accommodation

Communal Residential living accommodation for a number of unrelated persons in a building, excluding tourist accommodation, healthcare, and aged-care buildings

Evacuation Centre a room, set of rooms, or building intended to provide a safe haven for people during an extreme weather event or other emergency, and has plumbing, utilities and sanitary compartments needed to support the expected occupancy

Farm Building a structure used for agricultural operations, such as a livestock barn, processing and sorting of farm produce, and accommodations for farm labourers

Farm Shed a structure on a farm used primarily for storage of farm equipment

Health-Care Building a place where the primary purpose is health and care, including:

(a) Hospital, convalescent home, infirmary or similar institution or home for sick persons or people with disabilities needing full-time nursing care

(b) A day clinic or day surgery unit where prescribed surgical procedures are performed using general anesthesia, major regional anesthesia or intravenous sedation

Heritage Building a structure of great historical, cultural and/or artistic value that has official protection to prevent it from being changed or destroyed

Highrise a building greater than 8 storeys in height

Industrial Building a building designed to produce, manufacture, store, test, and/or operate a product and provides the necessary conditions for workers and the operation of equipment

Major Infrastructure applies to a structure not for human habitation including a bridge, derrick, tunnel, dam, jetty, wharf, port, boardwalk, seawall and recreational activity

Minor Structures a non-habitable building not attached to the main building, including a carport, private garage, gazebo, shade structure, machinery or equipment room, sanitary compartment, outdoor fireplace or oven, private swimming pool, greenhouse, farm building, retaining wall and fence

Mixed Use Building an enclosed structure containing two or more residential, commercial, assembly, industrial or other uses, either physically and functionally integrated or located in separate units

Multiple Unit Building a building which contains more than one single occupancy unit

Multiple Unit Residential Building each unit in the building is primarily used for living and sleeping

Office a building with employment activities that do not involve fabrication or production of goods

Private Garage an enclosure intended for the storage of up to 3 cars for a Class 1 building

Retail Building a single building or unit with a gross floor area less than 50 m^2 where goods, services or money are developed, sold, exchanged or stored

Residential a room, group of rooms or single occupancy unit used primarily for human habitation

School a place where the primary purpose is education including a primary or secondary school, college, university or similar, training centre or similar educational establishment

Service Station a non-private garage for servicing of vehicles, other than washing, cleaning, polishing

Single Occupancy Unit a room, group of rooms, or building occupied by one owner, lessee, tenant, family or other occupant

Single Unit Residential all rooms primarily used as living space and sleeping

Stadium a type of assembly building used for viewing an event that may be enclosed or open-air

Storage Building a type of industrial building whose primary use is for the storage of goods

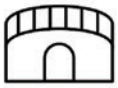
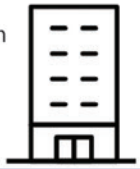
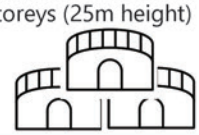
Temporary Structure a booth, tent, motor vehicle used for commercial purposes, or other temporary enclosure that is not intended to be permanently located or occupied, and used for 6 months or less

Tourist Accommodation a room, building or group of buildings providing overnight accommodation, food, and services for one or more guests

BUILDING CLASSIFICATIONS

Ten building classifications will be used to distinguish building types, and reflect the classifications in the National Construction Code of Australia, as shown in Table A.1

Table A.1 Building Classifications

Class 1	a) single residential home/accommodation unit, 3 storeys (10m height) max. b) terrace or townhouse residential up to 8 side-by-side units, 3 storeys (10m height) max. c) stacked residential duplex
Class 2	a) a boarding house, hostel, or hotel (max. of 12 occupancy rooms or units)  b) Multiple occupancy residential building with stacked units, 4 storeys (12m height) max, and four units per storey max.) 
Class 3	a) a boarding house, hostel, or hotel (> 12 accommodation units per building, 8 storeys (25m height) max.)  b) residential part of a hotel, motel, school or health-care building for staff members
Class 4	Dwelling in a Class 5 - 9 building if it is the only dwelling in the building
Class 5	a) Medium to high occupancy office building for professional or commercial use, or shopping mall with > 8 occupancy units b) Highrise (> 8 storeys, 25 m height) for residential, office, commercial or a combination, multiple units on the same storey
Class 6	Retail shop or service, single occupancy, including a) eating room, cafe, restaurant, milk or soft-drink bar b) dining room, bar and/or shop in a hotel or motel c) hairdressers, barber shop, public laundry, undertakers d) market or sales room, show room, service station
Class 7	A commercial building for: a) storage, display of goods or produce for sale by wholesale, and/or b) car park
Class 8	Industrial building, including: a) laboratory or industrial building for production, altering, repair, packing, finishing or cleaning of goods, or produce for trade, sale or gain, and/or b) any building that stores, handles or manufactures hazardous materials
Class 9	Public welfare buildings and gathering places, including a) health-care building, including a pathology laboratory b) places of worship, school, universities, sport facilities, night clubs, trade workshops c) buildings for the care of children, the elderly, people with a disability d) public works buildings e) any building that will serve as an evacuation centre following a disaster
Class 10	Non-habitable buildings and structures a) carport, private garage, shed, and the like b) fence, mast, antenna, retaining or free-standing wall, swimming pool, and the like

MEASUREMENT OF DISTANCES

Where the FNBC has provisions for minimum or maximum distance between objects, the following criteria apply:

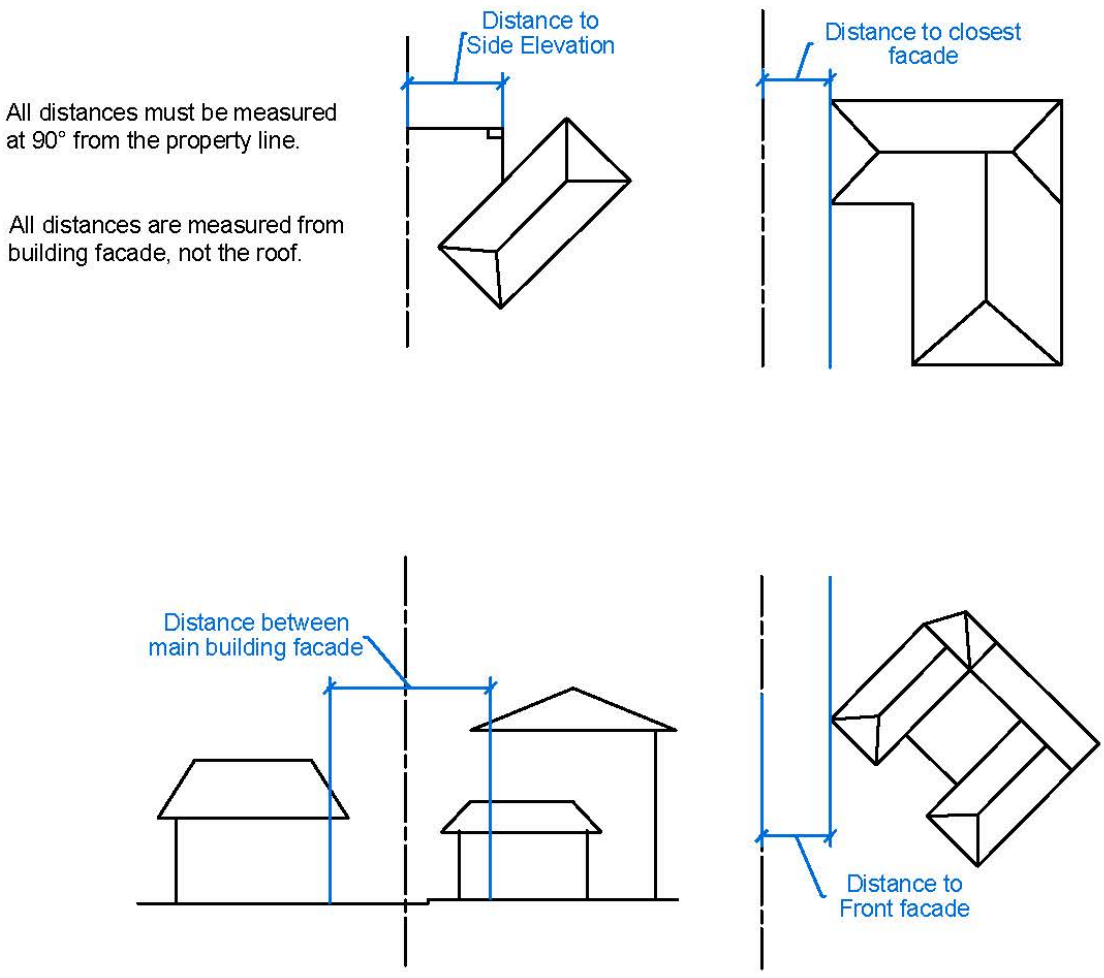
1. The distance from any point on an external wall of a building to a property boundary or another building is the distance to that point measured along a line at right angles from the starting point of measurement.

2. Where a wall within a specified distance is required to be constructed in a certain manner, only that part of the wall (including any openings) need be constructed in that manner.

3. Where the distance measured is between buildings of different heights, the distance must be taken from the external wall with the highest elevation measured at right angles to the external wall of the other building.

4. Only the wall facing or parallel to the property boundary or other building must be constructed in a particular manner.

Figure A2.1 Measurement of Distances



The minimum distances and setbacks are regulated through the Town and Country Planning Act and other policies approved by the Ministry of Local Government and Local Councils.

A3 BUILDING PERMIT APPROVAL PROCESS

The FNBC is an important part of the building approval process in Fiji, providing objectives, performance standards and minimum requirements to ensure a safe, healthy and sustainable built form. It provides guidance and standards for the following two-tiered approval system in Fiji:

Development Consent permission granted by an approval authority allowing development to occur on a site subject to the approval of a Building Permit

Building Permission permission granted by an approval authority that allows construction of a building or site to commence and proceed according to requirements in the development consent and building permit approvals

Multiple Allotments

All development planning proposals that involve the preparation of a schematic plan, zoning or a plan of subdivision involving multiple allotments are automatically required to apply for Development Consent prior to applying for a Building Permit. The approval authority will refer to the FNBC at this time and assess if the planning proposal is likely to comply with the FNBC at the building permit stage.

Single Allotments

When an application for development is submitted for a single allotment, the approval authority will assess the proposed land uses, scale and compliance with existing schematic plans, zoning and plans of subdivision, and based on that assessment will require the application to undertake one of three courses of action (illustrated in Table A3.1):

1. Small-scale developments that comply with planning documents – must apply for a Building Permit and Occupancy Permit

2. Large-scale developments that comply with planning documents – must apply for an Outline Application Permit, Building Permit, and Occupancy Permit

3. Large-scale developments that do not comply with planning documents – must apply for Development Consent, Outline Application, Building Permit and Occupancy Permit

Required Permits

Four types of permits may be required based on the proposed land use, building type, scale and compliance with planning documents:

Development Consent permission granted by an approval authority that allows development to occur on a site subject to the approval of a Building Permit

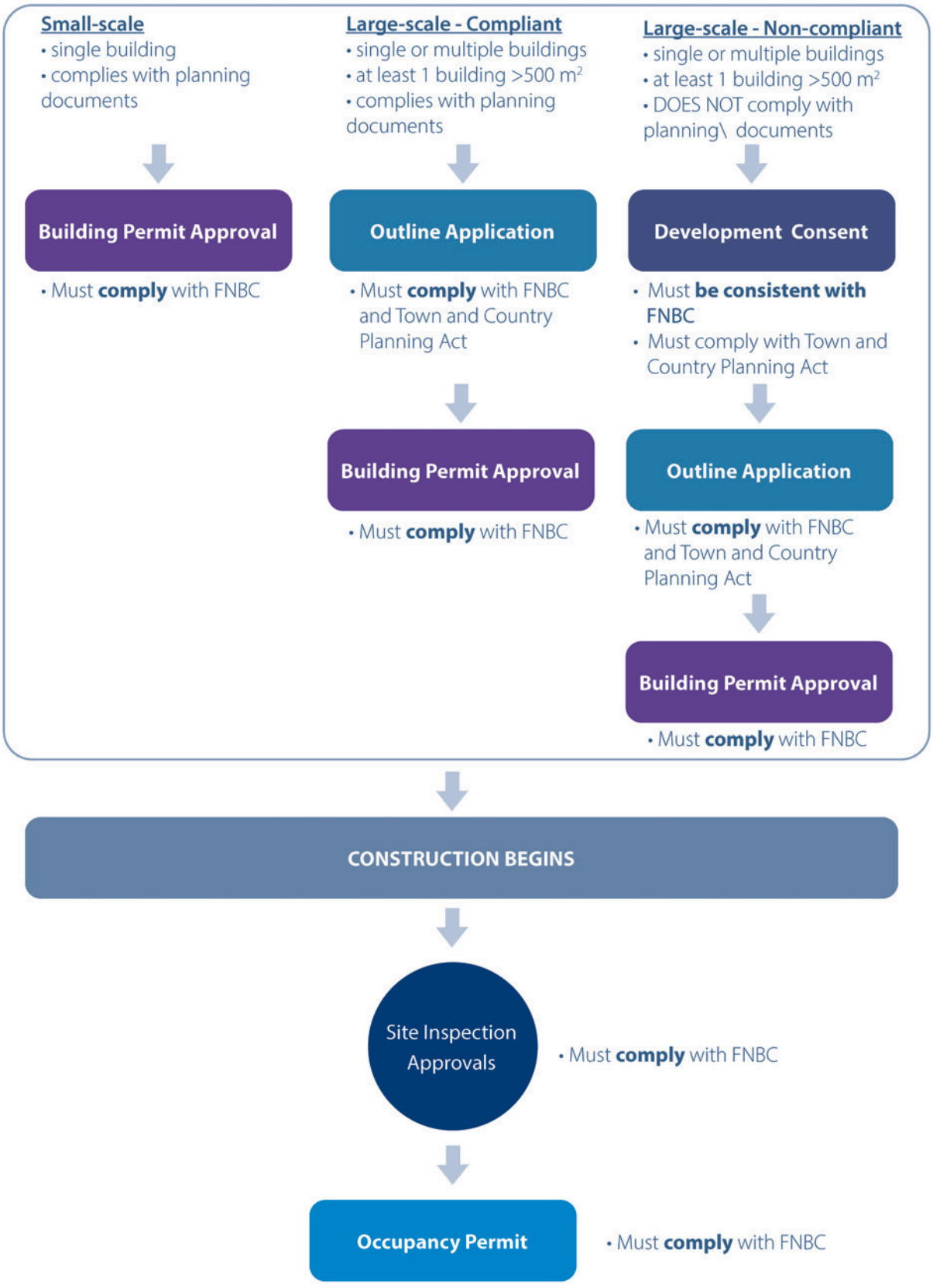
Outline Application permission granted by an approval authority that allows development to occur on a site subject to the approval of a Building Permit, applies to large-scale buildings

Building Permit permission granted by an approval authority that allows construction of a building or site to commence and proceed according to requirements in the development consent and building permit conditions

Occupancy Permit / Certificate of Occupancy permission granted by an approval authority to permit the use of the building post-construction

In addition, a series of site inspections must be successfully concluded to guarantee the quality of workmanship during construction.

Figure A3.1 Building Process



A4 COMPLIANCE

DEMONSTRATION OF PERFORMANCE

All applications for a building permit must have plans and specifications demonstrating that performance requirements of the FNBC have been achieved to the satisfaction of approval authorities in Fiji.

COMPLYING WITH PERFORMANCE REQUIREMENTS

For building permit approval, compliance with performance requirements can only be achieved by:

(a) Complying with deemed-to-satisfy provisions by:

  (i) Notating the appropriate acceptable solution and demonstrating how it is implemented in the proposed development

  (ii) Demonstrating in plans, specifications, or other suitable documents how the deemed-to-satisfy provisions are implemented in the design solution, and/or

  (iii) Listing appropriate legislation, regulation, or standards acceptable to the Government of Fiji and demonstrating how they are implemented in the proposed development

(b) Presenting an alternative solution which:

  (i) Complies with the performance requirements, or

  (ii) Is shown to be at least equivalent to the deemed-to-satisfy provisions; where deemed-to-satisfy provisions, acceptable solutions and/or alternative solutions are compliant with different components of a performance requirement, each one must be specifically notated, and

  (iii) Contains proven, supporting documentation that guarantee safety, resilience, sustainability and/or appropriateness of the design solution for Fiji such as accreditation certificates, test reports, detailed calculations and/or other documentary evidence demonstrating that a particular material, product or construction method satisfies the objectives and performance requirements of this Code

Where multiple deemed-to-satisfy provisions, acceptable solutions and/or alternative solutions are compliant with different components of a performance requirement, each one must be specifically notated.

ALTERNATIVE SOLUTIONS

An alternative solution only complies with the FNBC if appropriate assessment methods, satisfactory to the Government of Fiji are used. When submitting an alternative solution for consideration by the Government of Fiji, the submittal must:

(a) Identify the relevant deemed-to-satisfy provision relevant to the alternative solution

(b) Identify the performance requirements relevant to the identified deemed-to-satisfy provisions

(c) Describe the method, process, fabrication, construction, testing, or documentation of the expected results of the alternative solution

The following assessment methods, or any combination of them, can be used to determine if a proposed development complies with performance requirements:

(a) Supporting evidence (expert opinion) that the use of a building material, form of construction, or design meets a performance requirement, or a deemed-to-satisfy provision as described in A4.4 Suitability of Building Materials and A4.5 Evidence of Suitability

(b) Verification method acceptable to the Government of Fiji that is a test, inspection, calculation, or other method verifying that a building, building element, building material, assembly, facility, sitework, site servicing or structure complies with relevant performance requirements

(c) Satisfactory comparison with deemed-to-satisfy provisions

SUITABILITY OF BUILDING MATERIALS

Every part of a building, sitework or site servicing must be constructed in a manner which will achieve the required level of performance using building materials and methods that are not faulty or unsuitable for the purpose for which they are intended. Minimum standards for fire hazard properties of building materials contained in Specification C1.10 and Schedule 5 (Section C) must be achieved.

EVIDENCE OF SUITABILITY

Evidence to support the use of a building material, element, assembly, method, form of construction or other mechanism must be one or a combination of the following methods:

(a) A report issued by a registered testing authority, showing that the building material, method or form of construction has been submitted to the tests listed in the FNBC or acceptable solutions, and that the results of those tests and any other relevant information demonstrate its suitability for use in the development

(b) A current certificate of accreditation from an appropriately qualified professional consultant or approval authority which:

  (i) Certifies that a building material, method or form of construction complies with requirements of the FNBC

  (ii) Sets out the basis on which it is given and the extent to which relevant specifications, rules, codes of practice or other publications have been relied upon

(c) Product information sheets listing characteristics in compliance with performance requirements and/or deemed-to-satisfy provisions

(d) Certificates issued by the Standards Association of Australia, or the Standards Association of New Zealand accompanied by a report outlining compliance with performance requirements in the FNBC

(e) Any other form of documentary evidence that correctly describes the properties and performance of the material, method or form of construction and adequately demonstrates its suitability for use in the building acceptable to the Government of Fiji

All evidence submitted must be original copies and must comply with the Building Regulations.

BUILDING PERMIT APPLICATION REQUIREMENTS

Building permit applications (including plans, documents, specifications) will be deemed to be complete when provisions in Section A4.1 to A4.5 are adequately addressed, and the following is supplied:

(a) Plans are stamped by a qualified professional consultant for all disciplines (e.g., architectural, electrical, structural, mechanical) where deemed appropriate for the development (as determined by the Government of Fiji) with notation on the plans that the professional consultant certifies that performance standards in the FNBC have been achieved

(b) List of applicable deemed-to-satisfy provisions achieved

(c) List of acceptable solutions used

(d) List of verification methods achieved

(e) List of alternate solutions used, and the performance requirements satisfied as a result of their use

(f) List and submittal of product information sheets and the performance requirements satisfied as a result of their use

(g) List and submittal of certificates of accreditation

(h) Approval granted from Government agencies

Further information on the building permit approval requirements and procedures, including applicability and appropriateness of professional certification and procedures for the submission of certificates, reports or other documentation as evidence of compliance can be found in the Building Regulations and publications issued by the Government of Fiji.

COMPLIANCE WITH STANDARDS

A number of International and Fijian Standards, including acceptable solutions, specifications, guidelines, policy documents and instructional manuals, are referenced in the FNBC and listed as appropriate sources from which to design a solution that will comply with the FNBC. These standards are listed where appropriate throughout the document. A complete list of all referenced standards is included in Appendix A.

The current approved version of a standard listed in Appendix A and contained within the main body of the document will apply unless an earlier version is specifically referenced.

INTERPRETATION

The ability of a proposed development to meet the requirements in the FNBC does not override any decision on Development Consent or other approvals of the Government of Fiji.

Standards in the FNBC shall take precedence when differences arise between the FNBC and referenced international standards, policies or other external source. When referenced standards and policies require compliance with the laws and regulations of another country, the laws and regulations of the Government of Fiji shall take precedence.

A5 ABBREVIATIONS

ACRONYMS

A.C.	Alternating Current
ACIF	Australian Communications Industry Forum
AFRC	Australian Fenestration Rating Council
AHRI	Air-Conditioning, Heating, and Refrigeration Institute
AS	Australian Standards
ASTM	American Society for Testing and Materials
CCA	Climate Change Act
CNG	Compressed Natural Gas
D.C.	Direct Current
DFL	Design Flood Level
DPC	Damp-proof course
DTS	Deemed-to-Satisfy Provisions
EDGE	Excellence in Design for Greater Efficiencies
EER	Energy Efficiency Ratio
ELV	Extra Low Voltage
EMI	Electromagnetic Interference
EPB	Equipotential Bonding
EPDM	Ethylene Propylene Diene Terpolymer
FFL	Finished Floor Level
FNBC	Fiji National Building Code
FPAA	Fire Protection Association Australia
FRL	Fire Resistance Level
FS	Fiji Standard
GHG	Greenhouse Gas Emissions
GWP	Global Warming Potential
HDPE	High-Density Polyethylene
HVAC	Heating, Ventilation, and Air Conditioning
IPX	Ingress Protection
IRHACE	Institute of Refrigeration, Heating, Air Conditioning Engineers
LEDS	Low Emission Development Strategy
LEED	Leadership in Energy and Environmental Design
LV	Low Voltage
MEN	Multiple Earth Neutral
MEPS	Minimum Energy Performance Standards
MIMS	Mineral Insulated Metal Sheathed
NCC	National Construction Code of Australia
NFPA	National Fire Protection Association of Australia
NFRC	National Fenestration Rating Council
NPCAA	National Precast Concrete Association Australia
NZS	New Zealand Standards
NZSGA	New Zealand Safety Glass Association
ODP	Ozone Depletion Potential
PELV	Protected Extra Low Voltage
R.M.S.	Root Mean Squared
RCD	Residual Current Device
RFI	Radio Frequency Interference
RPL	Recycled Plastic Lumber
RSM	Rolling Sphere Method
SELV	Separated Extra Low Voltage
SHGC	Solar Heat Gain Coefficient
SPUF	Sprayed Polyurethane Foam
SRCD	Residual Current Device Switched Socket Outlet
SRI	Solar Reflective Index
TGSI	Tactile Ground and Surface Indicators
UPVC	Unplasticised Polyvinyl Chloride
VOC	Volatile Organic Compounds
VR	Regional Wind Gust (against annual probability)
WELS	Water Efficiency Label Standard
WERS	Window Energy Rating Scheme
WWR	Window-to-Wall Ratio

Government of Fiji Ministries and Departments

MLG	Ministry of Local Government
MTCS	Ministry of Trade, Cooperative, Small and Medium Enterprise and Communications
MOF	Ministry of Finance
MFF	Ministry of Forestry and Fisheries
MPWT	Ministry of Public Works, Meteorological Services & Transport
MiA	Ministry of iTaukei Affairs
MWCP	Ministry of Women, Children and Poverty Alleviation
MOWE	Ministry of Waterways and the Environmen
CCD	Climate Change Department
DTCP	Department of Town and Country Planning
NDMO	National Disaster Management Office

Agencies

CIC	Construction Industry Council
EF	Engineers Fiji
EFL	Energy Fiji Limited
FAA	Fiji Association of Architects
FBDA	Fiji Building Designers Association
FBS	Fiji Bureau of Statistics
FMBA	Fiji Master Builders Association
GGGI	Global Green Growth Institute
ICF	Insurance Council of Fiji
IFC	International Finance Corporation
NFA	National Fire Authority
NCPD	National Council for Persons with a Disability
PRIF	Pacific Region Infrastructure Facility
WAF	Water Authority of Fiji

A6 DEFINITIONS

(All electrical definitions are listed at the end)

Accessible having features to permit a person with a disability to approach, enter, and exit a building or site, and use the facilities and services of the building or site

Acceptable Exit see Exit

Accessible Route a walkway, ramp, hall, public corridor, landing, entry or exit designed to safely permit a person with a disability to enter and travel through the building, facility or site

Active Fire Protection a system of warning and firefighting equipment that are activated and used as a response to a fire, including fire extinguishers, fire hose reels, fire blankets, sprinkler systems, smoke alarms, automated fired doors, thermal detectors, fire control systems

Air Gap the open area between building materials in the construction of roofs, walls, ceilings and floors deliberately intended to create a sound or temperature insulation barrier

Airtight not allowing air to escape or pass through

Alteration in relation to a building, includes an addition or extension to a building

Alternative Solution one that is compliant with the FNBC but is not listed as a deemed-to-satisfy provision or an acceptable solution

Annual Greenhouse Gas Emissions the theoretical amount of greenhouse gas emissions attributable to the energy used annually by a building's services, excluding kitchen exhaust and the like

Approval Authority a person or organisation of persons that is sanctioned by the Government of Fiji as having appropriate and adequate certification, qualifications and experience to determine whether a proposed development complies with FNBC standards

Atrium a space within a building that connects 2 or more storeys and is wholly or substantially enclosed at the top by a ceiling or roof (including a glazed roof structure), and

(i) Includes any adjacent part of the building not separated by bounding construction, but

(ii) Does not include a stairwell, ramp well or the space with a shaft

Automated Access any motorised means of conveying people or goods, including lifts, escalators, moving walkways, ramps, inclined platform lifts, and the like, or allowing access to a building, facility or site, including automatic doors, windows, gates and turnstiles

Automatic designed to operate when activated by a heat, smoke or fire sensing device, applies to a fire door, smoke door, fire shutter, smoke and-heat vent, sprinkler system, alarm system and the like

Automatic Fire Alarm an automated audio and sometimes visual warning system triggered by smoke detectors that is connected to the fire safety system, fire control panel, and/or fire control centre

Automatic Fire Suppression an automatic system that controls and extinguishes fires without human intervention

Awning any hood, canopy, shade covering or other simple roof or slab structure over or across any public footway or part thereof, cantilevered or suspended from a wall of a building

Backflow Prevention Device an air gap, break tank or mechanical device that prevents the unplanned reversal of water or contaminant flow into a water service or a reticulated water supply

Back siphonage a reversal of the flow of water caused by negative pressure in the distributing pipes of a water service or supply

Backstage a space associated with, and adjacent to, a stage in a Class 9b building for scenery, props, equipment, dressing rooms, and the like

Balcony means any platform or gallery projecting from a building

Baluster an upright support for the top and bottom rails of a barrier or balustrade

Balustrade a sequence of balusters supporting a handrail

Bathroom room in a building or facility, or a stand-alone structure, containing at least a toilet and a means of personal hygiene (wash basin, sink, tap with running water, and may include other means of personal hygiene such as a shower or bathtub, and associated facilities such as a hot tub or sauna

Bio-energy a source of energy derived from the fermentation of organic matter

Blackwater the mixture of urine, faeces and flushwater that are diluted in the flush water of a toilet

Blockage an obstruction within a drainage system

Building Element primary structural frame members, load-bearing walls, common and interior walls, fire walls, floor and/or roof construction, exit construction, foundations, and windows

Building Material any substance used for construction, alteration or repair of a building, facility or site servicing, including natural and synthetic substances, fasteners, adhesives, and hardware

Building Permission permission granted by an approval authority that allows construction to commence and proceed according to development consent and building permit conditions

Building Permit document issued by the Government of Fiji allowing construction, alteration or demolition of a building, siteworks and/or site servicing to proceed according to conditions of the building permit

Bulk Insulation a substance that blocks conductive heat transfer and convective energy flow into or out of a building, including fiberglass, wool or cotton batts, rigid board, and spray foam insulation

Certificate of Occupancy / Occupancy Permit a certificate issued by an approval authority when a building, or part of a building, has been deemed to be safe for use by a qualified building inspector

Charged Dry Riser Main System one or more riser mains and fittings, not permanently connected to a fire main, that is charged with water from a reticulated water supply in order to make it self-monitoring against inadvertently left open hydrant valves and leakage

Cladding exterior surface of a building attached to external framing walls, the roof, or any other exterior surface

Climate Change a change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods

Climate Resilience the capability of communities, the built environment and ecosystems to respond to, withstand and recover from the adverse impacts of climate change

Coastal Flood Level hypothetical estimation of the height above typical high tide elevation along the shoreline that would be inundated by water as a result of storm surge, coastal flooding, and water table saturation, as determined by an approval authority and/or the Government of Fiji

Coastal Zone land adjacent to the sea identified by the Government of Fiji as being in the coastal zone

Combustible a material that ignites and burns easily when exposed to elevated temperatures, that has been subjected to the test conditions of AS 1530.1 Methods for Fire Tests on Building Materials, Components and Structures, Part 1: Combustibility Tests for Materials and has exceeded flaming or temperature rise limits specified in the standard

Common Wall see Wall

Compliant Sprinkler System pressurised sprinkler and water distribution piping system for automatically extinguishing fires that complies with Specification E1.5 Compliant Sprinkler Systems in this document

Conditioned Space a space within a building, including a ceiling or under-floor, supply air plenum or return air plenum, where the temperature is controlled by air-conditioning

Curtain Wall see Wall

Damp-proof course (DPC) a continuous layer of impervious material placed in a masonry wall or pier, or between a wall or pier and a floor to prevent the upward or downward migration of water

Dead Load see Permanent Load

Deck an open platform projecting from an external wall of a building and supported by framing and may be open underneath or partially or fully enclosed

Design Flood Level (DFL) hypothetical estimation of the height (elevation) above ground level that would be inundated by flooding as a result of storm surge or rainfall, as determined by an approval authority, the Government of Fiji, and/or a registered professional authority (engineer)

Desludge / Desludging removal of accumulated sludge and scum from the septic

Development the use of land (whether for a long term or temporary purpose), the erection of a building or other structure, the construction of services, and any other related activity regulated under the FNBC

Development Consent permission granted by an approval authority to proceed with a proposed development to the building permit stage

Deflection Limit (displacement) the movement of a structural member of a building including but not limited to beams, trusses and posts, from its original position due to the forces and loads being applied to the member

Disaster the following circumstances that involve threat or danger to human life or health, or to the environment, and which might require emergency responders to take action, including:

a) Any natural disaster affecting the whole or any part of Fiji

b) Any fire caused by any means

c) Any event, natural or otherwise, which threatens the supply of water or the quality of water resources in Fiji

d) Any unforeseen or unusual event involving hazardous substances

Discharge area a drainage ditch, swale, field, body of water, or the like, that is the final destination for the disposal of greywater, wastewater or stormwater

Discharge pipe an underground pipe that carries sewage or trade waste from a building to a reticulated sewage disposal system or on-site sanitary disposal system

Drain an above or below ground pipe that carries wastewater from a sanitary fixture or area catchment drain to a reticulated sewage disposal system, on-site sanitary disposal system, or a discharge pipe, including all fittings and equipment such as inspection openings, traps and gullies

a) It is a branch drain if it is intended to receive wastewater from a fixture and connects to a main drain

b) A main drain collects wastewater from branch drains and/or from fixture discharge pipes

Drainage any sanitary drainage, liquid trade waste, or stormwater

Drainage Ditch an open channel lower in elevation than the surrounding land that collects and conveys stormwater on private or public property

Drinking Water water intended primarily for human consumption and other domestic uses

Durability / Durable the safe performance of a building, siteworks or site for the designed life expectancy assuming the design and a regular schedule of maintenance activities is conducive with site conditions, and that does not result in unforeseen cost for maintenance and repair

Dwelling a building used for habitation by people

Eaves part of the roof that extends beyond the exterior face of the wall including framing, cladding, fascia and gutters

Effective Height the height from the ground floor of a building or open space (that is capable of providing unobstructed access to emergency vehicles) to the floor of the topmost storey (excluding the topmost storey if it contains only heating, ventilating, lift or other equipment, water tanks or similar service units). The effective height of a stepped or terraced building is the maximum effective height of any segment of the building.

Emergency Exit see Exit

Emergency Lift platform or compartment housed in a fire-isolated shaft used for raising and lowering people or things to different floors or levels, with an FRL of 120/120/120 and a carrying capacity of 600 kg minimum

Emergency Responders trained people who are likely to be the first to arrive at and assist at the scene of an emergency such as a fire or disaster

Emissions Reduction the anthropogenic removal or sequestration of one or more greenhouse gases from the atmosphere, or the avoidance or reduction of emissions of one or more greenhouse gases

Encroachment any construction that protrudes beyond the external wall of a building or structure into a setback from the allotment boundary

Energy Consumption the amount of energy needed to power a device requiring an electrical supply

Energy Production the amount and energy content produced by an energy-producing device

Energy Efficient / Energy Efficiency refers to a building material, building element or site servicing that is composed of, uses, or operates, with less energy expended than similar products

Engineered Fill soil or aggregate materials derived from on-property or off-property locations which has been placed on a site to meet specific engineering requirements outlined by a geotechnical engineer for the construction of buildings, utility lines, roadway sub-grade, or other structures. Generally, the materials are placed in layer with an optimum moisture content and compacted in layers to achieve the compaction requirements relative to maximum dry density.

Evacuation Route a continuous path of travel consisting of fire-resistant construction (which may include fire-isolated passageways, fire-isolated ramps, emergency exits, fire doors, smoke doors, smoke lobbies) from any habitable part of a building or single occupancy unit to a place of safety

Evacuation Time the time between the occurrence of a fire or disaster and the time needed for the last person to reach a place of safety or leave the building or structure

Exit an opening that provides egress from a building or facility

a) **Accessible Exit** a building exit that allows safe passage for people with disabilities

b) **Building Exit** an opening providing access to and from a building

c) **Emergency Exit** self-closing, fire-resistant door

d) **Fire-Isolated Exit** fire-resistant opening through which people of all abilities can safely exit a building or structure

e) **Fire Window** a window that opens to the outside of a structure that has an opening sufficient in size for emergency responders to crawl through in the event of an emergency

f) **Horizontal Exit** a fire-resistant doorway through an internal fire wall

g) **Required Exit** a fire-resistant exit in a building or structure that provides safe evacuation for people of all abilities to a place of safety during a fire or other emergency

h) **Roof Hatch** a fire-protected opening of sufficient size to allow people to exit the building to a roof of sufficient strength and fire-resistance to sustain people for a short time before they are rescued

External Wall see Wall

Explosive Atmosphere air containing flammable substances in the form of gas, vapour, dust, fibres or flyings that, after ignition, permits self-sustaining propagation

Fascia a material covering the end of roof supports or rafters extending past an external wall

Finished Floor top surface of a flooring material attached on top of the structural members of a floor

Finished Ground Level the ground level adjacent to a building footing system at the completion of construction, grading and landscaping

Fire Access Route a paved surface that extends from the allotment boundary to a building that provides an even, solid surface and strategic location for emergency vehicles to access fire hydrants and strategic position to perform firefighting operations

Fire Blanket sheet of fire-resistant flexible material, stored in a cupboard or the like, used to smother a fire

Fire Brigade Booster Connection a connecting device enabling the fire brigade to pressurize or pump water into a riser main or other system

Fire Compartment a part of a building that is separated from the remainder by fire-resisting construction

Fire Control Centre an enclosure in a tall building containing a fire control panel and other components necessary for emergency responders to use to control the spread of fire, smoke and other toxic, air-borne substances during an emergency

Fire Control Panel a device connected to smoke detectors that receives electronic signals that a fire has been detected, and provides for automatic fire suppression, smoke control and evacuation safety

Fire Curtain sheet of fire-resistant flexible fabric, stored in a fire-resistant container designed specifically for that purpose, that is automatically released to seal an opening when activated by the fire safety system

Fire Door a self-closing door with an approved FRL used in an evacuation route and to provide access to an evacuation route that is accessible

Fire Hazard the danger in terms of potential harm and degree of exposure arising from the start and spread of fire and the smoke and gases that are thereby generated

Fire Hose Reel manually operated mechanism in a cabinet or wall-mounted containing a rolled-up fire hose and valves connected to a water supply

Fire Hydrant a valve connected to a water main which allows emergency responders to access the main water supply

Fire Intensity the rate release of calorific energy in watts, determined either theoretically or empirically, as applicable

Fire Isolated Evacuation Route a series of fire-isolated passageways, ramps, lobbies, shafts and stairways that create a protected evacuation route to a place of safety

Fire-Isolated Exit see Exit

Fire Isolated Passageway a corridor, hallway or the like, of fire-resisting construction, which provides egress to or from a fire-isolated stairway or fire-isolated ramp or to a place of safety, and satisfies all standards for accessibility

Fire-Isolated Ramp a ramp within a fire resistant enclosure that meets all standards for accessibility

Fire-Isolated Route a connection that consists of a fire-isolated passageway, stairway, ramp, smoke lobby, shaft, and/or exit that together provides a continuous, safe means of evacuating a building to the exterior of the building during a fire that meets all standards for accessibility

Fire-Isolated Shaft a shaft that is fire resistant and constructed to be as airtight as possible

Fire-Isolated Stairway a stairway within a fire resistant shaft, including the floor, surrounding walls, and roof or top enclosure

Fire Load sum of the net calorific values of combustible contents which can reasonably be expected to burn within a fire compartment, including furnishings, built-in and removable materials, and building elements. The calorific values must be determined at the ambient moisture content or humidity in MJ (megajoules).

Fire Main a water supply service pipe located outside of a building that supplies water at adequate pressures and rates of flow for firefighting purposes. The fire main must be:

a) A part of a public supply system kept permanently charged with water, or

b) Privately provided in which case it must either be permanently charged with water from a reliable supply or be provided with adequate on-site storage and fire pumps

Fire Protective Covering inert material (such as plasterboard, cellulose, fibre-reinforced sheeting, and the like) that protects other materials or building elements from the damaging effects of fire

Fire Pump a mechanism that supplies pressure for a water supply system for firefighting either connected to the reticulated water supply piping, or a static water source (e.g., tank, reservoir, lake)

Fire Resistance ability of a building element, building material, finish or coating to resist a fully developed fire while still performing its structural function

Fire Resistant a building element, building material, finish or coating that has fire resistance and an FRL (fire resistance level) appropriate for that component

Fire Resistance Level / FRL ability of a building element, building material, finish or coating to resist fire as measured in elapsed time (minutes) until failure in accordance with Specification A2.3 of the National Construction Code of Australia, with regard to:

a) Structural adequacy – ability of a load-bearing building element or building material to continue supporting an intended load during a fire

b) Integrity – ability of a building element or building material to resist the passage of heat, flame and gases from an area exposed to fire to another area not exposed to fire

c) Insulation – ability of a building element or building material to maintain a temperature on a surface below the limits specified in **AS 1530.4 Methods for Fire Tests on Building Materials, Components and Structures, Part: 4 Fire Resistance Tests for Elements of Construction**

And expressed in that order, for example 60/60/60

Fire-Resisting a building material, assembly or equipment having the FRL required to remain structurally intact for a specified period of time

Fire Retardant a substance that reduces flammability of fuels, building materials and assemblies, or delays their combustion, including chemical agents, fire-fighting foams and fire-retardant gels

Fire Safety and Evacuation Plan document prepared for a building, siteworks and/or site servicing describing methods and procedures for operation and maintenance of the fire safety system, and safe evacuation of the building, facility and/or site in case of an emergency

Fire Safety System a number of devices working together to detect and warn people through visual and audio devices when smoke, fire and carbon monoxide are present, along with equipment to extinguish a fire

Fire Shutters barrier for openings (door, window, lifts, etc.) composed of fire resistant slats that are typically rolled up and hidden from view when not in use and cover the opening when activated by the fire safety system

Fire-Separated Section a part of a building which is separated from the remainder by firewalls

Fire-Source Feature a point from which a fire could spread to a building, or to which a fire could spread from a building, including:

a) The far boundary of a road adjoining the allotment
b) A side or rear boundary of the allotment, or
c) An external wall of another building on the allotment which is not of Class 10

Firewall see Wall

Fire Window see Exit

Flammability Index the index number determined under **AS 1530.2 Methods for Fire Tests on Building Materials, Components and Structures, Part 2: Test for Flammability of Materials** regarding the degree to which a material ignites at ambient temperatures

Flashing a continuous sheet of waterproofing material installed over gaps in roofs, walls, floors and foundations to prevent water from passing through

Flash flood a flood that is sudden and unexpected, often caused by sudden local or nearby heavy rainfall that peaks within 2-3 hours of the causative rain

Flight a series of steps between landings

Flood / Flooding a rise or overflow of water onto lands not normally submerged typically resulting from a heavy rainfall, storm surge, raised groundwater levels, overflow of river channels, increases in runoff from land or blocked drainage systems, and the like

Floodplain terrain adjacent to rivers and coasts which flood during periods of heavy rain and/or from storm surge

Flood Hazard Level flood level used to determine the height of floors in a building and represents the Defined Flood Level plus the freeboard

Floor Area the area of a room measured between the finished surfaces of the bounding walls, including area occupied by furnishings or fixtures

Floor Drain a plumbing fixture installed on the floor of a building, facility or low-lying, flat area of a site that accepts rainwater and wastewater and conveys it to a suitable discharge area or outfall

Footing that portion of the structure which directly transmits the loads of the building to the ground

Foundation Wall means a support wall built between the ground and the lowest floor

Framing timber or metal members to which lining, wallboard, insulation, cladding, flooring or decking is attached, or which support the structure and resist forces applied to it

Freeboard the height above the Defined Flood Level used to compensate for effects such as wave action and localised hydraulic behaviour acceptable to the Government of Fiji

French Drain a trench filled with aggregate and/or a perforated pipe that collects and conveys stormwater and runoff

Fuel Cell a device that produces a continuous electric current derived from the oxidation of a fuel, such as hydrogen

Fuel Gas Cylinder / gas bottle a tank containing compressed gas used as an energy source

Fuel Supply pipes and associated fittings that contain pressurised flammable mixtures of hydrocarbon gases to supply energy for heating and cooling in a building, including liquefied petroleum gas (propane) and natural gas (methane)

Glazing panes or sheets of glass or other transparent or translucent material installed onto or as part of an external wall that allows light to pass through from outside a structure to an interior room, or from room to room in a building interior

Green Building strategies for construction, alteration, operation and/or demolition of a building, structure, site, sitework or site servicing that reduce or remove detrimental impacts on the environment and the people using it

Green Roof a roof containing a vegetated layer of plant material that is part of the roof structure

Greenhouse Gas Emissions (GHG) gases produced by human activity and natural systems that contribute to global warming of the earth's atmosphere, the most abundant being water vapour (H_20), carbon dioxide (CO_2), methane (CH^4), nitrous oxide (N_2O), and chlorofluorocarbons (CFC)

Greywater household waste water from sinks, baths, washing machines, dishwashers and other kitchen appliances that do not contain toxic substances or faecal matter and can be re-used without any harm to health and well-being

Ground Finished Design Levels elevation and contour of land after site works are completed

Gross Floor Area means:

a) In relation to a building - the total floor area (length times width) of all storeys

b) In relation to a storey - the area (length times width) of all floors measured over the enclosing walls (if any) including the mezzanine, interior walls, partitions, cupboards, and other built-in furniture, fixture or fitting

c) In relation to a room - the area (length times width) measured between the finished surfaces of the walls, including area occupied by a cupboard or other built-in furniture,

d) In relation to a fire compartment - the total area (length times width) of all floors in the finished surfaces of the bounding construction of the fire compartment or within areas having a use contributing to the fire load

e) In relation to an atrium - the total area (length times width) of all floors within the atrium measured within the bounding construction or external walls

Groundwater water naturally stored or flowing beneath the surface of the ground

Growing substrate substance such as peat, humus, wood chips, sand, lava, expanded clay, bamboo through which plant roots grow and extract water and nutrients on a green roof

Gully assembly used for providing a water seal and handling discharge from waste fixtures and soil fixtures:

a) **Disconnector Gully** - provides a separation through the water seal between the discharge from waste fixtures and the rest of the sanitary system

b) **Floor Waste Gully** - a disconnector gully used inside a building with a floor grating or waste outlet fitting on a riser pipe. Discharge pipes from waste fixtures may also connect to a floor waste gully

c) **Overflow Relief Gully** - a self cleaning trap with a loosely fitted grating that handles possible surcharge or overflow from the drain

Gutter a shallow trough fixed beneath the edge of a roof for carrying off rainwater

HVAC a mechanical, electrical, or other system for modifying air temperature, humidity, ventilation, or doing all of these things, in an airtight space within a building

Habitable / Habitable Room a building or room used for living, eating, sleeping and cooking:

a) Includes a bedroom, living room, lounge room, music room, television room, kitchen, dining room, sewing room, study, playroom, family room and sunroom

b) Excludes a bathroom, laundry, water closet, pantry, walk in wardrobe, corridor, hallway, lobby, photographic darkroom, clothes-drying room, and other spaces of a specialised nature occupied neither frequently nor for extended periods

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

Hazard / Hazardous anything with an unreasonable risk of bodily injury or deterioration of health, or that could cause a disaster

Hazardous Substances any substance authorised as hazardous by the Government of Fiji with one or more of the following intrinsic properties:

a) Explosiveness

b) Flammability

c) A capacity to oxidise

d) Corrosiveness

e) Toxicity (including chronic toxicity)

f) Ecotoxicity, with or without bio-accumulation, or

g) Which on contact with air or water (other than air or water where the temperature or pressure has been artificially increased or decreased) generates a substance with any one or more of the properties specified above

Heat Flux the amount of heat transferred per unit area per unit time from or to a surface, measured in kw/m^2

Height of a Building distance between the floor of the lowest occupied space above the ground and the top of the highest occupied floor, but not including spaces located within or on the roof that enclose stairways, lift shafts or machinery rooms

Horizontal Exit see Exit

Importance Level (wind load) a numeric scale assigned to a building based on the consequence of failure as reflected (explicitly or implicitly) in the probability of exceeding a limit state

Imposed Load the weight of everything temporarily adding load to a structure, such as people or goods in/on a building, storey or room, but not including anything permanently attached to it

Infiltration the uncontrolled air leakage into or out of a building caused by pressure effects of wind or the effects of differences in the outdoor and indoor air density or both

Insulated in relation to electricity, an element separated from adjacent conducting material by a non-conducting substance or airspace permanently providing resistance to the passage of current, or to disruptive discharges through or over the surface of the substance or space, to obviate the danger of shock or injurious leakage of current

Insulation in relation to energy efficiency, a material or combination of materials and air gap that reduce heat transfer between rooms and interior-exterior of a building, see Bulk Insulation

Insulation in relation to FRL, means the ability to maintain a temperature on the surface not exposed to the furnace below the limits specified in AS 1530.4 Methods for Fire Tests on Building Materials, Components and Structures, Part 4: Fire-Resistance Tests for Elements of Construction

Integrity in relation to FRL, means the ability to resist the passage of flames and hot gases specified in AS 1530.4 Methods for Fire Tests on Building Materials, Components and Structures, Part 4: Fire-Resistance Tests for Elements of Construction

Interior Wall see Wall

iTaukei Land has the meaning given in Section 2 of the iTaukei Lands Act 1905

Junction a sanitary fitting used to connect one or more branch pipes or channels to a main pipe or channel

Large-Isolated Building a building of any occupancy that is four storeys or greater in height and/or exceeds a gross floor area of 8,000 m^2 on the ground floor, and is sited more than 25 m from an adjacent building or property

Lifespan the duration of a building, facility or site from construction to demolition

Lightweight Construction building material having no fire-resistant level, or using lightweight prefabricated materials such as:

a) Sheet or board material, plaster, render, sprayed application, or other material similarly susceptible to damage by impact, pressure or abrasion, or

b) Concrete and concrete products containing pumice, perlite, vermiculite, or other soft material similarly susceptible to damage by impact, pressure or abrasion, or

c) Masonry having a thickness less than 70 mm

d) Complies with Section B – Structure and with Specification C1.8 Structural Tests for Lightweight Construction

Live Load see Imposed Load

Load Bearing intended to resist forces and moments additional to those due to its own weight

Load-bearing Wall see Wall

Local Authority the government body for a municipality, township or district as defined in the Local Government Act, 1972, as amended

Low Emission Development Strategy or **LEDS** means Fiji's low emission development strategy 2018-2050 as updated from time to time

Manual Fire Alarm Box a device located on or near a building that sounds an audible, and sometimes visual warning or alarm when activated by a pull switch, call-button, and the like

Major Hazard Facility a building, siteworks or site servicing that has a high likelihood of posing harm to people or property due to the storage, use, dispensing or handling of hazardous substances

Masonry stone, brick, solid or hollow concrete block or other similar unit, or a combination of the same that is laid up unit by unit and set in mortar

Mezzanine an intermediate floor within a room which is not more than 1/3 of the floor area of the room or 200 metre square, whichever is the lesser

Minimum Energy Performance Standards (MEPS) means the standard for equipment and appliances established through the Greenhouse and Energy Minimum Standards Act 2012

Monel metal a group of alloys used in marine engineering that are resistant to corrosion and comprised of nickel and copper with small amounts of iron, manganese, carbon and silicon

Natural Disaster a disaster resulting from a force of nature such as a cyclone, tsunami, earthquake, landslip or bushfire

Natural Lighting Zone the interior area adjacent to a window or under a skylight that receives natural light from the exterior of the building

Nominal Size a numerical designation of the size of a building element that is a convenient round number used for reference purposes and does not necessarily relate to the actual dimensions of the building element

Non-Combustible a building material or finish that, in the form in which it is used and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapours, when subjected to fire or heat. Materials that pass AS 1530.1 Combustibility Tests for Materials and/or ASTM E 136 Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750ºC are considered to be non-combustible.

Occupancy means the purpose for which a building is used or intended to be used, but change of occupancy does not refer to a change of tenant or proprietors

Occupancy Permit see Certificate of Occupancy

On-Site Sewage Disposal System storage, treatment and disposal of human waste from a building or site on the same property as it is generated

On-Site Stormwater Disposal System storage, conveyance and treatment of stormwater on the same property from which it is collected

On-Site Wastewater Management Collection storage, treatment and disposal of wastewater from a building or facility on the same property as it is generated

Open Space a part of an allotment open to the sky and connected directly with the public road

Outfall the discharge area of wastewater or stormwater system

Overflow Device a device that provides relief to a water service, sanitary plumbing and/or drainage system, rainwater harvesting system or stormwater system to avoid the likelihood of uncontrolled discharge

Panel Wall a non load-bearing external wall, in frame or similar construction, that is wholly supported at each storey

Parapet the portion of any wall which is carried up beyond the line of junction with a roof or gutter or beyond the level of a flat roof

Passive Fire Protection a system that prevents ignition and spread of fire and smoke, and provides a safe evacuation route, including fire doors, wall and floors, fire-isolated passageways, ramps, stairs, shafts and lobbies, emergency exit sign, lighting and warning systems, protection of openings, smoke dampers

Peer Review an independent and objective technical review of the design of a building or structure conducted by a registered professional consultant who is at least comparable in experience to that of the professional consultant responsible for the project

Performance Requirement a provision in the FNBC that describes the level of performance that a building, facility, sitework, building element, building material, site servicing, and the like must have to comply with the FNBC

Permanent Load the weight assigned to the building elements of a building, storey or room excluding people, or goods

Person with a Disability a person who has long-term physical, psychosocial, intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others

Piping an assembly of pipes, with or without valves or other fittings, connected together for the conveyance of liquids and gases

Piping Junction a sanitary fitting used to connect one or more branch pipes or channels to a main pipe or channel

Pitch maximum angle to the horizontal of a line connecting the nosings of stair treads in a single straight flight of a stairway, or measuring the angle of a roof

Place of Safety a location that is not under threat from harmful effects of a fire or disaster that people can congregate in after escaping the effects of an emergency, including:

a) A designated location in a building, facility, or site connected to an evacuation route

b) A road or adjacent property not under threat

c) A location on site not under threat that is connected to a road or other means of safely leaving the site

Plumbing the system of pipes, tanks, fittings, and other apparatus required for potable water supply, wastewater removal and/or treatment, and ventilation / heating or cooling in a building, facility or site

Point of Connection the junction of any of the following:

a) A heated water service to a cold water service downstream of the isolation valve

b) An on-site drainage system to the reticulated sewage system or on-site sewage disposal system

c) An on-site drainage system to the reticulated stormwater system or to an on-site stormwater disposal system

d) A drainage pipe to the reticulated water supply system or to an alternative water supply system

Portable Fire Extinguisher a portable device filled with chemicals to extinguish a fire, approved by the National Fire Authority

Pour Flush Toilet a toilet whereby water is poured in by the user instead of coming from the cistern above. When the water supply is not continuous, any cistern flush toilet can become a pour flush toilet. Pour flush sludge chamber is the pit storing the excrement / night soil.

Probability of Exceedance the likelihood that a certain value will be exceeded in a predefined future period of time, relating to wind speed and earthquakes

Product Information Sheet a written statement by a manufacturer or other authorised expert or organisation describing and verifying a product's characteristics

Public Corridor an enclosed corridor hallway or the like which serves as a means of egress from two or more sole occupancy units to a required exit from the storey concerned

Quality Assurance a verification of the adequacy of a building, material, assembly, siteworks or site servicing to perform its intended function, usually involving an inspection by an approval authority to verify conformance with FNBC standards and other applicable legislation, regulations and standards

R-value ability of a building material, building element or air gap to reflect solar heat gain, with a higher value indicating increased resistance to heat gain and transfer

Radiant Flux minimum radiant energy needed to sustain flame propagation for floor coverings in kW/m^2

Refrigeration Room a sealed and ventilated room (constructed or pre-fabricated) that maintains a low internal temperature and is typically used to chill or freeze food stuffs

Refrigerant chemical used in a cooling mechanism such as an air conditioner or refrigerator

Reflective Insulation insulation that works in conjunction with an air gap to reduce radiant heat transfer across the air space. Typically reflects heat instead of either absorbing it or letting it pass through using a reflective (typically foil) material and encapsulated air to create a dead space.

Registered Professional Consultant a person with appropriate training and experience in a relevant field relating to the construction of buildings and is a registered member of FAA (Fiji Association of Architects) and/or EF (Engineers Fiji), or any other organisation acceptable to the Government of Fiji

Registered Testing Authority an approval authority recognised and acceptable to the Government of Fiji, including those registered by the National Association of Testing Authorities (NATA) to test in the relevant field, and/or listed below:

a) Testing laboratories registered by the National Association of Testing Authorities (NATA) to test the relevant field

b) Testing laboratories registered by the Testing Laboratory Registration Council (TELARC) of New Zealand to test in the relevant field

c) Building Research Association of New Zealand (BRANZ) Private Bag, Porirua, New Zealand

d) British Research Establishment (BRE), Watford, Hertfordshire, United Kingdom

e) National Institute of Standards and Technology (NIST), Gaithersburg, MD20899, USA

f) Underwriters Laboratories Incorporated 333 Plingsten Road, Northbrook, IL 60062, USA

g) National Research Council, Division of Building Research, 1200 Montreal Road, Ottawa, ON, Canada

i) Public Works Research Institute (PWRI), Tsukaba, Ibaraki, Japan

j) James Cook University, Material and Cyclone Testing Laboratory, Douglas, Townsville, Australia

Renewable Energy means energy that is produced by renewable resources, including solar energy, wind energy, biomass, tidal energy, wave energy, geothermal energy and hydropower

Renewable-Ready a building, siteworks or site servicing containing the appropriate infrastructure and facilities to allow a renewable energy source to be easily installed

Required as required by this Code

Required Accessible Building a Class 2 to 10 building and/or site that must be designed and equipped to accommodate safe use and occupancy for at least one person with a disability

Required Exit see Exit

Repairs action taken to restore the structural strength or appearance of a building without making any addition or extension to it

Resistance to the Incipient Spread of Fire the ability of a ceiling membrane to insulate the space between the ceiling and roof, or ceiling and floor above, and limit the temperature rise of combustible substances in this space during the standard fire test to 180ºC

Reticulated owned and operated by the Government of Fiji

Reticulated Sewage Disposal System pipes that are entirely owned and operated by the Government of Fiji that collect and convey wastewater

Reticulated Stormwater System pipes that are entirely owned and operated by the Government of Fiji that collect, store and convey runoff from a site to an outfall

Reticulated Wastewater System pipes that are entirely owned and operated by the Government of Fiji that collect and convey wastewater

Reticulated Water Supply System pressurised pipes that are entirely owned and operated by the Government of Fiji containing potable water

Retrofitting the repair or replacement of any part or component of an existing building for the purpose of its maintenance or to correct damage or failure, including the removal and replacement of any existing part, material, equipment

Rise in storeys the greatest number of stories from the ground up from the lowest elevation

Riser Main a pipe to convey water to all floors of a building and where appropriate to the roof for use by the fire brigade

Roof Hatch see Exit

Road Reserve land owned by the Government of Fiji containing facilities for the safe movement of vehicles and people of all abilities, and may contain reticulated stormwater, wastewater and water supply systems, utilities, transit facilities, drainage ditches and outfalls

Rooflight a skylight, window, and the like, installed in a roof to permit natural light to enter the room below

Run the horizontal distance between two adjacent tread nosings on a stair

Runoff rainfall that does not percolate into soil and becomes perched on the ground surface

Rural Area means any area not included within the boundaries of the cities of Suva, Nadi or Lautoka, or of any other place declared to be a city or town under the provisions of the Local Government Act

Safety Glass glass that has been toughened, laminated or had a safety film applied to it so that it resists shattering upon impact, is certified by an approval authority acceptable to the Government of Fiji, and bears identification markings indicating that the pane has been cut from safety glass material

Sanitary Compartment a room or space containing a toilet fixture, closet pan, soil pan, chemical toilet, and the like

Sanitary Fixture any receptacle or apparatus that receives clean, potable water and is used for domestic cleansing, including sinks, showers, bathtubs, hot tubs, laundry tubs and associated taps, stoppers and overflow mechanisms, towel racks, automatic hand dryers, soap dispensers, and the like

Sarking-Type Material a material such as a reflective foil or other flexible membrane used for waterproofing, vapor proofing or thermal reflectance

Seawall a wall or embankment constructed to prevent the sea encroaching on or eroding an area of land

Self-Closing a door or window equipped with a devise which returns the door or window to the fully closed and latched position immediately after each manual opening

Septage Liquid solid and semi-solid material that results from wastewater pre-treatment in a septic tank, which is removed from the system by pump-out/desludging operations

Setback distance from a curb, allotment boundary, building, or natural feature such as a riverbank within which development restrictions are imposed

Sewage waterborne human waste including feces, urine, and waste from kitchens, showers, baths, domestic laundries, and the like

Shaft the walls and other parts of a building bounding:

a) A well, other than an atrium well, or

b) A vertical chute duct or similar passage but not a chimney or flue, or

c) A lift or stairway

Site the land occupied or to be occupied by a building or structure including all land within the legal boundaries, all natural elements, all site works, and all site servicing

Site Servicing mechanical or electrical system in a building, structure or site that consists of one or a combination of plumbing (water supply and wastewater removal/treatment), electrical, stormwater management, telecommunications, and electrical system

Site Works earthworks and other activities preparatory to or associated with the construction, alteration, demolition or removal of a building, structure or site servicing

Slip-Resistant surface treated by chemical or physical means so that friction is created when stepped on

Sludge semi-liquid solids settled from wastewater

Smoke Alarm an all-in-one, self-contained device with a detector that senses the hot products of combustion (smoke) and sounds an audible and sometimes visual warning or alarm when activated

Smoke-and-Heat Vent a vent, located in or near the roof for smoke and hot gases to escape if there is a fire in the building

Smoke Control System a mechanical air-handling system that uses fans to produce pressure differences across smoke barriers to inhibit smoke movement across open-style atria such as malls, stages and platforms, assembly seating, and underground parking

Smoke Detector a device that senses the hot products of combustion (smoke) and sends a signal to a building's fire control panel

Smoke-Developed Index the index number for smoke developed under **AS 1530.3 Methods for Fire Tests on Building Materials, Components and Structures, Part 3: Simultaneous Determination of Ignitability, Flame Propagation, Heat Release and Smoke Release**

Smoke Door a self-closing, accessible door that prevents that passage of smoke and/or airborne toxins from one side of the doorway to the other

Smoke Lobby a portion of an evacuation route that is protected from the effects of smoke by separations, typically a buffer space for entry into a fire-isolated stairway

Smoke-Proof designed to restrict the spread of smoke through a building or facility, and/or impermeable to smoke

Soakpit a chamber of course aggregate, stones, coral, and the like, below ground level that collects stormwater and runoff and allows it to slowly soak into the ground

Soil Fixture a water closet pan, urinal, sanitary napkin disposal unit, slop hopper, bed pan washer or autopsy table

Soil Pipe a pipe which conveys discharge from soil fixtures

Solar Absorption degree of solar energy absorbed by a material, lower number is preferred (decimal between 0 - 1)

Solar Heat Gain Coefficient (SHGC) the fraction of solar radiation admitted through glass windows, doors, or skylights (either transmitted directly and/or absorbed) and subsequently released as heat. The lower the SHGC, the less solar heat the glazing transmits and the greater the shading ability.

Sole-Occupancy Unit a room or other portion of a building for occupation by one owner, lessee, tenant, or other occupier to the exclusion of any other owner, lessee, tenant, or other occupier

Specified Systems specific features or components of a building or facility for which on-going regulatory control is required for proper maintenance including the following:

a) Compliant sprinkler system

b) Dry and wet fire extinguishing systems

c) Automatic or manual emergency warning systems for fire or other hazards

d) Manual and automatic fire alarms, smoke / heat detectors, gas and radiation systems

e) Smoke control system (mechanical and natural)

f) Automatic gas leak detection systems for combustible gases

g) Emergency power systems

h) Intercom voice system to facilitate warning and evacuation

i) Electromagnetic or automatic doors (sliding or revolving), windows, and access controlled doors

j) Fire doors, smoke doors, fire windows and fire shutters

k) Emergency lighting systems

l) Evacuation route pressurisation system and signage

m) Riser mains for use by emergency responders

n) Automatic back-flow preventers connected to a potable water supply

o) Lifts, escalators, travelators, moving walks or other systems for moving people or goods

p) Mechanical ventilation or air conditioning systems

q) All devices providing access to the building interior

r) Audio loops or other assistive listening systems

s) FM radio frequency systems and infrared beam transmission

t) Cable cars used for emergencies

Spread-of-Flame Index the index number for spread of flame under **AS 1530.3 Methods for Fire Tests on Building Materials, Components and Structures, Part 3: Simultaneous Determination of Ignitability, Flame Propagation, Heat Release and Smoke Release**

Sprinkler System a system of automatic fire sprinklers complying with **NZS 4541 Automatic Fire Sprinkler Systems**

SRI (Solar Reflectance Index) ability of a material to radiate heat to the atmosphere, higher value preferred

Stack a vertical drain including offsets and extending to more than one storey

Standard Fire Test the fire-resistance test of buildings, facilities and building elements under **AS 1530.4 Methods for Fire Tests on Building Materials, Components and Structures, Part 4: Fire-Resistance Tests for Elements of Construction**

Storey a space within a building situated between one floor level and the ceiling or roof above, but not:

a) a space that contain one, or a combination of the following:

(i) A lift shaft stairway or meter room

(ii) A bathroom, shower room, water closet, or other sanitary compartment, or

(iii) A private garage

(iv) Heating, ventilating or lift equipment, water tanks or similar equipment at the top of the building, or

(v) A mezzanine, unless:

1. The gross floor area is >200 m^2 or >1/3 of the floor area of the room, whichever is less
2. Two or more mezzanines at or near the same level have an aggregate gross floor area >200 m^2 or >1/3 of the floor area of the room, whichever is less, or

b) A space partly below the finished ground and the underside of the ceiling is <1 m above the average finished level of the ground at the external wall, or if the external wall is >12 m long, the average for the 12 m part where the ground is lowest

Note: a storey 6 m in height or greater will be counted as 2 storeys unless it is the only storey above ground

Storm Surge a rise in sea level over and above the predicted astronomical tide

Stormwater Management use of mechanical equipment and/or natural means to manage surface water and runoff from rainfall, storms or other forms of precipitation and provide a controlled release

Structure any non-habitable structure (permanent or temporary, including fire and life-safety systems, storage buildings, tanks, equipment and processes dealing with flammable, combustible and/or hazardous substances exterior to the building, minor structures and temporary structures

Structural Adequacy in relation to a FRL means the ability to maintain stability and adequate load bearing capacity under **AS 1530.4 Methods for Fire Tests on Building Materials, Components and Structures, Part 4: Fire-Resistance Tests for Elements of Construction**

Structural Member a component or part of an assembly which provides vertical or lateral support to a building or structure

Stucco a wall cladding formed from reinforced solid plaster over a rigid or non-rigid backing

Stud an upright support in a building wall to which sheathing, drywall, and the like are attached

Surface Water naturally occurring water, other than groundwater, on the surface of the ground

Sustainable / Sustainable Development development occurring at a rate and in such a way to ensure environmental quality and supply of resources is maintained and, wherever practicable, enhanced to meet the needs of the present generation without compromising future generations

Sweep Junction a long radius bend entering a main pipe at 45 degrees, or a 45 degree junction fitted with a 45 degree bend

Swimming Pool any excavation or structure containing water and used for swimming, wading, peddling, or the like including a bathing or wading pool, or spa

Talanoa means the process of inclusive, participatory and transparent dialogue with the purpose of sharing stories, building empathy and making wise decisions for the collective good

Tapered Tread see tread

Thermal Bridging ability of a material to create a pathway for heat to transfer to other assemblies, rooms

Thermal Performance ability of a building to manage the flow of heat, air and moisture to benefit the sustainability of the structure, occupants and the environment

Toilet a mechanism for the collection and conveyance of human waste (urine and faeces), and sometimes treatment of human waste as in a composting toilet

Trade Waste waterborne waste from business, trade or manufacturing process containing predominantly non-human waste, but not unpolluted water

Treads a horizontal surface in a stairway

a) **Rectangular**: a tread found in a straight flight having parallel edges

b) **Tapered**: a tread found in a curved flight having non-parallel edges

c) **Spiral**: a tread found in a spiral flight having non-parallel edges

U-value thermal resistance of a building material or building element, with a lower value indicating better resistance to transfer of heat

Unit a room, rooms, portion of a building, or a whole building used by one or joint occupants, lessees, and/or tenants to the exclusion of all others

Urban Area means any area within the boundaries of a city or town declared under the provisions of the Local Government Act

Verandah a roofed platform attached to an external wall of a building at the ground floor with access to the ground

Verification Method a test, inspection, calculation or other method that determines whether a building, building element, facility, sitework and/or site servicing complies with relevant performance requirements acceptable to the government of Fiji

Volatile Organic Compounds (VOC) organic compounds containing one or more carbon atoms that evaporate readily into the atmosphere giving them the ability to spread quickly and usually considered to be hazardous, often used in the manufacture of paints, solvents, building materials, insulation, and the like

Waling plate timber member bolted to the face of a truss to support intersecting rafters or trusses and/or battens or purlins

Wall any of the following types used to support a ceiling or roof:

a) **Common wall** - wall shared by adjoining buildings or units

b) **Curtain wall** - non load-bearing, thin, external wall (typically consisting of an aluminium frame with glass, metal or stone panels) in which the frame transfers wind and gravity loads to the building, typically at the floor

c) **External wall** - outer wall of a building which is not a common wall

d) **Fire wall** a wall with an appropriate fire resistance level that divides a storey or building into fire compartments

e) **Interior wall** a non load-bearing wall entirely within the structure's interior

f) **Load-bearing wall** - an external wall or interior wall that resists forces in addition to those due to its own weight

Ward Area that portion of a storey of a Class 9a building used for sleeping, recreation and sanitary facilities, and nurses stations

Waste Fixture a sanitary fixture other than a soil fixture, such as basins, bidets, kitchen sink, laundry trough, and the like

Waste Pipe a pipe which conveys the discharge from waste fixtures

Wastewater dissolved and suspended waterborne waste which may consist of sewage and/or trade waste

Wastewater Water-Borne human waste from kitchens, showers, baths, domestic laundries, sanitary compartments, and the like, but does not include surface water, stormwater, groundwater or trade waste

Waterproof / Waterproofing the complete and total resistance of a building element or material to the ingress of moisture

Waterproof Membrane a thin layer of material that is laid, injected into, or sprayed onto a surface to prevent water from passing through

Water Closet see Bathroom and Sanitary Compartment

Water Resistant a building element or building material that restricts moisture movement and will not degrade under conditions of moisture

Water Table level of groundwater in soil and rock, below which the ground is saturated

Weathertight the resistance of a building to the weather where water and wind are prevented from entering and accumulating behind the cladding in amounts that can cause undue dampness or damage to the building

Wet Area an area within a building having water supplied from a water supply system which includes bathrooms, showers, laundries and sanitary compartments and excludes kitchens, bar areas, kitchenettes or domestic food and beverage preparation areas

Wet Riser Main System one or more riser mains in a building with all required fittings, permanently charged with water from a fire main. The term includes all associated pipe work from the point of connection to a fire man

Window includes a roof light, glass panel, glass brick, glass louvre, glazed sash, glazed door, or other device which transmits natural light directly from outside a building to the room concerned when in the closed position

Electrical

Aerial Conductor any stranded conductor supported by insulators or purpose-designed fittings above the ground directly exposed to the weather

Air Gap the open area between building materials in the construction of roofs, walls, ceilings and floors deliberately intended to create a sound or temperature insulation barrier

Appliance an energy consuming device, other than a lamp, in which electricity is converted into heat, motion or any other form of energy, or is substantially changed in its electrical character

Busbar metallic strip or bar (typically copper, brass or aluminium) that conducts electricity within a switchboard

Cable two or more wires running side by side and bonded, twisted or braided together to form a single assembly

Cable Core a conductor with its insulation but not including any mechanical protective covering

Catenary Wires system of wiring consisting of a cable or cables attached at intervals to a suitable support that is suspended between two points

Circuit-breaker a switch suitable for opening a circuit automatically, as a result of predetermined conditions, such as those of overcurrent or undervoltage, or by some form of external control

Circuit / Circuitry system of live conductors, protective conductors (if any), a protective device and associated switchgear, control-gear and accessories, that create a closed loop

Conductive / Conductors wire or other form of conducting material that allows the flow of current in one or more directions, but not including wire or other metallic parts directly employed in converting electrical energy into another form

Conduit a tube or trough protecting electrical wiring

Consumer Mains those conductors between the point of supply and the main switchboard

Current a flow of electrical charge

Distribution Switchboard a switchboard other than the main switchboard

Earthed / Earthing a system designed to protect electrical wires, components and equipment from damage caused by sudden electrical power surges and reduce the risk of electrical shock from uninsulated metal parts consisting of an intentional connection from a circuit conductor to the earth (earth electrode)

Earthing Conductor Main a conductor connecting to the main earthing terminal/connection or bar to the earth electrode or the earthing system of the electrical supply

Earthing Conductor Protective a conductor, other than a main earthing conductor, connecting any portion of the earthing system to the portion of the electrical installation or electrical equipment required to be earthed, or to any other portion of the earthing system

Earth Electrode metal plate, water pipe or other conductor partially buried in the earth to provide a reliable conductive path to the ground

Electrical Equipment Wiring Systems, switchgear, control-gear, accessories, appliances, luminaires, and fittings used for generation, conversion, storage, transmission, distribution or utilisation of electrical energy

Electrical Fault an electrical failure, defect or flaw in an electrical circuit, equipment, fixture or fitting and any situation resulting in an unintentional:

a) Loss, reduction or increase of current or voltage

b) Voltage exceeding the maximum of the rated voltage

c) Overcurrent, or

d) Arcing fault current

Electrical Installation permanently attached electrical appliance, equipment, wiring and components used in the reticulation of electricity

Equipotential Bonding electrical connections intended to bring exposed conductive parts or extraneous conductive parts to the same or approximately the same potential, but not intended to carry electrical current in normal service

Extra Low Voltage / ELV an electrical potential that carries a low risk of electrical shock

Fault a current resulting from an insulation failure or from the bridging of insulation

IPX Rates the degree of protection provided from dust, accidental contact, and water by mechanical casings and electrical enclosures

Live energized or subject to hazardous induced or capacitive voltages

Low Voltage / LV an electrical potential not large enough to cause injury or damage if diverted, usually used for lighting or appliances

Main Switch a mechanical or electronic device for making, breaking or changing the connection from the main electrical supply (reticulated and/or alternative energy) to the electrical system

Main Switchboard a switchboard receiving and controlling the electrical supply (reticulated and/or alternative energy) for the entire building, facility and/or site

Overcurrent a current exceeding the rated value

Protected Extra-Low Voltage / PELV an extra-low voltage system that is not electrically separated from earth, but that otherwise satisfies all the requirement for SELV

Relevant power authority a government or quasi-government organisation or private sector company that performs generation, regulation, inspection and distribution of power in Fiji

Residual Current Device / RCD a device that isolates supply to protected circuits, socket outlets or electrical equipment in the event of a current flow to earth that exceeds predetermined value

Ripple-Free D.C. For sinusoidal ripple voltage, a ripple content not exceeding 10% R.M.S

Separated Extra-Low Voltage / SELV an extra-low voltage system electrically separated from earth and from other systems in such a way that a single fault cannot give rise to the risk of electric shock

Submain a circuit originating at a switchboard to supply another switchboard

Switchboard an assembly of circuit protective devices, with or without switchgear, instruments or connective devices, suitably arranged and mounted for distribution to, and protection of, one circuit

Voltage differences of potential existing between conductors or between conductors and earth:

a) Extra-low voltage - not exceeding 50 V A.C. or 120 V ripple-free D.C.

b) Low voltage - exceeding extra-low voltage, but not exceeding 1.000 V A.C. or 1,500 V D.C.

c) High voltage - exceeding low voltage

Wiring an arrangement of wires used for electrical distribution

Wiring Enclosure pipe, tube, duct, conduit or cable trunking that is fixed or supported in position in accordance with provisions in this Code and provides protection of sheathed or unsheathed cables

Section B

Structure

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SPECIFICATIONS

Part 3.10.6 Attachment of Decks and Balconies to External Walls of Buildings

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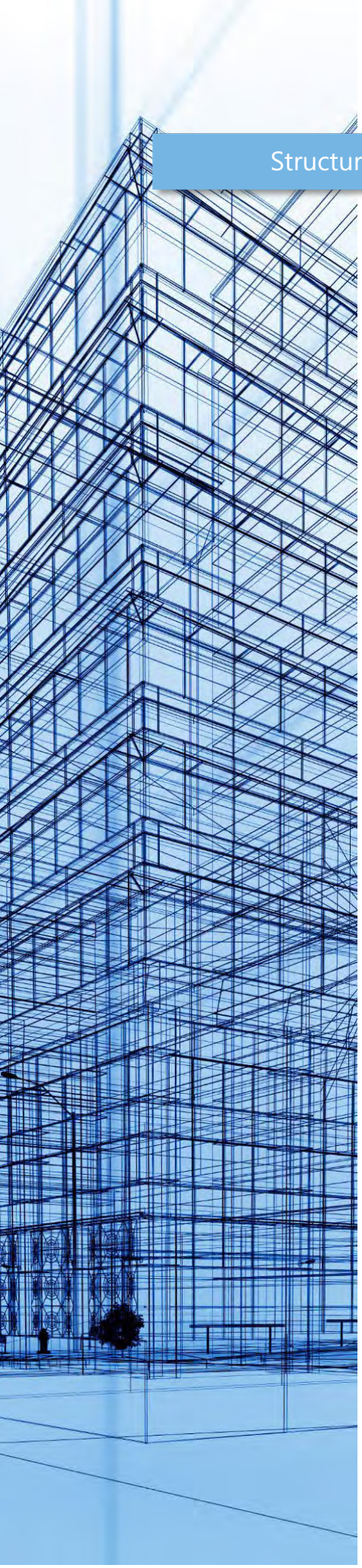


OBJECTIVES

All buildings, sites and site works must demonstrate compliance with the following objectives:

(1) Prevent death and injury to people from structural failure

(2) Avoid distress to occupants as a result of deflection, vibration, degradation or other similar causes

(3) Avoid damage to neighbouring property

(4) The building must satisfy the intended use

(5) Procedures and methods of demolition must be adequate to prevent death and injury to persons and avoid damage to neighbouring property

(6) Reflect policies and plans for climate resilience specified by the Government of Fiji Climate Change Act, 2021, and all associated approved policies and regulations

The performance requirements and deemed to satisfy provisions in Section B should be interpreted along with standards in Section G Energy Efficiency for roofs, walls, floors and energy generation devices.

B1 SITE WORKS

Site Work standards apply to all buildings and sites in Fiji in Class 1 to 10.

Performance Requirements

P1 SITE WORKS

(1) Site works during construction must not cause harm or threaten the safety of persons, property or the health of the natural environment

(2) Site works must be carried out to ensure the stability of the building site during the period of construction and the expected life of the building

(3) Site works must not cause any damage to existing structures or adjacent property

(4) Alterations to the ground water level resulting from site works must not be allowed to affect the stability of any existing or neighbouring building or structure

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Site work performance requirements of B1 are satisfied if:

- **All of the following** deemed-to-satisfy provisions are successfully demonstrated
- **Section B2 to B6, B8, and B9** are complied with

D1 SITE WORKS

.1 One or more of the following measures must be carried out if it is warranted by the dampness of the building site:

a) The subsoil must be adequately drained

b) The ground under the building must be regraded or filled and provided with outlets to prevent accumulation of water

c) The surface of the ground under the building must be covered with a suitable damp-resisting material

.2 The construction of a site drainage system and the position and manner of discharge of a stormwater drain must not:

a) Result in the entry of water into any building or other allotment

b) Affect the stability of any building, or

c) Create any unhealthy or dangerous conditions within or around any building

.3 A suitable system of drainage must be provided if paving, excavation, or any other work on an allotment will cause undue interference with the existing drainage of rainwater falling on the allotment whether the existing drainage is natural or otherwise.

.4 Buildings must be sited to maximize safety and resilience of existing landscape components on the site and immediately adjacent (e.g., beach, rock, cliffs, steep slopes, caves, water springs, mangroves, seawall, retaining and cut-off wall, jetty, wharf docks, piers, underground tunnel, access boat ramps, underground and submerged communication cables, historical monuments, and the like).

.5 Potential damage to the site, buildings, environment and neighbouring properties must be mitigated through any of the following:

a) Maintaining slopes of 3h:1v or less

b) Revegetation and/or slope stabilization techniques acceptable to the Government of Fiji for slopes greater than 3h:1v

.6 Stockpiling, erosion and sedimentation control measures during construction must be adhered to as identified in the Environmental Impact Assessment or Environmental Management Plan approved by the Government of Fiji.

.7 Site grading and stormwater management during construction and post-construction must be in accordance with the Development Consent approval drawings and specifications approved by the Government of Fiji to permit the development.

.8 All surface drainage must be conveyed to a legally approved discharge point.

B2 LOADS

Standards apply to all buildings in Class 1 to 10.

Performance Requirements

P1 DESIGN LOADS

(1) Buildings and their elements must be designed and constructed to prevent structural failure during the expected life of the building and to avoid unacceptable deflections and vibrations during the normal use of the building, resulting from:

a) Combinations of all possible loads, dynamic responses, and internal actions (see B2 to B5)

b) The properties of the materials used in the building (see B8)

c) The foundation conditions

d) Site works (see B1)

(2) The design and construction must take into account the loads resulting from the following:

a) Self-weight (permanent loads)

b) Imposed loads (imposed loads)

c) Temperature variations

d) Earth pressure

e) Wind action

f) Earthquake action

g) Resonance effects

h) Impact

i) Explosion / implosion

j) Thermal effects

k) Water and other liquids

l) Fatigue resulting from fluctuating loads

m) Differential displacement

n) Adverse effects due to closeness of other buildings

o) Ground movements resulting from swelling, shrinkage or liquidation of soil due to flooding

p) Landslip and subsidence

q) Site works associated with the building or structure

r) Termite actions

s) Any other expected loads

(3) Building design and construction must allow for:

a) The consequences of failure

b) The quality of workmanship available

c) Variations in material properties and site characteristics

d) Variations in accuracy in the methods used to predict the structural performance of the building

e) The intended use of the building

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Load requirements of B2 are satisfied if:

- **All of the following** deemed-to-satisfy provisions are successfully demonstrated
- **Sections B1 and B3 to B9** are complied with

B2.1 DESIGN LOADS

D1 CALCULATIONS

.1 Calculations for permanent, imposed and other loads must be determined using one or a combination of the following methods:

a) Demonstration of compliance using standard methods of calculation and/or load calculation software acceptable to the Government of Fiji

b) Full-scale testing of the adequacy of load-bearing components that demonstrates the building or structure can safely resist the load requirements of the FNBC to the satisfaction of the Government of Fiji

.2 In the case of Mixed-Use Buildings, load calculations must be applied to the entire building based on the most adverse combination of loads.

.3 Calculation of acceptable deflection and vibration limit must be consistent with standards in AS/NZS 1170 Structural Design Actions.

.4 Notwithstanding Clause B2 D1.3 above, calculation of the resistance of a building to actions such as wind and earth movement must comply with the level of importance assigned to the building type as indicated in Table B2.1 Importance Level and Table B2.1.2 Annual Probability of Exceedance below.

Table B2.1 Importance Level

Importance Level	Building Types
1	• Class 10 uninhabited buildings that are more than 200 m from inhabited buildings.
2	• Class 1, 2 and 3 residential and accommodation. • Buildings of any class that cannot contain more than 100 people at any time during normal operations • All other buildings not in Importance Level 1, 3 or 4 in this table.
3	• Buildings of any class that can contain more than 100 people at any time during normal operations. This may include some larger school buildings, resorts, large shopping centers, high-rise office and residential buildings
4	• Structures of any class that perform an essential function for community lifelines such as water, power and emergency communication. • Buildings of any class that have a post-disaster function. This may include hospitals, police stations, fire stations and buildings that are used as evacuation shelters such as some school buildings and halls. • A building of any class that manufactures or stores large amounts of hazardous substances that would be harmful if the building collapses.
Note:	*Class 4 (residential) will assume the highest Importance Level of the building in which it is situated within or Importance Level 2*

Table B2.2 Annual Probability of Exceedance

Design working life	Importance level	Annual probability of exceedance for ultimate limit states		Annual probability of exceedance for serviceability limit states	
		Wind	Earthquake	SLS1	SLS2 Importance Level 4 Only
Construction equipment	2	1/100	1/100	1/25	
5 years	1	1/50	1/50	-	-
	2	1/250	1/250	1/25	-
	3	1/500	1/500	1/25	-
	4	1/1000	1/1000	1/25	1/250
25 years	1	1/100	1/100	-	-
	2	1/250	1/250	1/25	-
	3	1/500	1/500	1/25	-
	4	1/1000	1/1000	1/25	1/250
50 years	1	1/250	1/250	-	-
	2	1/500	1/500	1/25	-
	3	1/1000	1/1000	1/25	-
	4	1/2500	1/2500	1/25	1/500
100 years or more	1	1/250	1/250	-	-
	2	1/1000	1/1000	1/25	-
	3	1/2500	1/2500	1/25	-
	4	*	*	1/25	*

Note: For Importance Level 4 structures with a design life of 100 years or more, design events are determined by hazard analysis but need to have probabilities less than or equal to those for Importance Level 3.

D2 PERMANENT, IMPOSED AND OTHER LOADS (DEAD, LIVE AND OTHER LOADS)

.1 Structural design actions (permanent, imposed and other) in buildings and structures must comply with AS/NZS 1170.1 Structural Design Actions, Part 1: Permanent, Imposed and Other Actions.

.2 All other loads must satisfy the principles of structural mechanics regarding equilibrium, stability, and geometric compatibility.

D3 WIND ACTION

.1 Buildings, structures and integrated or attached protrusions such as roof ventilators and skylights must resist loads in accordance with:

a) Requirements in FS 1170.2 Structural Design Actions, Part 2: Wind Actions as Fijian Standards and/or:

b) Requirements in FS 4055 Wind Loads on Housing (Class 1 and 10 buildings), and

c) In all cases, the Australian Wind Load standard AS/NZS 1170.2, Structural Design Actions, Part 2: Wind Actions as Fijian Standards for the average of Region C and Region D will take precedence until the time that FS 1170.2 Structural Design Actions, Part 2: Wind Actions as Fijian Standards and FS 4055 Wind Loads on Housing are officially approved and endorsed by the Government of Fiji

.2 Building design and construction for wind load resistance must allow for:

a) Importance Level as defined in Table B2.1

b) Annual Probability of Exceedance as defined in Table B2.2

B2.2 EARTHQUAKE RESISTANCE

Performance Requirements

P2 EARTH MOVEMENT RESISTANCE

(1) All Buildings and structures should be sited and designed to avoid damage and loss of life resulting from earthquakes due to dislodgement or displacement of natural and constructed elements.

(2) All Buildings and structures must be designed with:

a) Adequate strength

b) Adequate stiffness

c) Adequate ductility

d) Proper configuration

D1 SITING

.1 All buildings should be setback from known fault lines and sited according to NZS 1170.5 Structural Design Action, Part 5: Earthquake Actions, and/or as recommended in the approved geotechnical report prepared by a Registered Professional Consultant (geotechnical) acceptable to the Government of Fiji.

.2 Buildings should be sited to avoid damage from:

a) Projected paths for soil and rock movement, erosion and landslips if an earthquake occurs

b) Trees and vegetation that could damage the building if dislodged due to ground shaking

c) Nearby unstable buildings, structures or servicing

.3 Buildings should be sited to reduce the potential for collapse by ensuring site works securely support the building structure.

D2 STABILITY

.1 Stability of buildings must be assured by structural design that conforms with NZS 1170.5 Structural Design Actions, Part 5: Earthquake Actions and any subsequent updates.

.2 Stability of buildings must be assured by use of appropriate construction material, connections and fabrications that conform the following standards, where appropriate:

a) AS 3600 Concrete Structures, Steel & Tendons

b) AS 4100 Steel Structures

c) AS/NZS 1214 Hot Dip Galvanized Coatings on Threaded Fasteners

d) AS/NZS 5131 Structural Steelwork – Fabrication and Erection

e) NZS 3101.1&2 (Inc A1, A2, A3) Concrete Structures Standard

f) NZS 3404 Steel Structures Standard

g) NZS 3603 Timber Structures Standard

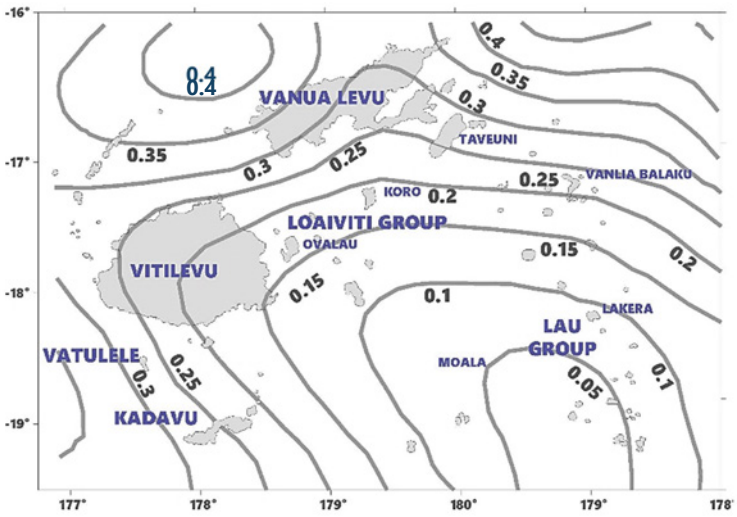
h) NZS 4230 Design of Reinforced Concrete Masonry Structures

i) Other appropriate building standards acceptable to the Government of Fiji

D3 EARTHQUAKE ZONES

.1 Earthquake loads in buildings and structures must comply with NZS 1170.5 Structural Design Actions, Part 5: Earthquake Actions, except mapping for Fiji shown in Figure B2.1 will replace and supersede the New Zealand maps shown in NZS 1170.5 Structural Design Actions, Part 5: Earthquake Actions.

Figure B2.1 Seismic Hazard Z-Factor Map for Fiji



Map uses a grid resolution of 0.1 degrees in latitude and longitude.

Lowest hazard is in the southeast (Lau area), Viti Levu and the central islands show intermediate hazard levels (Z = 0.15 to 0.25), and the highest level is in Vanua Levu and the Yasawa Group.

Source: GNS Science Consultancy Report 2014.261

B3 STORM SURGE AND FLOODING PROTECTION

Requirements for protection from water damage due to cyclones and flooding apply to all buildings in Fiji in Class 1 to 10 that may be subject to storm surge and periodic flooding based on geographical and landscape characteristics of the site.

Performance Requirement 1

P1 SITING

(1) Buildings must be sited to:
- a) Minimize potential for collapse based on geological, topographic and hydrological characteristics of the site
- b) Resist potential damage resulting from cyclones, storm surge and/or flooding

(2) Buildings must be designed to resist detachment, flotation, scouring and settlement resulting from storm surge and flooding.

(3) If a building is partially located in an area prone to flooding or storm surge, the entire building must be protected from potential damage from flooding or storm surge

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Performance requirements of B3 are satisfied if:
- **All of the following d**eemed-to-satisfy provisions are successfully demonstrated
- **Section B1, B2 and F1** are complied with

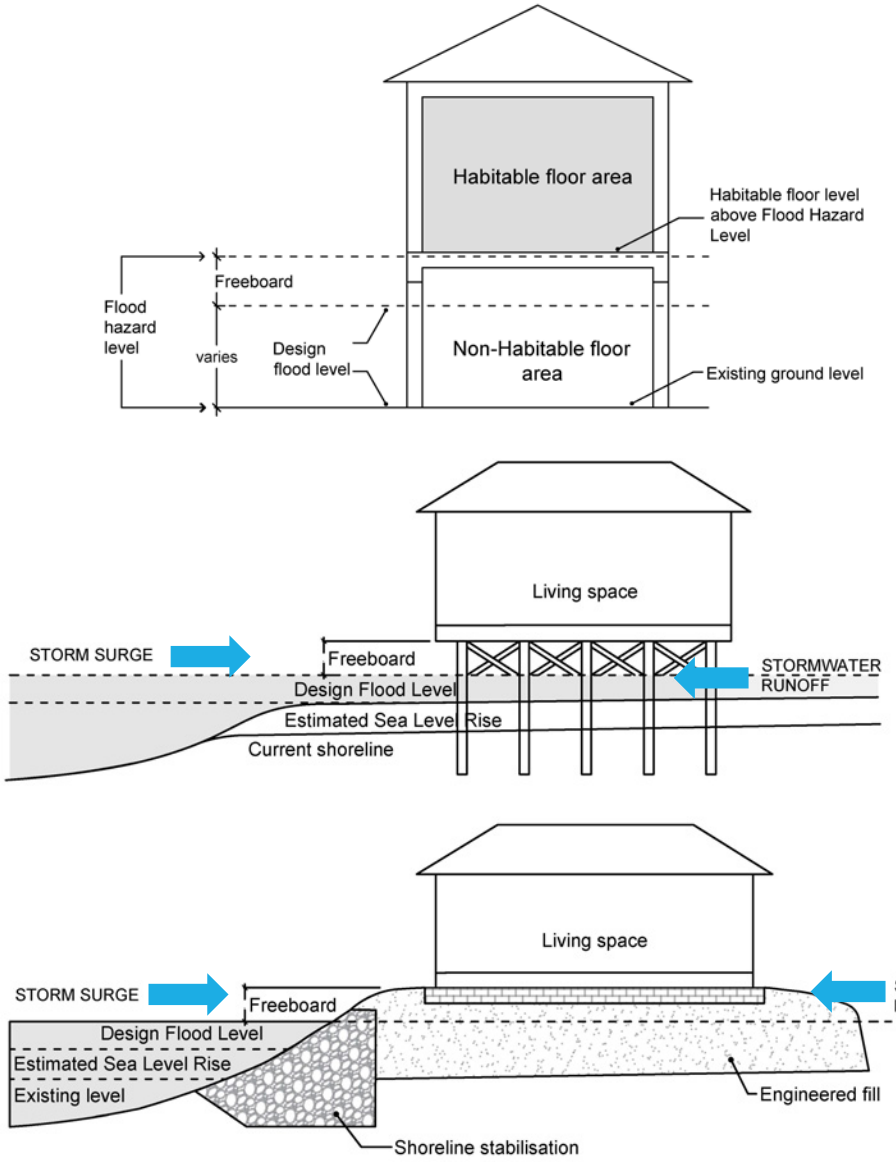
D1 SITING

.1 Buildings must be sited to reduce the impact of flooding by avoiding construction of buildings in flood prone areas, and areas regularly subjected to storm surge.

.2 Buildings along a coastline or in an area prone to flooding must be sited:
- a) On the highest possible elevation that does not compromise safety or structural stability, and/or
- b) In locations with soil and geological conditions that are safe for building construction, and/or
- c) In locations that can resist the impact of wave action, storm surge and flooding

.3 Buildings located along a coastline or in an area prone to flooding must be suitably protected and located to avoid potential harm or injury to occupants and property by having regard to:
- a) **Design Flood Level (DFL)** the flood level associated with the high-water mark observed during the most vigorous weather event appropriate to the building site acceptable to an approval authority
- b) **Flood Hazard Level** Design Flood Level plus freeboard acceptable to the Government of Fiji
- c) **Freeboard** the height above the Design Flood Level used to compensate for effects such as wave action and localised hydraulic behaviour acceptable to the Government of Fiji
- d) **Expected Sea Level Rise** the height that sea level is predicted to rise due to the impact of climate change (see Appendix E)

Figure B3.1: Design Considerations for Flood Prone Areas



.4 Habitable parts of buildings must be located above the Flood Hazard Level and/or above the expected sea level rise, design flood level and a 1.0 m freeboard in areas prone to storm surge.

.5 Buildings and sites in flood prone areas or areas subject to storm surge must be designed to:

a) Ensure adequate soil structure and soil bearing capacity in accordance with a site-specific geotechnical investigation report

b) Ensure appropriate setbacks from natural features (beaches, rocks, mangroves) and human-induced features (jetties, seawalls, riprap, docks, ports the like)

c) Ensure the topography of the development site and surrounding lands will be stable and not subject to erosion

d) Ensure the site will maintain adequate drainage patterns and not result in ponding that could impact slope stability

e) Ensure that vegetation, grading and landscaping that protects slope stability are not compromised

f) Adhere to any restrictions in shoreline protection areas identified and defined by the Government of Fiji

.6 Building parts subject to flooding and storm surge must be protected according to Section F1.D3.

B3.1 STABILITY AND PROTECTION

Performance Requirement 2

P2 STABILITY AND PROTECTION

(1) Buildings in areas prone to flooding or storm surge must be designed to withstand the impacts of the following actions in addition to those listed in B2:

a) Periodic flooding from tropical storms, high water tables, seepage and storm surge
b) Wave action from storm surge in coastal areas
c) Salt spray
d) Rapid and prolonged inundation and drawdown of floodwaters and/or storm surge
e) Earth pressure, erosion and scour
f) Deposition and sedimentation by floodwaters or storm surge
g) Ground water action
h) Rainwater action

(2) Buildings and structures must be firmly secured through the appropriate choice of:

a) Foundation type (pylon, wall, pile, pier, strip footings, raft slab, tied pads) appropriate for soil conditions
b) Reinforcement (bracing, steel mesh, reinforcing bars embedded into concrete)
c) Adequate footing depth based on the recommendations in an approved geotechnical report
d) Engineered Fill under foundation to provide stability
e) Means of relieving hydrostatic pressure below the ground surface

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Stability and protection performance requirements of B3 are satisfied if:

- **All of the following** deemed-to-satisfy provisions are successfully demonstrated
- **Section B1, B2 and F1** are complied with

D1 FOUNDATIONS AND FOOTINGS

.1 All foundations in coastal and flood-prone areas must use one or a combination of the following:

a) Concrete footings with steel or concrete posts, and the lowest habitable floor elevated above expected flood level

b) Concrete footings with wood posts and cross-bracing, and the lowest habitable floor elevated above expected flood level

c) Slab on grade concrete floor with appropriate weather resistant materials, steel reinforcement

d) Concrete masonry walls with vents or other openings

e) Foundation engineered as a seawall and expected to withstand continual wave action and submergence in water

.2 Proof that soil in coastal and flood-prone areas and any other area is adequate for the intended development must be verified in a geotechnical report by a Registered Professional Consultant (geotechnical) when deemed necessary by the Government of Fiji.

.3 Foundations must be suitable to provide and complete the load path to support and tie down the building walls, posts, floors and roof.

.4 Vertical foundations (piles, columns, etc.) must have sufficient depth below the ground to resist wave, current and debris forces, or other suitable design to minimize risk to structural stability.

.5 Pile foundations must have:

a) Minimum dimension of a cross-section of 0.3 m

b) Tied pile heads and/or diagonal bracing

c) Sufficient soil structure under the foundation

d) Depth appropriate to soil characteristics, groundwater and depth to bedrock

e) Continual load path from roof down to the foundation

f) Adequate strength and reinforcement appropriate to the load

.6 Acceptable material for pile foundations must be appropriate to the load and be one or a combination of the following types:

a) Pressure-treated, weather-resistance, timber complying with **AS/NZS 1604 Specification for Preservative Treatment** (see Appendix A), or naturally durable timber as defined in **AS 5604 Natural Durability Ratings – Timber**, or

b) Reinforced concrete, or

c) Steel

B4 LANDSLIP PROTECTION

Landslip requirements apply to all buildings in Fiji in Class 1 to 10 that are in close proximity to a cliff, rockface or other such geological formation.

Performance Requirements

P1 PROTECTION

(1) All buildings and structures should be sited and designed to avoid damage and loss of life resulting from collapse due to landslips.

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Landslip performance requirements of B4 are satisfied if:

- **All of the following** deemed-to-satisfy provisions are successfully demonstrated
- **Section B1 and B2** are complied with

D1 SETBACK AND ALIGNMENT

.1 Locate the building or structure either:

a) A sufficient distance from the landslip-prone area (as indicated in the approved geotechnical report), or

b) With a combination of sufficient setback and slope stabilization techniques (identified in the approved Development Consent Permit and/or Geotechnical Report) that secure the building safely if a landslip occurs

D2 STABILITY

.1 A building foundation near a landslip-prone area must have structural integrity in accordance with Section B2 (imposed and permanent loads) for all building classes.

.2 Foundations for buildings and structures must have appropriate choice of:

a) Adequate cross-section area and depth

b) Reinforcement

c) Appropriate material size and strength

d) Positive site drainage

e) Appropriate siting based on topography, soil conditions and hydrology

.3 Slope stabilization techniques (vegetation, retaining walls, matting, etc.) must be installed as part of building construction for slopes that are greater than 3h:1v across the entire length or width of the site.

.4 A Registered Professional Consultant (geotechnical) must prepare a slope stability study in the following circumstances:

a) When the slope within, immediately above, or below the site is steeper than 3h:1v, or

b) The slope height across the site is greater than 3.0 m, or

c) When deemed appropriate by the Government of Fiji

B5 CONNECTIONS AND FASTENINGS

Performance Requirement

P1 CONNECTIONS AND FASTENINGS

(1) All structural building material and fastenings must be water resistant and not prone to substantial degradation when subjected to storm surge in a saline environment, and/or when subjected to periodic flooding.

(2) All fastenings for cladding and support members of walls, roof, floor, doors, window shutters and any other protrusion that could be dislodged must resist the impact of cyclonic wind force, storm surge, and flooding.

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Connection and fastening performance requirements of B5 are satisfied if:

- **All of the following** deemed-to-satisfy provisions are successfully demonstrated
- **Section B1 and B2** are complied with
- **Part 3.10.6** is complied with

D1 CONNECTIONS AND FASTENINGS

.1 Trusses, rafters and walls must be secured to form a continual load path from roof to foundation using any of the following:

a) Galvanized metal brackets between the wall and truss

b) Cyclone-rated galvanized metal straps fastened to roof, rafter, truss, wall and footing

c) Galvanized U-shaped bolts securely fastened to trusses

d) Galvanized rods continuous from roof structure to foundation

e) Other Alternative Solution acceptable to the Government of Fiji

.2 All steel-based building materials and fastenings in coastal areas must be heavy-duty galvanized and/or marine-grade quality to resist corrosion, where applicable, based on an assessment by the Local Authority or other government approval body, and comply with the following standards:

a) AS/NZS 1214 Hot Dip Galvanized Coatings on Threaded Fasteners

b) AS 1627.1 Removal of Oil, Grease and Related Contamination

c) AS 1627.4 Abrasive Blast Cleaning of Steel

d) AS 1627.5 Preparation and Pretreatment of Surfaces Pickling

e) AS/NZS 2312.2 Guide to the Protection of Structural Steel Against Atmospheric Corrosion By the Use of Protective Coatings, Part 2: Hot Dip Galvanizing

f) AS/NZS 4680 Hot-Dip Galvanized (Zinc) Coatings on Fabricated Ferrous Articles

.3 Shop fabrication and site welding shall comply with fabrication and erection treatment requirements in the following standards:

a) AS/NZS 4680 Hot Dip Galvanized (Zinc) Coatings on Fabricated Ferrous Articles

b) AS/NZS 1214 Hot Dip Galvanized Coatings on Threaded Fasteners

c) AS/NZS 5131 (Amnt No. 1) Structural Steelwork – Fabrication and Erection

d) AS/NZS 2312 Guide to the Protection of Structural Steel Against Atmospheric Corrosion by the Use of Protective Coatings, Part 1: Paint Coatings

e) AS/NZS 4671 Steel for the Reinforcement of Concrete

B6 RETROFITTING

Retrofitting requirements apply to all existing buildings in Fiji in Class 1 to 10.

Performance Requirements

P1 SAFETY

(1) Retrofitting must maintain or increase the safe use and overall performance of the building and site works.
(2) Retrofitting must avoid potential negative consequences to the structure.
(3) Retrofitting must minimise the risk of exposure to hazardous materials or other contaminants that are harmful to people or the environment.
(4) Retrofitting must comply with all standards and specifications in the FNBC, applicable Australia and New Zealand standards, and other retrofitting standards acceptable to the Government of Fiii.

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Retrofitting performance requirements of B6 are satisfied if:
- **All of the following** deemed-to-satisfy provisions are successfully demonstrated
- **Section B1 to B9** are complied with
- **All other sections of the FNBC** are complied with, where applicable

D1 APPLICABILITY

.1 The following changes to a building or site are subject to the provisions of this Building Code:

a) Change of use that affects the structural integrity, health and/or safety of the building

b) Change to building components such as foundation, walls, roof, stairs, lifts, access

c) Change in site grading or landscape composition that could potentially affect slope stability, impact neighbouring property, or compromise the health and safety of the site

d) Additions or increase in occupancy load

D2 STRUCTURAL INTEGRITY

.1 Existing buildings or parts thereof must be certified to be suitable for retrofitting by a Registered Professional Consultant (structural engineer).

.2 Existing building parts to be maintained must demonstrate structural integrity and ability to support all loads resulting from the new construction.

.3 Existing building parts must demonstrate fire resistance appropriate to the proposed change in building use or be upgraded to the appropriate level.

.4 Any additions or changes to the electrical and/or plumbing system must not overload or compromise the existing electrical and/or plumbing systems.

B7 DEMOLITION

Demolition safety requirements apply to all buildings in Fiji in Class 1 to 10.

Performance Requirements

P1 DECLARATION

(1) When a building poses a health or safety risk to the public and/or adjacent property, the building or must be:

a) Repaired so that it meets the standards of the FNBC and related legislation within a timeframe acceptable to the Government of Fiji, or

b) Demolished

P2 SAFETY AND PROTECTION

(1) When buildings are demolished, the planning and execution of the demolition must:

a) Not put at risk the safety and health of the public and the worker

b) Avoid damage and nuisance from dust, vibrations, noise, water, fire, smoke and fumes

c) Avoid nuisance to others

d) Permit continued access to other properties

e) Allow continued access to the demolition portion of the property by authorized persons only

f) Prevent damage to public services such as water and sewerage pipes, electricity and telephone lines etc. and allow their continued use

g) Protect natural resources and environment

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Demolition performance requirements of B7 are satisfied if **any of the following** deemed-to-satisfy provisions are successfully demonstrated.

D1 UNSTABLE BUILDINGS

.1 A building will be declared unfit for human use by the Government of Fiji, in accordance with the FNBC and other applicable Acts, when it exhibits any of the following characteristics:

a) Any required exit is not of sufficient width or size or is not so arranged as to provide safe and adequate means of egress in case of fire or other emergency

b) One or more structural members or elements undergoes excessive overstress and excessive deflection beyond allowable limits in the design codes

c) Any portion of the building has been damaged by fire, earthquake, wind, flood or by any other cause, to such an extent that its structural strength or stability is materially less than it was before such catastrophe and is less by 33% or more than the minimum requirements for new buildings of similar class and type of construction

d) Any portion or member or attachment of the building is likely to fail, or to become detached or dislodged, or to collapse and thereby injure persons or damage property

e) Any portion of the building has suffered distortion, cracking or settlement to such an extent that walls or other structural portions have materially less resistance to winds or earthquakes than is required in the case of similar new construction

f) The building or any portion of it is likely to collapse or fail to perform the intended function as a result of:
   (i) Dilapidation, deterioration, or decay
   (ii) Faulty construction
   (iii) Removal, movement, or instability of any portion of the ground necessary for the purpose of supporting such building
   (iv) Deterioration, decay or inadequacy of its foundation
   (v) Any other cause

g) The building, exclusive of the foundation, shows 33% or more damage, deterioration, or compromise to its fire-resistance for any supporting member, or 50% or more damage, deterioration or compromise to its fire-resistance for its non-supporting members

h) The building could potentially cause sickness or disease due to inadequate maintenance, dilapidation, decay, damage, faulty construction or arrangement, inadequate light, air or sanitation facilities, or otherwise

.2 Any building declared to be unfit for human use by the Government of Fiji must be demolished according to a Demolition Plan that identifies:

a) Potential hazards and mitigation and/or removal strategy

b) Access, fencing, restricted access, signage locations

c) Demolition methods such as dismantling, excavation, wrecking balls, implosion, and the area impacted

d) Protection of utilities and services

e) Safety measures to protect adjacent buildings, allotments, roads, natural features and people

f) Dust and debris management

g) Waste management

h) Noise and vibration control

i) Protection of natural features

j) Site security measures

.3 An emergency plan identifying emergency procedures, access routes and safety measures must be prepared and approved.

.4 Requirements and procedures of related legislation and policy, such as the Environmental Management Act, must be incorporated into a Demolition Plan.

B8 BUILDING MATERIALS

Requirements for structural materials apply to all buildings in Fiji in Class 1 to 10.

Performance Requirements

P1 STRUCTURAL RESISTANCE

(1) Materials, components, and methods of construction used in a building or structure and all attached services must be capable of sustaining at an acceptable level of safety and serviceability:
   a) The most adverse combinations of loads (including combinations of loads that might result in a potential for progressive collapse)
   b) Other actions to which they may reasonably be subjected

(2) Building materials must be sufficiently durable for the intended lifespan without the need for reconstruction or major renovation.

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Building material requirements of B8 are satisfied if:
- **All of the following** deemed-to-satisfy provisions are successfully demonstrated
- **Section B2 and Section G5 Low Carbon Building Materials** are complied with

D1 MATERIAL STRENGTH

.1 The performance requirements of B8 for materials and forms of construction are satisfied if they comply with the following:

a) Masonry
   (i) NZS 4210 Code of Practice for Masonry Buildings, Materials and Workmanship
   (ii) NZS 4229 Code of Practice for Masonry Buildings Not Requiring Specific Design
   (iii) NZS 4230 Design of Reinforced Concrete Masonry Structures

b) Concrete
   (i) NZS 3101 Concrete Structures Standard
   (ii) NZS 3109 Concrete Construction
   (iii) NZS 3124 Specification for Concrete Construction for Minor Works

c) Steel construction – NZS 3404.1&2 Steel Structures Standard and AS 4100 Steel Structures and/or approved equivalent

d) Aluminum - AS/NZS 1664.1 Aluminum Structures, Part 1: Limit State Design

e) Timber Construction – AS 1720.1 Timber Structures Design Methods or NZS 3603 Timber Structures Standard
   For Class 1 to 10 - AS 1684 Part 1 to 4 Residential Timber-Framed Construction

f) Footings - AS 2870 Residential Slabs and Footings for Class 1 and 10a

g) Piling - AS 2159 Rules for the Design and Installation of Piling

h) Glass Installations: NZS 4223.1 Code of Practice for Glazing in Buildings Part 1: Glass Selection and Glazing

i) Roof construction: material must demonstrate performance at the load level determined in Section B1. Metal roofing material must comply with **AS 4040.3 Methods of Testing Sheet Roof and Wall Cladding Resistance to Wind Pressures for Cyclone Regions** and be installed in accordance with **AS/NZS 1562.1 Design and installation of Sheet Roof and Wall Cladding, Part 1: Metal** and manufacturer's recommendations.

j) Particleboard structural flooring: **AS/NZS 1860.1 Particleboard Flooring Part 1: Specifications** and **AS/NZS 1860.2 Particleboard Flooring Part 2: Installation**

k) Precast Concrete

(i) **NZS 3101 Concrete Structures Standard**

(ii) **NZS 3109 Concrete Construction**

(iii) **NZS 3114 Specification for Concrete Surface Finishes**

(iv) Concrete NZ Precast Publications

(v) WorkSafe NZ Safe Work with Precast Concrete

(vi) Overseas Design Guide – Precast Concrete Handbook (2009) from NPCAA (Australia)

D2 FRAMING

.1 Timber acceptable for framing must be of a species acceptable to the Government of Fiji and must be capable of receiving appropriate protective treatment to safeguard it from weather and pests, and effectively treated.

.2 Steel and timber framing must be appropriately sized and spaced according to the strength and durability of the material.

D3 METAL ROOF CLADDING

.1 Metal roof cladding, connections and supporting members must be capable of staying in position when subjected to cyclonic wind action under pressure sequences listed in **AS 4040.3 Methods of Testing Sheet Roof and Wall Cladding Resistance to Wind Pressures for Cyclone Regions**.

.2 Metal roof cladding must be sufficiently fabricated and securely fastened according to manufacturer's specifications to withstand wind load standards in Section B2.

D4 DURABILITY

.1 Building materials, components and servicing must be sufficiently durable according to Table B8.1:

Table B8.1 Required Durability of Building Materials

50 Years	15 Years	5 Years
• Structural materials / components of floors, walls, roof, foundation	• Servicing components (plumbing, electrical, fire safety system in Class 2 – 9 buildings) that are moderately easy to access and replace, and/or	• Non-structural cladding material, finishes, linings, coatings, fixtures, and the like, and/or
• Hidden components essential to safety and use of the building and site that are difficult to access, replace or monitor	• Hidden components that can easily be moderately detected during operation or regular maintenance	• Non-structural components that can be easily accessed and replaced during regular maintenance

B9 TERMITE PROTECTION

Termite protection requirements apply to all buildings in Fiji in Class 1 to 10 constructed in termite-prone areas.

Performance Requirements

P1 PREVENTION

(1) All buildings in termite-prone areas must be constructed with termite prevention measures that avert the penetration or movement of termites into the structure, and/or repel or kill termites.

(2) Termite prevention shall consist of one or a combination of the following preventative measures:

a) Use of termite-resistant building material

b) Installation of an impregnable barrier to prevent penetration or movement

c) Application of chemical treatment that repels or kills termites, or prevents penetration or movement of termites into the structure

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Termite protection performance requirements of B9 are satisfied if:

- **All of the following** deemed-to-satisfy provisions relevant to the type of construction are successfully demonstrated and are deemed acceptable to the Government of Fiji
- **Section B1, B5 and B8** are complied with

D1 FOUNDATIONS, FOOTINGS, AND FLOORS IN CONTACT WITH THE GROUND

.1 Termite management for foundations, footings and floors in contact with the ground must use termite resistant material acceptable to the Government of Fiji and in compliance with **AS 3660.1 Termite Management, Part 1 New Building Work**.

.2 Termite management must consist of one or a combination of:

a) Termite barriers fitted to concrete slab foundations and penetrations that comply with **AS 2870 Residential Slabs and Footings**

b) Crushed stone layer of sufficient height under a concrete slab that prevents termite penetration or movement

c) HDPE plastic, termite-proof stainless steel mesh, or sheet metal applied to underside of subfloor to prevent termite penetration or movement

d) Metal capping or termite-proof stainless steel mesh installed on top of post foundations to prevent termite penetration and movement

e) Use of termite-resistant material acceptable to the Government of Fiji

f) Other method approved by a testing agency acceptable to the Government of Fiji

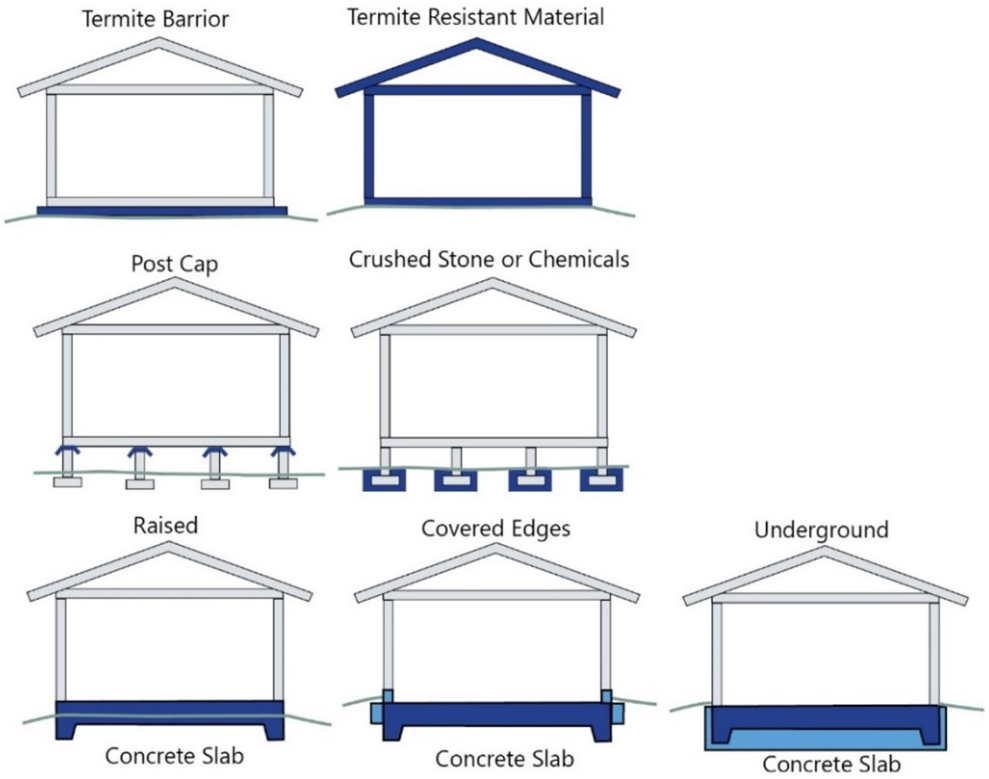
.3 Suspended floors that require termite protection must:

a) Be accessible for inspection, maintenance and treatment by having access doors, panels or open areas

b) Have a minimum clearance of 400 mm between the finished grade and underside of floor, beam or rafters being treated

c) Have unrestricted ventilation between the finished grade and the floor / beams / rafters requiring protection

Figure B9.1 Termite Protection Options



D2 TERMITE RESISTANT BUILDING PRACTICES

.1 All timber in termite-prone areas must be pressure-treated and/or termite-resistant.

.2 Other acceptable termite-resistant building materials include:

a) Steel, aluminum or other metal posts, beams and rafters

b) Concrete or masonry footings and foundations when appropriately treated and constructed according to Section B3.1 D1

c) Plastics and polycarbonates

d) Other material acceptable to the Government of Fiji

.3 New buildings identified for termite protection must comply with **AS 3660.1 Termite Management, Part 1: New Building Work**.

.4 All accessory structures such as steps, porches, verandahs, utility buildings and the like that are attached to the building must receive the same termite prevention measures applicable to the building material, or they should be physically separated from the building by a minimum 25 mm gap.

D3 CHEMICAL TERMITE TREATMENT

.1 Termite protection sprays and chemical treatment must be approved by the Ministry of Agriculture to ensure they are not harmful to the soil.

.2 Chemical termite prevention treatment shall be applied to the following building elements in termite-prone areas:

a) Concrete footings and slabs

b) Timber posts, beams, cladding, and framing within 2.0 m of finished grade

c) Interior and exterior timber walls within 2.0 m of finished grade

a) Penetrations through a foundation, slab or suspended wood floor for site servicing or other such means

.3 When selected to be part of the termite prevention plan, termite protection sprays and chemical treatment must be applied:

a) Prior to pouring and installing footings

b) After levelling of footing and slab areas

c) After final finished grade to exposed building parts requiring treatment

SPECIFICATIONS

B

Structure

Part 3.10.6 Attachment of Decks and Balconies to External Walls of Buildings

PART 3.10.6

Attachment of decks and balconies to external walls of buildings

1. APPLICATION

.1 Compliance with this acceptable construction practice satisfies Performance Requirements of Section B5 for the attachment of a deck or balcony to an external wall provided:

a) The deck or balcony is not located in an alpine area

b) The height of the deck or balcony is not more than 3 m above the surface below, measured from the uppermost finished floor surface of the deck or balcony at any point to the top of any ground level, supporting footing or balcony below

c) The waling plate does not support:

(i) More than one floor, or

(ii) Load-bearing or non load-bearing walls, or

(iii) Roof loads

d) The deck or balcony does not cantilever off the external wall

e) The total imposed load on the deck or balcony does not exceed 2 kPa (kilopascal)

f) The deck or balcony framing including member sizes, spans and spacing, bracing for racking and shear forces, fixings and structural supports complies with Section 2, 3 and 4 below

g) The deck or balcony framing is constructed of:

(i) Steel framing in accordance with Section B6, B8 and B9 in the FNBC, or

(ii) Timber framing in accordance with Section B6, B8 and B9 in the FNBC

h) The external wall supporting the deck or balcony is constructed of:

(i) 190 mm thick fully core-filled concrete masonry, reinforced with vertical N12 bars at not more than 600 mm centres, or

(ii) Steel framing complying with Section B6, B8 and B9 in the FNBC, or

(iii) Timber framing complying with Section B6, B8 and B9 in the FNBC

i) The external wall referred to in (g) above must be continuous from the upper most surface of the deck or balcony to the supporting footing and contain no openings or lintels below the deck or balcony

j) The waling plate (timber member bolted to the face of a truss to support intersecting rafters or trusses and/or battens or purlins) is fixed to the external wall in accordance with Section 2 and 3 below, and attached by:

(i) Fixing the waling plate through wall cladding complying with Section 4 below, provided the cladding is directly fixed to the external wall, or

(ii) Removing parts of the wall cladding so that the waling plate is directly fixed to the external wall with:

A. The junction of the waling plate and the external wall flashed in accordance with Section 2 and 3 below

B. The cladding restored to its original strength by installing blocking supports as necessary on completion of installation

k) The deck or balcony is braced to prevent longitudinal movement in accordance with Section 4 below.

2. FIXING DECKS AND BALCONIES TO EXTERNAL WALLS

.1 Where a deck or balcony relies on the external wall of a building or structure for support, the method of attachment to the external wall, including any fixings, must comply with the following:

a) The deck or balcony's joist framing members must be supported at the wall by a waling plate

b) The joist span nearest the external wall must not be more than 3 m (single or continuous span)

c) The size of a waling plate required by (a) above must be not less than:

(i) For a timber waling plate — 190 x 45 mm with a minimum stress grade of F5 or MGP10, or

(ii) For a steel waling plate — C15015 (minimum Grade G550) with the web located against the external wall

d) A waling plate must be attached so that:

(i) For core-filled reinforced concrete masonry external walls, fixings are staggered along the waling plate at not more than 300 mm centres measured along the waling plate

(ii) For timber external walls, two fixings are provided into a solid joist or bearer framing member that is not less than 190 x 100 mm with a minimum stress grade of F5 or MGP10, at not more than 300 mm centres measured along the waling plate

(iii) For steel framed external walls, two fixings are provided into a joist or bearer framing member not less than C20015 (Grade G550) at not more than 300 mm centres measured along the waling plate

(iv) Fixings are:

A. Installed within 300 mm of each end of the waling plate

B. For a timber waling plate — not located within 120 mm from the ends or within 60 mm from the top and bottom edges

C. For a steel waling plate — not located within 50 mm from the ends or within 30 mm from the top and bottom edges

e) Fixings must be:

(i) For timber external wall frames with a minimum stress grade of F5 or MGP 10:

A. M12 coach screws with not less than 3 mm thick, 55 mm diameter washers fixed so that the coach screw is embedded not less than 96 mm into the joist or bearer framing member (see Figure 4.1 and 4.2 below), or
B. 4.6/S M12 bolts with not less than 3 mm thick, 55 mm diameter washers placed on the waling plate under the bolt head

(ii) For steel external wall frames, 8.8/S M12 bolts with not less than 3 mm thick, 55 mm diameter washers

(iii) For a core-filled masonry external wall, 4.6/S M12 chemical or expanding/mechanical anchors with:

A. A minimum 2 kN (kilonewton) working load capacity in shear and 1.5 kN in tension
B. Not less than 3 mm thick, 55 mm diameter washers placed on the waling plate under the anchor head (see Figure 4.1 and 4.3 below)

f) Fixings used for attaching waling plates to external walls must be:

(i) Stainless steel where the building is located within 200 m of breaking surf, or

(ii) Hot-dipped galvanised, stainless steel or monel metal for all other areas

3. FLASHINGS FOR THE JUNCTION OF THE WALING PLATE AND EXTERNAL WALL

.1 Where the wall cladding is removed to attach a waling plate, openings in external wall cladding exposed to the weather must be flashed with materials complying with AS/NZS 2904 Damp Proof Courses and Flashings and in accordance with the following:

a) Flashing must be provided to the bottom, top and side of the junction of the waling plate and external wall, and must be installed so that the flashing:

(i) Extends not less than 150 mm beyond each side of the waling plate where practicable

(ii) Is attached to the waling plate and wall framing

(iii) Drains to the outside face of the wall or cladding at the top and bottom of the waling plate

b) Joins in the flashing must:

(i) Overlap by not less than 75 mm in the direction of flow

(ii) Be securely fastened at intervals of not more than 40 mm

(iii) Have sealant installed between laps

c) The method of flashing must be suitable for the framing and cladding used

d) Flashing must be securely fixed at least 25 mm under the cladding at the end of the framing and/or the opening

4. BRACING

.1 Where a deck or balcony is more than 1 m off the ground when measured from any point on the upper most surface of the deck or balcony to the top of any supporting footing, bracing must be installed as follows:

a) Two diagonally opposed 30 x 0.8 mm galvanised steel straps must be installed across the top or underside of the joists and be attached using one fixing at:

   (i) Each joist or equivalent framing member

   (ii) The waling plate

b) A secondary set of 30 x 0.8 mm steel straps must be installed using one fixing at each joist or equivalent framing member in accordance with Figure 4.1 and 4.2, where the deck or balcony extends more than 4 m from the external wall

c) The steel straps must:

   (i) Be continuous and extend diagonally at an angle between 30° to 60°

   (ii) Span not more than 4 m when measured along a line at a right angle from the external wall

d) Fixings for the steel straps must be:

   (i) For timber framing, 50 x 3.15 hot-dipped galvanised flat head ring shank or flat head deformed nail, or

   (ii) For steel framing, 8-18 self-embedding head or wafer head screws

e) Where the deck or balcony is located within a severe corrosion environment, bracing and fixings must be fabricated to resist corrosion

Figure 4.1 Sample Deck or Balcony Attachment To Concrete Wall

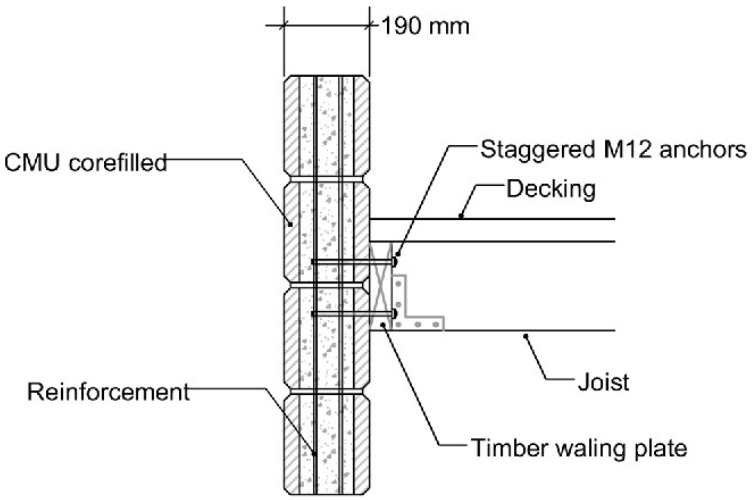


Figure 4.2 Sample Deck or Balcony Attachment to Timber Wall

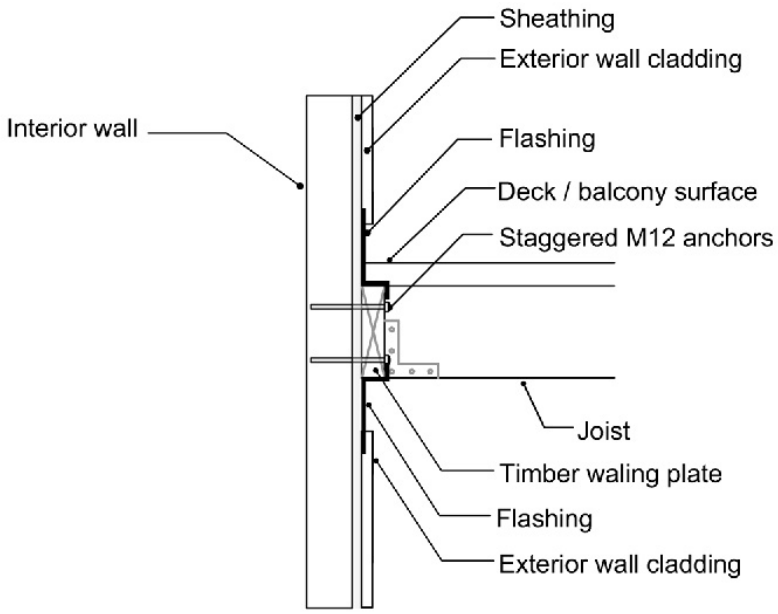
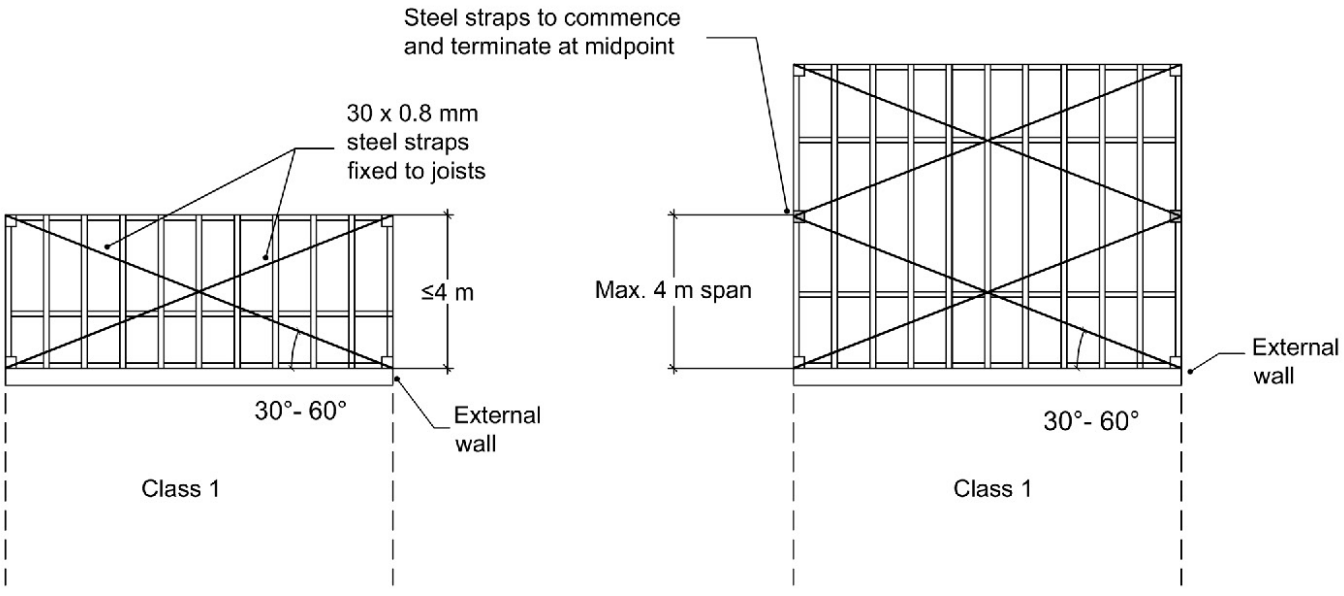


Figure 4.3 Sample Bracing of Decks and Balconies



Decks or balconies protruding up to 4m from the external wall

Decks or balconies protruding more than 4m from the external wall

Section C

Fire Protection

FIRE PROTECTION

CLASS 2 – 9 BUILDINGS

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OBJECTIVES

The design and construction of buildings in Class 2 to 9 must fulfill the following objectives:

(1) A building must be designed, constructed and demolished to safeguard people and neighboring property such that there is a low probability of harm and discomfort caused by fire and smoke

(2) Building materials must have characteristics that:

- a) Minimize the spread of fire and generation of smoke and toxic gases
- b) Maintain stability to allow sufficient time for occupants to escape and ensure the safety of firefighters
- c) Minimize risk of collapse
- d) Minimize risk of damage to other property

(3) Adequate in-built and external fire protection services must be provided to:

- a) Restrict fire growth to the compartment of origin
- b) Prevent fire spread to other buildings or allotments
- c) Facilitate firefighting operations
- d) Have regard to the size and use of the building and its type of construction

(4) Buildings must be designed to allow occupants to escape from the effects of fire and stay safely within unaffected compartments for the duration reasonably required to put out the fire by active means

(5) Buildings must be designed and constructed to prevent unwanted ignition

(6) Buildings must be designed and constructed with regard to the likelihood and consequence of failure of any active fire safety equipment intended to control fire spread

C1 FIRE RESISTANCE AND STABILITY

Performance Requirements

P1 FIRE-RESISTING CONSTRUCTION

(1) A Building must be designed and constructed so that there is a low probability of fire spread to other property vertically or horizontally across a relevant boundary.

(2) Building material must have an appropriate fire resistance such that loss of life and damage to property is minimized in the event of a fire.

(3) Materials used in the construction of buildings and structures must be such that if there is a fire in the building:

- a) The spread of fire and the generation of smoke and toxic gases will be minimized
- b) Stability will be maintained for a period at least sufficient for the occupants to escape and to ensure the safety of firefighters
- c) There will be little risk of collapse onto adjoining property

(4) To maintain structural adequacy and stability of a building in the event of a fire:

- a) The load-bearing elements must have fire-resistance appropriate to:
  - (i) The function or use of the building
  - (ii) Expected fire load, fire intensity and fire hazard
  - (iii) Fire risk
  - (iv) Height of the building
  - (v) Size of fire compartments
  - (vi) Its proximity to other property
  - (vii) Availability of external and internal firefighting and fire control resources
- b) The fire-resistance of structural elements must be at least equal to that of other elements to which they provide support
- c) Collapse of elements with a lower fire-resistance must not result in the collapse of elements with a higher fire-resistance

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Fire Resistant requirements of C1 are satisfied if:

- **All of the following** deemed-to-satisfy provisions are successfully demonstrated.
- Performance requirements of **Sections C2 to C6** are complied with
- Specification **C1.1, C1.8, C1.10, C1.11, C1.13, C1.13a, C2.5, C3.4, C3.15** must be complied with
- **Schedule 5** Fire Resistance must be complied with

D1 FIRE-RESISTING CONSTRUCTION

.1 A building material that is consistent with the fire-resisting construction standards contained in Specification C1.1 Fire-Resisting Construction and /or in the NCC (National Construction Code of Australia), Volume 1, Section C, will satisfy Performance Requirement P1 Fire Resistant Material if the following Specifications are also complied with, as appropriate to the construction:

a) Specification C1.8 Structural Tests for Lightweight Construction

b) Specification C1.10 Fire Hazard Properties

c) Specification C1.11 Performance of External Wall in Fire

d) Specification C1.13 Cavity Barriers for Fire-Protected Timber

e) Specification C1.13a Fire-Protected Timber

D2 TYPE OF CONSTRUCTION

.1 To determine the minimum fire-resistance required, all buildings will be categorised as Construction Type A, B, or C depending on the building classification, use, and height of the building, and must be designed and constructed with suitable fire-resisting construction according to standards in Specification C1.1 Fire Resisting Construction.

.2 Table C1.1 below over-rides a similar table in Specification C1.1 Fire Resisting Construction and must be used to categorise the building as Construction Type A, B or C.

Table C1.1 Construction Type

No. of Storeys	Type of Construction	Indication	Reference
5 or more	A	Structural elements have a high degree of fire-resistance	Requirements for Construction Type A, B and C are contained in Specification C1.1 Fire-Resisting Construction
3 or 4	B	External structural elements remain in place in the event of a fire for as long as possible, internal structural elements have a lower fire-resistance than Type A	
1 or 2	C	Least fire-resistant construction material (see Schedule 5 Fire Resistance of Building Elements for FRL)	
Evacuation Centres	A	Structural elements have a high degree of fire-resistance	

.3 A two storey Construction Type C building in Class 2 or 3 shall only be considered as Type C construction if each sole-occupancy unit has:

a) At least 2 exits, or

b) Its own direct access to a road or open space

If these conditions cannot be achieved, the building is deemed to be Construction Type B or A.

.4 A two storey Construction Type C building in Class 9 that provides accommodation for children, the elderly and/or disabled people, shall only be Construction Type C if it is protected throughout with a sprinkler system (other than a **FPAA101D Automatic Fire Sprinkler System Design and Installation** or **FPAA101H Automatic Fire Sprinkler System Design and Installation – Hydrant Water Supply**) complying with Specification E1.5 Fire Sprinkler Systems, and complies with the maximum compartment size specified in Table C2.1 for Type C Construction. If these conditions cannot be achieved, the building will be deemed as Construction Type B or A.

.5 A building may be of mixed types of construction if no part of the building is supported by, or vertically over, a part of lesser fire-resisting construction.

.6 Performance requirement P1(2) will be satisfied if building materials are used to provide appropriate fire-resisting structural stability and have the characteristics listed in Table C1.2 and in Section C1.D3 Non-Combustible Building Materials.

Table C1.2 Fire-resisting Materials for Construction Types A and B

Building Element	Type A Construction	Type B Construction
External wall	Non-combustible (including façade covering, framing and insulation)	Non-combustible (including façade covering, framing and insulation)
Common Wall	Non-combustible (including façade covering, framing and insulation)	Non-combustible (including façade covering, framing and insulation)
Floor and floor framing of lift pit	Non-combustible	Non-combustible
All load-bearing internal walls (including shafts)	Concrete, masonry or fire-protected timber	Concrete, masonry or fire-protected timber
Load-bearing fire walls	Concrete, masonry or fire-protected timber	Concrete, masonry or fire-protected timber
Non load-bearing walls required to be fire-resistant	Non-combustible	Non-combustible
Non load-bearing lift, ventilation, pipe, garbage and like shafts which do not discharge hot products of combustion	Non-combustible	Non-combustible for Class 2, 3 or 9 buildings, and for Class 5, 6, 7 and 8 buildings if the shaft connects more than 2 storeys
Requirements for external walls do not apply to gaskets, caulking, sealant, termite management systems, glass (including laminated glass), thermal breaks associated with glazing, damp-proof courses. See C1.D8 for a list of ancillary items permitted on external walls required to be fire-resisting.		

.7 In a building of multiple classifications, the type of construction required for the building is the most fire-resisting type resulting from the application of Table C1.1 on the basis that the classification applying to the top storey applies to all storeys.

.8 In a building containing a Class 4 part on the top storey, the classification applying to the top storey:

a) Is applicable to the next highest storey when the Class 4 part occupies the whole of the top storey, or

b) Is applicable to the adjacent part when the Class 4 part occupies part of the top storey

D3 NON-COMBUSTIBLE BUILDING MATERIALS

.1 The following are designated as non-combustible building materials when composed entirely of itself:

a) Autoclaved aerated concrete, mortar
b) Steel, including metallic coated
c) Masonry, including mortar
d) Aluminum, including aluminum alloy
e) Concrete
f) Iron
g) Terracotta
h) Porcelain
i) Ceramic
j) Natural Stone
k) Copper
l) Zinc
m) Lead
n) Bronze
o) Brass

.2 The following building materials may be used wherever a non-combustible material is permitted:

a) Plasterboard

b) Perforated gypsum lath with a normal paper finish

c) Fibrous-plaster sheet

d) Fibre-reinforced cement sheeting

e) Pre-finished metal sheeting having a combustible surface finish not exceeding 1 mm thickness and where the Spread-of-Flame Index of the product is not greater than 0

f) Sarking-type materials that do not exceed 1 mm in thickness and have a Flammability Index not greater than 5

g) Bonded laminated materials where:

(i) Each lamina, including any core, is non-combustible

(ii) Each adhesive layer does not exceed 1 mm in thickness and the total thickness of the adhesive layers does not exceed 2 mm

(iii) The Spread-of-Flame Index and the Smoke-Developed Index of the bonded laminated material as a whole do not exceed 0 and 3 respectively

D4 FIRE-PROTECTED TIMBER: CONCESSION

.1 Fire-protected timber may be used wherever an element is required to be non-combustible, provided:

a) The building is:

(i) A separate building, or

(ii) Has a part of the building which:

A. Only occupies part of a storey, and is separated from the remaining part of a fire wall, or

B. Is located above or below a part not containing fire-protected timber and the floor between the adjoining parts is provided with an FRL not less than that prescribed for a fire wall in the lower storey

b) The building has an effective height of not more than 25 m

c) The building has a sprinkler system (other than a **FPAA101D Automatic Fire Sprinkler System Design and Installation** or **FPAA101H Automatic Fire Sprinkler System Design and Installation –Hydrant Water Supply**) throughout complying with Specification E1.5 Fire Sprinkler Systems

d) Any insulation installed in the cavity of the timber building element is non-combustible

e) Cavity barriers are provided in accordance with Specification C1.13 Cavity Barriers for Fire-Protected Timber

D5 OPEN SPECTATOR STANDS AND INDOOR SPORTS STADIUMS

.1 An open spectator stand or indoor sports stadium which has only changing rooms, sanitary facilities or the like below the tiered seating, need not comply with the other provisions of this part if it contains not more than 1 tier of seating and is of Type C and non-combustible construction.

D6 LIGHTWEIGHT CONSTRUCTION

.1 Lightweight construction must comply with Specification C1.8 Structural Tests for Lightweight Construction if it is used for fire-resisting construction. It must also comply if used for:

a) A lift shaft, stair shaft or service shaft

b) An external wall bounding a public corridor including a non-fire-isolated passageway or ramp

c) A spectator stand, sports stadium, cinema, theatre, railway or bus station, or airport terminal

.2 If lightweight construction is used for the fire-resisting covering of a steel column or the like and the covering is not in continuous contact with the column, then the void must be filled solid to a height of not less than 1.2 m above the floor to prevent indenting.

.3 If lightweight construction is used for the fire-resisting covering of a steel column or the like and the column is liable to be damaged from the movement of vehicles, materials or equipment, then the covering must be protected by steel or other suitable material.

D7 PERFORMANCE OF EXTERNAL WALLS IN FIRE

.1 A concrete external wall that could collapse as a complete panel (e.g. tilt-up, pre-cast concrete) in a building less than 3 storeys must comply with Specification C1.11 Performance of External Walls in Fire.

D8 ANCILLARY ITEMS PERMITTED ON NON-COMBUSTIBLE EXTERNAL WALLS

.1 An ancillary element must not be fixed, installed or attached to the internal parts or external face of an external wall that is required to be non-combustible unless it is one of the following:

a) An ancillary element that is non-combustible

b) A gutter, downpipe or other plumbing fixture or fitting

c) A flashing

d) A grate or grille not more than 2 m^2 in area associated with a building service

e) An electrical switch, socket-outlet, cover plate or the like

f) A light fitting

g) A required sign

h) A sign other than one provided under (a) or (g) that:

(i) Achieves a group number of 1 or 2

(ii) Does not extend beyond one storey

(iii) Does not extend beyond one fire compartment

(iv) Is separated vertically from other signs permitted under (h) by at least 2 storeys

i) An awning, sunshade, canopy, blind or shading hood other than one provided under (a) that:

(i) Meets the relevant requirements of Table 4.1 of Specification C1.10 Fire Hazard Properties as for an internal element

(ii) Serves a storey:

A. At ground level, or

B. Immediately above a storey at ground level

(iii) Does not serve an evacuation route

j) A part of a security, intercom or announcement system

k) Wiring

l) A paint, lacquer or a similar finish

m) A gasket, caulking, sealant or adhesive directly associated with (a) to (k)

D9 FIRE HAZARD PROPERTIES

.1 The fire hazard properties of the following internal linings, materials and assemblies must comply with Specification C1.10 Fire Hazard Properties:

a) Floor linings and floor coverings

b) Wall linings and ceiling linings

c) Air-handling ductwork

d) Lift cars

D10 CALCULATION OF RISE IN STOREYS

.1 In calculating the rise in storeys:

a) A storey that has an average internal height of more than 8 m is counted as:

(i) One storey if it is the only storey above the ground, or

(ii) 2 storeys in any other cases

b) A storey is not counted if:

(i) It is situated at the top of the building and contains only service units or equipment, or

(ii) It is situated partly below the finished ground and the underside of the ceiling is not more than 1 m above the average finished ground at the external wall

.2 The rise in storeys is the sum of the greatest number of storeys at any part of the external walls of the building and any storeys within the roof space measured:

a) Above the finished ground next to that part, or

b) Above the existing ground level along the allotment boundary if part of the external wall is on the boundary of the allotment

.3 In a Class 7 or 8 building, a storey that has an average internal height of more than 6 m is counted as:

a) One storey if it is the only storey above the ground, or

b) 2 storeys in any other case

.4 For the purposes of calculating the rise in storeys of a building:

a) A mezzanine is regarded as a storey if its floor area is more than 200 m^2 or more than 1/3 of the floor area of the room, whichever is the lesser

b) Two or more mezzanines are regarded as a storey in that part of the building in which they are situated if they are at or near the same level and have an aggregate floor area more than 200 m^2 or more than 1/3 of the floor area of the room, whichever is the lesser

D11 FIRE-RESISTING CONSTRUCTION IN EVACUATION ROUTES

.1 Evacuation routes and places of safety must have fire-isolating construction appropriate to building type, classification, size and occupancy, as indicated in Table C1.3:

Table C1.3 Required Fire Resisting Construction per Building Classification

Building Class	Fire-isolated passageway or open access corridor	Fire-isolated or open access stairway	Fire-isolated or open access ramp	Automatic air pressurisation system	Automatic fire door
Class 2	Open access corridor for stacked units	Open access for stacked units	Open access ramp for stacked units if required	No	No
Class 3	For stacked units	For stacked units	For stacked units, if required	No	For stacked units
Class 4	Yes	Yes, if unit is above the 1st storey	Yes, if required	No	Yes
Class 5	Yes	Yes	Yes, if required	Yes for buildings > 25 m height / 8 storeys	Yes, except for side-by-side sole occupancy units
Class 6	No	Yes, if more than 1 storey in height			Yes, if occupancy is > 50
Class 7	Yes	Yes, if more than 1 storey in height	Yes, if required	Yes for buildings > 8 storeys except open air car park	Yes, except for open air car park
Class 8	Yes, unless room has a door leading to a place of safety	Yes, if more than 1 storey in height	Yes, if required	Yes for buildings > 25 m height / 8 storeys	Yes
Class 9	Yes, except places of worship and schools that have one principal gathering area	Yes, if more than 1 storey in height	Yes, if required	Yes for buildings > 25 m height / 8 storeys	Yes
Atrium	Yes, unless fire door to outside	n.a.	Yes, if required	No	Yes

Note: Table C5.1 to C5.3 are inter-related and should be read together.
Refer to Section D for construction standards for Fire-Isolated Construction.

C2 FIRE COMPARTMENTS AND SEPARATION

This section applies to all multiple occupancy buildings in Class 2 to 9.

Performance Requirements

P1 COMPARTMENTS

(1) Buildings and structures must be constructed with fire compartments and separation to protect people from harm and loss of life, to protect property from damage by fire or smoke, and to protect the environment from the release of hazardous substances, when:

a) The building has multiple occupancy units that are attached horizontally or vertically

b) The permitted use of the building involves the storage, use or manufacture of hazardous substances (see Section H)

c) The building provides temporary accommodation for health-care, the aged, disabled or other group of people or permanent sleeping spaces

d) The building has multiple classrooms, each one must be protected

e) A safety concern exists due to the use and occupancy of the building

(2) Fire compartment size and separations must be such that the potential size and spread of fire and smoke are limited in order to:

a) Protect the occupants of one part of a building from the effects of fire elsewhere in the building

b) Control the spread of fire or smoke to adjoining buildings and property

c) Facilitate access to the building by firefighters

d) Protect escape routes

e) Minimize disruption to firefighting

(3) The size of a fire compartment must be consistent with the fire severity of the fire load density it contains and the likely spread of fire between it and any other compartment, storey or building.

(4) Fire compartments must be constructed of fire-resistant materials in accordance with Section C1 that are appropriate to the use and occupancy of the building, evacuation time, and to avoid damage to other parts of the building or neighbouring property.

(5) Fire compartments must be properly sealed to prevent the spread of fire and smoke in accordance with Section C3 Protection of Service Openings and Equipment

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Fire Compartment requirements of C2 are satisfied if

- **All of the following** deemed-to-satisfy provisions are complied with
- **Section C1 and C3-C6** are complied with
- **Specification C1.1, C1.11, C1.13, C1.13a, C2.5, C3.4 and C3.15,** are complied with
- **Schedule 5** Fire Resistance is complied with

D1 GENERAL FLOOR AREA LIMITATIONS

.1 The size of any fire compartment or atrium in a Class 5, 6, 7, 8 or 9b building must not exceed the relevant maximum floor area and volume set out in Table C2.1 except as permitted in Section D2 Large Isolated Buildings.

.2 A part of a building which contains only heating, ventilating, or lift equipment, water tanks, or similar service units is not counted in the floor area or volume of a fire compartment if it is situated at the top of the building.

.3 In a building containing an atrium, the part of the atrium well bounded by the perimeter of the openings in the floors and extending from the level of the first floor above the atrium floor to the roof covering is not counted in the volume of the atrium for the purposes of this clause.

Table C2.1 Maximum Size of Fire Compartments

CLASSIFICATION	TYPE OF CONSTRUCTION			
		Type A	Type B	Type C
CLASS 5, 6, 7, 8 or 9b:	Max floor area -	2,000 m^2	1,500 m^2	1,000 m^2
	Max volume -	12,000 m^3	9,000 m^3	6,000 m^3

Note: Subject to the requirements of Table C2.1 and if fully protected with a sprinkler system and water supply to NZS 4541 Automatic Fire Sprinkler Systems, these areas and volumes of the fire compartment can be increased to a maximum of:

(i) 8 times where the sprinkler system has two independent water supplies to Class A
(ii) Where the sprinkler system has a single water supply to Class C
(iii) 2,000 m^2 in Class 2, 3 and 5 with a rise of no more than 4 storeys
(iv) *4 times in all other classes*

D2 LARGE ISOLATED BUILDINGS OF CLASS 5, 6, 7, 8 or 9b

.1 The floor area of a fire compartment in a large, isolated building may exceed that specified in Table C2.1 subject to the following limits and conditions:

a) The building is Class 5, 6, 7, 8 or 9, and the building is protected throughout with a sprinkler system and perimeter vehicular access complying with Section C2 D3.2 is provided, or

b) The floor area is up to 18,000 m^2 and:

(i) The building is Class 7 or 8, and contains not more than 2 storeys, and

(ii) It has an open space complying with Section C2 D3.1 of not less than 18 m wide provided around the building with unobstructed access for firefighting vehicles and equipment, or

c) The floor area is 18,000 m^2 or more, and:

(i) If the ceiling height of the fire compartment is not more than 12 m, it has:

A. a smoke exhaust system in accordance with Specification E2.2b Smoke Exhaust Systems, or

B. smoke-and-heat vents and the space below the roof is divided into compartments in accordance with AS 2685 Confined Spaces

(ii) If the ceiling height is 12m or more, it has a smoke exhaust system in accordance with Specification E2.2b Smoke Exhaust Systems

d) If more than one building is on the allotment:

(i) Each building complies with (a) or (b) or (c), or

(ii) If the buildings are closer than 6m to each other and no building is more than 45m from the required vehicular access, they are regarded as one building and collectively comply with (a) or (b)

D3 OPEN SPACES AND VEHICULAR ACCESS

.1 An open space (place of safety) required by Section C2 D2 must:

a) Be wholly within the allotment or next to the boundaries of the allotment, and may include any public road, river or space adjoining the allotment

b) Include vehicular access in accordance with D3.2 below

c) Not be used for the storage or processing of materials

d) Not be built upon, except for guard houses and service structures (such as substations and pump houses) which may encroach upon the width of the space if they do not unduly impede firefighting at any part of the perimeter of the allotment or unduly add to the risk of spread of fire to any building on an adjoining allotment

e) Include vehicular access

f) Be fully accessible

.2 Vehicular access must:

a) Be capable of providing emergency vehicle access and passage to enable travel in a forward direction from the public road

b) Have a minimum unobstructed width of 6 m

c) Have a minimum height clearance from the access to accommodate the height of fire brigade vehicles

d) In no part be built upon or used for any purpose other than vehicular or pedestrian movement

e) Must be such that reasonable pedestrian access from the vehicular access to the building is available

f) Must be of adequate load bearing capacity and unobstructed height to permit the operation and passage of fire brigade vehicles.

.3 Vehicular access to the building site may be substituted by a public road if the building faces and is accessible from the road, and is located no further than 45 m from the road.

D4 CLASS 9a AND 9c BUILDINGS

.1 A wall required to be smoke-proof must:

a) Be non-combustible and extend to the underside of the floor above the roof covering

b) Only have doorways which are fitted with smoke doors complying with Specification C3.4 Fire Doors, Smoke Doors, Fire Windows and Shutters, and which do not extend higher than 800 mm from the underside of an imperforate roof covering, floor or ceiling above it

c) Not incorporate any other opening which is not smoke-proof

.2 Fire compartments must be separated from the remainder of the building by firewalls complying with Specification C1.1 Fire-Resisting Construction, Section 3.1(d) and:

a) In Type A construction – floors and roof or ceiling as required in Specification C1.1 Fire Resisting Construction

b) In Type B construction – floors with a FRL of not less than 120/120/120, or 60/60/60 if fully protected with a sprinkler system

c) In Type C construction – floors with a FRL of not less than 60/60/60

.3 A Class 9a health-care building must have fire compartments that are separated from the remainder of the building by fire walls and:

a) In Type A construction — floors and roof or ceiling as required in Specification C1.1 Fire Resisting Construction

b) In Type B construction — floors with an FRL of not less than 120/120/120 and with openings in external walls bounding patient care areas complying with Type A construction requirements

c) Ward areas:

(i) Where the floor area exceeds 1,000 m^2, it must be divided into floor areas not more than 1,000 m^2 by walls with an FRL of not less than 60/60/60

(ii) Where the floor area exceeds 500 m^2, it must be divided into floor areas not more than 500 m^2 by smoke-proof walls complying with Specification C2.5 Smoke-proof Walls in Health-care and Residential-Care Buildings

(iii) Where the floor area is not more than 500 m^2, must be separated from the remainder of the patient care area by smoke-proof walls complying with Specification C2.5 Smoke-proof Walls in Health-care and Residential-care Buildings

(iv) Where division of ward areas by fire-resisting walls under (i) or (iii) above is not required, any smoke-proof wall required under (iii) must have an FRL of not less than 60/60/60

d) Treatment areas:

(i) Where the floor area exceeds 1,000 m^2, it must be divided into floor areas not more than 1,000 m^2 by smoke-proof walls complying with Specification C2.5 Smoke-proof Walls in Health-care and Residential-care Buildings

(ii) Where the floor area is not more than 1,000 m^2, it must be separated from the remainder of the patient care area by smoke-proof walls complying with Specification C2.5 Smoke-proof Walls in Health-care and Residential-care Buildings

e) Ancillary use areas located within a patient care area and containing equipment or materials that are a high potential fire hazard, must be separated from the remainder of the patient care area by walls with an FRL of not less than 60/60/60

f) The ancillary use areas referred to in (e) include, but are not limited to, the following:

(i) A kitchen and related food preparation areas having a combined floor area of more than 30 m^2

(ii) A room containing a hyperbaric facility (pressure chamber)

(iii) A room used predominantly for the storage of medical records having a floor area of more than 10 m^2

(iv) A laundry, where items of equipment are of the type that are potential fire sources (e.g. gas fire dryers)

g) A wall required by (e) to separate ancillary use areas from the remainder of the building must extend to the underside of:

(i) The floor above, or

(ii) A non-combustible roof covering, or

(iii) A ceiling having a resistance to the incipient spread of fire to the space above itself of not less than 60 minutes

h) Openings in walls in ward areas and treatment areas required to have an FRL must be protected as follows:

(i) Doorways—self-closing or automatic closing –/60/30 fire doors

(ii) Windows—automatic or permanently fixed closed –/60/– fire windows or –/60/– automatic fire shutters

(iii) Other openings—construction having an FRL not less than –/60/–

.4 A Class 9c building must have fire compartments that comply with the following:

a) A building must be divided into areas not more than 500 m^2 by smoke-proof walls complying with Specification C2.5 Smoke-proof Walls in Health-care and Residential-care Buildings

b) A fire compartment must be separated from the remainder of the building by fire walls and, notwithstanding C2.7 and Specification C1.1 Fire Resisting Construction, floors with an FRL of not less than 60/60/60

c) Internal walls (other than those bounding lift and stair shafts) supported by floors provided in accordance with C2.5(b)(ii) need not comply with Specification C1.1 Fire Resisting Construction if they have an FRL not less than 60/–/–

d) Ancillary use areas containing equipment or materials that are a high potential fire hazard, must be separated from the sole-occupancy units by smoke-proof walls complying with Specification C2.5 Smoke-proof Walls in Health-care and Residential-care Buildings

e) The ancillary use areas referred to in (iv) include, but are not limited to, the following:

(i) A kitchen and related food preparation areas having a combined floor area of more than 30 m^2

(ii) A laundry, where items of equipment are of the type that are potential fire sources (e.g. gas-fueled dryers)

(iii) Storage rooms greater than 10 m^2 used predominantly for the storage of administrative records

f) Openings in fire walls must be protected as follows:

(i) Doorways — self-closing or automatic closing –/60/30 fire doors

(ii) Windows — automatic or permanently fixed closed –/60/– fire windows or –/60/– automatic fire shutters

(iii) Other openings — construction having an FRL not less than –/60/–

D5 VERTICAL SEPARATION OF OPENINGS IN EXTERNAL WALLS

.1 Unprotected openings that are above one another vertically must be protected if the building is not fully protected with a sprinkler system. Buildings that are exempt include:

a) Open-deck carpark with a sprinkler system

b) Buildings that are two storeys or less in rise

.2 Methods for protecting vertically aligned openings (as described in C2.D5.1 above) include:

a) A slab or other horizontal construction that:

(i) Projects outward from the external face of the wall not less than 1100 mm

(ii) Extends horizontally along the wall not less than 450 mm beyond the openings concerned

(iii) Is non-combustible and has a FRL of not less than 60/60/60, or

b) A spandrel which:

(i) Is not less than 1100 mm (900 mm) in height

(ii) Extends not less than 600 mm above the upper surface of the intervening floor

(iii) Is of non-combustible material having a FRL of not less than 60/60/60, or

c) Providing the windows or opening in the upper storey with a glazing system with a FRL of not less than -/60/30

d) Any gap in the construction which separates the two storeys must be packed with a non-combustible material that will withstand the relative thermal or structural movements of the walling and glazing without loss of seal

D6 SEPARATION BY FIRE WALLS

.1 A fire wall must have the relevant FRL listed in Specification C1.1 Fire Resisting Construction.

.2 Any openings in a fire wall must not reduce the FRL required by Specification C1.1 Fire Resisting Construction and must comply with Section C3 Protection of Openings.

.3 Building elements, other than roof battens with dimensions of 75 mm x 50 mm or less, or sarking-type material, must not pass through or cross the fire wall unless the required fire-resisting performance of the fire wall is maintained.

.4 A part of a building separated from the remainder of the building by a firewall is treated as a separate fire compartment if the fire wall:

a) Extends through all storeys and spaces in the nature of storeys that are common to that part and any adjoining part of the building

b) Is carried through to the underside of the roof covering

.5 Has the relevant FRL prescribed by Specification C1.1 Fire Resisting Construction for each of the adjoining parts, and if these are different, the greater FRL applies to all parts.

.6 Timber purlins or other combustible material must not pass through or cross the fire wall unless they are appropriately firestopped and maintain the required FRL.

.7 Where the roof of one of the adjoining parts is lower than the roof of the other part, the fire wall extends to the underside of:

a) The covering of the higher roof, or not less than 6 m above the covering of the lower roof

b) The lower roof if it has a FRL not less than that of the fire wall and no openings closer than 3 m to any wall above the lower roof

c) The lower roof if its covering is non-combustible and the lower part has a sprinkler system, or

d) The design of the building must otherwise restrict the spread of fire from the lower part to the higher part

D7 SEPARATION OF CLASSIFICATIONS IN THE SAME STOREY

.1 If a building has parts of different classifications located alongside one another in the same storey:

a) Each building element in that storey must have the higher FRL prescribed in Specification C1.1 Fire Resisting Construction, or

b) The parts must be separated in that storey by a fire wall with the greater of the two FRLs prescribed in Specification C1.1 Fire Resisting Construction, and

c) Where one part is a carpark that complies with Table 3.9, 4.2 or 5.2 of Specification C1.1 Fire Resisting Construction, the parts may be separated by a fire wall complying with the appropriate table

D8 SEPARATION OF CLASSIFICATIONS IN DIFFERENT STOREYS

.1 If parts of different building classifications are situated one above the other in adjoining storeys, they must be separated as follows:

a) Type A construction – The floor between the adjoining parts must have a FRL not less than that prescribed in Specification C1.1 Fire Resisting Construction for the classification of the lower storey

b) Type B or C construction – The underside of the floor (including the sides and underside of any floor beams) must have a fire-protective covering. If one of the adjoining parts is of Class 2, 3 or 4, the floor separating the part from the storey below must:

(i) Be a floor/ ceiling system incorporating a ceiling which has a resistance to the incipient spread of fire to the space above itself of not less than 60 minutes, or

(ii) Have a fire-protective covering on the underside of the floor, including beams incorporated in it, if the floor is combustible or of metal

D9 SEPARATION OF LIFT SHAFTS

.1 Any lift (other than if wholly in an atrium) must be separated from the remainder of the building by enclosure in a shaft with its FRL prescribed by Specification C1.1 Fire Resisting Construction if it connects more than two storeys in an unsprinklered building or three storeys in a sprinklered building, and:

a) In a building required to be of Type A construction—the walls have the relevant FRL prescribed by Specification C1.1 Fire Resisting Construction

b) In a building required to be of Type B construction, the walls:

(i) If load-bearing, have the relevant FRL prescribed by Table 4.1 of Specification C1.1 Fire Resisting Construction, or

(ii) If non load-bearing, be of non-combustible construction

.2 Any lift in a patient care area in a Class 9a health-care building or a resident use area in Class 9c building must be separated from the remainder of the building by a shaft having an FRL of not less than:

a) In a building of Type A or B construction — 120/120/120, or

b) In a building of Type C construction — 60/60/60

.3 An emergency lift must be contained within a fire-resisting shaft having an FRL of not less than 120/120/120.

.4 The openings for the lift landing doors and services must be protected in accordance with Section D Access.

D10 STAIRWAYS AND LIFTS IN ONE SHAFT

.1 A stairway and lift must not be in the same shaft if either the stairway or the lift is required to be in a fire-resisting shaft.

D11 SEPARATION OF PLANT EQUIPMENT

.1 A wall having a FRL of not less than 60/60/60 must bound a room housing equipment comprising:

a) Lift motors and lift emergency generators used to sustain emergency equipment operating in emergency mode

b) The main electrical switchboard in a building with an effective height of more than 25 m

c) Required stair pressurizing equipment, or

d) Boilers, emergency batteries, emergency generators or central smoke control plant, except:

(i) Equipment located in a separate storey (or in the topmost storey) and separated from the remainder of the building by floor construction having a FRL of 60/60/60

(ii) Smoke control exhaust fans located in the air stream if they are constructed for high temperature operation in accordance with Specification E2.2b Smoke Exhaust Systems, or

(iii) Equipment that is otherwise adequately separated from the remainder of the building

.2 Equipment need not be separated in accordance with Section D11.1 above if the equipment comprises:

a) Smoke control exhaust fans located in the air stream which are constructed for high temperature operation

b) Stair pressurizing equipment installed in compliance with the relevant provisions of **AS 1668.1 The Use of Ventilation and Air Conditioning in Buildings, Part 1: Fire and Smoke Control in Buildings**, or

c) A lift installation without a machine-room, or

d) Equipment otherwise adequately separated from the remainder of the building

.3 Separation of on-site fire pumps must comply with the requirements of **AS 2419.1 Fire Hydrant Installations, Part 1: System Design, installation and Commissioning.**

.4 Separating construction must have:

a) An FRL as required by Specification C1.1 Fire Resisting Construction, but not less than 120/120/120

b) Any doorway protected with a self-closing fire door having an FRL of not less than –/120/60, or

c) When separating a lift shaft and lift motor room, an FRL not less than 120/120/120

D12 ELECTRICITY SUBSTATIONS

.1 If an electricity substation is situated within a building:

a) It must be separated from any other part of the building by construction having a FRL of not less than 120/120/120, and must have any doorway in that construction protected with a self-closing fire door having an FRL of not less than –/120/30

b) Doors, windows and any other openings on an external wall need not have a FRL if such openings are no closer to a fire source feature or exit than 3 m. Any other doorways including those opening to any other part of the building must be protected with self-closing -/120/30 fire doors

c) Electricity supply cables between a main and the substation, and between the substation and the main switchboard, must be enclosed or otherwise protected by construction having a FRL of not less than 120/120/120

d) Any openings, fans or grilles for natural or mechanical ventilation must be located only on an external wall unless protected with an automatic -/120/60 fire shutter

e) A main switchboard located within the building which sustains emergency equipment operating in the emergency mode must:

(i) Be separated from any other part of the building by construction having an FRL of not less than 120/120/120

(ii) Have any doorway in that construction protected with a self-closing fire door having an FRL of not less than –/120/30

f) Electrical conductors located within an electricity substation must be enclosed or otherwise protected by construction having an FRL of not less than 120/120/120

g) Where emergency equipment is required in a building, all switchboards in the electrical installation which sustain the electricity supply to the emergency equipment must be constructed so that emergency equipment switchgear is separated from non-emergency equipment switchgear by metal partitions designed to minimise the spread of a fault from the non-emergency equipment switchgear

h) For the purposes of (g), emergency equipment includes but is not limited to the following:

(i) Fire hydrant booster pumps

(ii) Pumps for automatic sprinkler systems, water spray, chemical fluid suppression systems or the like

(iii) Pumps for fire hose reels where such pumps and fire hose reels form the sole means of fire protection in the building

(iv) Air handling systems designed to exhaust and control the spread of fire and smoke

(v) Emergency lifts

(vi) Control and indicating equipment

(vii) Emergency warning and intercom systems

C3 PROTECTION OF OPENINGS

This section applies to all buildings in Class 2 - 9.

Performance Requirements

P1 OPENINGS

.1 Openings and service penetrations required to be fire-resisting, including doorways and windows (including any associated fanlight or infill panel) must be protected so that an adequate level of performance is maintained.

.2 Openings of any nature in the envelope surrounding fire compartments must be so protected that they do not allow the passage of dangerous amounts of heat, flames, smoke and gases for a period sufficient to:

a) Allow the safe evacuation of all affected people

b) Allow fire fighters to fight the fire and carry out rescue operations

.3 The sufficiency of the acceptable fire resistance of openings must take into account the nature of the occupancy of the building as well as the proximity of other buildings and their occupancy.

Applicability

.1 This section applies to openings in building elements required to be fire-resisting, including doorways, windows (including any associated fanlight or infill panel) and other fixed or openable glazed areas that do not have the required FRL.

.2 This section does not apply to:

a) Control joints, weep holes, and the like, in masonry construction and joints between pre-cast concrete panels if they are not larger than necessary for the purpose, or

b) Non-combustible ventilators for sub-floor or cavity ventilation, if each does not exceed 45,000 mm^2 in face areas and is spaced not less than 2 m from any other ventilator in the same wall

c) Openings in the vertical plane formed between building elements at the construction edge or perimeter of a balcony or verandah, colonnade, terrace, or the like

d) Where the connected carpark levels comply as a single fire compartment, openings (other than a floor that separates a part not used as a carpark) for:

(i) Service penetrations

(ii) Use of the vehicular ramp

.3 For the purposes of the Deemed-to-Satisfy Provisions of this Part, openings between building elements such as columns, beams and the like, in the plane formed at the construction edge or perimeter of the building, are deemed to be openings in an external wall.

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Protection of openings and equipment requirements of C3 are satisfied if:

- **All of the following** deemed-to-satisfy provisions appropriate to the building type are complied with
- **Specification C1.13 and C3.15** are complied with

D1 PROTECTION OF OPENINGS IN EXTERNAL WALLS

.1 Openings in an external wall that is required to have a FRL must:

a) Be not less distant from a fire-source feature to which it is exposed than:

(i) 1 m in a building not more than 1 storey in rise, or

(ii) 1.5 m in a building more than 1 storey in rise

b) Be protected in accordance with C3 D3 if it is situated closer to a fire-source feature to which it is exposed than:

(i) 3 m from a side or rear boundary of the allotment

(ii) 6 m from the far boundary of a road, river, lake or the like adjoining the allotment, if not located in a storey at or near ground level, or

(iii) 6 m from another building on the allotment that is not Class 10

c) If required to be protected under (b), not occupy more than 1/3 of the area of the external wall of the storey in which it is located unless:

(i) They are in a Class 9b building used as an open spectator stand, or

(ii) They face a public road and are located in a storey at ground level

D2 SEPARATION OF OPENINGS IN DIFFERENT FIRE COMPARTMENTS

.1 The distance between openings in external walls in compartments separated by a fire wall must not be less than that set out in Table C3.1, unless:

a) Those parts of each wall have an FRL not less than (60)/60/60

b) The openings are protected in accordance with Section C3 D3 below

Table C3.1 Distance Between Openings in Different Compartments

Angle Between Walls	Minimum Distance Between Openings
0° (walls opposite)	6 m
More than 0° to 45°	5 m
More than 45° to 90°	4 m
More than 90° to 135°	3 m
More than 135° to 180°	2 m
180 or more	Nil

D3 ACCEPTABLE METHODS OF PROTECTION

.1 Where protection is required, doorways, windows, and other openings must be fitted with suitable:

a) **Doorways**: -/60/30 self-closing or automatic fire doors and fire shutters, or internal or external wall-wetting sprinklers as appropriate used with doors that are self-closing or automatic closing

b) **Windows:** -/60/30 fire windows (automatic or permanently fixed in the closed position), or -/60/30 automatic fire shutters, or internal or external wall-wetting sprinklers as appropriate used with windows that are automatic closing or permanently fixed in the closed position

c) **Other openings:** construction having FRL not less than -/60/30 or excluding voids – internal or external wall-wetting sprinklers, as appropriate

These methods of protection may be replaced with specifically engineered external drenchers provided an adequate supply of water can be ensured.

.2 Fire doors, smoke doors, fire windows, and fire shutters satisfy (a) if they comply with NCC Specification C3.4 Fire Doors, Smoke Doors, Fire Windows and Shutters.

D4 DOORWAYS IN FIRE WALLS

.1 The aggregate width of openings for doorways in a fire wall which are not part of a horizontal exit must not exceed 1/2 of the length of the fire wall.

.2 Each doorway in a fire wall must be protected by:

a) Two fire doors or fire shutters, one on each side of the doorway, each of which:

(i) Has a FRL of not less than 1/2 that required by Specification C1.1 Fire Resisting Construction for the fire wall except that each door or shutter must have an insulation level of at least 30, or

(ii) Is self-closing unless provided with an automatic release mechanism for any hold-open device which will close the door upon actuation of any of the fire/smoke detection systems installed on both sides of the fire wall

b) A fire door on one side and a fire shutter on the other side of the doorway, each of which complies with (a), or

c) A single fire door or a non-metallic fire shutter, which:

(i) Has a FRL of not less than that required by Specification C1.1 Fire Resisting Construction for the fire wall except that each door or shutter must have an insulation level of at least 30 minutes

(ii) Is self-closing unless provided with an automatic release mechanism for any hold-open device which will close the door upon actuation of any of the fire/smoke detection systems installed on both sides of the fire wall

.3 Automatic closing of a doorway in a fire wall required by (b) and (c) above must be initiated by the activation of a smoke detector, heat detector or any other detector deemed suitable in accordance with AS 1670.1 Automatic Fire Detection and Alarm Systems, Part 1: System Design, Installation and Commissioning Fire.

.4 Automatic closing of a door in a firewall separating two or more fire compartments that is activated by a sprinkler system (other than a FPAA101D Automatic Fire Sprinkler System Design and Installation - Drinking Water Supply) must comply with Specification E1.5 Fire Sprinkler Systems.

D5 SLIDING FIRE DOORS

.1 If a doorway in a fire wall is fitted with a sliding fire door which is open when the building is in use:

a) It must be held open with a fusible link, or an electromagnetic device which when de-activated, allows the door to be fully closed in not less than 20 seconds, and not more than 30 seconds, after release

b) Thermal or smoke detectors as appropriate must be installed on each side of the doorway, in accordance with NZS 4512 Fire Detection and Alarm Systems in Buildings

c) An audible warning device located near the doorway and a red flashing warning light of a suitable intensity (visible from the room or corridor to which it opens) on each side of the doorway must be activated when a required detector or sprinkler system in the part of the building served by the door is activated

d) Signs must be installed on each side of the doorway located directly over the opening stating

"WARNING – SLIDING FIRE DOOR"

In capital letters not less than 50 mm high in a colour contrasting with the background

e) In the event of power failure to the door — the door must fail safe in the closed position in accordance with (a)

.2 The electromagnetic device required by (a)(i) must be de-activated and the warning system activated by heat or smoke detectors, as appropriate, installed in accordance with **AS 1905.1 Components for the Protection of Openings in Fire-Resistant Walls, Part 1: Fire-Resistant Doorsets**, and the relevant provisions of **AS 1670.1 Automatic Fire Detection and Alarm Systems, Part 1: Fire Detection, Warning, Control and Intercom Systems - System Design, Installation and Commissioning Fire**

.3 Where any other required suitable fire alarm system, including a sprinkler system (other than a **FPAA101D Automatic Fire Sprinkler System Design and Installation - Drinking Water System**) complying with Specification E1.5 Fire Sprinkler Systems, is installed in the building, activation in either fire compartment separated by the fire wall must also de-activate the electromagnetic device and activate the warning system.

D6 PROTECTION OF DOORWAYS IN HORIZONTAL EXITS

.1 A doorway that is part of a horizontal exit must be protected:

a) In a Class 7 or 8 building – by 2 fire doors, one on each side of the doorway, each with a FRL of not less than 1/2 that required by Specification C1.1 Fire Resisting Construction for the fire wall except that each door must have an insulation level of at least 30 minutes, or

b) In all classes of buildings, by a single fire door which has a FRL of not less than that required by Specification C1.1 Fire Resisting Construction for the fire wall except that the door must have an insulation level of at least 30 minutes

.2 Each door must be self-closing, or provided with automatic release of any hold-open device upon detection of smoke or fire in accordance with the following:

a) The automatic-closing operation must be initiated by the activation of a smoke detector, or any other detector deemed suitable in accordance with **AS 1670.1 Automatic Fire Detection and Alarm Systems, Part 1: Fire Detection, Warning, Control and Intercom Systems - System Design, Installation and Commissioning Fire**. If smoke detectors are unsuitable in the atmosphere, it must be installed in accordance with the relevant provisions of **AS 1670.1 Automatic Fire Detection and Alarm Systems, Part 1: Fire Detection, Warning, Control and Intercom Systems - System Design, Installation and Commissioning Fire** and located on each side of the fire wall not more than 1.5 m horizontal distance from the opening.

b) Where any other required suitable fire alarm system, including a sprinkler system (other than a **FPAA101D Automatic Fire Sprinkler System Design and Installation - Drinking Water System** complying with Specification E1.5 Fire Sprinkler Systems, is installed in the building, activation of the system in either fire compartment separated by the fire wall must also initiate the automatic-closing operation.

D7 OPENINGS IN FIRE-ISOLATED EXITS

.1 A doorway that opens to a fire-isolated stairway, fire-isolated passageway or fire-isolated ramp and does not open to a road or open space must be protected by a -/60/30 fire door that is self-closing, or automatic-closing.

~~.2~~ The automatic-closing operation required by D7.1 above must be initiated by the activation of a smoke detector, or any other detector deemed suitable in accordance with **AS 1670.1 Automatic Fire Detection and Alarm Systems, Part 1: Fire Detection, Warning, Control and Intercom Systems** or by any other automatic fire alarm or sprinkler system installed in the building.

.3 A window in an external wall of a fire-isolated stairway, fire-isolated passageway or fire-isolated ramp must be protected in accordance with C3.D3 if it is within 5 m of, and exposed to:

a) A fire-source feature, or

b) Another window or other opening in a wall of the same building, other than in the same fire-isolated enclosure

D8 SERVICE PENETRATIONS IN EVACUATION ROUTES

.1 An evacuation route must not be penetrated by any service other than:

a) Electrical wiring associated with:

(i) Lighting, detection or pressurization system serving the exit, or

(ii) Security, surveillance or management system servicing the exit, or

(iii) An intercommunication system or an audible or visual alarm system, or

(iv) The monitoring of hydrant or sprinkler isolating valves

b) Ducting associated with the pressurizing system if it:

(i) Is constructed of material having a FRL of not less than 120/120/60 where it passes through any other part of the building

(ii) Does not open into any other part of the building, or

c) Water supply pipes for fire services or domestic use

.2 Where penetrations are necessary, joints and gaps are to be fire stopped with an approved system achieving an FRL not less than the FRL for the separation that the service is penetrating.

D9 OPENINGS IN FIRE-ISOLATED LIFT SHAFTS

.1 If a lift shaft is required to be fire-isolated under Section C2, an entrance doorway to that shaft must be protected by -/60/30 fire doors that:

a) Comply with AS 1735.11 Fire-Rated Landing Doors

b) Are set to remain closed except when discharging or receiving passengers, goods or vehicles

.2 A lift call panel, indicator panel or other panel in the wall of a fire-isolated lift shaft must be backed by construction having a FRL of not less than 60/60/60 if it exceeds 35,000 mm^2 in area.

D10 BOUNDING CONSTRUCTION CLASS 2, 3 AND 4 BUILDINGS

.1 A doorway in a Class 2 or 3 building must be protected if it provides access from a sole-occupancy unit to:

a) A public corridor, public hallway, or the like, or

b) A room not within a sole-occupancy unit, or

c) The landing of an internal non-fire-isolated stairway that serves as an evacuation route, or

d) Another sole-occupancy unit

.2 A doorway in a Class 2 or 3 building must be protected if it provides access from a room not within a sole-occupancy unit to:

a) A public corridor, public lobby, or the like, or

b) The landing of an internal non-fire-isolated stairway that serves an evacuation route

.3 A doorway in a Class 4 part must be protected if it provides access to any other internal part of the building.

.4 Protection for a fire-isolated exit must be at least:

a) In a building of Type A construction – a self-closing -/60/30 fire door

b) In a Type B or C construction – a self-closing, tight fitting, solid core door, not less than 35 mm thick in a rebated frame

Except

c) In a Class 3 building used as a residential care building protected with a sprinkler system complying with Specification E1.5 (Fire Sprinkler Systems):

(i) A tight fitting, solid core door not less than 35 mm thick if the building is divided into floor areas not exceeding 500 m^2 with smoke proof walls complying with

Clause 2 of Specification C2.5 Smoke-proof Walls in Health-care and Residential-care Buildings, or

(ii) A tight fitting, solid core door not less than 35 mm thick fitted with a self-closing device, a delayed closing device or an automatic closing device

.5 Other openings in internal walls which are required to have a FRL to inhibit the lateral spread of fire must not reduce the fire-resisting performance of the wall.

.6 In a Class 2 or 3 building where only a single direction of travel to an exit is available and is along an open balcony, landing or the like and passes an external wall of:

a) Another sole-occupancy unit, or

b) A room not within a sole-occupancy unit,

the external wall must:

c) Be constructed of concrete or masonry, or be lined internally with a fire-protective covering

d) Have any doorway fitted with a self-closing, tight-fitting solid core door not less than 35 mm thick

e) Have any windows or other openings:

(i) Protected internally in accordance with C3.D3 or

(ii) Located at least 1.5 m above the floor of the balcony, landing or the like

D11 OPENINGS IN FLOORS AND CEILINGS FOR SERVICES

.1 In a building of Type A or B construction, services associated with the functioning of the building and passing through a floor must either be installed in shafts complying with Specification C1.1 Fire Resisting Construction or so that the fire-resisting performance of the building element is not impaired.

.2 Where a service passes through:

a) A floor that is required to have an FRL with respect to integrity and insulation, or

b) A ceiling required to have a resistance to the incipient spread of fire

The service must be installed with an FRL and resistance to the incipient spread of fire not less than the floor or ceiling that it penetrates.

.3 A service must be protected:

a) In a building of Type A construction, by a shaft complying with Specification C1.1 Fire Resisting Construction, or

c) In a building of Type B or C construction, by a shaft that will not reduce the fire performance of the building elements it penetrates, or

d) In accordance with C3.15

.4 Where a service passes through a floor which is required to be protected by a fire-protective covering, the penetration must not reduce the fire performance of the covering.

D12 OPENINGS IN SHAFTS

.1 In a building of Type A construction, an opening in a wall providing access to a ventilating pipe, garbage chute or other service shaft must be protected by:

a) If it is in a sanitary compartment – a door or panel which, together with its frame, is non-combustible or has a FRL of not less than -/30/30, or

b) A self-closing -/60/30 fire door or hopper, or

c) An access panel having a FRL of not less than -/60/30

d) If the shaft is a garbage shaft — a door or hopper of non-combustible construction

D13 OPENINGS FOR SERVICE INSTALLATIONS

.1 Any electrical, electronic, plumping, mechanical ventilation or air conditioning, or other service that penetrates a building element (other than external wall or roof) that is required to have an FRL with a resistance to the incipient spread of fire, must be installed so that the fire-resisting performance of the building element that it penetrates is not impaired.

.2 The determination of the required FRL must be confirmed in a report from a Registered Testing Authority in accordance with Specification C3.15 Penetration of Walls, Floors and Ceilings by Services and/or verified by a Registered Professional Consultant (Fire Engineer).

.3 The installation of services in C3 D13.1 above must comply with any of the following:

a) **Tested systems**: The service, building element and protection method at the penetration must:

(i) Achieve the required resistance to the incipient spread of fire, or

(ii) Achieve the required FRL of the adjacent walls, floor, ceiling and fire compartment requirements and be identical with a prototype assembly of the service, building element and protection method which has been tested in accordance with **AS 4072.1 Components for the Protection of Openings in Fire-Resistant Separating Elements - Service Penetrations and Control Joints** and **AS 1530.4 Methods for Fire Tests on Building Materials, Components and Structures. Part: 4 Fire Resistance Tests for Elements of Construction**, or

(iii) Differ from a prototype assembly of the service, building element and protection method in accordance with Section 4 of **AS 4072.1 Components for the Protection of Openings in Fire-Resistant Separating Elements - Service Penetrations and Control Joints**

(iv) Comply with (a) above, except for the insulation criterion, if:

1. The service is farther than 100 mm from any combustible material
2. It is not located in an evacuation route
3. The service is a pipe system comprised entirely of metal (excluding pipe seals or the like)
4. Any combustible building element is not located within 100 mm of the service for a distance of 2 m from the penetration
5. Combustible material is not able to be located within 100 mm of the service for a distance of 2 m from the penetration

b) **Ventilating or air-conditioning ducts or equipment:** Installation must be in accordance with **AS 1668.1 The Use of Ventilation and Air Conditioning in Buildings, Part 1: Fire and Smoke Control in Buildings**

c) **Pipe system:** can comply with Specification C3.15 Penetration of Walls, Floors and Ceilings by Services if it:

(i) Is constructed entirely of metal (excluding pipe seals or the like) or is a PVC pipe

(ii) Penetrates the wall, floors or ceiling of a Class 5, 6, 7, 8 or 9b building, but not a ceiling required to have a resistance to the incipient spread of fire

(iii) Connects not more than 2 fire compartments in addition to any fire-resisting service shafts

(iv) Does not contain a flammable or combustible liquid or gas

d) **Sanitary compartment:** the service penetrates the floors of a Class 5, 6, 7, 8 or 9b building and is separated from other parts of the building by walls with the FRL required by Specification C1.1 Fire Resisting Construction for a stair shaft in the building and a self-closing -/60/30 fire door

e) **Wire or Cable:** The service is a single or cluster of wires or cables installed in accordance with Specification C3.15 Penetration of Walls, Floors and Ceilings by Services and it:

(i) Penetrates a wall, floor or ceiling, but not a ceiling required to have a resistance to the incipient of fire

(ii) Connects not more than 2 fire compartments in addition to any fire-resisting service shafts

f) The service is an electrical switch, outlet, or the like, and it is installed in accordance with Specification C3.15 Penetration of Walls, Floors and Ceilings by Services

D14 CONSTRUCTION JOINTS

.1 Construction joints, spaces and the like in and between building elements required to be fire-resisting with respect to integrity and insulation must be protected in a manner identical with a prototype tested in accordance with **AS 1530.4 Methods for Fire Tests on Building Materials, Components and Structures, Part 4: Fire Resistance Tests for Elements of Construction** to achieve the required FRL and acceptable to approval authorities.

.2 The requirements of (a) do not apply where joints, spaces and the like between fire-protected timber elements are provided with cavity barriers in accordance with Specification C1.13 Cavity Barriers for Fire-protected Timber.

D15 COLUMNS PROTECTED WITH LIGHTWEIGHT CONSTRUCTION

.1 A column protected by lightweight construction to achieve an FRL which passes through a building element that is required to have an FRL or a resistance to the incipient spread of fire, must be installed using a method and materials identical with an assembly of the construction which has achieved the required FRL or resistance to the incipient spread of fire and acceptable to approval authorities.

C4 FIREFIGHTING EQUIPMENT AND OPERATIONS

This section applies to all buildings in Class 2 – 9.

Performance Requirements

P1 FIREFIGHTING EQUIPMENT AND OPERATIONS

(1) Buildings must be designed and constructed so that there is a low probability of illness or injury to firefighters or other emergency services personnel during rescue and firefighting operations.

(2) Active fire protection equipment must be appropriate to:

a) Building size, scale, use and occupancy

b) Proximity to potential fire sources

c) Type of construction in relation to fire resistance

d) Size of fire compartments

e) Flow rate and pressure of water supply available for firefighting operations

f) Capacity and resources of fire fighters that serve the area

g) Technical resources available locally to effectively install, test and maintaining the active fire safety system

(3) Active firefighting equipment that must receive approval from the National Fire Authority of Fiji prior to installation includes:

a) Fire extinguisher

b) Fire hose reel

c) Fire blanket

d) Fire shutters

e) Sprinkler system

f) Fire and thermal detectors and alarms

g) Fire pump

h) Fire control panel

(4) Reliable detection and warning systems must be installed for automatic operation and initiation of suitable firefighting systems in the event of a fire or generation of unacceptable levels of smoke for the following:

a) Tall buildings

b) Buildings of medium size or larger, frequented by the public and where flammable and consumer goods are displayed

c) Occupancies of excessive hazard of moderate size or larger

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Firefighting equipment and operations requirements of C4 are satisfied if:

- **All of the following** deemed-to-satisfy provisions appropriate to the building type are successfully demonstrated
- **Specification E1.2, E1.5, E1.5a and E1.8** are complied with

D1 REQUIRED FIRE DETECTION AND ALARM EQUIPMENT

.1 Fire detection and alarm equipment must be provided in every building and structure based on building classifications outlined in Table C4.1, and according to DTS Provisions C4.D2 to D9:

Table C4.1 Required Fire Detection and Alarm Equipment by Building Classification

Required Fire Detection and Alarm Equipment					
Building Class	**Manual fire alarm**	**Automatic fire detection and alarm system**	**Fire Pump (where sufficient mains pressure capacity is available)**	**Fire Control Panel**	**Fire Control Centre**
Class 2	Yes	Yes. or a smoke detection system	No	Yes	No
Class 3	Yes	Yes. or a smoke detection system	Not required for buildings less than 25m ht / 8 storeys	Yes for buildings using a common evacuation route	No
Class 4	Yes	Yes. or a smoke detection system	Not required	Not required	No
Class 5	Yes	Yes	All high rises > 25m height / 8 storeys	Yes	If building has an internal common evacuation route
Class 6	Yes	Yes	Not required for buildings less than 25m ht. / 8 storeys	Yes	No
Class 7	Yes	Yes, except open-air car park	Not required for buildings less than 25m ht. / 8 storeys	Yes	Depends on scale and use
Class 8	Yes	Yes	Not required for buildings less than 25m ht. / 8 storeys	Yes	Depends on scale and use
Class 9	Yes	Yes	Not required for buildings less than 25m ht. / 8 storeys	Yes	Yes
Atrium	Yes	Not required	I Not required for buildings less than 25m ht. / 8 storeys	No	No
Evacuation Centre	Yes	Yes	If building is greater than 25m height / 8 storeys	Yes	Depends on scale and use
Note: Refer to Table C5.2 on page C-37 for requirements for smoke detection and alarm equipment					

.2 Fire alarm and detection systems must comply with Specification E2.2a Smoke Detection and Alarm Systems.

D2 REQUIRED FIREFIGHTING EQUIPMENT BY BUILDING CLASSIFICATION

.1 Firefighting equipment must be provided in every building and structure based on building classifications as outlined in Table C4.2, and according to DTS Provisions C4.D2 to D9.

Table C4.2 Required Firefighting Equipment by Building Classification

Required Firefighting Equipment					
Building Class	**Portable Fire Extinguisher**	**Automatic sprinkler system**	**Internal Fire Hydrant**	**Fire Hose Reel and internal pressurised water supply**	**Riser Main**
Class 2	Yes	Yes, for buildings > 10 m height / 3 storeys	Yes	Yes, for buildings > 10 m height / 3 storeys	No
Class 3	Yes	Yes	Yes	Yes	Yes, if building is > 25 m height / 8 storeys
Class 4	Yes	Yes, if no other source of water available	Yes	Yes, if no other source of water available	Yes, if unit is located above 3 storeys
Class 5	Yes	See C4 D2.2	Yes	Any storey > 750 m^2, or if > 3 storeys	Yes, if building is > 25 m height / 8 storeys
Class 6	Yes	See C4 D2.2	Yes	Not required	n.a.
Class 7	Yes	See C4 D2.2	Yes	Any storey > 750 m^2, or if > 3 storeys	Yes, if building is > 25 m height / 8 storeys
Class 8	Yes	See C4 D2.2	Yes	Any storey > 750 m^2, or if > 3 storeys	Yes, if building is >25m height / 8 storeys
Class 9	Yes	See C4 D2.2	Yes	Yes	Yes, if building is > 25m height / 8 storeys
Atrium	Yes	Yes	Yes	Yes, if no other source of water available	n.a.
Evacuation Centre	Yes	Not required for primary and secondary school	Yes	Yes, if no other source of water available	Yes, if building is >25m height / 8 storeys

Notes:
A. Applies to Class 7 or 8 buildings which do not exceed 18,000 m^2 in floor area nor exceed 109,000 m^3 in volume.
B. A fire hose reel must be provided wherever an internal hydrant is required.

D3 FIRE MAINS AND WATER SUPPLY

.1 Where a permanently charged fire main and water supply system are available, these must provide a continuous supply of water at sufficient pressures and rates of flow to enable effective firefighting on any adjoining building. The system must in addition have hydrants located free of obstructions at appropriate intervals. The location of the hydrants must be suitably marked for ease of identification by the fire service.

.2 In the case of buildings with a rise of 5 storeys or more, where an adjoining permanently charged fire main and water supply system is not available, adequate on-site water storage and suitable fire pumps must be provided to give the rates and pressures of flow for firefighting as per NZS 4510 Fire

Hydrant Systems and/or NZS 4509 Stand-Alone Power Systems. In addition, the system provided may serve any required sprinkler system or other required water type in-built fire protection system.

.3 A fire main and water supply system must comply with Specification E1.2 Fire Mains and Water Supply Services.

D4 RISER MAIN SYSTEM

.1 Riser mains that comply with NZS 4510 Fire Hydrant Systems must be provided in buildings with a rise of 5 storeys or more.

.2 In buildings with a rise of up to 8 storeys, a charged dry riser main system is allowable.

.3 For buildings with a rise of more than 8 storeys:

a) A wet riser main system is required

b) Any wet riser main system must be connected to a permanently charged fire main

c) A dedicated automatic starting fire pump or pumps in accordance with NZS 4510 Fire Hydrant Systems must be installed to boost the pressure and/or the rates of flow to values required by the standard

D5 HYDRANTS

.1 One or more hydrants must be provided:

a) In each storey with a floor area of more than 500 m^2

b) In every storey if the building contains 5 storeys or more

c) On the roof if the building has a rise of more than 8 storeys, except a roof having a pitch of more than 10 degrees, or on a roof of an equipment room or other subsidiary structure on the main roof

d) Where a fire brigade station is equipped with firefighting equipment capable of utilizing a fire hydrant and is located no more than 50 km from the building measured along existing roads

.2 For external hydrants, the configuration and location of a building and of adjacent external hydrants must be such that the farthest point on the storeys to which direct access from a street is available for the fire service must be within reach of a 6m spray from the nozzle of a 120 m length fire hose.

.3 External hydrants must be located:

a) Not closer than 6 m from a building unless protected from it with a wall having an FRL of not less than 60/60/30 extending at least 2 m each side and 3 m above the hydrant outlets

b) Not more than 20 m unobstructed distance from a hard surface standing access for a fire pump appliance

.4 Hydrants on the ground floor of a building may be external hydrants.

.5 For internal hydrants, the riser main system must provide for sufficient number and disposition of internal hydrants such that any point on any storey is within reach of a 6 m spray from the nozzle of a 45 m fire hose.

.6 Internal hydrants must be located on the floor not more than 4 m from a required fire-isolated exit, or within an evacuation route so as not to encroach on the required width of the exit.

.7 Where internal fire hydrants are provided, they must serve only the storey on which they are located except that a sole-occupancy unit:

a) In a Class 2 or 3 building or Class 4 part of a building, it may be served by a single fire hydrant located at the level of egress from that sole-occupancy unit, or

b) In a Class 5, 6, 7, 8 or 9 or not more than 2 storeys, it may be served by a single fire hydrant located at the level of egress from that sole-occupancy unit provided the fire hydrant can provide coverage to the whole of the sole-occupancy unit

.8 The fire hydrant system must cover Class A and E fire risks and be installed in accordance with AS 2419.1 Fire Hydrant installations, Part 1: System Design, Installation and Commissioning, except:

a) A Class 8 electricity network substation need not comply with clause 4.2 of **AS 2419.1 Fire Hydrant installations, Part 1: System Design, Installation and Commissioning** if:

(i) It cannot be connected to a town main supply

(ii) One hour water storage is provided for firefighting

b) Where a sprinkler system is installed throughout a building in accordance with:

(i) **AS 2118.1 Automatic Fire Sprinkler Systems General, Part 1: General Systems**, or

(ii) **AS 2118.4 Automatic Fire Sprinkler Systems, Part 4: Sprinkler Protection for Accommodation Buildings Not Exceeding Four Storeys in Height**, or

(iii) **AS 2118.6 Automatic Fire Sprinkler Systems, Part 6: Combined Sprinkler and Hydrant Systems in Multi-storey Buildings**, or

(iv) **FPAA101H Automatic Fire Sprinkler System Design and Installation – Hydrant Water Supply**, or

(v) **FPAA101D Automatic Fire Sprinkler System Design and Installation - Drinking Water Supply**

The fire hydrant booster protection requirements of clauses 7.3(c)(ii) and 7.3(d)(iii) of **AS 2419.1 Fire Hydrant Installations, Part 1: System Design, Installation and Commissioning** do not apply.

.9 A fire hydrant booster assembly may be located between 3.5 m and 10 m of the building, and need not comply with clause 7.3(d)(iii) of **AS 2419.1 Fire Hydrant Installations, Part 1: System Design, Installation and Commissioning** where the assembly is protected by an adjacent fire-rated freestanding wall that:

a) Achieves an FRL of not less than 60/60/60

b) Extends not less than 1 m each side of the outermost fire hydrant booster risers within the assembly and is not less than 3 m wide

c) Extends to a height of not less than 2 m above finished ground level

D6 FIRE HOSE REELS

.1 A fire hose reel system must be installed to the degree necessary to allow occupants to safely undertake initial attack on a fire appropriate to:

a) The size of the fire compartment

b) The function or use of the building

c) Any other fire safety systems installed in the building

d) The fire hazard

.2 A fire hose reel must be located:

a) So that the nozzle end of a fully extended fire hose fitted to the reel and laid to avoid any partitions or other physical barriers will reach every part of the floor, or

b) In multiple locations on a floor so that sufficient system coverage is achieved and all required portions of a building can be serviced, and

c) Not more than 4m from a required fire-isolated exit on each floor of the building (including the ground floor), and

d) Adjacent to an internal fire hydrant required within the building, and

e) Internally, externally, or in combination to achieve the system coverage specified in **AS 2441 Installation of Fire Hose Reels**, and

f) Where internal fire hydrants are not installed, to serve any fire compartment with a floor area greater than 500 m^2

.3 The above standard (C4 D6.2) does not apply to:

a) A Class 2, 3 or 5 building or Class 4 part of a building, or

b) A Class 8 electricity network substation, or

c) A Class 9c building, or

d) Classrooms and associated corridors in a primary or secondary school

.4 A fire hose reel must not be located within a fire-isolated passageway.

.5 A fire hose reel must serve only the floor on which it is located except:

a) A fire hose reel may serve a sole-occupancy unit of not more than 2 storeys at the level of egress from the sole-occupancy permit provided sufficient coverage is achieved

b) A unit with a mezzanine floor if the fire hose reel is located at the level of egress from that unit

.6 A fire hose reel must comply with **AS 2441 Installation of Fire Hose Reels, NZS 4504 Specification for Fire Hose Reels, or NZS 4503 Hand Operated Fire-Fighting Equipment**.

.7 A fire hose reel must be located so that the fire hose will not need to pass through doorways fitted with fire or smoke doors, except:

a) Doorways in walls referred to in DTS provision C2 D4 in a Class 9a and Class 9c Building, separating ancillary use areas of high potential fire hazard

b) Doorways in walls referred to in DTS Provision C2 D11 or C2 D12 separating equipment or electrical supply systems

c) Doorway openings to shafts referred to in DTS Provision C3 D12

.8 Where the normal water supply cannot achieve the flow and pressure required by **AS 2441 Installation of Fire Hose Reels**, or is unreliable, the following equipment must be installed to provide the minimum flow and pressures required by clause 6.1 of **AS 2441 Installation of Fire Hose Reels**:

a) A pump, or

b) Water storage facility, or

c) Both a pump and water storage facility

D7 SPRINKLERS

.1 A sprinkler installed to the degree necessary to control the development and spread of fire must be appropriate to the:

a) Size of the fire compartment

b) Function or use of the building

c) Fire hazard

d) Height of the building

.2 A sprinkler system must:

a) Comply with Specification E1.5 Fire Sprinkler Systems

b) Comply with Specification E1.5a Fire Sprinkler Systems in Class 2 and 3 buildings not more than 25 m in effective height as applicable

c) Be installed as listed in Table C4.3 below

d) Connection to monitoring service:

(i) Connection of a residential sprinkler system to a fire station or other approved monitoring service must be via a sprinkler alarm switch, connected to alarm signaling equipment. The connection from the alarm signaling equipment must be in accordance with **AS 1670.3 Automatic Fire Detection and Alarm Systems, Part 3: Fire Detection, Warning, Control and Intercom Systems- System design, Installation and Commissioning Fire Alarm Monitoring.**

(ii) The alarm signaling equipment must be installed:

A. In a secure, accessible position

B. In a weatherproof housing, if located externally

C. Not more than 500 mm from the system flow switch

e) Indication at the fire indicator panel — the fire signal from the alarm signaling equipment must be mimicked by an audible and visible signal at the fire indicator panel

Table C4.3 Requirements for Sprinklers

Occupancy	Where Sprinklers are Required
All classes, including an open-deck carpark with a multi-classified building, but excluding: a) An open-deck carpark being a separate building b) A Class 8 electricity network substation, with a floor area not more than 200 m^2, located within a multi-classified building	Throughout the whole building if any part of the building has an effective height of more than 25 m
Class 2 or 3 building (excluding a building used as a residential care building) and any other class of building (excluding a building used as residential care building) containing a Class 2 or 3 part	Throughout the whole building including any part of another class, if any part of the building has a rise in storeys of 4 or more and an effective height of not more than 25 m
Class 3 building used as a residential care building	Throughout the building and in any fire compartment containing a Class 3 part used for residential care
Class 6	In fire compartments where either of the following apply: (a) Floor area of more than 3,500 m^2 (b) A volume more than 21,000 m^3
Class 7a, other than open-deck carparks	In fire compartment where more than 40 vehicles are accommodated
Class 9a health-care building used as a residential care building	Throughout the building and in any fire compartment containing a Class 9a part used for residential care
Class 9c building	Throughout the building and any fire compartment containing a Class 9c part
Class 9b	See Part H1
Atrium construction	See Part G3
Large isolated buildings	See Clause C2.3
Occupancies of excessive hazard	In fire compartments where either of the following apply: (a) A floor area of more than 2,000 m^2 (b) A volume of more than 12,000 m^3

***Notes**:*

1) See Specification C1.1 Fire Resisting Construction for use of sprinklers in Class 2 buildings and carparks generally

2) See Part E2 for use of sprinklers to satisfy Smoke Hazard Management provisions

3) See C1.13 and Specification C1.1 Fire Resisting Construction for use of sprinklers in Class 2, 3 and 5 buildings with fire-protected timber

4) For the purpose of this Table, occupancies for excessive fire hazard comprise buildings which contain:

- *(a) Hazardous processes or storage including but not limited to the following:*
  - *(i) Aircraft hangars*
  - *(ii) Cane furnishing manufacture, processing and storage*
  - *(iii) Fire-lighter and fireworks manufacture and warehousing*
  - *(iv) Foam plastic and foam plastic goods manufacture, processing and warehousing e.g. furniture factory*
  - *(v) Hydrocarbon based sheet product, manufacture, processing and warehousing e.g. vinyl floor coverings*
  - *(vi) Woodwool and other flammable loose fibrous material manufacture*
- *(b) Combustible goods with an aggregate volume exceeding 1,000 m^3 and stored to a height greater than 4 m including but not limited to the following:*
  - *(i) Aerosol packs with flammable contents*
  - *(ii) Carpets and clothing*
  - *(iii) Electrical appliances*
  - *(iv) Combustible compressed fibreboards (low and high density) and plywood*
  - *(v) Combustible cartons, irrespective of content*
  - *(vi) Esparto and other fibrous combustible material*
  - *(vii) Furniture including timber, cane and composite, where foamed rubber or plastics are incorporated*
  - *(viii) Paper storage) e.g. bales, sheet, horizontal or vertical rolls, waxed coated or processed*
  - *(ix) Textiles raw and finished, e.g. rolled cloth, clothing and Manchester*
  - *(x) Timber storage including sheets, planks, boards, joists and cut sizes*
  - *(xi) Vinyl, plastic, foamed plastic, rubber and other combustible sheets, offcuts and random pieces and rolled material storage, e.g. carpet, tar paper, linoleum, wood veneer and foam mattresses*
  - (xii) *All materials having wrappings or preformed containers of foamed plastics*

D8 FIRE EXTINGUISHERS

.1 Fire extinguishers must be installed to the degree necessary to allow occupants to undertake initial attack on a fire appropriate to:

a) Function or use of the building

b) Any other fire safety systems installed in the building

c) Fire hazard

.2 Portable fire extinguishers must be:

a) Provided as listed in Table C4.4 Fire Extinguisher Requirements

b) For a Class 2, 3, or 5 building or Class 4 part of a building, provided:

(i) To serve the whole Class 2, 3 or 5 building or Class 4 part of a building where one or more internal fire hydrants are installed

(ii) Where internal fire hydrants are not installed, to serve any fire compartment with a floor area greater than 500 m^2, and for the purposes of this clause, a sole-occupancy unit in a Class 2 or 3 building or Class 4 part of a building is considered to be a fire compartment

c) Subject to (b), selected, located and distributed in accordance with Sections 1 to 4 of AS 2444 Portable Fire Extinguishers and Fire Blankets – Selection and Location

Table C4.4 Fire Extinguisher Requirements

Fire Extinguisher Type	Application
Class A: for fires involving ordinary combustibles such as wood, paper, textiles	In the following building types that are not protected with a fire hose reel or sprinkler system: o Common areas in **Class 2, 3, or 5 buildings** and **Class 4 part of a building** o Overnight accommodation rooms in **Class 9a, 9c**, and in detention or correctional occupancy rooms o **Class 6, 7, 8, and 9** buildings in common areas, corridors and near exits o **Class 9b** buildings in classrooms and meeting rooms
Class B: for fires involving flammable liquids such as petrol, oil, paints	**Class 6, 7, 8, 9 or 10** building storing, manufacturing or extensively using flammable liquids in excess of 50 litres (not including fuel tanks in vehicles)
Class C: for fires involving flammables gases	**Class 6, 7, 8, 9 or 10** building storing, manufacturing or extensively using flammable gases
Class D: for fires involving combustible metals	**Class 6, 7, 8, 9 or 10** buildings that produce or operate with combustible metals such as a foundry, metalworking plant, laboratory, metal storage, mining equipment
Class E: for fires involving live electrical equipment	o Any building with an emergency services switchboard, electrical room and the like o Class 6, 7, 8 or 9 building with IT facilities, laboratories, medical equipment, and the like o Nursing station, supervisory station, common area and the like in a **Class 9** building
Class F: for fires involving cooking oils and fats	o **Class 1, 2, 3, 4 and 5** shared kitchens o **Class 2, 3 or 5 hote**l building in overnight accommodation rooms containing a kitchen o **Class 6, 7, 8, and 9** commercial kitchens

Notes:

(i) For the purposes of this Table, an emergency services switchboard is one which sustains emergency equipment operating in the emergency mode.

(ii) *The fire risks in a Class 2 or 3 building or Class 4 part of a building must include risks within any sole-occupancy units, however, portable fire extinguishers are not required to be located within a sole-occupancy unit unless the sole-occupancy unit has a floor area greater than 500 m^2.*

.3 Portable fire extinguishers provide in a Class 2 or 3 building or Class 4 part of a building must be:

a) An ABE type fire extinguisher

b) A minimum size of 2.5 kg

c) Installed outside a sole-occupancy unit:

(i) To serve only the storey at which they are located

(ii) So that the travel distance from the entrance doorway of any sole-occupancy unit to the nearest fire extinguisher is not more than 10 m.

D9 FIRE ALARMS

.1 The placement of smoke alarms and detectors within building types must comply with Specification E2.2A.

.2 A manually operated evacuation alarm system to the relevant provisions of **AS 1670 Automatic Fire Detection and Alarm Systems** must be provided in any building of:

a) Class 3 containing more than 20 beds where the rooms for residential use are located up to a height of only 2 storeys

b) Class 5 with a rise of 3 or 4 storeys and a storey floor area of more than 500 m^2

c) Class 6, 7 or 8 excluding a public carpark with a rise of up to 4 storeys and a storey floor area of more than 500 m^2

d) Hospital or health-care (Class 9) with a rise of up to 4 storeys

e) In the residential part of a school accommodating more than 20 persons at a level above or below the entrance level

f) In all other class 9 building (including schools) with a rise of up to 4 storeys and a storey floor area of more than 250 m^2

.3 Type A, B or C alarm systems are acceptable for Class 3 building, Type B or C, for Class 6 and 9 (other than schools), and a Type A system for Class 7 and 8 buildings and schools.

D10 FIRE CONTROL CENTRES

.1 Suitable facilities must be provided to the degree necessary in a building to co-ordinate fire brigade intervention during an emergency appropriate to:

a) Function or use of the building

b) Floor area of the building

c) Height of the building

.2 A fire control centre facility in accordance with Specification E1.8 Fire Control Centres must be provided for:

a) A building with an effective height of more than 25 m

b) A Class 6, 7, 8 or 9 building with a total floor area of more than 18,000 m^2

D11 FIREFIGHTING SERVICES IN BUILDINGS UNDER CONSTRUCTION

.1 Suitable means of firefighting must be installed to the degree necessary in a building under construction to allow initial fire attack by construction workers and for the fire brigade to undertake attack on the fire appropriate to the:

a) Fire hazard

b) Height the building has reached during its construction

.2 In a building under construction:

a) Not less than one fire extinguisher suitable for Class A, B and C fires must be provided at all times on each storey adjacent to each fire-isolated exit or temporary stairway or exit

b) After the building has reached an effective height of 12 m:

(i) The required fire hydrants and fire hose reels must be operational in at least every storey that is covered by the roof or the floor structure above, except the 2 uppermost storeys

(ii) Any required booster connection must be installed

D12 PROTECTION FOR SPECIAL HAZARDS

.1 Suitable additional safety provisions must be made if special problems of firefighting could arise because of:

a) The nature or quantity of materials stored, displayed or used in a building or on the allotment

b) The location of the building in relation to a water supply for firefighting purposes

C5 SMOKE MANAGEMENT AND EVACUATION

This section applies to all buildings in Class 2 - 9.

Performance Requirements

P1 SMOKE DETECTION, ALARM AND MANAGEMENT

(1) In the event of a fire, buildings and structures must incorporate measures to minimize the spread of smoke to evacuation routes, to other fire compartments, and to enable access by fire fighters

(2) An evacuation route, appropriate to the size and building type, must provide safe egress to a place of safety in the event of a fire or other emergency

(3) Places of safety, indoor and/or outdoor, must provide a refuge for people to gather in the event of a fire and remain in safely until able to safely egress the allotment

(4) Evacuation routes must be appropriate to:

a) Number, mobility and other characteristics of the occupants

b) Function or use of the building

c) Travel distance and other characteristics of the building

d) The fire load

e) Potential fire intensity

f) Fire hazard

g) Any active fire safety systems installed in the building

h) Fire brigade capacity

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Smoke management and evacuation requirements of C5 are satisfied if:

- **All of the following** deemed-to-satisfy provisions appropriate to the building type are successfully demonstrated, but does not apply to**:**
  - an open-deck carpark
  - open spectator stand
  - a Class 8 electricity network substation with a floor area not more than 200 m^2 located within a multi-classified building
  - an area not used by occupants for an extended period of time such as a small storeroom, sanitary compartment, or the like

- **Specification C1.13, C2.5, C3.4, C3.15, E2.2A, E2.2B, G3.8 and E3** must be complied with

D1 SMOKE MANAGEMENT PER BUILDING CLASSIFICATION

.1 Smoke detection, alarm and warning system must be provided in every building and structure based on building classification as outlined in Table C5.1 and Table C5.2 and Section D1.2 to D1.16 below.

Table C5.1 Small Buildings: Smoke Detection and Alarm per Building Classification

Required Smoke Detection, Alarm and Warning System Buildings < 25 m in Height (8 storeys)					
Building Class	Automatic smoke alarm (not part of a system)	Zone-pressurisation of evacuation route, and between vertically separated fire compartments	Automatic smoke/heat detection and alarm system	Automatic smoke control or natural venting	Emergency warning system, lighting and intercom
Class 2	In each sole occupancy unit, internal hallway	Not required	For multiple-occupancy buildings	Natural venting on walls, roof	Exit signs in internal hallway only
Class 3	In each sole occupancy unit; On every storey for stacked units, and all internal hallways	For multiple-occupancy buildings	For multiple-occupancy buildings	Natural venting on walls, roof	Exit signs and lighting only
Class 4	Yes	Not required	No	Automatic or natural	Exit signs and lighting only
Class 5	Yes	For structures > 3 storeys, with 2 or more fire compartments in the same class	Yes, or automatic sprinkler system, or automatic smoke-and-heat vents	Automatic required in enclosed room and corridor, fire isolated routes	Yes
Class 6	Yes	For structures > 3 storeys, with 2 or more fire compartments in the same class	Yes, or automatic sprinkler system, or automatic smoke-and-heat vents	Automatic vents for buildings with ovens, chimney, or a fire source, or > 2,000 m^2 area	Exit signs only, and in internal hallways
Class 7	Yes	For structures > 3 storeys, with 2 or more fire compartments in the same class	Yes, or automatic sprinkler system, or automatic smoke-and-heat vents	Automatic required in enclosed room, corridor and fire isolated routes	Yes
Class 8	Yes	For structures > 3 storeys, with 2 or more fire compartments in the same class	Yes, or automatic sprinkler system, or automatic smoke-and-heat vents	Automate for enclosed rooms with hazardous goods storage or manufacture, and in enclosed fire isolated routes	Yes
Class 9	Yes	Buildings > 3 storeys, with 2 or more Class 9 fire compartments, or a sprinkler system	Yes, or automatic sprinkler system, or automatic vents	Automatic required for health care, evacuation centre, enclosed fire isolated routes	Yes, intercom not required for public schools < 10m height
Atrium	Yes	Yes	Yes	Yes	Yes

Note: Table C4.4, C5.1 and C5.2 are inter-related and should be read together
Must comply with Specification E2.2a Smoke Detection and Alarm Systems
Must comply with Specification E2.2b Smoke Exhaust Systems

Table C5.2 Tall Buildings: Smoke Detection and Alarm per Building Classification

Required Smoke Detection, Alarm and Warning System Buildings > 25 m in height (8 storeys)					
Building Class	Automatic smoke/heat alarm (not part of a system)	Zone-pressurisation of evacuation route, and between vertically separated fire compartments	Automatic smoke/heat detection and alarm system	Automatic smoke control or natural venting	Emergency warning system, lighting and intercom
Class 2	Yes	n.a.	n.a.	n.a.	n.a.
Class 3	Yes	No	Within each Class 3 sole occupancy unit or fire compartment	n.a.	Yes
Class 4	Yes	If Class 4 unit is located above 8 storeys in height	If Class 4 unit is located above 8 storeys in height	Automatic or natural	If justified based on use and occupancy
Class 5	Yes	Building with 2 or more Class 5 fire compartments	Yes	Automatic in enclosed rooms and corridors, fire isolated routes	Yes
Class 6	Yes	Building with 2 or more Class 6 fire compartments and interior hallways	Yes	Automatic in enclosed rooms and corridors, fire isolated routes	Yes
Class 7	Yes	Building with 2 or more Class 7 fire compartments	Yes	Automatic in enclosed rooms and corridors, fire isolated routes	Yes
Class 8	Yes	Building with 2 or more Class 8 fire compartments in the same class	Yes	Automate for enclosed rooms with hazardous goods storage or manufacture , and in enclosed fire isolated routes	Yes
Class 9	Yes	Building with 2 or more Class 9 fire compartments	Class 9a	Both Required	Yes
Atrium	Yes	n.a.	If justified based on use and occupancy	If justified based on use and occupancy	If justified based on use and occupancy
Note: Table C4.4, C5.1 and C5.2 are inter-related and should be read together *Must comply with Specification E2.2a Smoke Detection and Alarm Systems* *Must comply with Specification E2.2b Smoke Exhaust Systems*					

.2 Notwithstanding Tables C5.1 and C5.2, smaller size buildings in Class 5, 6, 7, 8 and 9 that are greater than 3 storeys (but less than 18,000 m^2 in floor area and not exceeding 108,000 m^3 in volume) must be provided with:

a) A sprinkler system (other than a **FPAA101D Automatic Fire Sprinkler System Design and Installation - Drinking Water Supply** or **FPAA101H Automatic Fire Sprinkler System Design and Installation – Hydrant Water Supply system**) complying with Specification E1.5 Fire Sprinkler Systems, or

b) An automatic smoke detection and alarm system complying with Specification E2.2a Smoke Detection and Alarm Systems, or

c) A zone pressurization system between vertically separated fire compartments in accordance with **AS 1668.1 The Use of Ventilation and Air Conditioning in Buildings, Part 1: Fire and Smoke Control in Buildings**, if the building has more than one fire compartment (where fire compartments are above and below each other, not in the same storey), or

d) An automatic air pressurization system for evacuation routes in accordance with **AS 1668.1 The Use of Ventilation and Air Conditioning in Buildings, Part 1: Fire and Smoke Control in Buildings**

.3 Notwithstanding Table C5.2, larger size buildings in Class 5, 6, 7, 8 and 9 that are greater than 3 storeys (and exceed 18,000 m^2 in floor area or 108,000 m^3 in volume) must be provided with:

a) If the ceiling height of the fire compartment is not more than 12 m, an automatic smoke exhaust system and/or smoke-and-heat vents in accordance with Specification E2.2b Smoke Exhaust Systems, or

b) If the ceiling height of the fire compartment is more than 12 m, an automatic smoke exhaust system in accordance with Specification E2.2b Smoke Exhaust Systems

Class 9 (health-care, child-care, care for the aged and disabled people)

.4 Notwithstanding the above, hospitals in Class 9 must be provided with a zone pressurization system between vertically separated fire compartments in accordance with **AS 1668.1 The Use of Ventilation and Air Conditioning in Buildings, Part 1: Fire and Smoke Control in Buildings.**

.5 In addition to requirements in Tables C5.1 and C5.2, and Specification E2.2a Smoke Detection and Alarm Systems, Class 9 buildings must be provided with a means of automatic shutdown of any air-handling system which does not form part of a zone pressurization system, except:

a) Individual room units with a capacity not more than 1,000 L/s

b) Systems servicing critical treatment areas

c) Miscellaneous exhaust air systems installed in accordance with Section 5 and 6 of **AS 1668.1 The Use of Ventilation and Air Conditioning in Buildings, Part 1: Fire and Smoke Control in Buildings** on the activation of smoke detectors installed in accordance with C5.D6

d) Any other installed fire detection and alarm system including a sprinkler system complying with Specification E1.5 Fire Sprinkler Systems that forms part of a zone pressurization system

Basements

.6 A basement, not counted in the rise in storeys in accordance with Table C5.1 and C5.2, must:

a) Comply with measures in accordance with the tables generally

b) Where the basement has a total floor area of more than 2,000 m^2, be provided with:

(i) If not more than 2 storeys below ground:

A. A zone pressurisation system between vertically separated fire compartments in accordance with **AS 1668.1 The Use of Ventilation and Air Conditioning in Buildings, Part 1: Fire and Smoke Control in Buildings,** if the basement has more than one fire compartment, or

B. An automatic smoke detection and alarm system complying with Specifications E2.2a Smoke Detection and Alarm Systems, or

C. A sprinkler system (other than a **FPAA101D** or **FPAA101H** system) complying with Specification E1.5 Fire Sprinkler Systems

(ii) If more than 2 storeys below ground, a sprinkler system (other than a **FPAA101D** or **FPAA101H** system) complying with Specification E1.5 Fire Sprinkler Systems

Nightclubs, discotheques and the like

.7 A building in Class 8 used as a nightclub, discotheque, or the like, must be provided with automatic shutdown of any air-handling system (other than miscellaneous exhaust air systems installed in accordance with Sections 5 and 6 of **AS 1668.1 The Use of Ventilation and Air Conditioning in**

Buildings, Part 1: Fire and Smoke Control in Buildings) which does not form part of the smoke hazard management system, on the activation of:

a) Smoke detectors installed complying with Clause 6 of Specification E2.2a Smoke Detection and Alarm Systems, and

b) Any other installed fire detection and alarm system including a sprinkler system complying with Specification E1.5 Fire Sprinkler Systems, and

c) An automatic smoke exhaust system complying with Specification E2.2b Smoke Exhaust Systems, or

d) A sprinkler system (other than FPAA101D or FPAA101H systems) complying with Specification E1.5 Fire Sprinkler Systems with fast response sprinkler heads

Shopping malls (without enclosed common walkway)

.8 Where the floor area of a Class 6 part of a fire compartment is more than 2,000 m^2, the fire compartment must be provided with:

a) An automatic smoke exhaust system complying with Specification E2.2b Smoke Exhaust Systems, or

b) If the floor area of the fire compartment is not more than 3,500 m^2 and the building:

(i) Is single storey, an automatic smoke detection and alarm system complying with Specification E2.2a Smoke Detection and Alarm Systems must be provided, or

(i) Has a rise in storeys of more than 2, a sprinkler system (other than a FPAA101D or FPAA101H system) complying with Specification E1.5 Fire Sprinkler Systems must be provided

.9 The provisions of Section D5.2(b) above do not apply to:

a) A Class 6 sole-occupancy unit that:

(i) Has a floor area of not more than 2,000 m^2

(ii) Is single storey with a main public entrance opening to a road or open space

(iii) Is separated from other parts of the fire compartment by construction, including openings, penetrations and junctions with other building elements, that prevents the free passage of smoke

b) Parts of any other classification that are smoke separated from a Class 6 part by fire-resisting construction

Shopping malls (containing an enclosed common walkway)

.10 Where the floor area of a Class 6 part of a fire compartment is more than 2,000 m^2, the fire compartment, including the enclosed common walkway or mall, must be provided with:

a) An automatic smoke exhaust system complying with Specification E2.2b Smoke Exhaust Systems, or

b) If the floor area of the fire compartment is not more than 3,500 m^2, and the building has a rise in storeys not more than 2, a sprinkler system (other than a FPAA101D or FPAA101H system) complying with Specification E1.5 Fire Sprinkler Systems

.11 The provisions above do not apply to:

a) A class 6 sole-occupancy unit that:

(i) Opens onto the enclosed common walkway or mall if the Class 6 sole-occupancy unit has a floor area of not more than 1,000 m^2, or

(ii) Does not open onto the enclosed common walkway or mall of the Class 6 sole-occupancy unit and:

A. Has a floor area of not more than 2,000 m^2

B. Is single storey with a main entrance opening to a road or open space

(iii) Is separated from other parts of the fire compartment by construction, including openings, penetrations and junctions with other building elements, that presents the free passage of smoke

b) Parts of any other classification that are smoke-separated from a Class 6 part

.12 A fire compartment having a floor area of more than 3,500 m^2 in a Class 6 building requires a sprinkler system according to Specification E1.5 Fire Sprinkler Systems.

Exhibition Halls

.13 A building or part of a building used as a theatre, public hall, or cinema/auditorium complex must be provided with an automatic smoke exhaust system or automatic smoke-and-heat vents complying with Specification E2.2b Smoke Exhaust Systems for the following:

a) A school assembly, church or community hall, or any other exhibition hall with a stage or backstage area with a total floor area of more than 300 m^2, or

b) Has a stage with an associated rigging loft

.14 A building or part of a building used as a theatre or public hall (not listed above) including a lecture theatre and cinema/auditorium complex:

a) Must be provided with automatic shutdown of any air-handling system (other than miscellaneous exhaust air systems installed in accordance with Section 5 and 6 of **AS 1668.1 The Use of Ventilation and Air Conditioning in Buildings, Part 1: Fire and Smoke Control in Buildings**) which does not form part of the smoke hazard management system, on the activation of:

(i) Smoke detectors installed complying with Specification E2.2a Smoke Detection and Alarm Systems

(ii) Any other installed fire detection and alarm system, including a sprinkler system complying with Specification E1.5 Fire Sprinkler Systems

b) Other than in the case of a school lecture theatre, where the floor area of the fire compartment is more than 2,000 m^2, the building must be provided with:

(i) An automatic smoke exhaust system or automatic smoke-and-heat vents complying with Specification E2.2b Smoke Exhaust Systems, or

(ii) If the floor area of the fire compartment is not more than 5,000 m^2 and the building has a rise in storeys of not more than 2:

A. An automatic smoke detection and alarm system complying with Specification E2.2a Smoke Detection and Alarm Systems, or

B. A sprinkler system (other than a **FPAA101D** or **FPAA101H** system) complying with Specification E1.5 Fire Sprinkler Systems

Other Assembly Buildings (not listed above) and Excluding Schools

.15 Each fire compartment, other than one in a building described below in (b), having a floor area of more than 2,000 m^2 must be provided with an automatic smoke exhaust system or automatic smoke-and-heat vents complying with Specification E2.2b Smoke Exhaust Systems for the following:

a) If the building is single storey, or

b) If the floor area of the fire compartment is not more than 5,000 m^2 and the building has a rise in storeys of not more than 2:

(i) An automatic smoke detection and alarm system complying with Specification E2.2a Smoke Detection and Alarm Systems, or

(ii) A sprinkler system (other than a **FPAA101D** or **FPAA101H** system) complying with Specification E1.5 Fire Sprinkler Systems

.16 The following buildings are exempt from the provisions of D2.9 above:

a) Sporting complexes (sports halls, gymnasiums, swimming pools, ice and roller rinks, and the like) other than an indoor sports stadium with a total spectator seating for more than 1,000

b) Churches and other places used solely for religious worship

D2 SMOKE AND HEAT VENTING

.1 Windows, doors, panels, or the like, provided to control the movement of smoke must:

a) Be as evenly distributed as practicable

b) Be readily openable, except that if windows and panels or the like are provided on the ground level storey, they need only be shatterable

.2 Automatic smoke-and-heat vents must be installed as a system complying with **AS 2665 Smoke / Heat Venting Systems - Design, Installation and Commissioning**

.3 Permanently open vents may form part of the smoke/heat venting system provided they comply with relevant criteria for automatic smoke-and-heat vents in **AS 2665 Smoke / Heat Venting Systems- Design, Installation and Commissioning**

.4 Smoke-and-heat vents must be initiated by:

a) Smoke detection complying with Clauses 6 and 8 of Specification E2.2a Smoke Detection and Alarm Systems

b) Thermally released link operation

.5 Smoke and heat vents must support a smoke management systems arranged in zones to match the smoke reservoirs.

D3 ROOF VENTS

.1 Required roof vents must comply with **AS 2665 Smoke / Heat Venting Systems – Design, Installation and Commissioning**, except that:

a) Smoke curtains may divide the space below the roof into compartments with an area not more than 1,500 m^2

b) All roof vents within the same compartment must open at the same time

c) Roof vents must be activated by:

(i) Except in a Class 7 or 8, a sprinkler system if it is installed throughout the building, or

(ii) A fire detection and alarm system which complies with **AS 1670 Automatic Fire Detection and Alarm Systems** or **NZS 4512 Fire Detection and Alarm Systems in Buildings**, or

(iii) Smoke detectors spaced not more than 30 m apart and 15 m from any smoke curtain and with not less than one detector for each 500 m^2 of floor area, or

(iv) Rate of rise heat detectors spaced not more than 15 m apart and 7.5 m from any smoke curtain and with not less than one detector for each 250 m^2 of floor area

D4 SMOKE EXHAUST SYSTEM

.1 A required smoke exhaust system must comply with Specification E2.2b Smoke Exhaust Systems.

.2 In addition to requirements in Table C5.1 and C5.2, all evacuation routes must be provided with:

a) An automatic air pressurisation system for fire-isolated exits and evacuation routes in accordance with **AS 1668.1 The Use of Ventilation and Air Conditioning in Buildings, Part 1: Fire and Smoke Control in Buildings**, or

b) Open access ramps or balconies in accordance with D2.5 for the following:

(i) Building height is 25 m or greater, or

(ii) Building has more than 2 below ground storeys, or

(iii) Building has an atrium, or

(iv) Building is Class 9 with a rise in storeys of more than 2, and

(v) Building has fire-isolated passageways or ramps with a length of travel more than 50 m to a road or place of safety

.3 A smoke pressurisation system must:

a) Comply with **AS 1668.1 The Use of Ventilation and Air Conditioning in Buildings, Part 1: Fire and Smoke Control in Buildings**, except that instead of the criterion of 50 Pa pressure differential across each door when all doors are closed, it must be 25 Pa

b) Not allow openable windows or other openable devices (other than necessary doorways, pressure-controlled relief louvres and windows openable by a key) in the stairway, ramp or passageway

c) Not serve more than one evacuation route and not form part of any other air-handling system

D5 SMOKE DETECTION AND AIR-HANDLING SYSTEM

.1 Smoke detection, alarm and warning system must comply with:

a) Table C1.1, C5.1 and C5.2

b) Specification E2.2a Smoke Detection and Alarm Systems

c) **AS 1668.1 The Use of Ventilation and Air Conditioning in Buildings, Part 1: Fire and Smoke Control in Buildings** for zone pressurisation and automatic air pressurisation for fire-isolated exits and evacuation routes

d) **AS 1670.1 Automatic Fire Detection and Alarm Systems, Part 1: Fire Detection, Warning, Control and Intercom Systems - System Design, Installation and Commissioning Fire**

.2 Additional smoke hazard management measures must consider:

a) Special characteristics of the building

b) Special function of the building

c) Special type or quantity of materials stored, displayed or used in a building

d) Special mix of classifications within a building or fire compartment

.3 An air-handling system which does not form part of a smoke hazard management system and which recycles air from one fire compartment to another fire compartment or operates in a manner that may unduly contribute to the spread of smoke from one fire compartment to another fire compartment must:

a) Be designed and installed to operate as a smoke control system in accordance with **AS 1668.1 The Use of Ventilation and Air Conditioning in Buildings, Part 1: Fire and Smoke Control in Buildings**, or

b) Incorporate smoke dampers where the air handling ducts penetrate any elements separating the fire compartments served

c) Be arranged such that the air-handling system is shut down and the smoke dampers are activated to close automatically by smoke detectors complying with Clause 7.5 of **AS 1670.1 Automatic Fire Detection and Alarm Systems, Part 1: Fire Detection, Warning, Control and Intercom Systems - System Design, Installation and Commissioning Fire**

d) Have a sufficient degree of fire-resistance to discourage spread of fire

e) For the purposes of this provision, each sole-occupancy unit in a Class 2 or 3 building is treated as a separate fire compartment

.4 Miscellaneous air-handling systems serving more than one fire compartment (other than a carpark ventilation system) and not forming part of a smoke hazard management system must comply with Sections 5 and 6 of **AS 1668.1 The Use of Ventilation and Air Conditioning in Buildings, Part 1: Fire and Smoke Control in Buildings**.

C6 PREVENTION OF FIRE AND FIRE SPREAD

This section applies to all buildings in Class 2 – 9

Performance Requirements

P1 PREVENTION OF FIRE

(1) Buildings and structures must be designed, constructed and demolished to control heat and energy sources, and limit the possibility of unwanted ignition

(2) Any fuel-burning appliances and fuel supply must be prevented from uncontrolled combustion, explosion, or becoming a source of ignition

(3) Fixed appliances using controlled combustion and other fixed equipment must be designed, constructed and installed in buildings in a way that reduces the likelihood of illness or injury due to fire occurring

(4) Buildings must be designed and constructed so that there is a low probability of injury or illness to persons not in close proximity to a fire source.

(5) Buildings must be designed, sited and constructed so that there is a low probability of fire spread to other property vertically or horizontally across a relevant boundary.

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Prevention of fire and fire spread requirements of Section C6 are satisfied if:

- **All of the following** deemed-to-satisfy provisions appropriate to the building type are successfully demonstrated, as appropriate for the building type, size, function and use
- **Specification C1.1** is complied with
- **Schedule 5** Fire Resistance is complied with

D1 FIRE IGNITION PREVENTION

.1 The maximum surface temperature of combustible building materials close to fixed appliances using controlled combustion and other fixed equipment when operating at their design level must not exceed 90°C.

.2 A heating appliance and its associated components within a building or structure in Class 3-10, including an open fireplace, chimney, or the like, must be installed:

a) To withstand temperatures likely to be generated by the appliance

b) So that it does not raise the temperature of any building element to a level that would adversely affect the elements physical or mechanical properties or function

c) So that hot products of combustion will not:

(i) Escape through the walls of the associated components

(ii) Cause fire to spread to nearby combustible materials or allow smoke to penetrate nearby windows, ventilation inlets, or the like

.3 Where flammable, combustible and explosive substances and atmospheres are permitted, potential ignition sources must be separated from areas containing these substances.

D2 ELECTRICAL PROTECTION AND APPLIANCES

.1 To prevent unwanted ignition and combustion, installation of all electrical equipment and wiring must comply with:

a) AS/NZS 3000 Electrical Installations - Buildings, Structures and Premises (known as the AS/NZS Wiring Rules)

b) Section E Electrical in this document

.2 Electrical equipment and wiring must be selected, installed and protected such that they will not:

a) Obstruct a fire-isolated passageway, fire-isolated stairway or ramp, evacuation route, accessible route, or emergency exit

b) Contribute to, or propagate a fire

c) Attain a temperature high enough to ignite adjacent material

.3 Electrical equipment and wiring must have an appropriate fire-resistance in keeping with the level of protection required for the building, facility, room, or part thereof, in accordance with AS/NZS 3013 Electrical Systems: Classification of Fire and Mechanical Performance of Wiring Systems.

.4 Cables not complying with the required fire-resistance level must be limited to short lengths for connection of appliances to a wiring system, and must not pass from one fire compartment to another.

.5 The installation of a stove, heater or similar appliance in a building must comply with:

a) AS/NZS 2918 Domestic Solid Fuel Burning Appliances — Installation

b) AS/NZS 1200 Boilers and Pressure Equipment

D3 INCINERATION ROOM

.1 If an incinerator is installed in a building, any hopper giving access to a charging chute must be:

a) Non-combustible

b) Gas-tight when closed

c) Designed to return to the closed position after use

d) Not attached to a chute connecting directly to a flue unless the hopper is located in open air

e) Not located in an evacuation route or emergency exit

.2 A room containing an incinerator must be separated from other parts of the building by construction with an FRL of not less than 60/60/60.

D4 ELECTRICAL ROOMS (SUBSTATION, BATTERY ROOMS)

.1 An electrical room with the following equipment must be within a stand-alone enclosure located far enough away from the building, facility or fire source and with sufficient fire-resisting construction that the threat of spread of fire is minimised:

a) Transformers (for 1kV and above & its cooling design- indoor or outdoor)

b) Switchgears (for 1kV and above)

c) Generators (depending on cooling design and sound proofing as determined by energy provider)

.2 An electrical room must be protected from the spread of fire, and from becoming a source of fire by the following:

a) Fire-resistant construction with a minimum FRL of 60/60/60 and/or non-combustible material

b) Allow air-intake at the bottom of the enclosure and air out-take at the highest point

c) Have batteries, fuel cells, transformers, and the like, located on a mounted stand so that they do not come directly in contact with the walls, floor or ceiling of the enclosure

d) Have access / safety signs and perimeter markings that comply with Section H Hazardous Substances

e) Have a disconnection switch or quick-disconnect fuse near the entrance so that the electrical equipment can be isolated from the rest of the system

f) Have building material and ventilation that provides the appropriate room temperature for the equipment according to manufacturer's recommendations

g) Provide a natural means of lighting such as a window or rooflight

h) Have sufficient access and working space maintained around all electrical equipment to permit ready and safe operation and maintenance of such equipment and avoid harm from live parts

i) Ensure exposed high-voltage equipment, such as transformer banks, open switches, and similar equipment with exposed energized parts are isolated to prevent unauthorized access by fencing, locked rooms, screened enclosures, or other suitable means

j) Comply with Section E Electrical

.3 In addition to Section C6.D.2 above, a stand-alone electrical room must have the following:

a) A concrete base, or base fabricated of other non-combustible material, no less than 100 mm thick

b) Adequate drainage around the enclosure such that runoff or stormwater will not accumulate and pond around the base

c) Weathertight construction yet maintain sufficient ventilation

d) Be constructed with sufficient structural capacity to withstand the consequences of disaster for wind speed in accordance with Section B and seismic loads in accordance with **NZS 1170.5 Structural Design Actions - Part 5: Earthquake Actions**

.4 Electrical rooms may be combined with telecommunication equipment provided appropriate room temperature, fire protection and ventilation are maintained.

.5 Fuel cells and energy storage mechanisms such as batteries must be installed in a well-ventilated enclosure that:

a) Allows air-intake at the bottom of the enclosure and air out-take at the highest point

b) Is constructed of fire-resistant materials

c) Uses fans, where additional ventilation is needed

d) Has a concrete base, or equivalent complying with Section B Structure

e) Has a mounted stand so that batteries and fuel cells do not sit directly on the base

f) Access / safety signs that comply with Section H Hazardous Substances

g) Has a disconnection switch or quick-disconnect fuse near the fuel cell and/or batteries so they can be electrically isolated from the rest of the system

D5 OPEN FIREPLACES AND OVENS

.1 An open fireplace, or solid-fuel burning oven or appliance in which the fuel-burning compartment is not enclosed must have:

a) A hearth constructed of stone, concrete, masonry or similar non-combustible material so that:

(i) It extends not less than 300 mm beyond the front of the fireplace opening and not less than 150 mm beyond each side of that opening

(ii) It extends beyond the limits of the fireplace or appliance not less than 300 mm if the fireplace or appliance is free-standing from any wall of the room

(iii) Its upper surface does not slope away from the grate or appliance

(iv) It has combustible material situated below the hearth but not below that part required to extend beyond the fireplace opening or the limits of the fireplace is not less than 150 mm from the upper surface of the hearth

b) Walls forming the sides and back of the fireplace up to not less than 300 mm above the underside of the arch or lintel which:

(i) Are constructed in 2 separate leaves of solid masonry not less than 180 mm thick, excluding any cavity

(ii) Do not consist of concrete block masonry in the construction of the inner leaf

c) Walls of the chimney above the level referred to in (b):

(i) Constructed of masonry units with a net volume, excluding cored and similar holes, not less than 75% of their gross volume, measured on the overall rectangular shape of the units, and with an actual thickness of not less than 100 mm

(ii) Lined internally to a thickness of not less than 12 mm with rendering consisting of 1 part cement, 3 parts lime, and 10 parts sand by volume, or other suitable material

d) Suitable damp-proof courses or flashings so that it is weathertight

D6 CHIMNEYS AND FLUES

.1 A chimney or flue must be constructed:

a) To withstand the temperature likely to be generated by the appliance to which it is connected

b) So that the temperature of the exposed faces will not exceed a level that would cause damage to nearby parts of the building

c) So that hot products of combustion will not:

(i) Escape through the walls of the chimney or flue, or

(ii) Cause fire to spread to nearby combustible materials or allow smoke to penetrate through nearby-windows, ventilation inlets, or the like

d) To prevent rainwater from penetrating to any part of the interior of the structure

e) Such that its termination is not less than:

(i) 600 mm above any point of penetration of or contact with the roof

(ii) 900 mm above any opening or openable part in any structure, which is within 3 m horizontal distance of the chimney or flue

f) So that it is accessible for cleaning

D7 LIGHTNING PROTECTION

.1 All buildings and sites with non-residential human occupancy must be protected from potential lightning strikes by provision of appropriate lightning protection as detailed in Section E Electrical.

D8 FIRE SPREAD BETWEEN BUILDINGS ON ADJOINING ALLOTMENTS

.1 Buildings are sufficiently separated to avoid the spread of fire on adjoining allotments when it is calculated that:

a) A building will not cause heat flux in excess of those set out in Column 2 of Table C6.1 below at the location on an adjoining property set out in Column 1

b) When located at the distances from the allotment boundary set out in Columns 1 of Table C6.1 a building is capable of withstanding the heat flux set out in Column 2 without ignition.

Table C6.1 Fire Spread on Adjoining Allotments

Column 1 Location	Column 2 Heat Flux (kW/m^2)
On boundary	80
1 m from boundary	40
3 m from boundary	20
6 m from boundary	10

D9 FIRE SPREAD BETWEEN BUILDINGS ON THE SAME ALLOTMENT

.1 Buildings are sufficiently separated to avoid the spread of fire between buildings on the same allotment when it is calculated that a building:

a) Is capable of withstanding the heat flux set out in Column 2 of Table C6.2 below without ignition

b) Will not cause heat flux in excess of those set out in Column 2 of Table C6.2 below

c) When the distance between the buildings is as set out in Column 1 of Table C6.2 below

Table C6.2 Fire Spread on Same Allotment

Column 1 Distance between Buildings on the same allotment (m)	Column 2 Heat Flux (kW/m^2)
0	80
2	40
6	20
12	10

SPECIFICATIONS

C

Fire Protection

C1.1 Fire-Resisting Construction
C1.8 Structural Tests for Lightweight Construction
C1.10 Fire Hazard Properties
C1.11 Performance of External Walls in Fire
C1.13 Cavity Barriers for Fire-Protected Timber
C1.13a Fire-Protected Timber
C2.5 Smoke-Proof Walls in Health-Care and Residential-Care Buildings
C3.4 Fire Doors, Smoke Doors, Fire Windows and Shutters
C3.15 Penetration of Walls, Floors and Ceilings by Services

E1.5 Fire Sprinkler Systems
E1.5a Class 2 and 3 Buildings Not More Than 25 m in Effective Height
E1.8 Fire Control Centres
E2.2a Smoke Detection and Alarm Systems
E2.2b Smoke Exhaust System
E2.2d Residential Fire safety Systems
E2.4 Air-Handling Systems

G3.8 Fire and Smoke Control Systems in Buildings Containing an Atrium

Schedule 5 Fire-Resistance of Building Elements

Part E4 Visibility in an Emergency, Exit Signs and Warning Systems

SPECIFICATION C1.1
Fire-resisting construction

1. SCOPE

This Specification contains requirements for the fire-resisting construction of building elements.

2. GENERAL REQUIREMENTS

.1 EXPOSURE TO FIRE-SOURCE FEATURES

.1 A part of a building element is exposed to a fire-source feature if any of the horizontal straight lines between that part and the fire-source feature, or vertical projection of the feature, is not obstructed by another part of the building that:

a) Has an FRL of not less than 30/–/–

b) Is neither transparent nor translucent

.2 A part of a building element is not exposed to a fire-source feature if the fire-source feature is:

a) An external wall of another building that stands on the allotment and the part concerned is more than 15 m above the highest part of that external wall, or

b) A side or rear boundary of the allotment and the part concerned is below the level of the finished ground at every relevant part of the boundary concerned

.3 If various distances apply for different parts of a building element:

a) The entire element must have the FRL applicable to that part having the least distance between itself and the relevant fire-source feature, or

b) Each part of the element must have the FRL applicable according to its individual distance from the relevant fire-source feature, but this provision does not override or permit any exemption from Clause 2.2

.2 FIRE PROTECTION FOR A SUPPORT OF ANOTHER PART

.1 Where a part of a building required to have an FRL depends upon direct vertical or lateral support from another part to maintain its FRL, that supporting part must:

a) Have an FRL not less than that required by other provisions of this Specification

b) Have an FRL in respect of structural adequacy equal to or greater than the supporting part if located within the same fire compartment

c) Be non-combustible if required by other provisions in this Specification or if the part it supports is required to be non-combustible

.2 The following building elements need not comply with the above requirement (2.2.1):

a) A timber column providing lateral support to an external wall complying with Clause 5.1(b) in this specification or C1.11 in the FNBC

b) An element providing support within a carpark and complying with Clause 3.9, 4.2 or 5.2

c) A roof providing lateral support in a building:

(i) Of Type A construction if it complies with Clause 3.5(a), (b) or (d)

(ii) Of Type B and C construction

d) A column providing lateral support to a wall where the column complies with Clause 2.5(a) and (b)

e) An element providing lateral support to a fire wall or fire-resisting wall, provided the wall is supported on both sides and failure of the element on one side does not affect the fire performance of the wall

.3 LINTELS

.1 A lintel must have the FRL required for the part of the building in which it is situated, unless it does not contribute to the support of a fire door, fire window or fire shutter, and:

a) It spans an opening in:

(i) A wall of a building containing only one storey, or

(ii) A non load-bearing wall of a class 2 or 3 building, or

b) It spans an opening in masonry which is not more than 150 mm thick and:

(i) Not more than 3 m wide if the masonry is non load-bearing, or

(ii) Not more than 1.8 m wide if the masonry is load-bearing and part of a solid wall or one of the leaves of a cavity wall

.4 METHOD OF ATTACHMENT NOT TO REDUCE THE FIRE-RESISTANCE OF BUILDING ELEMENTS

The method of attaching or installing a finish, lining, ancillary element or service installation to the building element must not reduce the fire-resistance of that element to below that required.

.5 GENERAL CONCESSIONS

.1 The following fire-resisting construction requirements apply to all buildings:

a) **Steel columns**: A steel column, other than one in a fire wall or common wall, need not have an FRL in a building that contains:

(i) Only 1 storey, or

(ii) 2 storeys in some parts and 1 storey only in its remaining parts if the sum of the floor areas of the upper storeys of its 2 storey parts does not exceed the lesser of:

A. 1/8 of the sum of the floor areas of the 1 storey parts, or

B. 1/10 of the floor area if the maximum floor areas specified in Table C2.2 is applicable, or

C. In the case of a building to which two or more of the maximum floor areas specified in Table C2.2 is applicable, 1/10 of the lesser of those areas need not have an FRL

b) **Timber columns**: A timber column may be used in a single storey building if:

(i) In a fire wall or common wall the column has an FRL not less than that listed in the appropriate Table 3, 4 or 5

(ii) It has an FRL of not less than 30/–/– and is required to have an FRL in accordance with Table 3, 4 or 5

c) **Structures on roofs**: A non-combustible structure situated on a roof need not comply with the other provisions of this Specification if it only contains:

(i) Lift motor equipment, or

(ii) One or more of the following:

A. Hot water or other water tanks

B. Ventilating ductwork, ventilating fans and their motors

C. Air-conditioning chillers

D. Window cleaning equipment

E. Other service units that are non-combustible and do not contain flammable or combustible liquids or gases

d) **Curtain walls and panel walls**: A requirement for an external wall to have an FRL does not apply to a curtain wall or panel wall which is of non-combustible construction and fully protected by automatic external wall-wetting sprinklers

e) **Balconies and verandahs**: A balcony, verandah or the like and any incorporated supporting part, which is attached to or forms part of a building, need not comply with Tables 3, 4 and 5 if:

(i) It does not form part of the only path of travel to a required exit from the building

(ii) In type A construction:

A. It is situated not more than 2 storeys above the lowest storey providing direct egress to a road or open space

B. Any supporting columns are of non-combustible construction

.6 MEZZANINE FLOORS: CONCESSION

.1 This Clause does not apply to a Class 9b building that is a spectator stand or audience viewing area accommodating more than 100 persons as calculated according to D1.13.

.2 A mezzanine and its supports need not have an FRL or be non-combustible provided:

a) The total floor area of all the mezzanines in the same room does not exceed 1/3 of the floor area of the room or 200 m^2, whichever is the lesser

b) The FRL of each wall and column that supports any other part of the building within 6 m of the mezzanine is increased by the amount listed in Table 2.6

Table 2.6 Increased FRLs - Construction Surrounding Mezzanines

Level otherwise required for any FRL criterion (mins)	Increase in level to not less than (mins):
30	60
60	90
90	120
120	180
180	240

Note to Table 2.6: The increase in level applies to each FRL criterion (structural adequacy, integrity or insulation) relevant to the building element concerned.

.7 ENCLOSURE OF SHAFTS

.1 Shafts required to have an FRL must be enclosed at the top and bottom by construction having an FRL not less than that required for the walls of a non load-bearing shaft in the same building, except that these provisions need not apply to:

a) The top of a shaft extending beyond the roof covering, other than one enclosing a fire-isolated stairway or ramp, or

b) The bottom of a shaft if it is non-combustible and laid directly on the ground

.8 CARPARKS IN CLASS 2 AND 3 BUILDINGS

.1 If a Class 2 building contains not more than 4 storeys of which:

a) One storey is Class 7 used solely for the purpose of parking motor vehicles or for some other purpose that is ancillary to a Class 2

b) The remaining storeys are of Class 2

the carpark storey is regarded as Class 2 only for the purpose of determining the relevant fire-resisting requirements of this Specification.

.2 If a Class 3 building or a building of Class 2 and 3 contains not more than 3 storeys of which:

a) One storey is Class 7 used solely for the purpose of parking motor vehicles or for some other purpose that is ancillary to the other storeys

b) The remaining storeys are of Class 2 or 3

the carpark storey is regarded as Class 2 or 3 only for the purpose of determining the relevant fire-resisting requirements of this Specification.

.9 RESIDENTIAL CARE BUILDING: CONCESSION

.1 In a Class 3 building protected with a sprinkler system complying with Specification E1.5 and used as a residential care building, any FRL criterion prescribed in Tables 3, 4 or 5:

a) For any floor and any load-bearing wall, may be reduced to 60, except any FRL criterion of 90 for an external wall must be maintained when tested from the outside

b) For any non load-bearing internal wall, need not apply if:

(i) It is lined on each side with standard grade plasterboard not less than 13 mm thick or similar non-combustible material

(ii) It extends:

A. To the underside of the floor next above, or

B. To the underside of a ceiling lined with standard grade plasterboard not less than 13 mm thick or a material with at least an equivalent level of fire protection, or

C. To the underside of a non-combustible roof covering

(iii) Any insulation installed in the cavity of the wall is non-combustible

(iv) Any construction joint, space or the like between the top of the wall and the floor, ceiling or roof is smoke sealed with intumescent putty or other suitable material.

.2 The concession described at (a) does not apply to fire-protected timber building elements.

3. TYPE A FIRE-RESISTING CONSTRUCTION

.1 FIRE-RESISTANCE OF BUILDING ELEMENTS

.1 In a building required to be of Type A construction:

a) Each building element listed in Table 3 and any beam or column incorporated in it, must have an FRL not less than that listed in the Table for the particular Class of building concerned

b) Any internal wall required to have an FRL with respect to integrity and insulation must extend to:

(i) The underside of the floor next above, or

(ii) The underside of a roof complying with Table 3, or

(iii) If under Clause 3.5 the roof is not required to comply with Table 3, the underside of the non-combustible roof covering and, except for roof battens with dimensions of 75 mm x 50 mm or less or sarking-type material, must not be crossed by timber or other combustible building elements, or

(iv) A ceiling that is immediately below the roof and has a resistance to the incipient spread of fire to the roof space between the ceiling and the roof of not less than 60 minutes

c) A load-bearing internal wall and a load-bearing fire wall (including those that are part of a load-bearing shaft) must be constructed from:

(i) Concrete, or

(ii) Masonry, or

(iii) Fire-protected timber, provided that the building:

A. Is a separate building, or

B. Is a part of a building which:

a. Only occupies part of a storey, and is separated from the remaining part by a fire wall, or

b. Is located above or below a part not containing fire-protected timber and the floor between the adjoining parts is provided with an FRL

c. Is not less than that prescribed for a fire wall for the lower storey

C. Has an effective height of not more than 25 m

D. Has a combination of any of the following:

a. A sprinkler system (other than a **FPAA101D** or **FPAA101H** system) throughout complying with Specification E1.5, or

b. Non-combustible insulation, or

c. Cavity barriers provided in accordance with Specification C1.13

d) The FRLs specified in Table 3 for an external column apply also to those parts of an internal column that face and are within 1.5 m of a window and are exposed through that window to a fire-source feature.

Table 3.1 Type A Construction: FRL of Building Elements

Building element	FRL : Structural Adequacy/Integrity/Insulation (in minutes)			
	Class 2, 3 or 4	Class 5, 7a or 9	Class 6	Class 7b or 8
EXTERNAL WALL including any column and other building element incorporated within it or other external building element, where the distance from any fire-source feature to which it is exposed is:				
For load-bearing parts				
Less than 1.5 m	90/ 90/ 90	120/120/120	180/180/180	240/240/240
1.5 to less than 3 m	90/ 60/ 60	120/ 90/ 90	180/180/120	240/240/180
3 m or more	90/ 60/ 30	120/ 60/ 30	180/120/ 90	240/180/ 90
For non load-bearing parts				
Less than 1.5 m	–/ 90/ 90	–/120/120	–/180/180	–/240/240
1.5 to less than 3 m	–/ 60/ 60	–/ 90/ 90	–/180/120	–/240/180
3 m or more	–/–/–	–/–/–	–/–/–	–/–/–
EXTERNAL COLUMN (not incorporated in an external wall)				
Load-bearing	90/–/–	120/–/–	180/–/–	240/–/–
Non load-bearing columns	–/–/–	–/–/–	–/–/–	–/–/–
INTERNAL WALLS				
Common and Fire Walls	90/ 90/ 90	120/120/120	180/180/180	240/240/240
Fire-resisting lift and stair shafts				
Load-bearing	90/ 90/ 90	120/120/120	180/120/120	240/120/120
Non load-bearing	–/ 90/ 90	–/120/120	–/120/120	–/120/120
Bounding public corridors, public lobbies and the like				
Load-bearing	90/ 90/ 90	120/–/–	180/–/–	240/–/–
Non load-bearing	–/ 60/ 60	–/–/–	–/–/–	–/–/–
Between or bounding sole-occupancy units				
Load-bearing	90/ 90/ 90	120/–/–	180/–/–	240/–/–
Nonn load-bearing	–/ 60/ 60	–/–/–	–/–/–	–/–/–
Ventilating, pipe, garbage, and like shafts not used for the discharge of hot products of combustion				
Load-bearing	90/ 90/ 90	120/ 90/ 90	180/120/120	240/120/120
Non load-bearing	–/ 90/ 90	–/ 90/ 90	–/120/120	–/120/120
Other internal load-bearing elements				
Wall, beam, truss, column	90/–/–	120/–/–	180/–/–	240/–/–
Floor	90/ 90/ 90	120/120/120	180/180/180	240/240/240
Roof	90/ 60/ 30	120/ 60/ 30	180/ 60/ 30	240/ 90/ 60

.2 CONCESSIONS FOR FLOORS

.1 A floor need not comply with Table 3.1 if:

a) It is laid directly on the ground, or

b) In a Class 2, 3, 5 or 9 building, the space below is not a storey, does not accommodate motor vehicles, is not a storage or work area, and is not used for any other ancillary purpose, or

c) It is a timber stage floor in a Class 9b building laid over a floor having the required FRL and the space below the stage is not used as a dressing room, store room, or the like, or

d) It is within a sole-occupancy unit in a Class 2 or 3 building or Class 4 part of a building, or

e) It is an open-access floor (for the accommodation of electrical and electronic services and the like) above a floor with the required FRL

.3 FLOOR LOADING OF CLASS 5 AND 9B BUILDINGS: CONCESSION

.1 If a floor in a Class 5 or 9b building is designed for a live load not exceeding 3 kPa:

a) The floor next above (including floor beams) may have an FRL of 90/90/90, or

b) The roof, if that is next above (including roof beams) may have an FRL of 90/60/30

.4 ROOF SUPERIMPOSED ON CONCRETE SLAB: CONCESSION

.1 A roof superimposed on a concrete slab roof need not comply with Clause 3.1 as to fire-resisting construction if:

a) The superimposed roof and any construction between it and the concrete slab roof are non-combustible throughout

b) The concrete slab roof complies with Table 3

.5 ROOF: CONCESSION

.1 A roof need not comply with Table 3 if its covering is non-combustible and the building:

a) Has a sprinkler system (other than a FPAA101D or FPAA101H system) complying with Specification E1.5 installed throughout, or

b) Has a rise in storeys of 3 or less, or

c) Is of Class 2 or 3, or

d) Has an effective height of not more than 25 m and the ceiling immediately below the roof has a resistance to the incipient spread of fire to the roof space of not less than 60 minutes

.6 ROOF LIGHTS

.1 If a roof is required to have an FRL or its covering is required to be non-combustible, roof lights or the like installed in that roof must:

a) Have an aggregate area of not more than 20% of the roof surface

b) Be not less than 3 m from:

(i) Any boundary of the allotment other than the boundary with a road or public place

(ii) Any part of the building which projects above the roof unless that part has the FRL required of a fire wall and any openings in that part of the wall for 6 m vertically above the roof light or the like are protected in accordance with C3.4

(iii) Any roof light or the like in an adjoining sole-occupancy unit if the walls bounding the unit are required to have an FRL

(iv) Any roof light or the like in an adjoining fire-separated section of the building

.2 If a ceiling with a resistance to the incipient spread of fire is required, be installed in a way that will maintain the level of protection provided by the ceiling to the roof space.

.7 INTERNAL COLUMNS AND WALLS: CONCESSION

.1 For a building with an effective height of not more than 25 m and having a roof without an FRL in accordance with Clause 3.5, in the storey immediately below that roof, internal columns and internal walls other than fire walls and shaft walls may have:

a) In a Class 2 or 3 building: FRL 60/60/60, or

b) In a Class 5, 6, 7, 8 or 9 building:

(i) With rise in storeys exceeding 3: FRL 60/60/60, or

(ii) With rise in storeys not exceeding 3, no FRL

.8 OPEN SPECTATOR STANDS AND INDOOR SPORTS STADIUMS: CONCESSION

.1 In an open spectator stand or indoor sports stadium, the following building elements need not have the FRL specified in Table 3:

a) The roof if it is non-combustible

b) Columns and load-bearing walls supporting only the roof if they are non-combustible

c) Any non load-bearing part of an external wall less than 3 m:

(i) From any fire-source feature to which it is exposed if it has an FRL of not less than – /60/60 and is non-combustible, or

(ii) From an external wall of another open spectator stand if it is non-combustible

.9 CARPARKS

.1 Notwithstanding Clause 3.1, a carpark may comply with Table 3.2 if it is an open-deck carpark or is protected with a sprinkler system (other than a FPAA101D or FPAA101H system) complying with Specification E1.5 and is:

a) A separate building, or

b) A part of a building:

(i) Which only occupies part of a storey, and is separated from the remaining part by a fire wall, or

(ii) Which is located above or below another classification, and the floor separating the classifications complies with C2.9 in the FNBC, or

(iii) Which is located above another Class 7 part of the building not used for carparking, and the floor separating the parts complies with Table 3 for a Class 7 part other than a carpark, or

(iv) Which is located below another Class 7 part of the building not used for carparking, and the floor separating the parts complies with Table 3.2

c) For the purposes of this Clause, a carpark:

(i) Includes:

A. An administration area associated with the functioning of the carpark

B. Where the carpark is sprinklered, is associated with a Class 2 or 3 building and provides carparking for separate sole-occupancy units, each carparking area with an area not greater than 10% of its floor area for purposes ancillary to the sole-occupancy units

(ii) Excludes:

A. Any area of another classification or other part of a Class 7 building not used for carparking with the exception of the above clause 3.9.1(c)(i) B

B. A building or part of a building specifically intended for the parking of trucks, buses, vans and the like

Table 3.2 Requirements for Carparks

Building Element			Minimum FRL Structural Adequacy / Integrity / Insulation Maximum ESA/M
Wall			
(a)	**External wall**		
	(i)	Less than 3 m from a fire-source feature to which it is exposed:	
		Load-bearing	60/60/60
		Non load-bearing	–/60/60
	(ii)	3 m or more from a fire-source feature to which it is exposed	–/–/–
(b)	**Internal wall**		
	(i)	Load-bearing, other than one supporting only the roof (not used for carparking)	60/–/–
	(ii)	Supporting only the roof (not used for carparking)	–/–/–
	(iii)	Non load-bearing	–/–/–
(c)	**Fire wall**		
	(i)	From the direction used as a carpark	60/60/60
	(ii)	From the direction not used as a carpark	as required by Table 3
Column			
(a)	Supporting only the roof (not used for carparking) and 3 m or more from a fire-source feature to which it is exposed		–/–/–
(b)	Steel column, other than one covered by (a) and one that does not support a part of a building that is not used as a carpark		60/–/– or 26 m^2/tonne
(c)	Any other column not covered by (a) or (b)		60/–/–
Beam			
(a)	Steel floor beam in continuous contact with a concrete floor slab		60/–/– or 30 m^2/tonne
(b)	Any other beam		60/–/–
Fire-resisting lift and stair shaft **(within the carpark only)**			60/60/60
Floor slab and vehicle ramp			60/60/60
Roof **(not used for carparking)**			–/–/–

Notes to Table 3.9:

1. *ESA/M means the ratio of exposed surface area to mass per unit length.*
2. *Refer to Specification E1.5 for special requirements for a sprinkler system in a carpark complying with Table 3.2 and located within a multi-classified building.*

.10 CLASS 2 AND 3 BUILDINGS: CONCESSION

.1 In a Class 2 or 3 building with a rise in storeys of not more than 3, timber framing may be used for:

a) External walls

b) Common walls

c) Floor framing of lift pits

d) Non load-bearing internal walls which are required to be fire-resisting

e) Non load-bearing shafts, except shafts used for the discharge of hot products of combustion

f) Spandrels or horizontal construction provided for the purposes of C2.6

g) For load-bearing internal walls and load-bearing fire walls

.2 A Class 2 or 3 building having a rise in storeys of not more than 4 may have the top three storeys constructed in accordance with the above clause 3.10.1 provided:

a) The lowest storey is used solely for the purpose of parking motor vehicles or for some other ancillary purpose

b) The lowest storey is constructed of concrete or masonry including the floor between it and the Class 2 or 3 part of the building above

c) The lowest storey and the storey above are separated by construction having an FRL of not less than 90/90/90 with no openings or penetrations that would reduce the fire-resisting performance of that construction except that a doorway in that construction may be protected by a –/60/30 self-closing fire door

.3 In a Class 2 or 3 building complying with the above clauses 3.10.1 and 3.10.2 and fitted with a sprinkler system (other than a **FPAA101D** or **FPAA101H** system) complying with Specification E1.5, any FRL criterion prescribed in Table 3:

a) Any floor and any load-bearing wall may be reduced to 60, except any FRL criterion of 90 for an external wall must be maintained when tested from the outside

b) An FRL is not required for any non load-bearing internal wall if:

(i) It is lined on each side with 13 mm standard grade plasterboard or similar non-combustible material

(ii) It extends:

A. To the underside of the floor next above, or

B. To the underside of a ceiling with a resistance to the incipient spread of fire of 60 minutes, or

C. To the underside of a non-combustible roof covering

(iii) Any insulation installed in the cavity of the wall is non-combustible

(iv) Any construction joint, space or the like between the top of the wall and the floor, ceiling or roof is smoke sealed with intumescent putty or other suitable material

(v) Any doorway in the wall is protected by a self-closing, tight fitting, solid core door not less than 35 mm thick

4. TYPE B FIRE-RESISTING CONSTRUCTION

.1 FIRE-RESISTANCE OF BUILDING ELEMENTS

.1 In a building required to be of Type B construction, each building element listed in Table 4.1, and any beam or column incorporated in it, must have an FRL not less than that listed in the Table for the particular Class of building concerned.

.2 If a stair shaft supports any floor or a structural part of it:

a) The floor or part must have an FRL of 60/–/– or more, or

b) The junction of the stair shaft must be constructed so that the floor or part will be free to sag or fall in a fire without causing structural damage to the shaft

.3 Any internal wall which is required to have an FRL with respect to integrity and insulation, except a wall that bounds a sole-occupancy unit in the topmost (or only) storey and there is only one unit in that storey, must extend to:

a) The underside of the floor next above if that floor has an FRL of at least 30/30/30, or

b) The underside of a ceiling having a resistance to the incipient spread of fire to the space above itself of not less than 60 minutes, or

c) The underside of the roof covering if it is non-combustible and, except for roof battens with dimensions of 75 mm x 50 mm or less or sarking-type material, must not be crossed by timber or other combustible building elements, or

d) 450 mm above the roof covering if it is combustible

.4 A load-bearing internal wall and a load-bearing fire wall (including those that are part of a load-bearing shaft) must be constructed from:

a) Concrete, or

b) Masonry, or

c) Fire-protected timber, provided that the building is:

(i) A separate building, or

(ii) A part of a building:

A. Which only occupies part of a storey, and is separated from the remaining part by a fire wall, or

B. Which is located above or below a part not containing fire-protected timber and the floor between the adjoining parts is provided with an FRL not less than that for a fire wall on the lower storey, or

(iii) The building has an effective height of not more than 25 m

(iv) Any combination of:

A. The building has a sprinkler system (other than a FPAA101D or FPAA101H system) throughout complying with Specification E1.5

B. Any insulation installed in the cavity of the timber building element required to have an FRL is non-combustible

C. Cavity barriers are provided in accordance with Specification C1.13

.5 In a Class 5, 6, 7, 8 or 9 building, in the storey immediately below the roof, internal columns and internal walls other than fire walls and shaft walls, need not comply with Table 4.1.

.6 In a Class 2 or 3 building, except where within the one sole-occupancy units, or a Class 9a health-care building or a Class 9b building, a floor separating storeys or above a space for the accommodation of motor vehicles or used for storage or any other ancillary purpose, must:

a) Be constructed so that it is at least of the standard achieved by a floor/ceiling system incorporating a ceiling which has a resistance to the incipient spread of fire to the space above itself of not less than 60 minutes, or

b) Have an FRL of at least 30/30/30, or

c) Have a fire-protective covering on the underside of the floor, including beams incorporated in it, if the floor is combustible or of metal

.7 In a Class 9c building a floor above a space for the accommodation of motor vehicles or used for storage or any other ancillary purpose, and any column supporting the floor must:

a) Be constructed so that it is at least of the standard achieved by a floor/ceiling system incorporating a ceiling which has a resistance to the incipient spread of fire to the space above itself of not less than 60 minutes, or

b) Have an FRL of at least 30/30/30, or

c) Have a fire-protective covering on the underside of the floor, including beams incorporated in it, if the floor is combustible or of metal

Table 4.1 Type B Construction: FRL of Building Eements

Building element	FRL : Structural Adequacy/Integrity/Insulation (in minutes)			
	Building Class			
	Class 2, 3 or 4	Class 5, 7a or 9	Class 6	Class 7b or 8
EXTERNAL WALL (including any column and other building element incorporated within it) or other external building element, where the distance from any fire-source feature to which it is exposed is:				
Load-bearing parts				
Less than 1.5 m	90/ 90/ 90	120/120/120	180/180/180	240/240/240
1.5 to less than 3 m	90/ 60/ 30	120/ 90/ 60	180/120/ 90	240/180/120
3 to less than 9 m	90/ 30/ 30	120/ 30/ 30	180/ 90/ 60	240/ 90/ 60
9 to less than 18 m	90/ 30/–	120/ 30/–	180/ 60/–	240/ 60/–
18 m or more	–/–/–	–/–/–	–/–/–	–/–/–
Non load-bearing parts				
Less than 1.5 m	–/ 90/ 90	–/120/120	–/180/180	–/240/240
1.5 to less than 3 m	–/ 60/ 30	–/ 90/ 60	–/120/ 90	–/180/120
3 m or more	–/–/–	–/–/–	–/–/–	–/–/–
EXTERNAL COLUMN not incorporated in an external wall, where the distance from any fire-source feature to which it is exposed is:				
Load-bearing columns				
Less than 18 m	90/–/–	120/–/–	180/–/–	240/–/–
18 m or more	–/–/–	–/–/–	–/–/–	–/–/–
Non load-bearing columns	–/–/–	–/–/–	–/–/–	–/–/–
INTERNAL WALLS				
Common walls, Fire walls	90/ 90 / 90	120/120/120	180/180/180	240/240/240
Fire-resisting lift and stair shafts				
Load-bearing	90/ 90/ 90	120/120/120	180/120/120	240/120/120
Fire-resisting stair shafts				
Non load-bearing	–/ 90/ 90	–/120/120	–/120/120	–/120/120
Bounding public corridors, public lobbies and the like				
Load-bearing	60/ 60/ 60	120/–/–	180/–/–	240/–/–
Non load-bearing	–/ 60/ 60	–/–/–	–/–/–	–/–/–
Between or bounding sole-occupancy units				
Load-bearing	60/ 60/ 60	120/–/–	180/–/–	240/–/–
Non- load-bearing	–/ 60/ 60	–/–/–	–/–/–	–/–/–
Other load-bearing elements				
Internal walls, columns	60/–/–	120/–/–	180/–/–	240/–/–
Roofs	–/–/–	–/–/–	–/–/–	–/–/–

.2 CARPARKS

.1 Notwithstanding Clause 4.1, a carpark may comply with Table 4.2 if it is an open-deck carpark or is protected with a sprinkler system (other than a FPAA101D or FPAA101H system) complying with Specification E1.5 and is:

a) A separate building, or

b) A part of a building, and if occupying only part of a storey, is separated from the remaining part by a fire wall

.2 For the purposes of this Clause, a carpark:

a) Includes:

(i) An administration area associated with the functioning of the carpark

(ii) Where the carpark is sprinklered, is associated with a Class 2 or 3 building and provides carparking for separate sole-occupancy units, each carparking area with an area not greater than 10% of its floor area for purposes ancillary to the sole-occupancy units

b) Excludes:

(i) Except for (b)(i), any area of another classification, or other part of a Class 7 building not used for carparking

(ii) A building or part of a building specifically intended for the parking of trucks, buses, vans and the like

Table 4.2 Requirements for Carparks

Building element				FRL **(not less than) Structural adequacy/Integrity/Insulation** ESA/M **(not greater than)**
Wall				
(a)	**External wall**			
	(i)	Less than 3 m from a fire-source feature to which it is exposed:		
			Load-bearing	60/60/60
			Non load-bearing	–/60/60
	(ii)	3 m or more from a fire-source feature to which it is exposed		–/–/–
(b)	**Internal wall**			
	(i)	Load-bearing, other than one supporting only the roof (not used for carparking)		60/–/–
	(ii)	Supporting only the roof (not used for carparking)		–/–/–
	(iii)	Non load-bearing		–/–/–
(c)	**Fire wall**			
	(i)	From the direction used as a carpark		60/60/60
	(ii)	From the direction not used as a carpark		as required by 4.1
Column				
(a)	Supporting only the roof (not used for carparking) and 3 m or more from a fire-source feature to which it is exposed			–/–/–
(b)	Steel column, other than one covered by (a)			60/–/– or 26 m^2/tonne
(c)	Any other column not covered by (a) or (b)			60/–/–
Beam				
(a)	Less than 3 m from a fire-source feature:			
	(i)	Steel floor beam, continuous contact with a concrete floor slab		60/–/– or 30 m^2/tonne
	(ii)	Any other beam		60/–/–
(b)	3 m or more from a fire-source feature			–/–/–
Lift shaft				–/–/–
Fire-resisting stair shaft (within the carpark only)				60/60/60
Roof, floor slab and vehicle ramp				–/–/–
Note to table 4.2: ESA/M means the ratio of exposed surface area to mass per unit length				

.3 CLASS 2 AND 3 BUILDINGS: CONCESSION

.1 In a Class 2 or 3 building with a rise in storeys of not more than 2, timber framing may be used for:

a) External walls

b) Common walls

c) The floor framing of lift pits

d) Non load-bearing internal walls which are required to be fire-resisting

e) Non load-bearing shafts, except shafts used for the discharge of hot products of combustion

f) For load-bearing internal walls and load-bearing fire walls, notwithstanding Clause 4.1(e) of Specification C1.1

.2 A Class 2 or 3 building having a rise in storeys of not more than 2, timber framing may be used for the top storey constructed in accordance with the clause above provided:

a) The lowest storey is used solely for the purpose of parking motor vehicles or for some other ancillary purpose

b) The lowest storey is constructed of concrete or masonry including the floor between it and the Class 2 or 3 part of the building above

c) The lowest storey and the storey above are separated by construction having an FRL of not less than 90/90/90 with no openings or penetrations that would reduce the fire-resisting performance of that construction except that a doorway in that construction may be protected by a –/60/30 self-closing fire door

.3 In a Class 2 or 3 building complying with the above two clauses and fitted with a sprinkler system (other than a **FPAA101D** or **FPAA101H** system) complying with Specification E1.5, any FRL criterion prescribed in 4.1:

a) For any load-bearing wall, may be reduced to 60, except any FRL criterion of 90 for an external wall must be maintained when tested from the outside

b) For any non load-bearing internal wall, an FRL requirement need not apply, if:

(i) It is lined on both sides with 13 mm standard grade plasterboard or similar non-combustible material

(ii) It extends:

A. To the underside of the floor next above if that floor has an FRL of at least 30/30/30 or is lined on the underside with a fire-protective covering, or

B. To the underside of a ceiling with a resistance to the incipient spread of fire of 60 minutes, or

C. To the underside of a non-combustible roof covering

(iii) Any insulation installed in the cavity of the wall is non-combustible

(iv) Any construction joints, spaces and the like between the top of the wall and the floor, ceiling or roof is smoke sealed with intumescent putty or other suitable material

5. TYPE C FIRE-RESISTING CONSTRUCTION

.1 FIRE-RESISTANCE OF BUILDING ELEMENTS

.1 In a building required to be of Type C construction, a building element listed in Table 5.1 and any beam or column incorporated in it, must have an FRL not less than that listed in the Table for the particular Class of building concerned.

.2 An external wall that is required by Table 5.1 to have an FRL need only be tested from the outside to satisfy the requirement.

.3 A fire wall or an internal wall bounding a sole-occupancy unit or separating adjoining units must comply with Specification C1.8 if it is of lightweight construction and is required to have an FRL.

.4 In a Class 2 or 3 building, an internal wall which is required by Table 5.1 to have an FRL must extend:

a) To the underside of the floor next above if that floor has an FRL of at least 30/30/30 or a fire-protective covering on the underside of the floor, or

b) To the underside of a ceiling having a resistance to the incipient spread of fire to the space above itself of not less than 60 minutes, or

c) To the underside of the roof covering if it is non-combustible, and except for roof battens with dimensions of 75 mm x 50 mm or less or sarking-type material, must not be crossed by timber or other combustible building elements, or

d) 450 mm above the roof covering if it is combustible

.5 In a Class 2 or 3 building, except where within the one sole-occupancy unit, or a Class 9a health-care building or a Class 9b building, a floor separating storeys, or above a space for the accommodation of motor vehicles or used for storage or any other ancillary purpose, and any column supporting the floor, must have:

a) An FRL of at least 30/30/30, or

b) A fire-protective covering on the underside of the floor including beams incorporated in it and around the column, if the floor or column is combustible or of metal

.6 In a Class 9c building, a floor above a space for the accommodation of motor vehicles or used for storage or any other ancillary purpose, any column supporting the floor, must have:

a) An FRL of at least 30/30/30, or

b) A fire-protective covering on the underside of the floor including beams incorporated in it and around the column, if the floor or column is combustible or of metal

Table 5.1 Type C Construction: FRL of Building Elements

Building Element	FRL : Structural Adequacy/Integrity/Insulation (in minutes)			
	Building Class			
	2, 3 or 4 part	5, 7a or 9	6	7b or 8
EXTERNAL WALL (including any column and other building element incorporated within it) or other external building element, where the distance from any fire-source feature to which it is exposed is:				
Less than 1.5 m	90/ 90/ 90	90/ 90/ 90	90/ 90/ 90	90/ 90/ 90
1.5 to less than 3 m	–/–/–	60/ 60/ 60	60/ 60/ 60	60/ 60/ 60
3 m or more	–/–/–	–/–/–	–/–/–	–/–/–
EXTERNAL COLUMN not incorporated in an external wall, where the distance from any fire-source feature to which it is exposed is:				
Less than 1.5 m	90/–/–	90/–/–	90/–/–	90/–/–
1.5 to less than 3 m	–/–/–	60/–/–	60/–/–	60/–/–
3 m or more	–/–/–	–/–/–	–/–/–	–/–/–
INTERNAL WALLS				
COMMON WALLS and FIRE WALLS	90/ 90/ 90	90/ 90/ 90	90/ 90/ 90	90/ 90/ 90
Bounding public corridors, public lobbies and the like	60/ 60/ 60	–/–/–	–/–/–	–/–/–
Between or bounding sole-occupancy units	60/ 60/ 60	–/–/–	–/–/–	–/–/–
Bounding a stair if required to be rated	60/ 60/ 60	60/ 60/ 60	60/ 60/ 60	60/ 60/ 60
ROOFS	–/–/–	–/–/–	–/–/–	–/–/–

.2 CARPARKS

.1 Notwithstanding Clause 5.1, a carpark may comply with Table 5.2 if it is an open-deck carpark or is protected with a sprinkler system (other than a FPAA101D or FPAA101H system) complying with Specification E1.5 and is:

a) A separate building, or

b) A part of a building, and if occupying only part of a storey, is separated from the remaining part by a fire wall

.2 For the purposes of this Clause, a carpark:

a) Includes:

(i) An administration area associated with the functioning of the carpark

(ii) Where the carpark is sprinklered, is associated with a Class 2 or 3 building and provides carparking for separate sole-occupancy units, each carparking area with an area not greater than 10% of its floor area for purposes ancillary to the sole-occupancy units

b) Excludes:

(i) Except for (b)(i), any area of another classification, or other part of a Class 7 building not used for carparking

(ii) A building or part of a building specifically intended for the parking of trucks, buses, vans and the like

Table 5.2 Requirements for Carparks

Building Element				Minimum FRL Structural adequacy/Integrity/Insulation Maximum ESA/M
Wall				
(a)	External wall			
	(i)	Less than 1.5 m from a fire-source feature to which it is exposed:		
			Load-bearing	60/60/60
			Non load-bearing	–/60/60
	(ii)	1.5 m or more from a fire-source feature to which it is exposed		–/–/–
(b)	**Internal wall**			–/–/–
(c)	**Fire wall**			
	(i)	From the direction used as a carpark		60/60/60
	(ii)	From the direction not used as a carpark		90/90/90
Column				
(a)	Steel column less than 1.5 m from a fire-source feature			60/–/– or 26 m^2/tonne
(b)	Any other column less than 1.5 m from a fire-source feature			60/–/–
(c)	Any other column not covered by (a) or (b)			–/–/–
Beam				
(a)	Less than 1.5 m from a fire-source feature			
	(i)	Steel floor beam in continuous contact with a concrete floor slab		60/–/– or 30 m^2/tonne
	(ii)	Any other beam		60/–/–
(b)	1.5 m or more from a fire-source feature			–/–/–
Roof, floor slab and vehicle ramp				–/–/–

Note to Table 5.2: ESA/M means the ratio of exposed surface area to mass per unit length

SPECIFICATION C1.10
Fire hazard properties

1. SCOPE

This Specification sets out requirements in relation to the fire hazard properties of linings, materials and assemblies in Class 2 to 9 buildings as set out in Table 1.

2. APPLICATION

Linings, materials and assemblies in Class 2 to 9 buildings must comply with the appropriate requirement described in Table 1.

Table 1 Fire Hazard Property Requirements

Lining, Material or Assembly	Requirement
Floor linings and floor coverings	Clause 3
Wall linings and ceiling linings	Clause 4
Air-handling ductwork	Clause 5
Lift cars	Clause 6
In fire control rooms subject to Specification C1.8 and fire isolated exits	Clause 7
In Class 9b buildings used as a theatre, public hall or the like: a) fixed seating in the audience area or auditorium b) a proscenium curtain required by Specification H1.3	Clause 7
Escalators, moving walkways and non-required non-fire-isolated stairways or pedestrian ramps subject to Specification D1.12	Clause 7
Sarking-type material	Clause 7
Attachments to internal floors, walls and ceilings	Clause 7
Other materials including insulation	Clause 7

3. FLOOR LININGS AND FLOOR COVERINGS

.1 A floor lining or floor covering must have:

a) A critical radiant flux not less than that listed in Table 2

b) A maximum smoke development rate of 750 percent-minutes in a building not protected by a sprinkler system (other than a FPAA101D or FPAA101H system) complying with Specification E1.5

c) A group number complying with Clause 6(b), for any portion of the floor covering that is continued more than 150 mm up a wall

Table 2 Critical Radiant Flux (CHF in kW/m^2) of Floor Linings and Floor Coverings

Class Of Building	Building Not Fitted With A Sprinkler System Complying with Specification E1.5	Building Fitted With A Sprinkler System Complying with Specification E1.5	Fire-Isolated Exits and Fire Control Rooms
Class 2, 3, 5, 6, 7, 8 or 9b, excluding: (i) Class 3 accommodation for the aged (ii) Class 9b as specified below	2.2 kW/m^2	1.2 kW/m^2	2.2 kW/m^2
Class 3 Accommodation for the aged	4.5 kW/m^2	2.2 kW/m^2	4.5 kW/m^2
Class 9a	4.5 kW/m^2	2.2 kW/m^2	4.5 kW/m^2
Class 9a Areas other than patient care areas	2.2 kW/m^2	1.2 kW/m^2	4.5 kW/m^2
Class 9b auditorium or audience seating area used mainly for indoor swimming or ice skating	1.2 kW/m^2	1.2 kW/m^2	2.2 kW/m^2
Class 9b auditorium or audience seating area used mainly for other sports or multi-purpose functions	2.2 kW/m^2	1.2 kW/m^2	2.2 kW/m^2
Class 9c resident use areas	N/A	2.2 kW/m^2	4.5 kW/m^2
Class 9c areas	N/A	1.2 kW/m^2	4.5 kW/m^2
Note to Table 2: Requirements do not apply to FPAA101D or FPAA101H System sprinkler systems			

4. WALL AND CEILING LININGS

.1 Properties of a wall or ceiling lining system must be tested for fire-resistance by a Registered Testing Authority and comply with the group number specified in Table 3 and 4.

.2 Buildings not fitted with a sprinkler system (other than a FPAA101D or FPAA101H system) complying with Specification E1.5 must have:

a) A smoke growth rate index not more than 100. or

b) An average specific extinction area less than 250 m2/kg

.3 A group number of a wall or ceiling lining and the smoke growth rate index or average specific extinction area must be determined in accordance with AS 5637.1 Determination of Fire Hazard Properties,Part 1: Wall and Ceiling Linings.

Table 3 General Properties of Group Numbers Assigned to Wall and Ceiling Linings

Group Number	General Properties
1	**Non-combustible**, very low flammability, including concrete, brick, certain types of glass
2	**Limited combustibility**, low flammability, including plasterboard, fiber cement sheeting
3	**Combustible**, average flammability, including timber, types of plywood, particleboard
4	**Highly combustible**, high flammability, including foam insulation

Table 4 Group Numbers for Wall and Ceiling Lining Materials by Building Cassification

Class of Building	Fire-Isolated Exits and Fire Control Rooms	Public Corridors	Specific Areas	Other Areas
Unsprinklered				
Class 2 or 3, excluding accommodation for the aged, people with disabilities, and children	Walls: 1 Ceilings: 1	Walls: 1, 2 Ceilings: 1, 2	Walls: 1, 2, 3 Ceilings: 1, 2, 3	Walls: 1, 2, 3 Ceilings: 1, 2, 3
Class 3 or 9a, accommodation for the aged, people with a disability, children and health-care buildings	Walls: 1 Ceilings: 1	Walls: 1 Ceilings: 1	Walls: 1, 2 Ceilings: 1, 2	Walls: 1, 2, 3 Ceilings: 1, 2, 3
Class 5, 6, 7, 8 or 9b schools	Walls: 1 Ceilings: 1	Walls: 1, 2 Ceilings: 1, 2	Walls: 1, 2, 3 Ceilings: 1, 2	Walls: 1, 2, 3 Ceilings: 1, 2, 3
Class 9b other than schools	Walls: 1 Ceilings: 1	Walls: 1 Ceilings: 1	Walls: 1, 2 Ceilings: 1, 2	Walls: 1, 2, 3 Ceilings: 1, 2, 3
Sprinklered				
Class 2 or 3, excluding accommodation for the aged, people with disabilities, and children	Walls: 1 Ceilings: 1	Walls: 1, 2, 3 Ceilings: 1, 2, 3	Walls: 1, 2, 3 Ceilings: 1, 2, 3	Walls: 1, 2, 3 Ceilings: 1, 2, 3
Class 3 or 9a, accommodation for the aged, people with a disability, children and health-care buildings	Walls: 1 Ceilings: 1	Walls: 1, 2 Ceilings: 1, 2	Walls: 1, 2, 3 Ceilings: 1, 2, 3	Walls: 1, 2, 3 Ceilings: 1, 2, 3
Class 5, 6, 7, 8 or 9b schools,	Walls: 1 Ceilings: 1	Walls: 1, 2, 3 Ceilings: 1, 2, 3	Walls: 1, 2, 3 Ceilings: 1, 2, 3	Walls: 1, 2, 3 Ceilings: 1 ,2, 3
Class 9b other than schools	Walls: 1 Ceilings: 1	Walls: 1, 2 Ceilings: 1, 2	Walls: 1, 2, 3 Ceilings: 1, 2, 3	Walls: 1, 2, 3 Ceilings: 1, 2, 3
Class 9	Walls: 1 Ceilings: 1	Walls: 1, 2 Ceilings: 1, 2	Walls: 1, 2, 3 Ceilings: 1, 2, 3	Walls: 1, 2, 3 Ceilings: 1, 2, 3

Notes to Table 3:

1. "Sprinklered" means a building fitted with a sprinkler system (other than a FPAA101D or FPAA101H system) complying with Specification E1.5.

2. "Specific areas" means within:

- *a) for Class 2 and 3 buildings, a sole-occupancy unit*
- *b) for Class 5 buildings, open plan offices with a minimum floor dimension/floor to ceiling height ratio > 5*
- *c) for Class 6 buildings, shops or other building with a minimum floor dimension/floor to ceiling height ratio > 5*
- *d) for Class 9a health-care buildings, patient care areas*
- *e) for Class 9b theatres and halls, and auditorium; and for Class 9b schools, a classroom*
- *f) for Class 9c buildings, resident use area*

5. LIFT CARS

Rigid and flexible ductwork in a Class 2 to 9 building must comply with the fire hazard properties set out in AS 4254.1 Ductwork for Air-Handling Systems in Buildings, Part 1: Flexible Duct and AS 4254.2 Ductwork for Air-Handling Systems in Buildings, Part 2: Rigid Duct.

6. AIR-HANDLING DUCTWORK

.1 Materials used as:

a) Floor linings and floor coverings must have a critical radiant flux not less than 2.2

b) Wall and ceiling linings must be a Group 1 material or a Group 2 material in accordance with Table 3 and 4, and AS 5637.1 Determination of Fire Hazard Properties, Part 1: Wall and Ceiling Linings.

7. OTHER MATERIALS

.1 Materials and assemblies in a Class 2 to 9 building not included in Clauses 3, 4, 5 or 6 must not exceed the indices set out in Table 5.1 and 6.

Table 5 Smoke Developed Index General Properties

SDI Number	General Properties	
1	Low smoke production and very high fire performance Used in evacuation routes and fire-resistant enclosures	Non-combustible material such as concrete, brick, types of glass
2	Low smoke production and high fire performance Used in areas where smoke management is important for occupant safety and evacuation safety	Fire-resistant plasterboard Fiber cement sheeting Concrete masonry units, Fire-resistant glass
3	Moderate smoke production, acceptable fire performance Used where smoke management is important in non-critical building areas where occupant safety is important	Standard plasterboard Types of plywood and particleboard Types of timber products such as veneer
4	Moderate smoke production and fire performance Not suitable for use in areas required to be fire-resisting such as an evacuation route or place of safety or where occupant safety could be compromised	Types of plywood Medium-density fiberboard (MDF) Types of synthetic insulation Types of wall coverings
5	Significant smoke production Not suitable where fire safety and smoke management are significant concerns	Types of foamed plastics Types of fabrics and textiles Types of polymers
6	Significant smoke production, highly combustible Not suitable where fire safety and smoke management are significant concerns	Highly combustible plastics Types of synthetic fabrics, textiles Low-density polyethylene (LDPE)
7	Substantial smoke production and extremely combustible Not suitable where fire safety and smoke management are significant concerns	Highly flammable plastics Types of foamed plastics Highly combustible synthetic fabrics, textiles
8	High smoke production and extremely combustible Not suitable where fire safety and smoke management are significant concerns	Types of highly flammable plastics Highly combustible synthetic fabrics, textiles Types of Insulation Materials
9	Extremely high smoke production and extremely high combustible Pose a significant fire safety risk	Type of extremely flammable plastics Highly combustible synthetic fabrics, textiles Types of highly flammable insulation materials
Notes to Table 5: Specific values of SDI vary for any one material based on material properties. Testing and certification by a Registered Testing Authority are necessary to enable an SDI Index number to be assigned to a material or product.		

Table 6 Fire Hazard Properties for Other Building Elements

Material or assembly location	Flammability Index	Spread-of-Flame Index	Smoke-Developed Index
Fire control rooms subject to Specification E1.8 and fire-isolated exits , other than a Sarking-type material used in a ceiling or used as an attachment or part of an attachment to a building element. Note 1	N/A	0	2
Any part of fixed seating in the audience area or auditorium of a.Class 9b buildings used as a theatre, public hall or the like	N/A	0	5
A proscenium curtain required by Specification H1.3 for a Class 9b buildings used as a theatre, public hall or the like	N/A	0	3
Escalators, moving walkways or non-required non-fire-isolated stairways or pedestrian ramps subject to Specification D1.12	N/A	0	5
Sarking-type material in a fire control room subject to Specification E1.8 or a fire-isolated exit or fire control room used in the form of an exposed wall or ceiling	0	N/A	N/A
Sarking-type material: In other locations. Note 2	5	N/A	N/A
Other materials or locations and insulation materials other than Sarking-type materials. Notes 2 and 3	N/A	9	8 if the Spread-of-Flame Index is more than 5

Notes to Table 4:

1. In a fire control room or fire-isolated stairway, a material used as an attachment or part of an attachment to a building element must, if combustible, be attached directly to a non-combustible substrate and not exceed 1 mm finished thickness.

2. A material, other than one located within a fire-isolated exit or fire control room, may be covered on all faces by concrete or masonry not less than 50 mm thick, as an alternative to meeting the specified indices.

3. In the case of a composite member or assembly, the member or assembly must be constructed so that when assembled as proposed in a building:

a) Any material which does not comply with this Table is protected on all sides and edges from exposure to the air

b) The member or assembly, when tested in accordance with Schedule 6, has a Spread-of-Flame Index and a Smoke-Developed Index not exceeding those prescribed in this Table

c) *The member or assembly retains the protection in position so that it prevents ignition of the material and continues to screen it from access to free air for a period of not less than 10 minutes*

SPECIFICATION C1.8
Structural tests for lightweight construction

1. SCOPE

This Specification describes tests to be applied to and criteria to be satisfied by a wall system of lightweight construction.

2. APPLICATION

A wall system need not be tested in accordance with this Specification for static pressure or impact if it is designed and constructed in accordance with the Deemed-to- Satisfy Provisions of Section B to resist the appropriate pressures and impacts defined in this Specification.

3. TESTS

.1 WALLS OF CERTAIN CLASS 9B BUILDINGS

.1 Lightweight construction forming:

a) A wall of a lift shaft and stair shaft

b) An external and internal wall bounding a public corridor, public lobby or the like, including a fire-isolated and non fire-isolated passageway or ramp, in a spectator stand, sports stadium, cinema or theatre, railway or bus station or airport terminal, must be subjected to the following tests and must fulfil the following criteria:

(i) The materials tests of Clause 5(a) and the criteria of Clause 6(a)

(ii) A static test by the imposition of a uniformly distributed load of 1.0 kPa (or its equivalent) in accordance with Clause 5(b) and the damage and deflection criteria of Clauses 6(b) and (c) respectively

(iii) A dynamic test by the fall of the impact bag through a height of 350 mm in accordance with Clause 5(c) and the damage and deflection criteria of Clauses 6(b) and (d) respectively

(iv) The surface indentation test of Clause 5(d) and the surface indentation criterion of Clause 6(e)

.2 WALLS OF SHAFTS AND FIRE-ISOLATED EXITS GENERALLY

.1 A wall of lightweight construction that is required to be fire-resisting and which bounds a lift shaft, stair shaft, or service shaft, fire-isolated passageway or fire-isolated ramp must be subjected to the following tests and must fulfil the following criteria:

a) The materials tests of Clause 5(a) and the criteria of Clause 6(a)

b) A static test by the imposition of a uniformly distributed load of 0.35 kPa (or its equivalent) in accordance with Clause 5(b) and the damage and deflection criteria of Clauses 6(b) and (c) respectively

c) A dynamic test by the fall of the impact bag through a height of 150 mm in accordance with Clause 5(c) and the damage and deflection criteria of Clauses 6(b) and (d) respectively

d) The surface indentation test of Clause 5(d) and the surface indentation criterion of Clause 6(e)

.3 ADDITIONAL REQUIREMENTS FOR LIFT SHAFTS

.1 In addition to the requirements of Clauses 3.1 and 3.2, a wall system for use in a lift shaft that is required to be fire-resisting must be subjected to dynamic test by the imposition of:

a) Where the lift car speed is 7 m/s or less: 106 cycles of a uniformly distributed load between 0 and 0.2 kPa (or its equivalent), or

b) Where the lift car speed is greater than 7 m/s: 106 cycles of a uniformly distributed load between 0 and 0.35 kPa (or its equivalent) in accordance with Clause 5(e) and must fulfil the damage criteria of Clause 6(b)

.2 The wall system must be subjected to the static test in accordance with Clause 3.2(b) after the successful conclusion of the dynamic test specified in (a).

.4 WALLS GENERALLY

.1 An external and internal wall of lightweight construction that is required to be fire-resisting, other than one covered by Clauses 3.1, 3.2 or 3.3, must be subjected to the following tests and must fulfil the following criteria:

a) The materials tests of Clause 5(a) and the criteria of Clause 6(a)

b) A static test by the imposition of a uniformly distributed load of 0.25 kPa (or its equivalent) in accordance with Clause 5(b) and the damage and deflection criteria of Clauses 6(b) and (c) respectively

c) A dynamic test by fall of the impact bag through a height of 100 mm in accordance with Clause 5(c) and the damage and deflection criteria of Clauses 6(b) and (d) respectively.

d) The surface indentation test of Clause 5(d) and the surface indentation criterion of Clause 6(e)

4. TEST SPECIMENS

.1 GENERAL

.1 Testing must be carried out on either:

a) Construction in-situ, or

b) A laboratory specimen of the construction

.2 TESTING IN-SITU

If testing is carried out in-situ, it must be done on that part of the construction least likely, because of the particular combination of the height of the walls, the support conditions and other aspects of the construction, to resist the loads.

.3 TESTING OF SPECIMENS

.1 If a laboratory specimen is tested, the specimen must span only in the direction corresponding to the height of the wall and testing must be done in accordance with either (a) or (b) below:

a) The test specimen:

(i) Height (or length, if the specimen is tested horizontally) must be identical with the height between supports in the actual construction

(ii) Must be supported at the top and bottom (or at each end if tested horizontally) by components identical with, and in a manner identical with, the actual construction

.2 If the distance between supports of the actual construction is more than 3 m, then a smaller specimen may be tested but:

a) The distance between supports must be not less than 3 m

b) Forces, reactions and support conditions must be modelled so as to reproduce the behavior of the actual construction if it were tested in-situ

5. TEST METHODS

.1 Tests must be carried out in accordance with the following:

a) **Material tests:** use the methods specified for the constituent materials of the construction of the standards adopted by reference in the FNBC

b) **Resistance to static pressure tests:** use the provisions for testing walls under transverse load in ASTM E72-15 Standard Test Methods of Conducting Strength Tests of Panels for Building Construction, except that:

(i) Support conditions must be as specified in Clause 4.3

(ii) Equivalent load shall mean the quarter-point load that produces the same deflection or central moment as appropriate

(iii) The timber species nominated in that standard may be substituted with a different species

c) **Resistance to impact tests:** use provisions for testing wall systems in ASTM E695-03 Standard Method for Measuring Relative Resistance of Wall, Floor, and Roof Construction to Impact Loading, except that:

(i) The point of impact must be set 1.5 m above finished floor level or 1.5 m above the part of the specimen that corresponds to finished floor level

(ii) The impact bag must be not less than 225 mm in diameter and not more than 260 mm in diameter and have a mass of not less than 27.2 or more than 27.3 kg

(iii) The mass must be achieved by putting loose, dry sand into the bag and must be adjusted before each series of impact tests

(iv) Where the impact bag and suspension cannot be vertical at the instant of impact on a curved surface or an inclined surface, the height of drop is the net height at the point

d) **Resistance to surface indentation tests:** must be carried out at three points on the surface of an undamaged sample sheet as follows:

(i) A steel ball of 10 mm diameter with a load of 150 N must be placed gently on the surface of the sheet and allowed to remain in position for 5 minutes

(ii) The ball and load must then be removed and the diameter of each impression of the ball on the surface measured

e) **Resistance of lift shaft construction to repetitive load test:** As for 5(b) except that:

(i) It is sufficient to test one specimen with the pressure applied from the side of the construction on which the lift will operate

(ii) The load must be applied dynamically at a frequency not less than 1 Hz and not more than 3 Hz

(iii) Equivalent load shall mean the quarter-point load that produces the same central moment as the distributed load.

6. CRITERIA FOR COMPLIANCE

.1 The wall system or the specimen of it must fulfil the following criteria:

a) **Materials**: must comply with the applicable standard adopted by reference in the FNBC

b) **Damage**: there must be no crack, penetration or permanent surface-deformation to a depth of more than 0.5 mm or any other non-elastic deformation or fastener failure

c) **Deflection - Static Pressure: u**nder static pressure, the deflection must not be more than:

(i) 1/240th of the height between supports, or

(ii) For construction other than a lift shaft - 30 mm, or

(iii) For a lift shaft - 20 mm

d) **Deflection - Impact**: under impact, the instantaneous deflection must not be more than:

(i) 1/120th of the height of the wall between supports, or

(ii) For construction other than a lift shaft - 30 mm, or

(iii) For a lift shaft - 20 mm

e) **Surface indentation**: no impression must be more than 5 mm in diameter

SPECIFICATION C1.11

Performance of external walls in fire

1. SCOPE

This Specification contains measures to minimise, in the event of fire, the likelihood of external walls covered by Clause 2 collapsing outwards as complete panels and the likelihood of panels separating from supporting members.

2. APPLICATION

.1 This Specification applies to buildings having a rise in storeys of not more than 2 with concrete external walls that could collapse as complete panels (e.g. tilt-up and precast concrete) which:

a) Consist of either single or multiple panels attached by steel connections to lateral supporting members

b) Depend on those connections to resist outward movement of the panels relative to the supporting members

c) Have height to thickness ratio not greater than 50

3. GENERAL REQUIREMENTS FOR EXTERNAL WALL PANELS

.1 Cast-in inserts and fixings must be anchored into the panel with welded bars or be fixed to the panel reinforcement.

.2 Cast-in inserts for top connections and fixings acting together must be able to resist an ultimate load of two times the larger of the forces required to develop:

a) The ultimate bending moment capacity of the panel at its base, or

b) The overturning moment at the base of the panel arising from an outwards lateral displacement at the top of the panel equal to one tenth of the panel height

.3 Top connections of the panel exposed to fire, such as clips and drilled-in inserts, acting together must be able to resist an ultimate load of six times the larger of the forces required to develop the moment specified in 2a) or b).

.4 The increased forces specified by use of the multiplier of two or six in Clause .2 and .3 above are to take account of the lower strength of the connections and members at the higher than ambient temperatures expected in a fire.

.5 Lateral supporting members and their connections must be designed to resist the connection forces specified in Clase .2 and .3 above.

.6 In the case of an eaves tie member, the force in the member must be determined assuming that it deforms in a manner compatible with the lateral displacement of the wall panels, and that it acts in tension only.

.7 External wall panels that span vertically must have at least two upper connections per panel to the supporting member, except that where a number of panels are designed to act as one unit, (e.g. tongue and groove hollow-core panels), only two upper connections are required for each unit.

.8 External wall panels that span horizontally between columns must have at least two connections at each column.

.9 Connections providing lateral support to a panel must be designed to remain engaged to the supported panel both before and during a fire.

4. ADDITIONAL REQUIREMENTS FOR VERTICALLY SPANNING EXTERNAL WALL PANELS ADJACENT TO COLUMNS

.1 Where vertically spanning external wall panels are located adjacent to columns, connections to the panels must be located and/or detailed to minimise forces that may develop between the panels and columns arising from the restraint of differential displacement.

.2 The requirements of Clause .1 above are satisfied by:

a) Detailing the connections and/or the supporting member to sustain a relative outward displacement between the panels and columns at the connection height where d(m) is calculated as:

i. The square of the connection height (m) divided by one hundred and twenty-five, when the connection height is less than 5 m, or

ii. The connection height (m) divided by twenty-five, when the connection height (m) is greater than or equal to 5 m, or

b) In situations where an eaves tie member is used to provide lateral support to external wall panels, the tie member is connected to the panels no closer than a distance (s) from the column where s(m) is taken as one quarter of the panel height (m)

SPECIFICATION C1.13

Cavity barriers for fire-protected timber

1. SCOPE

This Specification sets out requirements for cavity barriers in fire-protected timber construction.

2. REQUIREMENTS

.1 Cavity barriers must be provided in the following locations where fire-protected timber is used in any of the listed elements:

a) At concealed cavities adjacent to junctions between fire-resisting floor/ceiling assemblies and fire-resisting walls

b) At concealed cavities adjacent to junctions between fire-resisting floor/ceiling assemblies and fire-resisting or non-combustible external walls

c) At concealed cavities adjacent to junctions between fire-resisting walls and fire-resisting or non-combustible external walls

d) Around the perimeter of door and window openings in fire-resisting construction

.2 Cavity barriers must be installed so they are tight fitting and are able to withstand thermal expansion and structural movement without the loss of seal against fire and smoke.

.3 In addition to cavity barriers required by Clause 2.1 above, horizontal and vertical cavity barriers are to be provided to wall cavities within, around or adjacent to fire-protected timber elements as follows:

a) Horizontal cavity barriers at not more than 5 m centres

b) Vertical cavity barriers at not more than 10 m centres

.4 Cavity barriers must:

a) Achieve the performance specified in Table 1 based on the highest FRL of the elements they are mounted within or seal against, or

b) Consist of:

i. Timber with the minimum thickness specified in Table 1, or

ii. Polyethylene-sleeved mineral wool or mineral wool slabs or strips placed under compression to achieve the minimum thickness specified in Table 1

.5 Cavity barriers provided around openings may be formed by the window or door frame if:

a) The frame is constructed of steel or timber with the minimum thickness specified in Table 1 for timber

b) The frame is tightly fitted to rigid construction and mechanically fixed in position.

.6 The FRL of cavity barriers in fire-protected timber construction must be determined in accordance with Schedule 5 applying the criteria for control joint systems specified in Section 10 of **AS 1530.4 Methods for Fire Tests on Building Materials, Components and Structures** with the cavity barrier

system fitted within an opening between timber members exposed directly to the furnace heating conditions.

.7 Notwithstanding anything to the contrary in Schedule 5 Fire Resistance of Building Elements or AS 1530.4 Methods for Fire Tests on Building Materials, Components and Structures, the test results from Clause 2.6 above may be used when the fire-protected timber is constructed from timber having a nominal density at least equal to the tested timber.

Table 1 Cavity Barrier Requirements

Cavity Barrier Requirements	Wall Fire Resistance	
	–/60/60 or –/90/90	**–/120/120, –/180/180 or –/240/240**
FRL	–/45/45	–/60/60
Timber, required minimum thickness	45 mm	60 mm
Mineral wool, required minimum thickness	45 mm	60 mm

Note to Table 1:

Minimum thicknesses are to be measured in the direction of heat flow.

SPECIFICATION C1.13A
Fire-protected timber

1. SCOPE

This Specification contains requirements for fire-protected timber and procedures for determining the time at which the temperature at the interface between the protection system and the timber is exceeded.

2. REQUIREMENTS

.1 GENERAL REQUIREMENTS

.1 Fire-protected timber must:

a) Utilise a non-combustible fire-protective covering fixed in accordance with the system requirements to achieve an FRL not less than that required for the building element

b) Have a non-combustible fire-protective covering fixed in accordance with system requirements:

(i) To achieve a resistance to the incipient spread of fire of not less than 45 minutes when tested in accordance with:

A. **For horizontal elements:** AS 1530.4 Methods for Fire Tests on Building Materials, Components and Structures. Part: 4 Fire Resistance Tests for Elements of Construction

B. For other elements: the relevant test procedures in AS 1530.4 Methods for Fire Tests on Building Materials, Components and Structures. Part: 4 Fire Resistance Tests for Elements of Construction applied to the element lining, or

(ii) Which consists of not less than 2 layers of 13 mm thick, fire-protective grade plasterboard

.2 For the purposes of Clause 2.1.1a) below, the non-combustible fire-protective covering may form all or part of the non-combustible fire-protective covering provided under Clause 2.1.1b) below.

.2 MASSIVE TIMBER

.1 Fire-protected timber, where the timber is massive timber, need not comply with Clause 2.1 if the fire-protected timber:

a) Utilises a non-combustible fire-protective covering fixed in accordance with system requirements to achieve an FRL not less than that required for the building element

b) Has a non-combustible fire-protective covering fixed in accordance with system requirements:

(i) So as the temperature at the interface between the protection system and the timber does not exceed 300°C during a fire resistance test performed in accordance with Clause 3 for the application and periods listed in Table 1, or

(ii) Not less than that specified by Table 1, and

(iii) Has any cavity:

A. Between the surface of the timber and the fire-protective covering, or

B. Between timber elements within the fire-protective covering, filled with non-combustible insulation, or

(i) Has no cavity:

A. Between the surface of the timber and the fire-protective covering, or

B. Between timber members within the fire-protective covering

c) For the purposes of Clase 2.1 (a) above, the non-combustible fire-protective covering provided under Clause 2.1 (a)(ii) above may form all or part of the non-combustible fire-protective covering provided under Clause 2.1 (a)(i) above.

Table 1 Interface Temperature and Minimum Fire Protective Grade Plasterboard Thickness

Application	Time – without timber interface exceeding 300°C (mins)	Minimum thickness of fire-grade plasterboard (mm)
Inside a fire-isolated stairway or lift shaft	20	13
External walls within 1 m of an allotment boundary or 2 m of a building on the same allotment	45	2 x 13
All other applications	30	16

3. DETERMINATION OF TIME THE TIMBER INTERFACE TEMPERATURE EXCEEDS 300°C FOR TIMBER AT LEAST 75 MM THICK

.1 FORM OF TEST

.1 Tests must be carried out in accordance with the Standard Fire Test or an equivalent, or more severe test, on the timber element with the proposed non-combustible coverings fixed in a representative manner, with the time the timber interface temperatures exceeded 300°C confirmed in a report from an Accredited Testing Laboratory.

.2 If a fire protection system incorporates joints, the test specimens must incorporate representative joints.

.3 Interface temperatures must be measured over the following features by a minimum of two thermocouples:

a) At joint positions in the protection systems

b) At least 200 mm from any joint

c) At service penetrations

d) At any other locations where, in the opinion of the Accredited Testing Laboratory, the interface temperature may be higher than the above positions

e) The temperatures must be measured in accordance with Appendix C1 and Section 2 of **AS 1530.4 Methods for Fire Tests on Building Materials, Components and Structures. Part: 4 Fire Resistance Tests for Elements of Construction** appropriate

.2 SMALLER SPECIMEN PERMITTED

.1 An Accredited Testing Laboratory may carry out the test specified in Clause 3.1 above at pilot scale, provided:

a) A specimen (which must be not less than 1000 mm x 1000 mm) adequately represents the proposed construction in the building

b) The fire resistance of the specimen has already been determined in a full scale test performed in accordance with **AS 1530.4 Methods for Fire Tests on Building Materials, Components and Structures. Part: 4 Fire Resistance Tests for Elements of Construction** to demonstrate adequate retention of the fire protection system in conjunction with the timber elements being protected

c) The results of the test do not apply to construction larger than limits defined by the Accredited Testing Laboratory conducting the pilot examination

.3 ACCEPTANCE CRITERIA

The time the timber interface temperature exceeds 300°C must be taken as the minimum time any of the thermocouples specified in Clause 3.1 above exceeded 300°C.

SPECIFICATION C2.5
Smoke-proof walls in health-care and residential care buildings

1. SCOPE

This Specification sets out requirements for the construction of smoke-proof walls in Class 9a health-care buildings and Class 9c buildings. Smoke-proof walls required to have an FRL are to be in accordance with requirements for roof cladding in Section B1.3 Cyclone and Flooding Protection.

2. CLASS 9A HEALTH-CARE BUILDINGS

.1 Smoke-proof walls required by C2.5 in Class 9a health-care buildings must comply with the following:

a) Be non-combustible and extend to the underside of:

(i) The floor above, or

(ii) A non-combustible roof covering, or

(iii) A ceiling having a resistance to the incipient spread of fire to the space above itself of not less than 60 minutes

b) Not incorporate any glazed areas unless the glass is safety glass as defined in:

(i) AS 1288 Glass in Buildings: Selection and Installation

(ii) AS/NZS 2208 Safety Glazing Materials in Buildings

c) Only have doorways which are fitted with smoke doors complying with Specification C3.4 Fire Doors, Smoke Doors, Fire Windows, fire Shutters

d) Have all openings around penetrations and the junctions of the smoke-proof wall and the remainder of the building stopped with non-combustible material to prevent the free passage of smoke

e) Incorporate smoke dampers where air-handling ducts penetrate the wall unless the duct forms part of a smoke hazard management system required to continue air movement through the duct during a fire

3. CLASS 9C BUILDINGS

.1 Smoke-proof walls in Class 9c buildings must comply with the following:

a) The wall may be lined on one side only

b) Linings on the wall must be non-combustible and extend to the underside of:

(i) The floor above, or

(ii) A non-combustible roof covering, or

(iii) A flush plasterboard ceiling lined with 13 mm standard grade plasterboard or a fire-protective covering, with all penetrations sealed against the free passage of smoke

.2 If plasterboard is used in the lining on a wall, it must be a minimum of 13 mm standard grade plasterboard, and:

a) Not incorporate any glazed areas unless the glass is safety glass as defined in **AS 1288 Glass in Buildings: Selection and Installation**

b) Only have doorways which are fitted with smoke doors complying with Specification C3.4

c) Have all openings around penetrations and the junctions of the smoke-proof wall and the remainder of the building stopped with non-combustible material to prevent the free passage of smoke

d) Incorporate smoke dampers where air-handling ducts penetrate the wall unless the duct forms part of a smoke hazard management system required to continue air movement through the duct during a fire

4. DOORWAYS IN SMOKE-PROOF WALLS

.1 A door required to be smoke-proof by Section C or D of the FNBC or this Specification or has an FRL other than one that serves a fire compartment provided with a zone pressurisation system in accordance with **AS 1668.1 The Use of Air conditioning and Ventilation in Buildings, Part 1: Fire and Smoke Control in Buildings** must provide a smoke reservoir by not extending within 400 mm of the underside of:

a) A roof covering, or

b) The floor above, or

c) An imperforate false ceiling that will prevent the free passage of smoke

SPECIFICATION C3.4
Fire doors, smoke doors, fire windows and shutters

1. SCOPE

.1 This Specification sets out requirements for the construction of fire doors, smoke doors, fire windows and fire shutters.

.2 A fire door, smoke door, fire window and fire shutter must have labelling or certification by a registered testing authority or registered professional consultant (Fire Engineer) that guarantees the required performance.

2. FIRE DOORS

.1 A required fire door in a Class 2 to 9 building must:

a) Comply with **AS 1905.1 Components for the Protection of Openings in Fire-Resistant Walls, Part 1: Fire-Resistant Doorsets**

b) Not fail by radiation through any glazed part during the period specified for integrity in the required FRL

c) Be a minimum of 1.0m in width

d) Prevent the spread of flames and heat during a fire and allow occupants to safely evacuate the building

.2 A fire door must contain:

a) A fire-resistant core consisting of fire-resistant materials such as mineral wool or solid timber

b) Fire-resistant frame and hardware (hinges, locks, latch) that achieve the required FRL

c) Intumescent seal around the edges of the door that will expand when exposed to heat and create a barrier to prevent the passage of smoke and gases

.3 If glazing is used, it must be:

a) Fire resistant and achieve the required FRL

b) Contain safety glass (tempered or laminated) that complies with Appendix B Glazing Tables

c) Contain a manifestation as per Section G4 Lighting and Windows

d) Contain a kickplate at the based of the door or other impact-resistant material

3. SMOKE DOORS

.1 A smoke door must be constructed so that smoke will not pass from one side of the doorway to the other and allow occupants to evacuate safely.

.2 A smoke door located in an evacuation route must have the required fire-resistance.

.3 A smoke door of one or two leaves satisfies Clause 3.1 above if it is constructed as follows:

a) The leaves are side-hung to swing:

(i) In the direction of egress, or

(ii) In both directions

b) The leaves are:

(i) Normally in the closed position, or

(ii) Closed automatically with the automatic closing operation initiated by smoke detectors that are:

A. Installed in accordance with the relevant provisions of **AS 1670.1 Automatic Fire Detection and Alarm Systems Part 1: Fire Detection, Warning, Control and Intercom System**

B. Located on each side of the doorway not more than 1.5 m horizontal distance from the doorway

(iii) Solid-core and at least 35 mm thick or are capable of resisting smoke at 200°C for 30 minutes

(iv) Fitted with smoke seals

(v) Fail-safe in the closed position In the event of power failure to the door

(vi) Returned to the fully closed position after each manual opening

c) Any glazing incorporated in the door complies with **AS 1288 Glass in Buildings: Selection and Installation**

.4 If a glazed panel is capable of being mistaken for an unobstructed exit, the presence of the glass must be identified by an opaque mid-height band, mid-rail, crash-bar or other opaque construction.

.5 A smoke door must have a clear width to accommodate a wheelchair (minimum width of 915 mm).

4. FIRE SHUTTERS

.1 A required fire shutter used to mitigate the potential for fire spread must:

a) Be a shutter that:

(i) Is identical with a tested prototype that has achieved the required FRL

(ii) Is installed in the same manner and in an opening that is not larger than the tested prototype

(iii) Not have a rise in average temperature on the side remote from the furnace of more than 140 K during the first 30 minutes of the test, or

b) Be a steel shutter complying with **AS 1905.2 Components for the protection of openings in fire-resistant walls, Part 2: Fire-Resistant Roller Shutters** if a metallic fire shutter is not prohibited in Section C Fire Protection

.2 A fire shutter must not be used as an intended means of escape for building occupants.

.3 A fire shutter is generally not permitted in an evacuation route, but may be placed in an evacuation route providing it has the same FRL as the wall, floor or ceiling in which it is installed and a Registered Professional Consultant (Fire Engineer) approves of such placement.

5. FIRE WINDOWS

.1 A required fire window must be designed and tested to achieve the required FRL, or be:

a) Identical in construction with a prototype that has achieved the required FRL

b) Installed in the same manner and in an opening that is not larger than the tested prototype

.2 A fire window must contain:

a) Fire-resistant glass that achieves the required FRL

b) Intumescent strips or seals around the edges of the window that will expand when exposed to heat and create a barrier to prevent the passage of smoke and gases

c) Fire-resistant framing material and hardware (hinges, locks, latch)

.3 A fire window must be constructed and installed to prevent the spread of fire, smoke and toxic gases for the duration of the fire resistance rating.

SPECIFICATION C3.15

Penetration of walls, floors and ceilings by services

1. SCOPE

This Specification prescribes materials and methods of installation for services that penetrate walls, floors and ceilings required to have an FRL.

2. APPLICATION

.1 This Specification applies to installations permitted under the Deemed-to-Satisfy Provisions of the FNBC as alternatives to systems that have been demonstrated by test to fulfil the requirements of Section C3.D13 Openings for Service Installations in the FNBC.

.2 This Specification does not apply to installations in ceilings required to have a resistance to the incipient spread of fire nor to the installation of piping that contains or is intended to contain a flammable liquid or gas.

3. METAL PIPE SYSTEMS

.1 A pipe system comprised entirely of metal (excluding pipe seals or the like) that is not normally filled with liquid must not be located within 100 mm, for a distance of 2 m from the penetration, of any combustible building element or a position where combustible material may be located, and must be constructed of:

a) Copper alloy or stainless steel with a wall thickness of at least 1 mm, or

b) Cast iron or steel (other than stainless steel) with a wall thickness of at least 2 mm

.2 An opening for a pipe system comprised entirely of metal (excluding pipe seals or the like) must:

a) Be neatly formed, cut or drilled

b) Be no closer than 200 mm to any other service penetration

c) Accommodate only one pipe

.3 A pipe system comprised entirely of metal (excluding pipe seals or the like) must be wrapped but must not be lagged or enclosed in thermal insulation over the length of its penetration of a wall, floor or ceiling unless the lagging or thermal insulation fulfils the requirements of Clause 7 below.

.4 The gap between a metal pipe and the wall, floor or ceiling it penetrates must be fire-stopped in accordance with Clause 7 below.

4. PIPES PENETRATING SANITARY COMPARTMENTS

.1 If a pipe of metal or UPVC penetrates the floor of a sanitary compartment in accordance with Section C3.D13 of the FNBC:

a) The opening must be neatly formed and no larger than is necessary to accommodate the pipe or fitting

b) The gap between pipe and floor must be fire-stopped in accordance with Clause 7 below

5. WIRES AND CABLES

.1 If a wire or cable or cluster of wires or cables penetrates a floor, wall or ceiling:

a) The opening must be neatly formed, cut or drilled and no closer than 50 mm to any other service

b) The opening must be no larger in cross-sectional area than:

(i) 2000 mm^2 if only a single cable is accommodated and the gap between cable and wall, floor or ceiling is no wider than 15 mm, or

(ii) 500 mm^2 in any other case

c) The gap between the service and the wall, floor or ceiling must be fire-stopped in accordance with Clause 7 below.

6. ELECTRICAL SWITCHES AND OUTLETS

.1 If an electrical switch, outlet, socket or the like is accommodated in an opening or recess in a wall, floor or ceiling:

a) The opening or recess must not:

(i) Be located opposite any point within 300 mm horizontally or 600 mm vertically of any opening or recess on the opposite side of the wall, or

(ii) Extend beyond half the thickness of the wall

b) The gap between the service and the wall, floor or ceiling must be fire-stopped in accordance with Clause 7 below

7. FIRE-STOPPING

.1 Services penetrating a wall, floor or ceiling must be firestopped as follows:

a) **Material**: Must be concrete, high-temperature mineral fibre, high-temperature ceramic fibre or other material that does not flow at a temperature below 1120°C when tested in accordance with **ISO 540 Hard Coal and Coke – Determination of Ash Fusibility,** and must have:

(i) Demonstrated in a system tested in accordance with Section C3.15(a) of the FNBC that it does not impair the fire-resisting performance of the building element in which it is installed, or

(ii) Demonstrated in a test in accordance with Clause (e) below that it does not impair the fire-resisting performance of the test slab

b) **Installation**: Fire-stopping material must be packed into the gap between the service and wall, floor or ceiling in a manner, and compressed to the same degree, as adopted for testing under Clause 7(a)(i) or (ii)

c) **Hollow construction:** If a pipe penetrates a hollow wall (such as a stud wall, a cavity wall or a wall of hollow blockwork) or a hollow floor/ceiling system, the cavity must be so framed and packed with fire-stopping material that is:

(i) Installed in accordance with Clause 7(b) above to a thickness of 25 mm completely around the service for the full length of the penetration

(ii) Restrained independently of the service from moving or parting from the surface of the wall, floor or ceiling, and from breaking a seal and/or connection to the service to which it is attached

d) **Recesses**: If an electrical switch, socket, outlet or the like is accommodated in a recess in a hollow wall or hollow floor/ceiling system:

(i) The cavity immediately behind the service must be framed and packed with fire-stopping material in accordance with Clause 7(c) above, or

(ii) The back and sides of the service must be protected with refractory lining board identical with and to the same thickness as that in which the service is installed

di) **Test**: The test to demonstrate compliance of a fire-stopping material with this Specification must be conducted as follows:

(i) The test specimen must comprise a concrete slab not less than 1 m^2 and not more than 100 mm thick, and appropriately reinforced if necessary for structural adequacy during manufacture, transport and testing

(ii) The slab must have a hole 50 mm in diameter through the centre and the hole must be packed with the fire-stopping material

(iii) The slab must be conditioned in accordance with **AS 1530.4 Methods for Fire Tests on Building Materials, Components and Structures. Part: 4 Fire Resistance Tests for Elements of Construction**

(iv) Two thermocouples complying with **AS 1530.4 Methods for Fire Tests on Building Materials, Components and Structures. Part: 4 Fire Resistance Tests for Elements of Construction** must be attached to the upper surface of the packing each about 5 mm from its centre

(v) The slab must be tested on flat generally in accordance with Section 10 of **AS 1530.4 Methods for Fire Tests on Building Materials, Components and Structures. Part: 4 Fire Resistance Tests for Elements of Construction** and must achieve an FRL of 60/60/60 or as otherwise required

SPECIFICATION E1.2

Fire mains and water supply services

1. SCOPE

This specification refers to fire mains and water supply services for fire-fighting equipment in buildings.

2. GENERAL REQUIREMENTS

.1 A fire main must:

a) Be capable of supplying water at the flow rates and pressures necessary for the satisfactory operation of the required fire-fighting equipment

b) Not incorporate plastic pipes above ground

c) Not be used for other than fire-fighting purposes, except a fire main serving only hose reels may be connected to a metered supply if:

(i) The required flow rate and pressure can be maintained at the most hydraulically disadvantage hose reel

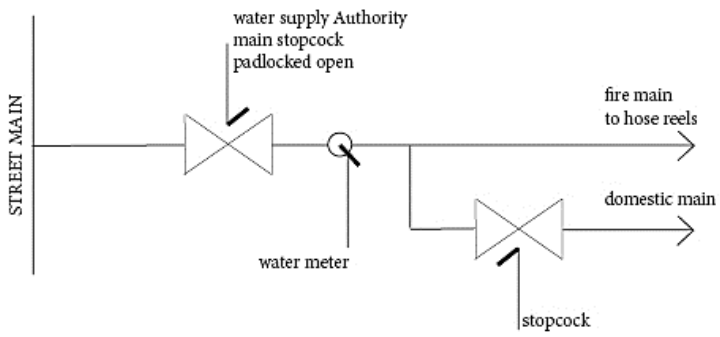
(ii) The water meter and street supply to the allotment have a nominal diameter of not less than 32 mm

(iii) Water supply pipework reticulation arrangements comply with Figure 2 or a similar arrangement

(iv) Any system valve which can isolate flow in the fire main is secured in the open position by a padlocked metal strap

.2 In buildings with a sprinkler system with a dual supply to Class A of NZS 4541 Automatic Fire Sprinkler Systems, the water supply to any wet riser main system and/or hose reels may be taken from one of those supplies provided the rates of flow and pressures are adequate for both or all three purposes.

Figure 2.1 Water Supply Reticulation: Combined Services



3. WATER SUPPLIES FOR SPRINKLER SYSTEMS

.1 All water supplies for sprinkler systems must satisfy the requirements of **NZS 4541 Automatic Fire Sprinkler Systems**, and:

a) A Class C single supply system must comprise:

(i) A street main which may be boosted by a diesel fire pump unit

(ii) On-site storage or any source allowed by the Standard, or

(iii) A combined supply from two street mains which individually are inadequate

b) A Class A dual supply system must include:

(i) A street main which may be boosted by a diesel fire pump or, any other primary source

(ii) A separate on-site storage or other source allowed by the Standard, with an independent electric or diesel fire pump

4. FIRE PUMP ENCLOSURES

.1 Fire pumps must be located in a room or enclosure which has a FRL of not less than 60/60/30 and is:

a) Within the building, or

b) External but not within 6 m of the building and any fire-source feature

5. BOOSTER AND CHARGED DRY RISER MAIN CONNECTIONS AND CABINETS

.1 Each fire brigade booster connection and the fire service inlet connection for a charged dry riser main system must be in locked cabinets accessible only to the fire service.

.2 If the system is fitted with a pressure gauge, the gauge must comply with **AS 1349 Bourdon Tube Pressure and Vacuum Gauges**, and have a full scale reading of not less than 25% more than the pressure to which the system has been hydrostatically tested.

.3 Cabinets may be located:

a) At the external wall of a building if they are within sight of the main entrance and for Class 6,7,8 or 9b buildings, separated from the building by construction having a FRL of not less than 60/60/30 for not less than 2 m each side of and above the top of the cabinet

b) Remote from the building if they are:

(i) At the boundary of the allotment

(ii) Within sight of the main entrance to the building

(iii) Adjacent to the principal vehicular access to the allotment and located not less than 10 m from the external wall of any building, or

c) In any other suitable position

.4 A permanent fade and water-resistant plan, equal to photo-engraved anodized aluminum, must be displayed in a prominent position within the cabinet, showing the following information:

a) The layout of the building and adjacent streets

b) The layout of the fire hydrant system reticulation, with supply authority street mains and size, location of street and allotment hydrants, fire hose reels, booster connections, street and allotment isolating and non-return valves, pumps and tanks

c) The operational discharge pressure and pressure at zero flow of any pump installed in the system

d) The capacity of any tank connected to the system

e) The height of the highest hydrant outlet above the lowest booster inlet connection

f) The year of installation of the system

.5 Suitable provision must be made for the drainage of water from within a booster or charged dry riser main system cabinet.

SPECIFICATION E1.5

Fire sprinkler systems

1. SCOPE

This Specification sets out requirements for the design and installation of fire sprinkler systems.

2. APPLICATION OF AUTOMATIC FIRE SPRINKLER STANDARDS

.1 Subject to this Specification, an automatic fire sprinkler system must comply with:

a) For all building classifications: **AS 2118.1 Automatic Fire Sprinkler Systems, Part 1: General System**, or

b) For a Class 2 or 3 building with an effective height of not more than 25 m and a rise in storeys of 4 or more: Specification E1.5a Fire Sprinkler Systems in Class 2 and 3 Buildings Not More Than 25 m in Effective Height, and the relevant provisions of this Specification as applicable, or

c) For Class 5, 6, 7, 8, 9a (other than a residential care building) or 9b parts of a building with an effective height not more than 25 m, the relevant provisions of this Specification except:

(i) FPAA101D sprinkler system cannot be used where the Class 5, 6, 7, 8, 9a (other than a residential care building) or 9b parts:

A. Contain more than 2 storeys, or
B. Are more than 25% of the total floor area of the building, or
C. Are located above the fourth storey

(ii) FPAA101D or FPAA101H sprinkler system cannot be used where the Class 7a part (other than an open-deck carpark) accommodates more than 40 vehicles, or

d) For a Class 9a health-care building used as a residential care building: **AS 2118.4 Automatic Fire Sprinkler Systems, Part 4: Sprinkler Protection for Accommodation Buildings not Exceeding Four Storeys in Height** as applicable, or

e) For a Class 2, 3 or 9c building: **AS 2118.4 Automatic Fire Sprinkler Systems, Part 4: Sprinkler Protection for Accommodation Buildings not Exceeding Four Storeys in Height** as applicable

.2 All portions of a building containing Class 2 or 3 parts must comply with Specification E1.5a Fire Sprinkler Systems in Class 2 and 3 Buildings Not More Than 25 m in Height.

.3 A combined sprinkler and fire hydrant system must comply with **AS 2118.6 Automatic Fire Sprinkler Systems, Part 6: Combined Sprinkler and Hydrant Systems in Multi-storey Buildings**

3. SEPARATION OF SPRINKLERED AND NON-SPRINKLERED AREAS

.1 Where a part of a building is not protected with sprinklers, the sprinklered and non-sprinklered parts must be fire-separated with a wall or floor which must:

a) Comply with any specific requirement of the Deemed-to-Satisfy Provisions of Section C Fire Protection, or

b) Where there is no specific requirement, comply with the relevant part of AS 2118 Automatic Fire Sprinkler Systems, FPAA101D or FPAA101H.

4. PROTECTION OF OPENINGS

.1 Any openings, including those for service penetrations, in construction separating sprinklered and non-sprinklered parts of a building, including the construction separating the areas nominated for omitted protection in AS 2118.1 Automatic Fire Sprinkler Systems, Part 1: General Requirements, must be protected in accordance with:

a) Deemed-to-Satisfy Provisions of Section C Fire Protection

b) Specification C3.15 Penetration of Walls, Windows, Floors and Ceilings by Services

5. FAST RESPONSE SPRINKLERS

.1 Fast response sprinklers may be installed only if they are suitable for the type of application proposed and it is demonstrated that the sprinkler system is designed to accommodate their use.

6. SPRINKLER VALVE ENCLOSURES

.1 Sprinkler alarm valves must be located in a secure room or enclosure which has direct egress to a road or open space.

.2 All sprinkler valve rooms and enclosures must be secured with a system suitable for use by the fire brigade.

7. WATER SUPPLY

.1 A required sprinkler system must be provided with at least one water supply.

.2 A required sprinkler system in a building greater than 25 m in effective height must be provided with dual water supply, except that a secondary water supply storage capacity of 25,000 litres may be used if:

a) The storage tank is located at the topmost storey of the building

b) The building occupancy is classified as no more hazardous than Ordinary Hazard 2 (OH2) under AS 2118.1 Automatic Fire Sprinkler Systems, Part 1: General Requirements

c) An operational fire brigade service is available to attend to a building fire

8. BUILDING OCCUPANT WARNING SYSTEM

A required sprinkler system, except a FPAA101D sprinkler system, must be connected to and activate a building occupant warning system complying with Clause 7 of Specification E2.2a Smoke Detection and Alarm Systems.

9. CONNECTION TO OTHER SYSTEMS

Where a smoke hazard management system is installed and is actuated by smoke detectors, the sprinkler system must, wherever practicable, be arranged to also activate the smoke hazard management system.

10. ANTI-TAMPER DEVICES

.1 Where a sprinkler system is installed:

a) Over any stage area in a theatre, public hall or the like, visual and audible status indication of sprinkler valves must be provided at the location normally used by the stage manager, or

b) In a space housing lift electrical and control equipment (including machine rooms, secondary floors and sheave rooms), any valves provided to control sprinklers in these spaces must be located adjacent to the space

.2 Any valves provided to control sprinklers required by Clause (a) above must be fitted with anti-tamper monitoring devices connected to a monitoring panel.

11. SPRINKLER SYSTEMS IN CARPARKS

.1 A sprinkler system protecting a multi-classified building with a carpark must:

a) Comply with Table 3.2 of Specification C1.1 Performance of External Walls in Fire

b) Be designed such that the section protecting the non-carpark part can be isolated without interrupting the water supply or otherwise affecting the effective operation of the section protecting the carpark

12. RESIDENTIAL-CARE BUILDINGS

.1 In addition to the provisions of **AS 2118.4 Automatic Fire Sprinkler Systems, Part 4: Sprinkler Protection for Accommodation Buildings not Exceeding Four Storeys in Height**, a sprinkler system in:

a) A Class 3 building used as a residential care building, or

b) A Class 9a health-care building used as a residential care building, or

c) A Class 9c building, or

d) Any other Class 2, 3 or 5 residential building that has a fire sprinkler system

Must:

(i) Be provided with a monitored main stop valve in accordance with **AS 2118.1 Automatic Fire Sprinkler Systems, Part 1: General Requirements**

(ii) Be permanently connected with a direct data link or other approved monitoring system to a fire station, fire station dispatch centre, or other approved monitoring service via a sprinkler alarm switch in accordance with **AS 1670.3 Automatic Fire Detection and Alarm Systems, Part 3: Fire Detection, Warning, Control and Intercom Systems- System Design, Installation and Commissioning Fire Alarm Monitoring**

13. SPRINKLER SYSTEMS IN LIFT INSTALLATIONS

.1 Where sprinklers are installed in a space housing lift electrical and control equipment, including machine rooms, secondary floors and sheave rooms, sprinklers in these spaces must:

a) Have heads protected from accidental damage by way of a guard that will not impair the performance of the head

b) Be capable of being isolated and drained, either separately or collectively, without isolating any other sprinklers within the building

.2 Valves provided to control sprinklers referred to in Clause (a) above must be installed in accordance with Clause 10(b) above.

SPECIFICATION E1.5A

Fire sprinkler systems in Class 2 and 3 buildings less than 25 m in height

1. SCOPE AND APPLICATION

This Specification sets out requirements for the design and installation of fire sprinkler systems, and concessions for Class 2 and 3 buildings not more than 25 m in effective height with a rise in storeys of 4 or more. The Deemed-to-Satisfy Provisions of this specification take precedence where there is a difference in the provisions of the Deemed- to-Satisfy Provisions of FNBC Sections C and D.

2. SYSTEM REQUIREMENTS

.1 A required automatic fire sprinkler system installed in a Class 2 or 3 building with an effective height of not more than 25 m and a rise in storeys of 4 or more must comply with:

a) AS 2118.1 Automatic Fire Sprinkler Systems, Part 1: General Systems, or

b) AS 2118.4 Automatic Fire Sprinkler Systems, Part 1: Sprinkler Protection for Accommodation Buildings not Exceeding Four Storeys in Height, as applicable, or

c) FPAA101D, except for residential care buildings, or

d) FPAA101H, except for residential care buildings

.2 A Class 2 or 3 building not more than 25 m in effective height with a rise in storeys of 4 or more provided with an automatic fire sprinkler system under Clause 2(a)(i) or 2(a)(ii) below may be constructed in accordance with Clause 3(a) below, as applicable, provided:

a) The automatic fire sprinkler system is permanently connected to a fire alarm monitoring system connected to a fire station or fire station dispatch centre in accordance with Specification E2.2d Residential Fire Safety System if:

(i) The system has more than 100 sprinkler heads, or

(ii) In the case of a residential care building, the building will accommodate more than 32 residents

b) For bedrooms, the automatic fire sprinkler system is fitted with sprinklers complying with Clause 4.4, 4.5 and 5.5.2 of 2118.4 Automatic Fire Sprinkler Systems, Part 1: Sprinkler Protection for Accommodation Buildings not Exceeding Four Storeys in Height

c) An automatic smoke detection and alarm system is installed in accordance with Specification E2.2a Smoke Detection and Alarm Systems except that it need not be connected to a fire alarm monitoring system connected to a fire station or fire station dispatch centre, and in the case of a residential care building it must be installed in accordance with:

(i) Clause 4 of Specification E2.2a Smoke Detection and Alarm Systems, or

(ii) Clause 3 in Specification E2.2a Smoke Detection and Alarm Systems, provided Specification E2.2a Clause 3(a)(ii) is applied as if the building was not protected with a sprinkler system, and

(iii) Specification E2.2d Residential Fire Safety Systems

d) In a residential care building, the automatic smoke detection and alarm system and the automatic fire sprinkler system are connected to a local fire indicator panel provided in accordance with Specification E2.2d Residential Fire Safety System

3. PERMITTED CONCESSIONS

.1 The following concessions are permitted for Class 2 and 3 buildings provided with a required automatic fire sprinkler system in accordance with Clause 2(a)(i) or 2(a)(ii) above:

a) The FRL for self-closing fire doors, as required by FNBC Section C3.D7 Openings in Fire-Isolated Exits and C3.D10 Bounding Construction in Class 2, 3 and 4 Buildings, may be reduced to not less than -/30/30

b) The FRL for:

(i) Non load-bearing internal walls and shafts constructed of fire-protected timber required to have FRLs greater than -/60/60 according to Specification C1.1 Fire-resisting Construction, may be reduced to -/60/60

(ii) All other non load-bearing internal walls not required to be fire-protected timber, as required by Specification C1.1 Fire-resisting Construction, may be reduced to -/45/45

(iii) Service penetrations through non load-bearing internal walls and shafts constructed of fire-protected timber, as required by FNBC Section C3.D13 Openings for Service Installations, may be reduced to not less than -/60/15

(iv) Service penetrations through internal non load-bearing walls and shafts that are not required to be fire-protected timber by FNBC Section C3.D13 Openings for Service Installations and Specification C1.1 Fire-resisting Construction may be reduced to an FRL of -/45/15

c) The FRL for fire-isolated stairways enclosed with non load-bearing construction, as required by FNBC Section D4.D2 Fire Isolated Route Placement, may be reduced to -/45/45

d) Except in a residential care building, the maximum distance of travel, as required by FNBC Section D1.D3.8 Number of Required Exits, may be increased from 6 m to 12 m

e) The maximum distance of travel from a single exit serving the storey at the level of egress to a road or open space, as required by FNBC Section D1.D3.8 Number of Required Exits, may be increased from 20 m to 30 m

f) The maximum distance between alternative exits, as required by FNBC Section D1.D3.4 Required Exit Placement for Class 2 and 3 buildings, may be increased from 45 m to 60 m

g) Internal fire hydrants are not required where:

(i) The building is served by external fire hydrants that provide compliant coverage installed in accordance with FNBC Section C4.D5 Hydrants, except that in a residential care building the nozzle at the end of the length of hose need only reach the entry door of any sole-occupancy unit, or

(ii) A dry fire hydrant system that otherwise complies with **AS 2419.1 Fire Hydrant Installation, Part 1: System Design, Installation and Commissioning** is installed in the building and:

A. Each fire hydrant head is located in accordance with FNBC Section C4 Fire Fighting Equipment and Operations and fitted with a blank end cap or plug

B. The pipework is installed in accordance with FNBC Section C4 Fire Fighting Equipment and Operations (required fire main) except that it need not be connected to a water supply

C. A hydrant booster inlet connection is provided in accordance with FNBC Section C4 Fire Fighting Equipment and Operations

D. An external street or feed hydrant capable of providing the required system flow is located within 60 m of the hydrant booster connection

.2 An emergency warning and intercom system need not be provided in a residential care building if a warning system with an override public address facility is installed in accordance with Specification E2.2d Residential Fire Safety Systems.

.3 The following concessions are permitted for Class 2 and 3 buildings provided with a required automatic fire sprinkler system in accordance with Clause 2(a)(iii) above:

a) Window openings need not be protected in accordance with FNBC Section C3.D10 Bounding Construction in Class 2, 3 and 4 Buildings provided the room served by the window is sprinkler protected.

b) The FRL for:

(i) Service penetrations through non load-bearing internal walls and shafts, as required by FNBC Section C3.D13 Openings for Service Installations, may be reduced to -/60/15

(ii) Non load-bearing fire-resisting lift and stair shafts, as required by Specification C1.1 Fire-resisting Construction may be reduced to -/60/60

c) The maximum distance of travel may be increased from 6 m to 12 m

d) The maximum distance of travel from a single exit serving the storey at the level of egress to a road or open space may be increased from 20 m to 30 m

e) The maximum distance between alternative exits, as required by FNBC Section D1.D3.4 Required Exit Placement for Class 2 and 3 buildings, may be increased from 45 m to 60 m

f) Internal fire hydrants in accordance with FNBC Section C4 Fire Fighting Equipment and Operations are not required where:

(i) The building is served by external fire hydrants that provide compliant coverage installed in accordance with FNBC Section C4 Fire Fighting Equipment and Operations, or

(ii) A dry fire hydrant system that otherwise complies with **AS 2419.1 Fire Hydrant Installation, Part 1: System Design, Installation and Commissioning** is installed in the building except:

A. The system pipework is not connected to the water supply

B. An on-site fire pump set is not required

C. The minimum fire hydrant outlet flow of 6 L/s may be achieved when boosted by a fire brigade pumping appliance

D. The minimum pipe sizes specified in **AS 2419.1 Fire Hydrant Installation, Part 1: System Design, Installation and Commissioning** do not apply

E. Each fire hydrant head is located in accordance with FNBC Section C4 Fire Fighting Equipment and Operations and fitted with a blank end cap or plug

F. A hydrant booster inlet connection is provided

G. An external street or feed hydrant capable of providing the required system flow is located within 60 m of the hydrant booster connection

.4 The following concessions are permitted for Class 2 and 3 buildings provided with a required automatic fire sprinkler system in accordance with Clause 2(a) (iv) above:

a) Window openings need not be protected in accordance with FNBC Section C3.D10 Bounding Construction in Class 2, 3 and 4 Buildings provided the room served by the window is sprinkler protected

b) The FRL for:

   (i) Service penetrations through non load-bearing internal walls and shafts, as required by FNBC Section C3.D13 Openings for Service Installations, may be reduced to -/60/15

   (ii) Non load-bearing fire-resisting lift and stair shafts, as required by Specification C1.1, may be reduced to -/60/60

c) The maximum distance of travel, as required by FNBC Section D1.D3.8 Number of Required Exits, may be increased from 6 m to 12 m

d) The maximum distance of travel from a single exit serving the storey at the level of egress to a road or open space, as required by FNBC Section D1.D3.8 Number of Required Exits may be increased from 20 m to 30 m

e) The maximum distance between alternative exits, as required by FNBC Section D1.D3.4 Required Exit Placement for Class 2 and 3 buildings, may be increased from 45 m to 60 m

SPECIFICATION E1.8

Fire control centres

1. SCOPE

This Specification describes the construction and content of required fire control centres and fire control rooms.

A fire control centre is a separate building. Clauses 2 to 5 below apply to fire control centres.

A fire control room is a dedicated room in a building or fire control centre with additional specific requirements. A fire control room must comply with Clauses 6 to 12 below, in addition to Clauses 2 to 5.

2. PURPOSE AND CONTENT

.1 A fire control centre must:

a) Provide an area from which fire-fighting operations or other emergency procedures can be directed or controlled

b) Contain controls, panels, telephones, furniture, equipment and the like relative to the fire services in the building

c) Not be used for any purpose other than the control of:

(i) Fire-fighting activities

(ii) Other measures concerning the occupant safety or security

3. LOCATION OF FIRE CONTROL CENTRE

A fire control centre must be located in a building where egress from any part of its floor to a road or open space does not involve changes in level which in aggregate exceed 300 mm.

4. EQUIPMENT NOT PERMITTED WITHIN A FIRE CONTROL CENTRE

An internal combustion engine, pumps, sprinkler control valves, pipes and pipe fittings must not be located in a fire control centre, but may be located in rooms accessed through the fire control centre.

5. AMBIENT SOUND LEVEL FOR A FIRE CONTROL CENTRE

.1 The ambient sound level within the fire control centre measured when all fire safety equipment is operating in the manner in which it operates in an emergency must not exceed 65 dB(A).

.2 The measurement must be taken for a sufficient time to characterize the effects of all sound sources.

.3 Where there is not a great variation in noise level, a measurement time of 60 seconds may be used.

6. CONSTRUCTION OF A FIRE CONTROL ROOM

.1 A fire control centre in a building more than 50 m in effective height must be in a separate room where:

a) The enclosing construction is of concrete, masonry or the like, sufficiently resistant to withstand the impact of any likely falling debris, and with an FRL of not less than 120/120/120

b) Any material used as a finish, surface, lining or the like within the room complies with the requirements of Specification C1.10 Fire Hazard Properties

c) Services, pipes, ducts and the like that are not directly required for the proper functioning of the fire control room do not pass through it

d) Openings in the walls, floors or ceiling which separate the room from the interior of the building are confined to doorways, ventilation and other openings for services necessary for the proper functioning of the facility

7. PROTECTION OF OPENINGS IN A FIRE CONTROL ROOM

.1 Openings permitted by Clause 6 above must be protected as follows:

a) Openings for windows, doorways, ventilation, service pipes, conduits and the like in an external wall of the building that faces a road or open space, must be protected in accordance with FNBC Section C Fire Protection

b) Openings in the floors, ceilings and internal walls enclosing a fire control room must, except for doorways, be protected in accordance with FNBC Section C Fire Protection

c) A door opening in the internal walls enclosing a fire-control room must be fitted with a self-closing –/120/30 smoke sealed fire door

d) Openings associated with natural or mechanical ventilation must:

(i) Not be made in any ceiling or floor immediately above or below the fire control room

(ii) Be protected by a –/120/– fire damper if the opening is for a duct through a wall required to have an FRL, other than an external wall

8. DOORS TO A FIRE CONTROL ROOM

.1 Required doors to a fire control room must open into the room, be lockable and located so that persons using an evacuation route from the building will not obstruct or hinder access to the room.

.2 The fire control room must be accessible via two paths of travel:

a) One from the front entrance of the building

b) One directly from a public place or fire-isolated passageway which leads to a public place and has a door with an FRL of not less than –/120/30

9. SIZE AND CONTENTS OF A FIRE CONTROL ROOM

.1 A fire control room must contain:

a) A fire indicator panel and necessary control switches and visual status indication for all required fire pumps, smoke control fans and other required fire safety equipment installed in the building

b) A telephone directly connected to an external telephone exchange

c) A blackboard or whiteboard not less than 1200 mm wide x 1000 mm high

d) A pin-up board not less than 1200 mm wide x 1000 mm high

e) A raked plan layout table of a size suitable for laying out the plans provided under (d)

f) Colour-coded, durable, tactical fire plans

.2 In addition, a fire control room may contain:

a) Master emergency control panels, lift annunciator panels, remote switching controls for gas or electrical supplies and emergency generator backup

b) Building security, surveillance and management systems if they are completely segregated from all other systems

.3 A fire control room must have:

a) A floor area of not less than 10 m^2 and the length of any internal side must be not less than 2.5 m

b) A net floor area of not less than 8 m^2 with a clear space of not less than 1.5 m^2 in front of the fire indicator panel If only the minimum prescribed equipment is installed

c) An additional area of not less than 2 m^2 net floor area for each additional facility and a clear space of not less than 1.5 m^2 in front of each additional control or indicator panel

d) An area required for any path of travel through the room to other areas be provided in addition to the requirements (b) and (c)

10. VENTILATION AND POWER SUPPLY FOR A FIRE CONTROL ROOM

.1 A fire control room must be ventilated by:

a) Natural ventilation from a window or doorway in an external wall of the building which opens directly into the fire control room from a road or open space, or

b) A pressurisation system that only serves the fire control room that:

(i) Is installed in accordance with **AS 1668.1 The Use of Ventilation and Air Conditioning in Buildings: Part 1: Fire and Smoke Control in Buildings**, as though the room is a fire-isolated stairway

(ii) Is activated automatically by operation of the fire alarm or sprinkler system complying with Specification E1.5 Fire Sprinkler Systems, installed in the building and manually by an over-riding control in the room

(iii) Provides a flow of fresh air through the room of not less than 30 air changes per hour when the system is operating and any door to the room is open

(iv) Has fans, motors and ductwork that form part of the system but not contained within the fire control room protected by enclosing construction with an FRL of not less than 120/120/120

(v) Has any electrical supply to the fire control room or equipment necessary for its operation connected to the supply side of the main disconnection switch for the building,

(vi) Has no openable devices other than necessary doorways

(vii) Pressure-controlled relief louvres and windows that are openable by a key must be constructed in the fire control room

11.SIGN FOR A FIRE CONTROL ROOM

The external face of the door to the fire control room must have a sign with the words:

FIRE CONTROL ROOM

in letters of not less than 50 mm high and of a colour which contrasts with that of the background.

12.LIGHTING FOR A FIRE CONTROL ROOM

Emergency lighting in accordance with Part E4 Visibility in and Emergency, Exit Signs and Warning Systems must be provided in a fire control room, except that an illumination level of not less than 400 lux must be maintained.

SPECIFICATION E2.2A
Smoke detection and alarm systems

1. SCOPE

This Specification describes the installation and operation of automatic smoke detection and alarm systems.

2. TYPE OF SYSTEM REQUIRED

.1 A required automatic smoke detection and alarm system must be provided in accordance with the following:

a) A Class 1 building must have a smoke alarm (mains-powered or battery-operated) within:

(i) Each bedroom

(ii) In each hallway connecting a bedroom to a living area

(iii) On each storey

(iv) In public hallways if there is more than one sole=occupancy unit, and

(v) All smoke alarms must be interconnected such that they all provide a warning sound if one alarm is triggered

b) A Class 2 or 3 building and Class 2, 3 or 4 part of a building must have:

(i) A smoke alarm system complying with Clause 3 below, or

(ii) A smoke detection system complying with Clause 4 below, or

(iii) A combination of a smoke alarm system and a smoke detection system, and

(iv) Must comply with Clause 2.1 above if the building contains residential sole-occupancy units or components

c) Class 5, 6, 7, 8, 9b and 9c buildings must have:

(i) A smoke alarm system and a smoke detection system, or

(ii) A combined smoke alarm and detection system

d) Class 9a health-care buildings must have a smoke detection system that:

(i) Is a combined smoke alarm and detection system where more than 6 bed patients are accommodated, or

(ii) Where 6 or less bed patients are accommodated:

A. A smoke alarm system complying with Clause 3 below, or
B. A smoke detection system complying with Clause 4 below, and
C. Must comply with Clause 2.1 above where there is over-night accommodation

e) A Class 10 building must have a smoke alarm and/or detection system if it contains a material, substance and/or operation that:

(i) Is Highly flammable

(ii) Could threaten the health and safety of building occupants or neighbouring allotments if ignited

.2 The following installations must be connected to a fire alarm monitoring system connected to a fire station or fire station dispatch centre in accordance with **AS 1670.3 Automatic Fire Detection and Alarm Systems Part 3: Fire Detection, Warning, Control and Intercom System: System Design, Installation and commissioning Fire alarm monitoring**

a) A smoke detection system in a Class 3 building

b) A smoke detection system in a Class 9a health-care building, if the building accommodates more than 20 patients

c) A smoke detection system in a Class 9c building that has:

(i) Smoke detection in accordance with Clause 5 below provided to activate a smoke exhaust system in accordance with Specification E2.2b Smoke Exhaust Systems, or

(ii) Smoke-and-heat vents in accordance with Specification E2.2c Smoke-and-heat Vents

d) An automatic fire detection and alarm system required in large isolated buildings

3. SMOKE ALARM SYSTEM

.1 A smoke alarm must be installed on or near the ceiling toward the centre of the room according to manufacturer's instructions.

Class 2 to 9 buildings

.2 A smoke alarm system must:

a) Comply with **AS 3786 Smoke Alarms** regarding selection, location, and installation of smoke alarms

b) Comply with **AS 1670.1 Automatic Fire Detection and Alarm Systems, Part 1: Fire Detection, Warning, Control and Intercom Systems - System Design, Installation and Commissioning Fire** regarding system layout, component selection, zoning, and interconnection, and connection of the smoke alarm system to other air-handling and smoke management systems

c) Be powered from the consumer mains source

.3 In kitchens and other areas where a smoke alarm is likely to cause spurious signals, an alarm acknowledgement facility must be provided, except where the kitchen or other area is in a building is protected with a sprinkler system complying with Specification E1.5 Fire Sprinkler Systems (other than a **FPAA101D** system).

.4 Where there is more than one sole-occupancy unit in the building, an interconnected alarm system must be:

a) Installed in public corridors and other internal public spaces, located in accordance with the requirements for smoke detectors in **AS 1670.1 Automatic Fire Detection and Alarm Systems, Part 1: Fire Detection, Warning, Control and Intercom Systems - System Design, Installation and Commissioning Fire**

b) Connected to activate a building occupant warning system

c) If protected with a sprinkler system complying with Specification E1.5 (other than a **FPAA101D** system), a smoke alarm is not required in public corridors and other internal public spaces

.5 For Class 9a buildings, in addition to Clause 3.2 to 3.4 above, smoke alarms must be:

a) Installed in every room, public corridor and other internal public space

b) Interconnected to provide a common alarm

c) Have manual call points installed in evacuation routes so that no point on a floor is more than 30 m from a manual call point

4. SMOKE DETECTION SYSTEM

.1 All Class 2 - 9 buildings must have a smoke detection system that:

a) Complies with **AS 1670.1 Automatic Fire Detection and Alarm Systems, Part 1: Fire Detection, Warning, Control and Intercom Systems - System Design, Installation and Commissioning Fire**

b) Activates a building occupant warning system in accordance with Clause 6 below

c) In kitchens and other areas where the use of the area is likely to result in smoke detectors causing spurious signals, smoke detection must be provided by way of:

(i) Any other detector deemed suitable in accordance with **AS 1670.1 Automatic Fire Detection and Alarm Systems, Part 1: Fire Detection, Warning, Control and Intercom Systems - System Design, Installation and Commissioning Fire**, or

(ii) An alarm acknowledgement facility is installed, or

(iii) If the kitchen or other area is in a building protected with a sprinkler system complying with Specification E1.5 Fire Sprinkler Systems (other than a FPAA101D or FPAA101H system), no detectors are required

.2 For Class 2 or 3 buildings or Class 4 parts of a building, smoke detectors must be installed:

a) Within each sole-occupancy unit

b) In public corridors and other internal public spaces

c) If protected with a sprinkler system complying with Specification E1.5 Fire Sprinkler Systems (other than a FPAA101D or FPAA101H system), smoke detectors are not required in public corridors and other internal public spaces

.3 For Class 9a health-care buildings, the following applies:

a) Photoelectric type smoke detectors must be installed in patient care areas and in paths of travel to exits from patient care areas

b) In areas other than patient care areas and paths of travel to exits from patient care areas, where the use of the area is likely to result in smoke detectors causing spurious signals, any other detector deemed suitable in accordance with **AS 1670.1 Automatic Fire Detection and Alarm Systems, Part 1: Fire Detection, Warning, Control and Intercom Systems - System Design, Installation and Commissioning Fire** may be installed

c) If an area is protected with a sprinkler system complying with Specification E1.5 Fire Sprinkler Systems, smoke detectors need not be installed where the use of the area is likely to result in spurious signals

d) Manual call points must be installed in evacuation routes so that no point on a floor is more than 30 m from a manual call point

.4 For Class 9c buildings, remote automatic indication of each zone must be given in each smoke compartment by means of:

a) Mimic panels with an illuminated display, or

b) Annunciator panels with alpha numeric display, and

c) If the building accommodates more than 20 residents, manual call points must be installed in paths of travel so that no point on a floor is more than 30 m from a manual call point

5. SMOKE CONTROL SYSTEM

.1 Smoke detectors provided to activate a smoke control system must:

a) Form part of a building fire or smoke detection system complying with AS 1670.1 Fire Detection, Warning, Control and Intercom Systems, or

b) Be a separate dedicated system incorporating control and indicating equipment complying with AS 1670.1 Fire Detection, Warning, Control and Intercom Systems

c) Activate a building occupant warning system complying with Clause 6 below, except that smoke detectors provided solely to initiate automatic shutdown of air- handling systems need not activate a building occupant warning system

.2 Smoke detectors required to activate:

a) Automatic shutdown of air-handling systems in accordance with Table 1 in Specification E2.2b Smoke Exhaust Systems, or

b) A smoke exhaust system in accordance with Specification E2.2b Smoke Exhaust Systems must:

c) Be spaced:

(i) Not more than 20 m apart and not more than 10 m from any wall, bulkhead or smoke curtain

(ii) Not more than 15 m apart and not more than 7.5 m from any wall, bulkhead or curtain

d) For a Class 6 building, have a sensitivity:

(i) In accordance with AS 1670.1 Automatic Fire Detection and Alarm Systems, Part 1: Fire Detection, Warning, Control and Intercom Systems - System Design, Installation and Commissioning Fire in areas other than a multi-storey walkway and mall

(ii) Not exceeding 0.5% smoke obscuration per metre with compensation for external airborne contamination as necessary, in a multi-storey walkway and mall

.3 Smoke detectors required to activate air pressurisation systems for fire-isolated exits and zone pressurisation systems must have additional smoke detectors installed adjacent to each bank of lift landing doors set back horizontally from the door openings by a distance of not more than 3 m.

6. BUILDING OCCUPANT WARNING SYSTEM

.1 Subject to Part E4.9 Visibility in an Emergency, Exit Signs and Warning Systems, a building occupant warning system provided as part of a smoke hazard management system must comply with Clause 3.22 of AS 1670.1 Fire Detection, Warning, Control and Intercom Systems to sound through all occupied areas.

.2 Exceptions to the above clause for a Class 2 and 3 building or Class 4 part of a building provided with a smoke alarm system in accordance with Clause 3 above are:

a) For a smoke alarm system:

(i) The sound pressure level need not be measured within a sole-occupancy unit if a level of not less than 85 dB(A) is provided at the door providing access to the sole-occupancy unit

(ii) The inbuilt sounders of the smoke alarms may be used to wholly or partially to meet requirements

b) For a smoke detection system:

(i) The sound pressure level from a building occupant warning system need not be measured within a sole-occupancy unit if a level of not less than 100 dB(A) is provided at the door providing access to the sole-occupancy unit

.3 In a Class 3 building used as a residential care building or in a patient-care area of a Class 9a health-care building, the system: must be:

a) Arranged to provide a warning for occupants in areas used by residents

b) May have its alarm adjusted in volume and content to minimise trauma consistent with the type and condition of residents

.4 In a Class 9c building, the system must be arranged to provide a warning for occupants that:

a) Notifies staff caring for the residents of the building

b) Has its alarm adjusted in volume and content to minimise trauma consistent with the type and condition of residents in areas used by residents

.5 Alarm signaling equipment must be installed:

a) In a secure, accessible position

b) In a weatherproof housing, if located externally

c) Not more than 500 mm from the system flow switch.

.6 The fire signal from the alarm signaling equipment must be mimicked by an audible and visible signal at the fire indicator panel.

SPECIFICATION E2.2B
Smoke exhaust systems

1. SCOPE

This Specification describes the requirements for mechanical smoke exhaust systems.

2. SMOKE EXHAUST CAPACITY

.1 Smoke exhaust fans must have a sufficient capacity to contain the smoke layer:

a) Within a smoke reservoir formed in accordance with Clause 4 below and not less than 2 m above the highest floor level

b) Above the top of any openings interconnecting different smoke reservoirs

.2 Exhaust rates must be determined in accordance with Figure 1, with the height measurement taken from the lowest floor level to the underside of the smoke layer and the fire load determined in accordance with Table 1.

3. SMOKE EXHAUST FANS

.1 Each smoke exhaust fan, complete with its drive, flexible connections, control gear and wiring must:

a) Be constructed and installed so that it is capable of continuous operation (exhausting the required volumetric flow rate at the installed system resistance) at a temperature of 200° C for a period of not less than 1 hour

b) In a building not fitted with a sprinkler system, be capable of continuous operation at a temperature of 300° C for a period of not less than 30 minutes

c) Be rated to handle the required volumetric flow rate at ambient temperature to be capable of exhausting cool smoke during the early stages of a fire and to allow routine testing

d) Have any high temperature overload devices installed be automatically overridden during the smoke exhaust operation

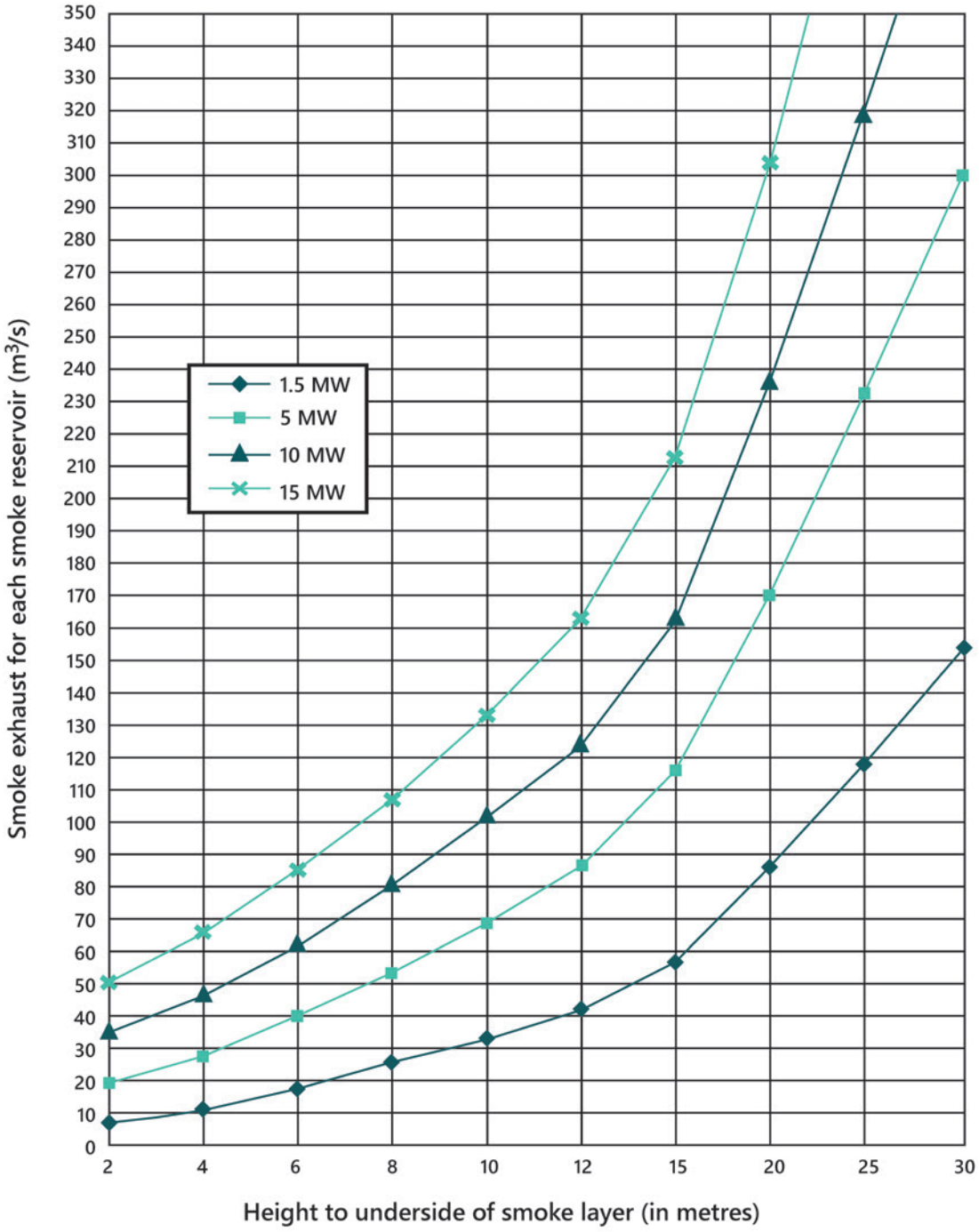
Table 1 Fire Load (MW)

Classification	Fire load (MW) for unsprinklered buildings	Fire load (MW) for sprinklered buildings
Class 2, 3 or 5	5	1.5
Class 6	10	5
Class 7 or 8	15	5
Class 9 — Generally	5	1.5
Class 9b buildings covered by Part H1 (see Note), or exhibition halls.	10	5

Note to Table 1:

If the smoke reservoir above the stage is smoke separated from the audience area, the fire load specified applies to the stage area only and the fire load for the audience area is as per Class 9 generally.

Figure 1 Smoke Exhaust Rate



4. SMOKE RESERVOIRS

.1 A fire compartment must be divided at ceiling level into smoke reservoirs formed by smoke baffles/curtains of non-combustible and non-shatterable construction.

.2 The horizontal area of a smoke reservoir must not exceed 2,000 m^2, and in enclosed walkways and malls of a Class 6 building, must not exceed 60 m in length.

.3 Smoke reservoirs must be of sufficient depth to contain the smoke layer and must not be less than 500 mm below an imperforate ceiling or roof.

.4 Within a multi-storey fire compartment, a non-combustible bulkhead or smoke baffle/curtain must be provided around the underside of each opening into a building void to minimise the spread of smoke to other storeys.

.5 The depth of the bulkhead or smoke baffle must not be less than the depth of the smoke reservoir provided under Clause 4.3 above, plus an additional 400 mm.

5. SMOKE EXHAUST FAN AND VENT LOCATION

.1 Smoke exhaust fans and vents must be located:

a) Such that each smoke reservoir is served by one or more fans

b) So that the maximum exhaust rate at any one point avoids extracting air from below the smoke layer

c) To prevent the formation of stagnant regions resulting in excessive cooling and downward mixing of smoke

d) At natural collection points for the hot smoky gases within each smoke reservoir having due regard to the ceiling geometry and its effect on the migratory path of the smoke

e) Away from the intersection of walkways or malls

f) To ensure that any voids containing escalators and/or stairs commonly used by the public are not used as a smoke exhaust path

g) To discharge directly to outdoor with a velocity of not less than 5 m/s, at a suitable point not less than 6 m from any air intake point or exit

6. MAKE-UP AIR

.1 Low level make-up air must be provided either automatically or via permanent ventilation openings to replace the air exhausted so as to minimise:

a) Any disturbance of the smoke layer due to turbulence created by the incoming air

b) The risk of smoke migration to areas remote from the fire due to the effect of make-up air on the air balance of the total system

.2 The velocity of make-up air through doorways must not exceed 2.5 m/s.

.3 Within a multi-storey fire compartment, make-up air must be provided across each vertical opening from a building void to the fire-affected storey at an average velocity of 1 m/s to minimise the spread of smoke from the fire-affected storey to other storeys.

7. SMOKE EXHAUST SYSTEM CONTROL

.1 Each smoke exhaust fan must be activated sequentially by smoke detectors complying with Specification E2.2a Smoke Detection and Alarm Systems and arranged in zones to match the smoke reservoir served by the fan(s).

.2 Subject to Clause 7.3 below, an air handling system (other than individual room units less than 1000 L/s and miscellaneous exhaust air systems installed in accordance with Sections 5 and 6 of **AS 1668.1 Fire and Smoke Control in Buildings**) which does not form part of the smoke hazard management system must be automatically shut down on the activation of the smoke exhaust system.

.3 Air handling systems in all non fire-affected zones may operate on 100% outdoor air to provide make-up air:

a) To the fire-affected zone in a single storey fire compartment

b) To the fire-affected storey via building voices connecting storeys in a multi-storey fire compartment

.4 Manual override control and indication together with operating instructions for use by emergency personnel must be provided adjacent to the fire indicator panel in accordance with the requirements of Clauses 4.11 and 4.13 of **AS 1668.1 Fire and Smoke Control in Buildings**.

.5 Manual control for the smoke exhaust system must also be provided at a location normally used by the stage manager in a theatre.

.6 Power supply wiring to exhaust fans together with detection, control, and indication circuits (and where necessary to automatic make-up air supply arrangements) must comply with **AS 1668.1 Fire and Smoke Control in Buildings**.

8. SMOKE DETECTION

A smoke detection system must be installed in accordance with Specification E2.2a Fire Detection and Alarm Systems to activate the smoke exhaust system.

SPECIFICATION E2.2D
Fire safety systems in residential-care buildings

1. APPLICATION

This Specification describes the requirements for residential fire safety systems referenced in Specification E1.5a for Class 3, 5 and 9 residential-care buildings.

2. SMOKE ALARM SYSTEM REQUIREMENTS

.1 Residential-care buildings in Class 3, 5 and 9 must have a system of smoke alarms powered either:

a) Directly from the low voltage supply mains, or

b) From an extra-low voltage power source originating at a local fire indicator panel with a battery back-up facility

.2 A smoke detector complying with Clause 2.1.2(a)(ii), (xi) or (xv) of **AS 1670.1 Fire Detection, Warning, Control and Intercom Systems** may be substituted for a smoke alarm provided an audible alarm device is associated with each detector.

.3 The sound pressure level provided by a warning device must be equivalent to that required in Clause 3.22 of **AS 1670.1 Fire Detection, Warning, Control and Intercom Systems**, except that the sound pressure level need not be measured inside a sole-occupancy unit, provided that a level of not less than 85 dB(A) is attained at the access door to the unit.

.4 The alarm system must be wired for low voltage or extra-low voltage wiring.

.5 The system must be designed so:

a) An audible alarm is given in the area in which the smoke alarm activates

b) Visible and audible indication of an alarm is provided at the local fire indicator panel

c) An audible alarm is given in any area (including sleeping quarters and staff outbuildings) set aside for staff use

.6 The smoke alarm system is not required to be connected to a fire alarm monitoring system (refer to Clause 2(b)(iii) of Specification E1.5a Fire Sprinkler Systems in Class 2 and 3 Buildings.

3. ALARM ZONES

.1 The maximum number of smoke alarms on any one alarm zone must:

a) Be determined by the maximum current output rating of the system source

b) Not exceed 10

.2 Each alarm zone must be located around a single central access passageway, corridor or similar thoroughfare, to enable staff to readily identify the source of the alarm.

.3 Where the smoke alarm is functionally dependent on an external power source, an audible fault signal must sound at the local fire indicator panel if that power source fails.

4. FIRE INDICATOR PANEL

.1 The local fire indicator panel must be located in a central area, such as a reception area, so that it is readily accessible by staff at all times.

.2 The local fire indicator panel must incorporate the following:

a) A battery back-up power supply capable of operating the system for 12 hours

b) Connections to extra-low voltage smoke alarms

c) Terminals for input signal conductors from the smoke alarm and residential sprinkler system. If the signal source is from a low voltage smoke alarm, external isolation must be provided

d) Visible indication of the alarm zone in which the actuating device is located

e) Automatic audible and visible indication of the following faults:

(i) A break in the wiring of any circuit between smoke alarms or sprinkler alarm switch and the local fire indicator panel

(ii) Low battery condition

(iii) Automatic visible indication of mains power failure

(iv) Initiation of any ancillary control facilities such as smoke door release or air-conditioning shut-down

(v) Local operation of individual smoke alarms, in the event of alarm zone isolation at the local fire indicator panel

.3 If the local fire indicator panel is also used for other non-fire related purposes such as security, then these functions must be on separate and distinct circuits. When disabled or isolated, these functions must not interfere with the operation of fire alarm circuitry.

.4 The local fire indicator panel must comply with **AS 1670.1 Automatic Fire Detection and Alarm Systems Part 1: Fire Detection, Warning, Control and Intercom Systems - System Design, Installation and Commissioning Fire**

.5 The local fire indicator panel must have the capacity to incorporate heat detectors deemed suitable in accordance with **AS 1670.1 Fire Detection, Warning, Control and Intercom Systems** on either the same or separate alarm zones as the smoke alarms.

.6 Requirements for a smoke alarm connected to a local fire indicator panel include:

a) Extra-low voltage smoke alarms must be compatible with the local fire indicator panel

b) Low voltage smoke alarms must be configured to send an output alarm signal to the local fire indicator panel

c) Unless there is internal isolation of the signal output conductors, they must at all times be treated as low voltage conductors

d) Requirements for a signal isolation interface unit for a local fire indicator panel include:

(i) Signal isolation interface units must isolate any low voltage connected to the smoke alarms from the local fire indicator panel

(ii) Signal isolation interface units must be certified by an Accredited Testing Laboratory as compatible with the specific types of smoke alarms used in the system

(iii) Signal isolation interface units must be acceptable to the electricity supply authority.

(iv) Units must be marked in a clearly visible location, with letters greater than or equal to 35 mm containing the following information:

SMOKE ALARM SIGNAL ISOLATION UNIT WARNING — 240V
Isolate power supply before removing cover

5. POWER AND WIRING

.1 The local fire indicator panel must be permanently connected to a reliable 240 V separate low voltage final sub-circuit.

.2 Source power must be protected by a separate circuit breaker, or fuse, supplied from the live side of the main switch.

.3 The local fire indicator panel, smoke alarms and associated equipment must be fixed wired for low voltage or extra-low voltage wiring systems, as applicable.

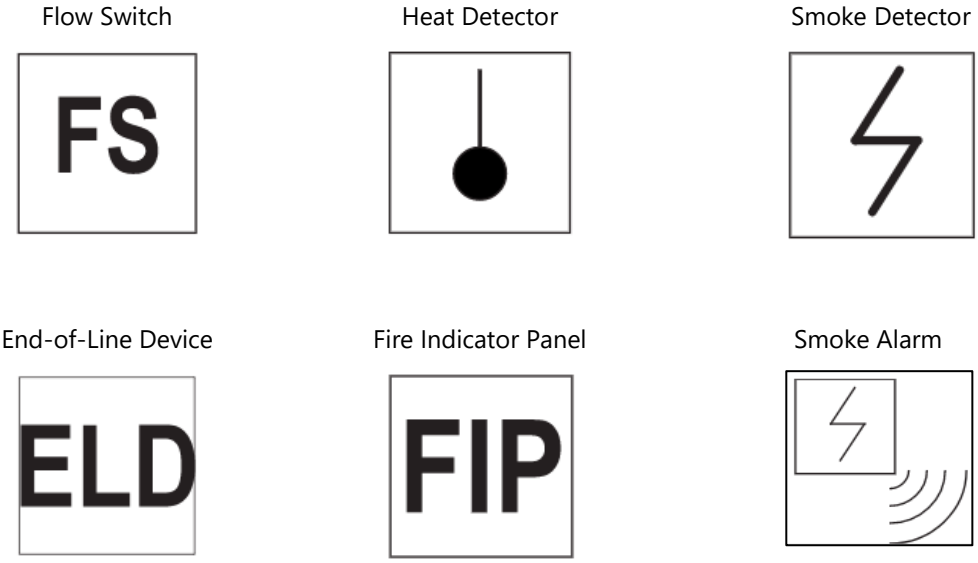
.4 All extra-low voltage wiring must be red sheathed 0.6/1 kV stranded, with conductors having a cross sectional area of not less than 0.75 mm^2.

.5 Clear and concise "as-installed" single line electrical drawings with a suitable scale, showing rooms, external and internal walls, fixed partitions, doorways etc., must be provided for each installation of a local fire indicator panel.

.6 Electrical drawings must include the actual location of fire alarms, smoke alarms, sprinkler flow switches (where installed), alarm connection points and local fire indicator panel, to enable easy identification of alarm system elements and their relationship to the building layout.

.7 Symbols to be used in electrical drawings include the following:

Figure 1 Symbols for Electrical Drawings



SPECIFICATION E2.4

Air-handling systems in buildings

1. SCOPE

This Specification outlines the performance and operation of mechanical ventilation and air-conditioning systems as they relate to smoke control in buildings.

2. COMMONLY USED SYSTEMS

.1 The following commonly used systems may be installed:

a) Small stand-alone or window units without ducting

b) Central chilled water systems with fan coil unit located in each story without any ducting

c) Central chilled water systems with separate air handling plants in each storey or fire compartment and associated independent ducting for the storey, or fire compartment

d) Individual packaged plants and associated ducting for each storey, or

e) Central plan where all the conditioning is done and with the ducting system connecting several fire compartments or storeys

3. ACTION ON DETECTION OF SMOKE FIRE OR FLAME

.1 In the case of small units the power supply to the unit must be switched of manually. With all other systems immediately on activation of any of the detection units:

a) The total system for the whole building must shut down

b) Any required exit pressurization system must operate

c) Any required smoke exhaust system or smoke-and-heat vent must operate

4. COMPLIANCE

.1 The action required under 3 a), b), or c) must be automatic and activated by:

a) Smoke detectors located in each storey or fire compartment in accordance with Specification E1.8 Fire Control Centres and with Ducted Systems, located just upstream of the supply fan as well as in the main return duct, or

b) By any other suitable fire alarm system including a sprinkler system, installed within the building

SPECIFICATION G3.8
Fire and smoke control systems in buildings containing atriums

1. SCOPE

This Specification sets out the requirements for the design and operation of systems of fire and smoke control in a building containing an atrium.

2. GENERAL REQUIREMENTS

.1 Except where varied or superseded by this Specification, a mechanical air-handling system in a building containing an atrium must:

a) Comply with AS 1668.1 The Use of Ventilation and Air Conditioning in Buildings, Part 1: Fire and Smoke Control in Buildings

b) Be installed in every building containing an atrium, except where varied or superseded by this Specification or standards in the FNBC

3. AUTOMATIC SPRINKLER SYSTEM

.1 A sprinkler system (other than a FPAA101D or FPAA101H system) complying with Specification E1.5 Fire Sprinkler Systems must be installed in every building containing an atrium, except where varied or superseded by this Specification or standards in the FNBC.

Automatic sprinklers

.2 A roof of an atrium which does not have the FRL prescribed in Specification C1.1 Fire-resisting Construction or the Deemed-to-Satisfy Provisions of Part C2 must be protected by automatic sprinklers arranged to wet both the covering membrane and supporting structure if the roof is:

a) Less than 12 m above the floor of the atrium or the floor of the highest storey where the bounding construction is set back more than 3.5 m from the atrium well if a Class 2, 3, 5 or 9 part of a building is open to the atrium, or

b) Less than 20 m above the floor of the atrium or the floor of the highest storey where the bounding construction is set back more than 3.5 m from the atrium well if a Class 6, 7 or 8 part of a building is open to the atrium, and the temperature rating of sprinkler heads providing roof protection must be within the range 79°C–100°C

Atrium floor protection

.3 The floor of the atrium must be protected by sprinklers with:

a) The use of sidewall pattern sprinkler heads together with overhead sprinklers where dictated by the dimensions of the atrium

b) Sprinkler heads of the fast response type

Wall wetting system on glazed walls

.4 Where an atrium is separated from the remainder of the building by walls or doors incorporating glazing, a wall wetting system must be provided to protect the glazing as follows:

a) On the atrium side of the glazing, to all glazed walls which are set back more than 3.5 m from the atrium well

b) On the atrium side of the glazing to all glazed walls which are not set back, or are set back 3.5 m or less from the atrium well, for all levels which are less than:

(i) 12 m above the floor of an atrium or the floor of the highest storey where the bounding wall is set back more than 3.5 m from the atrium well if a Class 2, 3, 5 or 9 part of the building is open to the atrium, or

(ii) 20 m above the floor of an atrium or the floor of the highest storey where the bounding wall is set back more than 3.5 m from the atrium well if a Class 6, 7 or 8 part of the building is open to the atrium

c) On the side of the glazing away from the well: to all glazing forming part of the bounding wall at each storey

.5 Sprinklers must be located in positions allowing full wetting of the glazing surfaces without wetting adjacent sprinkler heads.

.6 Sprinkler heads must be the fast-response type and have a maximum temperature rating of 74°C

Water discharge rate

.7 The rate of water discharge to protect glazing must not be less than:

a) On the atrium side of the glazing:

(i) 0.25 L/s.m^2 where glazing is not set back from the atrium well, or

(ii) 0.167 L/s.m^2 where glazing is set back from the atrium well

b) On the side away from the atrium well -- 0.167 L/s.m^2

Water supply

.8 In addition to basic sprinkler protection, the water supply to required wall wetting systems must be of adequate capacity to accommodate the following on the atrium side of the glazing:

a) Where the bounding walls are set back less than 3.5 m from the atrium well, wall wetting must be provided of a part not less than 6 m long for a height of not less than:

(i) 12 m above the floor of an atrium or the floor of the highest storey where the bounding wall is set back more than 3.5 m from the atrium well if a Class 2, 3, 5 or 9 part of the building is open to the atrium, or

(ii) 20 m above the floor of an atrium or the floor of the highest storey where the bounding wall is set back more than 3.5 m from the atrium well if a Class 6, 7 or 8 part of the building is open to the atrium

b) Where the walls are setback 3.5 m or more from the atrium well, wetting must be provided of a part not less than 12 m long on one storey

Stop Valves

.9 Basic sprinkler and wall wetting systems protecting a building containing an atrium must be provided with easily accessible and identified independent stop valves.

.10 Sprinkler heads protecting the roof of the atrium must be provided with a stop valve.

.11 Stop valve to wall wetting and roof sprinklers may be of the gate type.

.12 All sprinkler and wall wetting stop valves must be monitored to detect unauthorised closure.

4. SMOKE CONTROL SYSTEM

.1 Mechanical air-handling systems serving an atrium must be designed to operate so that during a fire:

a) A tenable atmosphere is maintained in all paths of travel along balconies to required exits during the period of evacuation

b) Smoke exhaust fans serving the atrium are only activated when smoke enters the atrium

c) Central plant systems do not use the atrium as a return air path

.2 Central plant systems which use return air paths remote from the atrium must:

a) Cycle to the full outside air mode

b) Stop supply air to the fire affected storey or fire compartment

c) Continue to fully exhaust the fire affected storey or fire compartment and reduce the exhaust from other storeys or fire compartments by at least 75%

d) Continue to supply air to fire compartments or storeys other than the fire affected storey or fire compartment

.3 Fans performing relief or exhaust duty from the atrium must stop normal operation,

.4 In the event of a fire or other emergency, a floor-by-floor or unitary air-handling plant serving a single fire compartment or storey must:

a) Cease normal operations in the fire-affected storey or fire compartment

b) Commence full relief or exhaust from the fire-affected storey or fire compartment

c) Continue to supply air to fire compartments or storeys other than the fire-affected storey or fire compartment

.5 The smoke control system must be activated by:

a) Operation of an automatic fire alarm, or

b) Operation of the sprinkler system, or

c) A manual start switch

.6 All controls for the smoke control system must be located:

a) In the fire control room, or

b) In the emergency control centre, (if any), or

c) Adjacent to the sprinkler control valves, or

d) Incorporated within the Fire Indicator Panel

5. SMOKE EXHAUST SYSTEM

.1 A smoke exhaust system serving an atrium must be designed on the basis of:

a) The sprinkler system limiting the size of a fire to:

(i) A heat output of 1.5 MW and perimeter of 7.5 m if a Class 2, 3, 5 or 9 part of the building is open to the atrium, or

(ii) A heat output of 5 MW and perimeter of 12 m if a Class 6, 7 or 8 part of the building is open to the atrium

b) A smoke plume reaching a level 3 m above the highest storey having a path of travel to a required exit along a balcony bounding the atrium well, and not less than:

(i) 12 m above the floor of an atrium or the floor of the highest storey where the bounding wall is set back more than 3.5 m from the atrium well if a Class 2, 3, 5 or 9 part of the building is open to the atrium, or

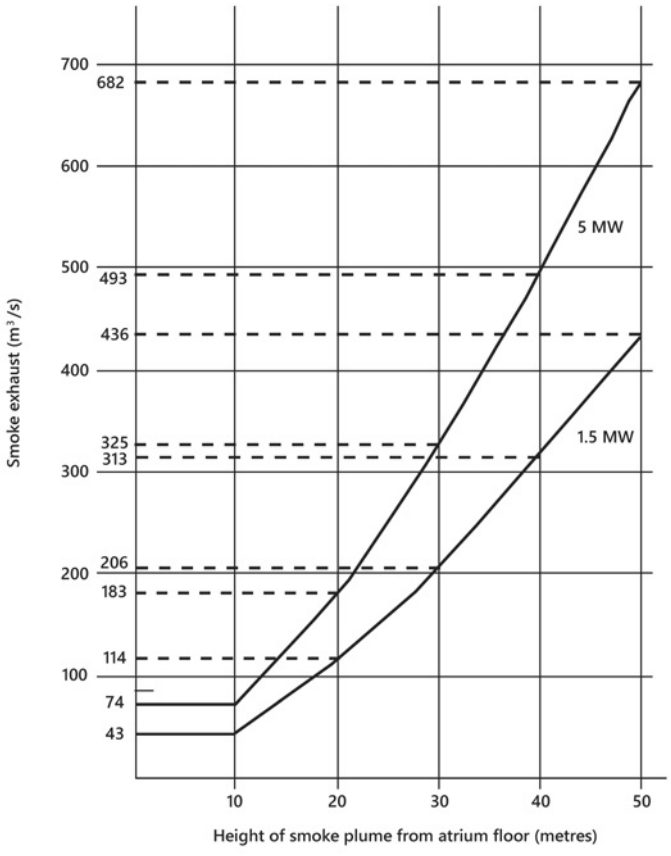
(ii) 20 m above the floor of an atrium or the floor of the highest storey where the bounding construction is set back more than 3.5 m from the atrium well if a Class 6, 7 or 8 part of the building is open to the atrium

c) The smoke exhaust system discharging smoke at a rate of not less than that shown in Figure 1 for the appropriate height of smoke plume and fire size:

(i) From the top of the atrium, or

(ii) Horizontally where calculations of wind velocity induced pressure profiles for the building verify that the exhaust system will operate effectively for all wind directions

Figure 1 Smoke Exhaust Rate



.2 Notwithstanding Clause 3.4(c) above, the average upward air velocity in the atrium, due to the required smoke exhaust quantity, must:

a) Be not less than 0.2 m/s at any level over an 18 m height above the floor of the atrium

b) Not exceed the following maximum velocities in atriums of constant cross sectional plan area:

(i) For occupancy classification qualifying for 1.5 MW fire size — 3.5 m/s

(ii) For occupancy classifications qualifying for 5 MW fire size — 5 m/s

Exhaust fans

.3 Smoke exhaust must be provided by fans capable of continuous and required operation for a period of not less than 1 hour when handling exhaust gases at 200°C.

.4 Where a Class 2, 3 or 9 part of a building adjoins an atrium, the atrium must be provided with a minimum of 3 fans each capable of 50% of the total required smoke exhaust capacity.

.5 Atriums other than those referred to in Clause .6 (b) above must be provided with a minimum of 2 fans each capable of 50% of the total required smoke exhaust capacity.

Smoke and heat vents

.6 Notwithstanding Clause 3.6 above, automatic vents complying with **AS 2665 Smoke / Heat Venting Systems - Design, Installation and Commissioning** may be used, except where a Class 6 part of a building adjoins the atrium, in lieu of exhaust fans provided that:

a) The height from the atrium floor to the bottom of the highest vent is not more than 12 m

b) The vents are fitted with a remote manual operation switch located adjacent to the sprinkler control valves or incorporated in the Fire Indicator Panel

Make-up air supply

.7 Uniformly distributed make-up air must be provided to the atrium exhaust system from:

a) Outside the atrium at or near the lowest storey level

b) Relief air from non-fire storeys

.8 A discharge volume sufficient to maintain a velocity of not less than 0.1 m/s towards the atrium well must be provided on all storeys where the bounding wall is set back from the atrium well.

.9 The requirements of Clause.8.1(a) above are satisfied if make-up air is provided to the atrium exhaust system in such a manner as to prevent, as far as possible, disturbance of the smoke layer due to turbulence created by the incoming air, through:

a) Openings directly from the outside air to the atrium and located as close as practicable to the lowest level of the atrium, or

b) Ducts from the outside air to the atrium which deliver air as close as practicable to the lowest level of the atrium and where passing through any other fire compartment having an FRL of at least 60/60/60, or

c) A combination of (a) or (b).

6. FIRE DETECTION AND ALARM SYSTEM GUIDE

.1 Except where superseded by this Specification, automatic fire detection and alarm systems in a building containing an atrium must comply with **AS 1670.1 Automatic Fire Detection and Alarm Systems, Part 1: Fire Detection, Warning, Control and Intercom Systems - System Design, Installation and Commissioning Fire**

.2 Smoke detection within an atrium:

a) Must be provided within all outside air intakes and at individual floor return air intakes of all air-handling systems to initiate automatic fire mode operation, and where applicable, comply with the restart facilities in **AS 1668.1 The Use of Ventilation and Air Conditioning in Buildings, Part 1: Fire and Smoke Control in Buildings**

b) Must operate at an obscuration level not greater than 0.5% per metre with compensation for external airborne contamination as necessary

c) Must sample air within the atrium and in storeys where the bounding wall is set back more than 3.5 m from the atrium well

d) Must be calibrated to compensate for smoke dilution where sampling occurs within return air path common to more than one room

e) May incorporate beam type detectors to sense smoke in an atrium in a Class 5, 6, 7 or 8 building with an effective height of not more than 25 m if:

(i) The beam detectors are located at intervals of not more than 3 storeys

(ii) Arranged to scan at 90 degrees orientation to adjacent beam units.

.3 Smoke detection systems must be located at all return and relief air openings associated with the building air-handling systems and be:

a) A sampling type system as required in Clause .4.2 below, or

b) A point-type photoelectric smoke detector.

Alarm systems

.4 A break-glass fire alarm point must be provided at each door to a fire-isolated stairway, fire-isolated ramp, or fire-isolated passageway.

.5 A staged alarm must be provided where an air sampling type smoke detection system is provided for the atrium, and must operate as follows:

a) Alert building management when abnormal smoke levels of 0.03% obscuration per metre are detected.

b) Initiate a second alarm to management and start all smoke control systems including pressurisation of escape routes when smoke levels of 0.07% obscuration per metre are detected.

c) Automatically call the fire brigade, activate the emergency warning and intercom system, and de-activate all plant not necessary for fire safety within the building when smoke levels of 0.09% obscuration per metre are detected.

.6 Beam and point type smoke detectors required must simultaneously operate all functions referred to above and activate at the level set out in AS 1670.1.

Emergency warning and intercom systems

.7 All buildings containing an atrium must be provided with an emergency warning and intercom system which:

a) Complies with **AS 1670.4 Automatic Fire Detection and Alarm Systems, Part 4: Fire Detection, Warning, Control and Intercom Systems - System Design, Installation and Commissioning Emergency Warning and Intercom Systems**

b) Incorporates visual warning devices that:

(iii) Operate upon the evacuation signal

(iv) Display the words "EVACUATE" in red with letters conforming with the requirements of the Deemed-to-Satisfy Provisions of Part E4 Visibility in an Emergency, Exit Signs and Warning Systems

(v) Systems for exit signs

Standby power system

.8 If a required path of travel to an exit is within an atrium, a suitable alternative power supply must be provided to operate required safety systems including sprinkler systems and fire hydrant pumps, air handling systems, alarms, warning and communication systems and emergency lighting circuits.

.9 The alternative power supply must:

a) Be connected automatically if the normal power supply fails

b) If located within the building, be separated from the remainder of the building by an enclosure with an FRL of at least 120/120/120

c) Be connected to the safety systems by means of cabling

.10 The requirements of (a) are satisfied by:

a) A single medium voltage supply taken from an electricity substation situated within, or adjacent to, the building concerned where the power supply to the substation consists of two or more high voltage cables each taking electricity from separate transformers, or

b) Two or more medium voltage supplies each taking electricity from separate electricity substations situated:

(i) Outside the building concerned

(ii) At a suitable distance from each other, or

c) A single medium voltage supply taken from an electricity substation together with an electricity generating plant capable of:

(i) Generating a medium voltage supply

(ii) Starting and taking the required electrical load within a period of not more than 30 seconds from the time of normal supply failure

SCHEDULE 5
Fire-resistance of building elements

1. SCOPE

This Schedule sets out the procedures for determining the FRL of building elements.

2. RATING

.1 A building element meets the requirements of this Schedule if:

a) It is listed in, and complies with Table 1 of this Schedule, or

b) It is identical with a prototype that has been submitted to the Standard Fire Test or an equivalent or more severe test, and the FRL achieved by the prototype without the assistance of an active fire suppression system is confirmed in a report from an Accredited Testing Laboratory which:

(i) Describes the method and conditions of the test and the form of construction of the tested prototype in full

(ii) Certifies that the application of restraint to the prototype complied with the Standard Fire Test, or

c) It differs in only a minor degree from a prototype tested under (b) and the FRL attributed to the building element is confirmed in a report from an Accredited Testing Laboratory which:

(i) Certifies that the building element is capable of achieving the FRL despite the minor departures from the tested prototype

(ii) Describes the materials, construction and conditions of restraint which are necessary to achieve the FRL, or

d) It is designed to achieve the FRL in accordance with:

(i) AS/NZS 2327 Composite Steel-Concrete Construction in Buildings, AS 4100 Steel Structures and AS/NZS 4600 Cold-formed Steel Structures if it is a steel or composite structure, or

(ii) AS 3600 Concrete Structures, Steel and Tendons if it is a concrete structure, or

(iii) AS 1720.4 Part 4: Timber Structures Fire resistance of Timber Elements if it is a timber element that is not fire-protected, or

(iv) AS 3700 Masonry Structures if it is a masonry structure, or

e) The FRL is determined by calculation based on the performance of a prototype in the Standard Fire Test and confirmed in a report in accordance with Clause 3, or

f) For fire-protected timber, it complies with Specification C1.13a where applicable.

3. FRLS DETERMINED BY CALCULATION

.1 If the FRL of a building element is determined by calculation based on a tested prototype:

a) The building element may vary from the prototype in relation to:

(i) Length and height if it is a wall

(ii) Height if it is a column

(iii) Span if it is a floor, roof or beam

(iv) Conditions of support

(v) To a minor degree, cross-section and components

b) The report must demonstrate by calculation that the building element would achieve the FRL if it is subjected to the regime of the Standard Fire Test in relation to:

(i) Structural adequacy (including deflection)

(ii) Integrity

(iii) Insulation

c) The calculations must take into account:

(i) The temperature reached by the components of the prototype and their effects on strength and modulus of elasticity

(ii) Appropriate features of the building element such as support, restraint, cross-sectional shape, length, height, span, slenderness ratio, reinforcement, ratio of surface area to mass per unit length, and fire protection

(iii) Features of the prototype that influenced its performance in the Standard Fire Test although these features may not have been taken into account in the design for dead and live load

(iv) Features of the conditions of test, the manner of support and the position of the prototype during the test, that might not be reproduced in the building element if it is exposed to fire

(v) The design load of the building element in comparison with the tested prototype.

4. INTERCHANGEABLE MATERIALS

a) Concrete and plaster: An FRL achieved with any material of Group A, B, C, D or E as an ingredient in concrete or plaster, applies equally when any other material of the same group is used in the same proportions:

Group A: any portland cement

Group B: any lime

Group C: any dense sand

Group D: any dense calcareous aggregate, including any limestone or any calcareous gravel

Group E: any dense siliceous aggregate, including any basalt, diorite, dolerite, granite, granodiorite or trachyte

b) Perlite and vermiculite: an FRL achieved with either gypsum-perlite plaster or gypsum-vermiculite plaster applies equally for each plaster

5. COLUMNS COVERED WITH LIGHTWEIGHT CONSTRUCTION

If the fire-resisting covering of a steel column is lightweight construction, the construction must comply with Specification C1.8 Structural Test for Lightweight Construction and Section C3.D15 of the FNBC.

6. NON LOAD-BEARING ELEMENTS

If a non load-bearing element is able to be used for a purpose where the Deemed-to-Satisfy Provisions prescribe an FRL for structural adequacy, integrity and insulation, that non load-bearing element need not comply with the structural adequacy criteria.

Table 1 FRLs Deemed to be Achieved by Building Elements

Building Element			Minimum Thickness (mm) of Principal Material for FRL's					Annexure Reference
Wall			Required Fire Resistance					
			60/60/60	90/90/90	120/120/120	180/180/180	240/240/240	Clause
Masonry								
Ashlar		-	-	-	-	300		**1**, **2**, **5**, **6**
Calcium silicate			see 2(d)(iv) of this Specification					
Concrete			see 2(d)(iv) of this Specification					
Fired clay (inc terracotta)			see 2(d)(iv) of this Specification					
Concrete								
No-fines		-	-	-	150	170	**1**, **5**, **6**	
Prestressed			see 2(d)(iv) of this Specification					
Reinforced			see 2(d)(iv) of this Specification					
Plain		-	-	-	150	170	**1**, **5**, **6**	
Solid gypsum blocks			75	90	100	110	125	**1**, **5**, **6**
Gypsum — perlite or Gypsum vermiculite - plaster **on metal lath and channel (non load-bearing walls only)**			50	50	65	-	-	**1**, **5**, **7**
CONCRETE COLUMN								
			60/60/60	90/90/90	120/120/120	180/180/180	240/240/240	Clause
Pre-stressed			see 2(d)(ii) of this Specification					
Reinforced			see 2(d)(ii) of this Specification					
HOT-ROLLED STEEL COLUMN								
			60/60/60	90/90/90	120/120/120	180/180/180	240/240/240	Clause
(inc a fabricated column) exposed on no more than 3 sides:								**8**
Fire protection of Concrete **— Cast in-situ—**								
Load-bearing		25	30	40	55	75	**9**, **11**, **12**	
Non load-bearing								
unplastered	25	30	40	50	60	**9**, **11**, **12**		
plastered 13mm—	25	25	30	40	50	**1**, **6**, **9**, **11**, **12**		
Gypsum **— Cast in-situ—**			-	-	-	-	50	**9**, **11**, **12**
Gypsum — perlite or Gypsum-vermiculite plaster								
sprayed to contour		20	25	35	50	55	**1**, **11**	
sprayed on metal lath		20	20	25	35	45	**1**, **7**	
HOT-ROLLED STEEL COLUMN								
			60/60/60	90/90/90	120/120/120	180/180/180	240/240/240	Clause
(inc a fabricated column) exposed on no more than 3 sides and with column spaces filled:								**8**, **9**
Fire protection of —								
Solid calcium-silicate masonry		50	50	50	50	65	**1**, **3**, **11**, **12**	

Building Element			Minimum Thickness (mm) of Principal Material for FRL's					Annexure Reference
Solid clay masonry		50	50	50	65	90	**1**, **3**, **11**, **12**	
Solid concrete masonry		50	50	50	65	90	**1**, **3**, **11**, **12**	
Solid gypsum blocks		50	50	50	50	65	**1**, **3**, **11**, **12**	
Hollow terracotta blocks—								
plastered 13mm	50	50	50	65	90	**1**, **3**, **6**, **10**, **11**, **12**		
HOT-ROLLED STEEL COLUMN								
			60/60/60	90/90/90	120/120/120	180/180/180	240/240/240	Clause
(inc a fabricated column) exposed on no more than 3 sides and with column spaces unfilled:								**8**, **9**
Fire protection of —								
Solid calcium-silicate masonry		50	50	50	-	-	**1**, **3**, **11**, **12**	
Solid clay masonry		50	50	65	-	-	**1**, **3**, **11**, **12**	
Solid concrete masonry		50	50	65	-	-	**1**, **3**, **11**, **12**	
Solid gypsum blocks		50	50	50	-	-	**1**, **3**, **11**, **12**	
Hollow terracotta blocks—								
plastered 13mm	50	50	65	-	-	**1**, **3**, **6**, **10**, **11**, **12**		
HOT-ROLLED STEEL COLUMN								
			60/-/-	90/-/-	120/-/-	180/-/-	240/-/-	Clause
(inc. a fabricated column) exposed on 4 sides:								**8**
Fire protection of —								
Concrete **— Cast in-situ—**								
Load-bearing		25	40	45	65	90	**9**, **11**, **12**	
Non load-bearing								
unplastered	25	30	40	50	65	**9**, **11**, **12**		
plastered 13mm—	25	25	30	40	50	**1**, **6**, **9**, **11**, **12**		
Gypsum **— Cast in-situ—**			-	-	-	-	50	**9**, **11**, **12**
Gypsum — perlite or Gypsum-vermiculite plaster								
sprayed to contour		25	30	40	55	65	**1**, **11**	
sprayed on metal lath		20	20	30	40	50	**1**, **7**	
HOT-ROLLED STEEL COLUMN								
			60/-/-	90/-/-	120/-/-	180/-/-	240/-/-	Clause
(inc. a fabricated column) exposed on 4 sides and with column spaces filled:								**8**, **9**
Fire protection of —								
Solid calcium-silicate masonry here		50	50	50	65	75	**1**, **3**, **11**, **12**	
Solid clay masonry		50	50	50	75	100	**1**, **3**, **11**, **12**	
Solid concrete masonry		50	50	50	75	100	**1**, **3**, **11**, **12**	

Building Element			Minimum Thickness (mm) of Principal Material for FRL's					Annexure Reference
Solid gypsum blocks		50	50	50	65	75	**1**, **3**, **11**, **12**	
Hollow terracotta blocks—								
plastered 13mm	50	50	50	75	100	**1**, **3**, **6**, **10**, **11**, **12**		
HOT-ROLLED STEEL COLUMN								
			60/-/-	90/-/-	120/-/-	180/-/-	240/-/-	Clause
(inc. a fabricated column) exposed on 4 sides and with column spaces unfilled:								**8**
Fire protection of —								
Solid calcium-silicate masonry here		50	50	50	-	-	**1**, **3**, **11**, **12**	
Solid clay masonry		50	50	65	-	-	**1**, **3**, **11**, **12**	
Solid concrete masonry		50	50	65	-	-	**1**, **3**, **11**, **12**	
Solid gypsum blocks		50	50	50	-	-	**1**, **3**, **11**, **12**	
Hollow terracotta blocks—								
plastered 13mm	50	50	65	-	-	**1**, **3**, **6**, **10**, **11**, **12**		
BEAM								
			60/-/-	90/-/-	120/-/-	180/-/-	240/-/-	Clause
Concrete —								
Prestressed			see 2(d)(ii) of this Specification					
Reinforced			see 2(d)(ii) of this Specification					
Hot-rolled Steel **(inc. an open-web joist girder truss etc.) exposed on no more than 3 sides:**								**8**
Fire protection of —								
Concrete **— Cast in-situ—**			25	30	40	50	65	**11**, **12**
Gypsum — perlite or Gypsum-vermiculite plaster								
sprayed to contour		20	25	35	50	55	**1**, **11**	
sprayed on metal lath		20	20	25	35	45	**1**, **7**	
Hot-rolled Steel **(inc. an open-web joist girder truss etc.) exposed on 4 sides:**								**8**
Fire protection of —								
Concrete **— Cast in-situ—**			25	40	45	60	90	**11**, **12**
Gypsum — perlite or Gypsum-vermiculite plaster								
sprayed to contour		25	30	40	55	65	**1**, **11**	
sprayed on metal lath		20	20	30	40	50	**1**, **7**	
FLOOR, ROOF OR CEILING								
			60/60/60	90/90/90	120/120/120	180/180/180	240/240/240	Clause
Concrete —								
Pre-stressed			see 2(d)(ii) of this Specification					
Reinforced			see 2(d)(ii) of this Specification					

ANNEXURE TO TABLE 1

1. MORTAR, PLASTER AND PLASTER REINFORCEMENT

.1 MORTAR FOR MASONRY

Masonry units of ashlar, calcium silicate, concrete or fired clay (including terracotta blocks) must be laid in cement mortar or composition mortar complying with the relevant provisions of AS 3700 Masonry Structures.

.2 GYPSUM BLOCKS

Gypsum blocks must be laid in gypsum-sand mortar or lime mortar.

.3 GYPSUM-SAND MORTAR AND PLASTER

Gypsum-sand mortar and gypsum-sand plaster must consist of either:

a) Not more than 3 parts by volume of sand to 1 part by volume of gypsum, or

b) If lime putty is added, not more than 2.5 parts by volume of sand to 1 part by volume of gypsum and not more than 5% of lime putty by volume of the mixed ingredients.

.4 GYPSUM-PERLITE AND GYPSUM-VERMICULITE PLASTER

Gypsum-perlite or gypsum-vermiculite plaster must be applied:

a) In either one or 2 coats each in the proportions of 1 m^3 of perlite or vermiculite to 640 kg of gypsum if the required thickness of the plaster is not more than 25 mm.

b) In 2 coats if the required thickness is more than 25 mm, the first in the proportions of 1 m^3 of perlite or vermiculite to 800 kg of gypsum and the second in the proportions of 1 m^3 of perlite or vermiculite to 530 kg of gypsum.

.5 PLASTER OF CEMENT AND SAND OR CEMENT, LIME AND SAND

Plaster prescribed in Table 1 must consist of:

a) Cement and sand or cement, lime and sand.

b) May be finished with gypsum, gypsum-sand, gypsum-perlite or gypsum-vermiculite plaster or with lime putty.

.6 PLASTER REINFORCEMENT

If plaster used as fire protection on walls is more than 19 mm thick:

a) It must be reinforced with expanded metal lath that:

(i) Has a mass per unit area of not less than 1.84 kg/m^2.

(ii) Has not fewer than 98 meshes per metre.

(iii) Is protected against corrosion by galvanising or other suitable method, or

b) It must be reinforced with 13 mm x 13 mm x 0.7 mm galvanised steel wire mesh

c) With the reinforcement must be securely fixed at a distance from the face of the wall of not less than 1/3 of the total thickness of the plaster

2. ASHLAR STONE MASONRY

Ashlar masonry must not be used in a part of the building containing more than 2 storeys, and must not be of:

a) Aplite, granite, granodiorite, quartz dacite, quartz diorite, quartz porphyrite or quartz porphyry, or

b) Conglomerate, quartzite or sandstone, or

c) Chert or flint, or

d) Limestone or marble.

3. DIMENSIONS OF MASONRY

The thicknesses of masonry of calcium-silicate, concrete and fired clay are calculated as follows:

.1 SOLID UNITS

For masonry in which the amount of perforation or coring of the units does not exceed 25% by volume (based on the overall rectangular shape of the unit) the thickness of the wall must be calculated from the manufacturing dimensions of the units and the specified thickness of the joints between them as appropriate.

.2 HOLLOW UNITS

For masonry in which the amount of perforation or coring of the units exceeds 25% by volume (based on the overall rectangular shape of the unit) the thickness of the wall must be calculated from the equivalent thicknesses of the units and the specified thickness of the joints between them as appropriate.

.3 EQUIVALENT THICKNESS

The equivalent thickness of a masonry unit is calculated by dividing the net volume by the area of one vertical face.

4. HEIGHT-TO-THICKNESS RATIO OF CERTAIN WALLS

The ratio of height between lateral supports to overall thickness of a wall of ashlar, no-fines concrete, unreinforced concrete, solid gypsum blocks, gypsum-perlite or gypsum-vermiculite plaster on metal lath and channel, must not exceed:

a) 20 for a load-bearing, or

b) 27 for a non load-bearing wall

5. INCREASE IN THICKNESS BY PLASTERING

.1 WALLS

If a wall of ashlar, solid gypsum blocks or concrete is plastered on both sides to an equal thickness, the thickness of the wall for the purposes of Table 1 (but not for the purposes of Annexure Clause 5) may be increased by the thickness of the plaster on one side.

.2 COLUMNS

Where Table 1 indicates that column-protection is to be plastered, the tabulated thicknesses are those of the principal material. They do not include the thickness of plaster which must be additional to the listed thickness of the material to which it is applied.

6. GYPSUM-PERLITE OR GYPSUM-VERMICULITE PLASTER ON METAL LATH

.1 WALLS

In walls fabricated of gypsum-perlite or gypsum-vermiculite plaster on metal lath and channel:

a) The lath must be securely wired to each side of 19 mm x 0.44 kg/m steel channels (used as studs) spaced at not more than 400 mm centres.

b) The gypsum-perlite or gypsum-vermiculite plaster must be applied symmetrically to each exposed side of the lath.

.2 COLUMNS

For the fire protection of steel columns with gypsum-perlite or gypsum-vermiculite on metal lath:

a) The lath must be fixed at not more than 600 mm centres vertically to steel furring channels, and:

(i) If the plaster is to be 35 mm thick or more : at least 12 mm clear of the column, or

(ii) If the plaster is to be less than 35 mm thick : at least 6 mm clear of the column, or

b) The plaster may be applied to self-furring lath with furring dimples to hold it not less than 10 mm clear of the column, and the thickness of the plaster must be measured from the back of the lath.

.3 BEAMS

For the fire protection of steel beams with gypsum-perlite or gypsum-vermiculite on metal lath:

a) The lath must be fixed at not more than 600 mm centres to steel furring channels and at least 20 mm clear of the steel. and

b) The thickness of the plaster must be measured from the back of the lath.

7. EXPOSURE OF COLUMNS AND BEANS

.1 COLUMNS

A column incorporated in or in contact on one or more sides with a wall of solid masonry or concrete at least 100 mm thick may be considered to be exposed to fire on no more than 3 sides.

.2 BEAMS

A beam, open-web joist, girder or truss in direct and continuous contact with a concrete slab or a hollow block floor or roof may be considered to be exposed to fire on no more than 3 sides.

8. FILLING OF COLUMN SPACES

a) The spaces between the fire-protective material and the steel (and any re-entrant parts of the column itself) must be filled solid with a fire-protective material like concrete, gypsum or grout.

b) The insides of hollow sections, including pipes, need not be filled.

9. HOLLOW TERRACOTTA BLOCKS

The proportion of cored holes or perforations in a hollow terracotta block (based on the overall rectangular volume of the unit) must not exceed the following:

a) For blocks up to 75 mm thick - 35%

b) For blocks more than 75 mm but not more than 100 mm thick - 40%

c) For blocks more than 100 mm - 50%

10. REINFORCEMENT FOR COLUMN AND BEAM PROTECTION

.1 MASONRY

Masonry of calcium-silicate, fired clay and concrete for the protection of steel columns must have steel-wire or mesh reinforcement in every second course and lapped at the corners.

.2 GYPSUM BLOCKS AND HOLLOW TERRACOTTA BLOCKS

Gypsum blocks and hollow terracotta blocks for the protection of steel columns must have steel-wire or mesh reinforcement in every course and lapped at corners.

.3 STRUCTURAL CONCRETE AND POURED GYPSUM

If a steel column or a steel beam is to be protected with structural concrete or poured gypsum:

a) The concrete or gypsum must be reinforced with steel-wire mesh or steel-wire binding placed about 20 mm from its outer surface:

(i) For concrete or gypsum less than 50 mm thick, the steel wire must be:

A. At least 3.15 mm in diameter,
B. Spaced at not more than 100 mm vertically, or

(ii) For concrete or gypsum not less than 50 mm thick, the steel wire must be either:

A. Of a diameter and spacing in accordance with (a), or
B. At least 5 mm in diameter and spaced at not more than 150 mm vertically.

.4 GYPSUM-PERLITE OR GYPSUM-VERMICULITE PLASTER SPRAYED TO CONTOUR

a) If a steel column or steel beam is protected with either gypsum-perlite or gypsum-vermiculite plaster sprayed to contour and the construction falls within the limits of Table 11.4, the plaster must be reinforced with:

(i) Expanded metal lath complying with Clause 1.6 of this Annexure, or

(ii) Galvanised steel wire mesh complying with Clause 1.6 of this Annexure.

b) The reinforcement must be placed at a distance from the face of the plaster of at least 1/3 of the thickness of the plaster and must be securely fixed to the column or beam at intervals of not more than the relevant listing in Table 11.4.

c) For the purposes of Table 11.4 :

(i) "vertical" includes a surface at not more than 10º to the vertical.

(ii) "horizontal" includes a surface at not more than 10º to the horizontal.

(iii) "underside" means the underside of any horizontal or non-vertical surface.

Table A1 Reinforcement of Gypsum-Perlite or Gypsum-Vermiculite Plaster Sprayed to Contour

Surface to be protected	Reinforcement required if smaller dimension of surface exceeds (mm)	Max spacing of fixings of the mesh to surface (mm)
Members with H or I cross-section:		
Vertical:	450	450
Non-vertical:	300	300
Underside:	300	300
Upper side of a horizontal surface:	Not required	N/A
Members with other shapes:		
Vertical:	Any size	450
Non-vertical:	Any size	300
Underside:	Any size	300
Upper side of a horizontal surface:	Not required	N/A

11. THICKNESS OF COLUMN AND BEAM PROTECTION

.1 MEASUREMENT OF THICKNESS

The thickness of the fire protection to steel columns and steel beams (other than fire protection of gypsum-perlite or gypsum-vermiculite plaster sprayed on metal lath or sprayed to contour) is to be measured from the face or edge of the steel, from the face of a splice plate or from the outer part of a rivet or bolt, whichever is the closest to the outside of the fire-protective construction, except that:

a) If the thickness of the fire protection is 40 mm or more, rivet heads may be disregarded

b) If the thickness of the fire protection is 50 mm or more:

   (i) Any part of a bolt (other than a high-tensile bolt) may be disregarded. and

   (ii) A column splice plate within 900 mm of the floor may encroach upon the fire protection by up to a 1/4 of the thickness of the fire protection. and

c) The flange of a column or beam may encroach by up to 12 mm upon the thickness of the fire protection at right angles to the web if:

   (i) The column or beam is intended to have an FRL of 240/240/240 or 240/–/–. and

   (ii) The flange projects 65 mm or more from the web. and

   (iii) The thickness of the edge of the flange (inclusive of any splice plate) is not more than 40 mm

PART E4
Visibility in an emergency, exit signs and warning systems

EP4.1 VISIBILITY IN AN EMERGENCY

.1 To facilitate safe evacuation in an emergency, a building must be provided with a system that:

a) Ensures a level of visibility sufficient to enable exits, paths of travel to exits and any obstacles along a path of travel to an exit to be identified

b) Activates instantaneously upon the failure of an artificial lighting system, to the degree necessary, appropriate to:

(i) Function or use of the building

(ii) Floor area of the building

(iii) Distance of travel to an exit

EP4.2 IDENTIFICATION OF EXITS

.1 To facilitate evacuation, suitable signs or other means of identification must, to the degree necessary:

a) Be provided to identify the location of exits

b) Guide occupants to exits, including people with disabilities

c) Be clearly visible to occupants

d) Operate in the event of a power failure of the main lighting system for sufficient time for occupants to safely evacuate

.2 EP4.2 does not apply to the internal parts of a sole-occupancy unit in:

a) A Class 1, 2 or 3 building, or

b) A Class 4 part of a building, or

c) A residential sole-occupancy unit in a Class 5 building

EP4.3 EMERGENCY WARNING AND INTERCOM SYSTEMS

.1 To warn occupants of an emergency and assist evacuation of a building, an emergency warning and intercom system must be provided, to the degree necessary, appropriate to:

a) Floor area of the building

b) Function or use of the building

c) Height of the building

d) Occupancy

VERIFICATION METHODS

EV4.1 EMERGENCY LIGHTING

.1 Compliance with EP4.1 is verified for the level of visibility for safe evacuation in an emergency and instantaneous activation, when an emergency lighting system satisfies the following:

a) The calculated horizontal illuminance is not less than:

(i) 0.2 lux at floor level in the path of travel to an exit

(ii) 1 lux at each floor level or tread in every required:

A. Fire-isolated stairway, or

B. Fire-isolated passageway, or

C. Fire-isolated ramp, or

D. Non-fire-isolated stairway, or

E. Non-fire-isolated ramp

b) The emergency lighting provides a level of illuminance not less than:

(i) 10% of that required by (a) within 1 second of energization

(ii) 80% of that required by (a) within 15 seconds of energization.

c) The full level of illumination required by (a) must be achieved within 60 seconds of energization

d) An emergency lighting system must operate at not less than the minimum required level of illuminance for not less than 90 minutes

Section CR

Fire Protection

FIRE PROTECTION

CLASS 1 AND 10 - RESIDENTIAL AND OUT-BUILDINGS

Contents

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SPECIFICATIONS

No specifications in this section.

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P1 Prevention of Fire and Fire Spread 8

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P1 Evacuation Safety 9

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OBJECTIVES

A Class 1 or Class 10 building must be designed and constructed to safeguard people and property such that:

(1) There is a low probability of harm or illness caused by fire and smoke

(2) Occupants have sufficient time to evacuate the building in the event of a fire

(3) Neighbouring buildings and property are protected from damage by fire

CR1 FIRE RESISTANCE

Performance Requirements

P1 FIRE RESISTING CONSTRUCTION

(1) Structural building elements required to be fire-resistant according to Schedule 5 Fire-Resistance of Building Elements, must have an appropriate fire resistance such that loss of life and damage to property is minimized in the event of a fire

(2) Materials used in the construction of buildings and structures must be such that if there is a fire in the building:

a) The spread of fire and the generation of smoke and toxic gases will be minimized

b) Stability will be maintained for a period at least sufficient for the occupants to escape and to ensure the safety of fire-fighters

c) There will be little risk of collapse onto adjoining property

(3) To maintain structural adequacy and stability of a building in the event of a fire, the load-bearing elements must have fire-resistance appropriate to:

a) Height of the building

b) Location of cooking equipment and other fire sources

c) Proximity to other property

d) Location and availability of firefighting resources

(4) The fire-resistance of structural elements must be at least equal to that of other elements to which they provide support

(5) Collapse of elements with a lower fire-resistance must not result in the collapse of elements with a higher fire-resistance

(6) External and common walls must prevent the passage of destructive heat, flame, smoke or gases for a minimum of one hour in the event of a fire to prevent harm to people and property

(7) The underside of a floor separating two residential occupancy units, each being a separate domicile, must not be combustible

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Fire Resistant performance requirements of CR1 are satisfied if:

- **All of the following** deemed-to-satisfy provisions are successfully demonstrated
- **Sections CR2 to CR6** are complied with
- **Specification C1.13** is complied with

D1 EXTERNAL WALLS

.1 External walls must be constructed of fire-resisting material that has an FRL of not less than 60/60/60.

.2 External walls that are located close to a building on an adjoining allotment or on the same allotment must have any openings (windows, doors, service openings) be fire-resistant to the same degree as the external wall if:

a) The wall is set back less than 1.5 m from an allotment boundary other than the boundary adjoining a road alignment or other public space, or

b) The wall is less than 3.0 m from another building on the same allotment other than a Class 10 building

.3 An external wall of a Class 10a building other than an open garage must be of non-combustible construction or lined externally with non-combustible material if it is setback less than 1.5 m from the allotment boundary other than with a road alignment or public space.

.4 When calculating a setback to an allotment boundary or between buildings, the distance must be the shortest distance measured from the outermost point of the external wall except the following building elements may encroach into the distance if the distance to the boundary is not reduced to less than 1 m nor the distance between the buildings to less than 1.5 m:

a) Fascia, gutters, downpipes, non-combustible eaves lining and the like

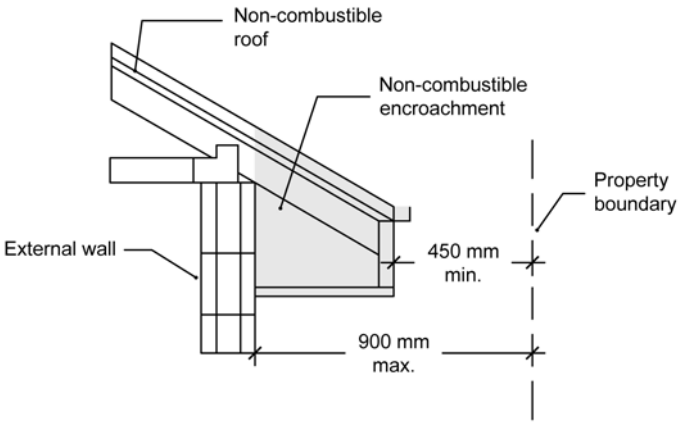
b) Masonry chimney backs, flues, pipes, cooling or heating appliances or other services

c) Light fittings, electricity or gas metres, aerials or antenna

d) Pergolas or sun blind

e) Unroofed terraces, landings, steps or ramps, not more than 1 m in height

Figure CR1.1 Non-Combustible Encroachments Permitted



.5 Existing external walls that are part of an addition to an existing building must be re-clad with fire resisting material as specified in Section D1.1 above.

D2 COMMON WALLS AND FLOORS

.1 A common wall between two or more residential occupancy units must be of fire resisting construction, and must:

a) Be non-combustible and fully lined with fire protective covering, and extend to the underside of a non-combustible roof or not less than 450 mm above the roof with a combustible lining

b) Have an FRL of not less than 60/60/60 if it separates Class 1 buildings, or a Class 1 building and a Class 10 building (shed, carport, garage, and the like) on different allotments, or

c) Be lined with a non-combustible material if it separates Class 10a buildings on different allotments

.2 The underside of a floor separating residential occupancy units, each being a separate domicile and located one above the other, must be lined with material with an FRL of not less than 60/60/60.

.3 Any sarking type material used in a Class 1 residential building must have a Flammability index of not more than 5.

Figure CR1.2 Fire Walls Between Adjoining Units

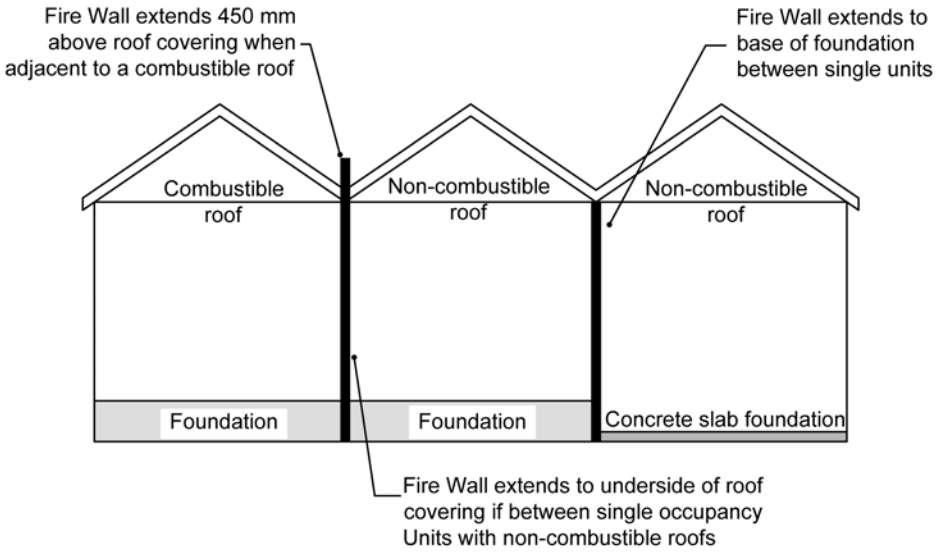


Figure CR1.3 Examples of Suitable Building Materials to Achieve Fire Resistance

Building materials with an FRL of 60/60/60 include:

Concrete *– with a fire-resistant additive or coating that achieves the FRL*

Steel, aluminum, wood or bamboo *- with a fire-resistant coating that achieves the FRL*

Gypsum board *– with a fire-resistant additive or coating that achieves the FRL*

Insulation *designed for high temperatures such as mineral wool and ceramic fiber*

Sealants, putties, pillows and wraps *– with a fire-resistance that achieves the FRL*

NOTE: to achieve an FRL of 60/60/60, fire-resistant metal cladding for walls and roofs may need to be combined with fire-resistant insulation, sarking material and gyp board to achieve an FRL of 60/60/60

Non-combustible building material

- *Steel*
- *Concrete*
- *Brick*
- *Glass*
- *Gypsum*
- *Stone*
- *Cementitious board*
- *Mineral wool*
- *Ceramic tiles*
- *Refractory materials used in fire-resistant coatings and additives*

CR2 PROTECTION OF OPENINGS

Performance Requirements

P1 OPENINGS REQUIRED TO BE FIRE-RESISTING

.1 This section applies to openings in building elements required to be fire-resisting, including doorways, windows (including any associated fanlight or infill panel), and openings for service cables, pipes, vents, and the like.

.2 This section does not apply to:

a) Control joints, weep holes, and the like, in masonry construction and joints between precast concrete panels, if they are not larger than necessary for the purpose, or

b) Non-combustible ventilators for sub-floor or cavity ventilation, if each does not exceed 45 x 10^3 mm^2 in face areas and is spaced not less than 2 m from any other ventilator in the same wall

c) Openings in the vertical plane formed between building elements at the construction edge or perimeter of a balcony or verandah, colonnade, terrace, or the like

.3 Openings to potentially be used by escaping occupants must be suitably configured and constructed to safeguard escaping occupants as much as possible.

.4 Service openings in walls must be protected so that they do not allow the passage of dangerous amounts of heat, flames, smoke and gases from building to building or to neighbouring properties in the event of a fire.

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Protection of openings in fire-resisting walls performance requirements of CR2 are satisfied if **all of the following** deemed-to-satisfy provisions appropriate to the building type are successfully demonstrated

D1 OPENINGS IN EXTERNAL WALLS (WINDOWS AND DOORS)

.1 An opening in an external wall must be placed so that it is separated from a fire source on a neighbouring property by:

a) At least 1 m, if the building on the adjacent allotment is not more than 1 storey in rise, or

b) At least 1.5 m, if the building on the adjacent allotment is more than 1 storey in rise

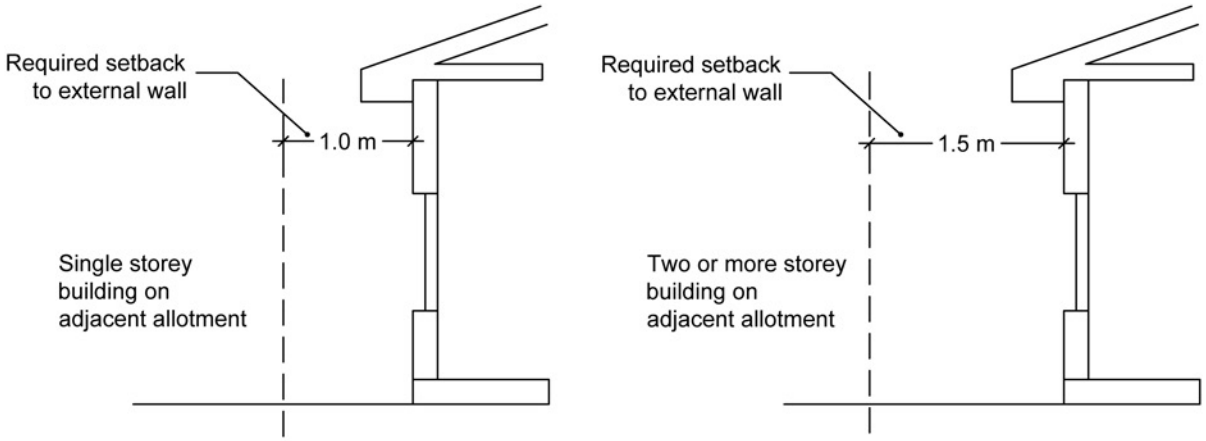
.2 Windows and doors facing another building that is located no more than 5.0m apart must not occupy more than 1/3 of the area of the external wall of the storey in which it is located.

.3 Windows and doors on an external wall or common wall in a multi-unit building are required to have the same fire resistance as the wall (minimum FRL of 60/60/60).

.4 Windows and doors required to be fire-resistant must have all material, including framing, hardware (hinges, locks, latch) and glazing achieve the required FRL.

.5 Openings in a garage wall or other structure that may contain a vehicle or other fuel-burning machine must not open directly into a room used for sleeping purposes.

Figure CR2.1 An Example of Openings and Required Setbacks



D2 SERVICE OPENINGS

.1 Service openings for cables, wires, pipes, ducts in a wall, floor or ceiling must be sealed with one or a combination of the following materials having a fire-resistance of 60/60/60:

a) Fire-resistant mortar

b) Fire-resistant sealant (foam, silicone, and the like

c) Fire-resistant metal collar with sealant

d) Fire-resistant putty

e) Intumescent wrap, sleeve or pillow that expands when exposed to heat to form a seal

f) Fire-resistant board or panel with sealant

CR3 SMOKE AND FIRE ALARMS

Performance Requirements

P1 SMOKE AND FIRE ALARMS

.1 Class 1 residential buildings shall be equipped with an automatic means of warning occupants in the event of a fire so that occupants can evacuate the building to a place of safety

.2 Equipment to warn occupants of smoke and/or fire must be installed for new construction and alterations that require a building permit (except for replacement of roofing, sheathing, plumbing or mechanical systems)

.3 Smoke and fire alarms must be placed in locations based on occupancy, size, layout and use of rooms and sole-occupancy units within the building

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Smoke and fire alarm performance requirements of CR3 are satisfied if **all of the following** deemed-to-satisfy provisions appropriate to the building type are successfully demonstrated

D1 PLACEMENT OF SMOKE ALARMS

.1 Smoke alarms shall be installed in the following locations within a Class 1 residential building:

a) In each sleeping room

b) In each hallway connecting a sleeping room to a living area

c) On each habitable story

d) In an internal public hallway in a multiple-occupancy building

.2 All smoke alarms must be interconnected such that they all provide a warning sound if one alarm is triggered.

.3 In buildings with split levels without an intervening wall or door between levels, a smoke alarm must be installed on the upper level or other suitable location to provide the highest possible coverage and early warning.

.4 Smoke alarms must not be installed any closer than 1.0 m horizontally from outside the door or opening of a bathroom that contains a bathtub or shower unless this would prevent placement of a smoke alarm required by CR3.D1.d above.

.5 Smoke alarms must be installed on the ceiling or close to the ceiling in close proximity to the centre of the room.

CR4 PREVENTION OF FIRE AND FIRE SPREAD

Performance Requirements

P1 PREVENTION OF FIRE AND FIRE SPREAD

.1 Class 1 and 10 buildings must be designed and constructed so that there is a low probability of fire spread to other buildings and property vertically or horizontally across a relevant boundary

.2 Sources of controlled combustion must be designed, constructed and installed to reduce the risk of injury to people or property from a fire

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Prevention of fire and fire spread performance requirements of CR4 are satisfied if **all of the following** deemed-to-satisfy provisions appropriate to the building type are successfully demonstrated

D1 VENTILATION

.1 Class 1 buildings and Class 10 buildings containing appliances and other sources of combustion must be equipped with sufficient openings and vents such that smoke resulting from a fire or cooking appliance will not be entrapped within the building.

.2 Any gaps in framing used for natural ventilation to cool the building interior must be:

a) Lined with non-combustible material

b) Have non-combustible material located within 2 m of internal and external inlet and outlet vents

D2 CAVITY BARRIERS IN FRAMING

.1 Class 1 buildings and Class 10 buildings with walls that are constructed with framing (and have an air gap between the wall cladding and internal gyp or wall board) must include cavity barriers in the wall framing to prevent the upward spread of fire and smoke.

.2 A cavity barrier must be installed midway from floor to ceiling in each storey.

.3 A cavity barrier must completely seal the gaps to prevent the passage of fire, smoke and toxic gases.

.4 Suitable material for a cavity barrier includes:

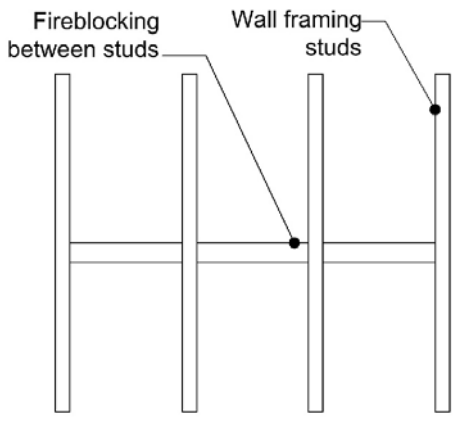
a) 50 mm ht nominal timber

b) One thickness of particle board or gypsum board

c) Cellulose, mineral wool or other fire-resistant insulation that prevents the spread of smoke

d) Metal, stone or brick

Figure CR4.1 Fireblocking in Framing



D3 APPLIANCES AND OTHER FIRE SOURCES

.1 Appliances, ovens and other heating elements for cooking must be placed in a room with a window or other source of ventilation, and/or be equipped with an exhaust system that distributes smoke directly to the exterior of the building.

CR5 EVACUATION

Performance Requirements

P1 EVACUATION SAFETY

.1 Buildings in Class 1 and 10 must be designed so that occupants have an unobstructed route to evacuate in case of a fire or other emergency

.2 The evacuation route must be configured and constructed so there is a low probability of occupants suffering injury or harm when evacuating

.3 The evacuation route must accommodate people with disabilities

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Evacuation performance requirements of CR5 are satisfied if **all of the following** deemed-to-satisfy provisions appropriate to the building type are successfully demonstrated

D1 REQUIRED EXITS

.1 A Class 1 building must have at least two means of entry for building occupants that are of sufficient size and materials to allow safe passage of occupants and people with disabilities during a fire or other emergency.

.2 The primary exit will be a doorway constructed to the same standard as a fire door and complies with Section CR5 D1.1 above and D2 below.

.3 The second exit may be a door or a window that complies with Section CR5 D1.1 above and D2 below.

.4 On a building site prone to flooding, Class 1 buildings must have a means of accessing the roof to permit safe passage for occupants in the event of a flood.

.5 Where bars, grilles, covers, screens or similar devices are placed over windows intended to provide emergency access to the outdoors, such devices must be releasable or removable from the inside without the use of a key or tool or excessive force that would prevent it from being opened by occupants.

D2 EMERGENCY EXIT WINDOW

.1 Where a window in an external wall serves as an emergency escape and rescue opening, it must be placed:

a) As far away as possible from any fire source on an adjacent allotment

b) A reasonable distance from the primary entry door such that there are two different paths of travel for occupants to use to evacuate the building

.2 A window designated as a means of egress for escaping occupants and emergency responders must be sized to:

a) Accommodate people with disabilities

b) Accommodate a wheelchair that is lifted and passed through the opening (minimum width of 1.0 m by 1.5m in height)

c) Accommodate emergency responders wearing emergency gear

.3 An emergency exit window must have a fire-resistance of 60/60/60 for the glazing, frame and sealants.

.4 A window designated as a means of egress must be placed such that the bottom of the sill is no higher than 1.0 m from the ground level.

Section D

Access & Egress

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See Section C for:

Part E4 Visibility in an Emergency, Exit Signs and Warning Systems

OBJECTIVES

A building must be designed and constructed so that the following objectives are fulfilled:

(1) Safeguard people from injury when entering or leaving the site, and entering and leaving buildings

(2) Provide safe passageway during regular use of the building and during a disaster or emergency

(3) The use of the building and site must be universally accessible for people of all abilities

(4) Ensure safe operation of mechanical means of movement

D1 INGRESS AND EGRESS

Performance Requirements

(1) All buildings and sites must provide safe entrances / exits and paths of travel, including accessible routes required by Section D6

(2) Access must be provided, to the degree necessary, to enable people of all abilities to:

a) Safely approach the building from the road boundary and from carparking spaces associated with the building

b) Safely access work and public spaces, accommodation, and facilities for personal hygiene within the building

c) Avoid the risk of having egress impeded or being trapped in the building

d) Avoid the risk of tripping or falling

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Access and movement performance requirements of D1.1 are satisfied if **all of the following** deemed-to-satisfy provisions are successfully demonstrated as well as standards in D6 Accessibility.

D1 ACCESSIBLE ROUTE REQUIREMENT

.1 All buildings in Class 2 to 9 must have an accessible route providing a means of egress during normal and emergency operations with the following attributes:

a) It must connect all rooms and activity areas to a place of safety

b) It must extend from the site boundary and connect to an accessible parking area, accessible dropoff area, and at least one accessible building entry, and be appropriate to the building size and occupancy

c) It must be free of hazards and obstructions

d) It must have emergency, information and directional signs and alerting devices placed at an accessible height between 0.8 to 1.8 m from the ground

.2 An accessible route must consist of:

a) A non-slip surface pathway

b) An accessible lift, ramp or stairway for a change in level or multiple storeys

c) Handrails, balustrades and/or kerbs appropriate to the change in elevation

.3 All accessible routes on the building interior shall have fire-resisting construction.

.4 All evacuation (fire-isolated) routes will be accessible.

.5 Accessible routes must be well-illuminated.

.6 An accessible route must have a minimum width that complies with standards in Table D4.1 on page D-37.

.7 Informative, directional and locational signage on an accessible route must identify the following:

a) Accessible route
b) Accessible entrance
c) Accessible parking
d) Accessible stairs or lifts
e) Emergency warning system
f) Accessible place of safety
g) Accessible sanitary compartments

.8 Accessible signage on an accessible route must comply with Section D6.1.D2.

D2 NUMBER OF REQUIRED FIRE-ISOLATED EXITS

.1 A required fire-isolated building exit may consist of any of the following:

a) Accessible doorway of fire-resistant construction
b) Accessible window of fire-resistant construction that is appropriately sized to accommodate people with disabilities and emergency responders passing through
c) Accessible roof hatch of fire-resisting construction

.2 Class 2 to 9 buildings must have:

a) A sufficient number of accessible, fire-isolated exits (doorways) appropriate to building occupancy, function, size, number of storeys and location of fire-isolated routes
b) An accessible, fire-isolated exit for every sole occupancy unit, without passing through another sole-occupancy unit

.3 Class 1 to 8 and Class 10 buildings must have a minimum number of fire-isolated exits as per Table D1.1A and D1.1B.

Table D1.1A Minimum Fire-Isolated Exit Requirements for Class 1 to 4 and Class 10 Buildings

Required	Class 1 and 10	Class 2, 3, (Up to 10 m ht)	Class 2, 3, (10 - 25 m ht)	Class 4
Number of fire-isolated exits on the ground floor of the building	Class 1: 2 exits per building Class 10 and temporary structures: at least 2 exits if the floor area is greater than 200 m^2	1 exit if building has up to 50-person occupancy per storey and no greater than 10m between the doorway of a sole-occupancy unit to the exit. An additional exit is required for an occupancy load greater than 50 at a rate of 1 exit per 50 people per storey	1 exit if building is sprinklered or built entirely with non-combustible material and has a maximum occupancy of 50 people per storey, 2 exits or more if unsprinklered or occupancy is greater than 50 persons per storey An additional exit is required for an occupancy load greater than 50 at a rate of 1 exit per 50 people per storey	Must adhere to exit requirement for the non-Class 4 parts of the building that surrounds it
Number of exits for a sole-occupancy unit in a multiple occupancy building	2 exits to a fir open space, or 1 exit to an open space and 1 exit to an evacuation route if on the ground floor, or 1 exit to an evacuation route on upper storeys			

Table D1.1B Minimum Fire-Isolated Exit Requirements for Class 5 to 8

Required	Class 5 (Up to 25m ht.)	Class 5 (Greater than 25m ht.)	Class 6, 7 and 8
Number of fire-isolated building exits on the ground floor	1 exit if building has up to 50-person occupancy per storey and no greater than 20m between the doorway of a sole-occupancy unit to the exit. An additional exit is required for an occupancy load greater than 50 at a rate of 1 exit per 50 people per storey	At least 2 exits per storey, and an additional exit for every additional 50-person occupancy per storey No greater than 20m between the doorway of a sole-occupancy unit to the exit	1 exit if building has up to 50-person occupancy per storey and no greater than 15m between the doorway of a sole-occupancy unit to the exit.
Number of exits for a sole-occupancy unit in a multiple occupancy building	2 exits to an open space for ground-floor units not separated by a fire wall; or 1 exit to an evacuation route for units separated by a fire wall	2 exits to an open space for ground-floor units not separated by a fire wall, or 1 exit to an evacuation route for units separated by a fire wall	

.9 A commercial kitchen or cooking area must have the number of fire-isolated exits determined according to the fire risk and occupancy, and must open into an evacuation route, a place of safety or the exterior of the building.

.10 For Class 9 buildings, in addition to any horizontal exit, not less than 2 accessible fire-isolated exits must be provided for:

a) Each storey of a building, where the building has 3 or more storeys or an effective height of more than 10 m

b) Any storey which includes:

(i) A patient-care area in a Class 9a health-care building

(ii) Sleeping areas in a Class 9c building

(iii) An early childcare centre in a Class 9b building

(iv) Each storey in a primary or secondary school with a rise in storeys of 2 or more

(v) Any storey or mezzanine that accommodates more than 100 people according to Section D3 Occupancy and Measurement

.11 Patient care areas in a Class 9a health-care building and a Class 9c building must have at least one exit provided from every portion of a storey that has been divided into fire compartments as per Section C Fire Protection.

.12 Every part of a Class 9b early childhood centre must be wholly within a storey that provides direct egress to a road or open space, except if the building is less than 3 storeys and the early childhood centre is the only use in the building.

.13 For any storey located underground, not less than 2 exits, with one of them being accessible, must be provided if egress from that storey involves an upward vertical climb within the building of more than 1.5 m, unless the area of the storey is not more than 50 m^2 as well as the distance of travel from any point on the floor to a single exit is not more than 20 m.

D3 PLACEMENT OF REQUIRED FIRE-ISOLATED EXITS

.1 A required fire-isolated exit must be positioned to provide safe and efficient access to the exterior of the building and/or a road or place of safety.

.2 Fire-isolated exits must be:

a) Distributed as uniformly as practicable within or around the storey served and in positions where unobstructed access to at least 2 exits is readily available from all points on the floor including lift lobby areas

b) Located so that alternative paths of travel do not converge such that they become less than 6 m apart

c) Not more than:

(i) In a Class 2 or 3 building – 45 m apart, or

(ii) In a Class 9a health-care building, if such required exit serves a patient care area – 45 m apart, or

(iii) In all other cases – 60 m apart

.3 Size and configuration of a fire-isolated exit must comply with accessibility standards in AS 1428 Design for Access and Mobility by providing a smooth, level surface that will not impede the use of it by people with disabilities.

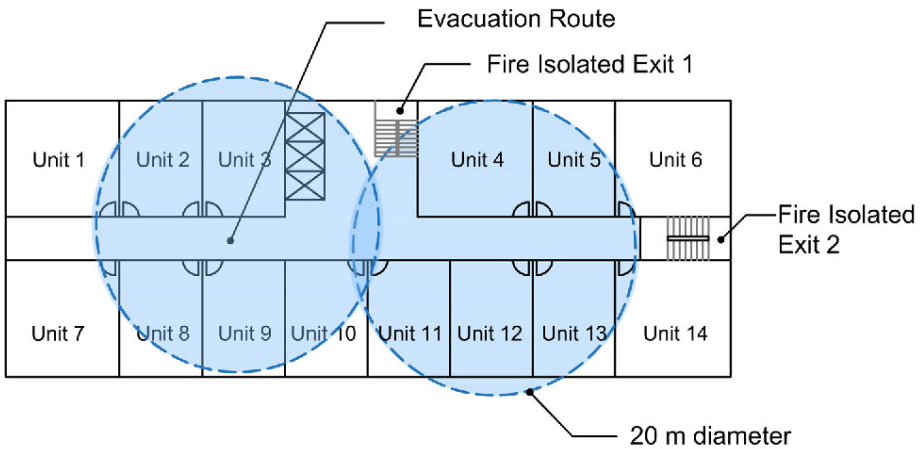
.4 The unobstructed width of a required fire-isolated exit must not diminish in the direction of travel.

.5 Placement of required fire-isolated exits must conform with Table D1.2.

Table D1.2 Placement of Sole Occupancy Unit Door

Required	Class 1 and 10	Class 2 to 4	Class 5 to 9
Distance of Sole-Occupancy unit door to a required fire-isolated exit	The main door to a sole-occupancy unit in a multiple occupancy building must be fire-isolated and within 10 m of a fire-isolated exit	Sole-occupancy unit door must be within 20m of a required fire-isolated exit, and/or Within 30m of a required fire-isolated exit in a building of Construction Type C, and The entrance doorway to any Class 4 part of a building must be less than 6 m from an exit or a point from which travel in different directions to 2 exits is available	Sole-occupancy unit door must be within 30m of a required fire-isolated exit The distance from any point on a floor and a point of egress to a road or place of safety by way of a required non fire-isolated stairway or ramp must not exceed 80m

Figure D1.1 Example of 20m Minimum Distance to a Required Exit for Class 3 or 5 Building



Doorways are within 20m of a required fire-isolated exit

Class 9 buildings:

.6 In a patient care area in a Class 9a building:

a) No point on the floor must be more than 12 m from a point from which travel in different directions to 2 of the required exits is available

a) The maximum distance to one of those exits must not be more than 30 m from the starting point.

b) In open spectator stands (Class 9b building), the distance of travel to an exit must be not more than 60 m

.7 In an assembly building (Class 9b) other than a school or early childhood centre, the distance to one of the exits may be 60 m if:

a) The path of travel from the room concerned to that exit is through another area which is a corridor, hallway, lobby, ramp or other circulation space

b) The room is smoke-separated from the circulation space by construction having an FRL of not less than 60/60/60 with every doorway in that construction protected by a tight fitting, self-closing, solid-core door not less than 35 mm thick

c) The maximum distance of travel does not exceed 40 m within the room and 20 m from the doorway to the room through the circulation space to the exit

.8 In a Class 9b open spectator stand that accommodates more than 500 persons, a required stairway or required ramp must not discharge to the ground in front of the stand.

.9 In a Class 9b building containing an auditorium which accommodates more than 500 persons, not more than 2/3 of the required width of exits must be located in the main entrance foyer.

.10 In a Class 9b building, a required non fire-isolated stairway or ramp must discharge at a point not more than:

a) 20 m from a doorway providing egress to a road or open space or from a fire-isolated passageway leading to a road or open space, or

b) 40 m from one of 2 such doorways or passageways if travel to each of them from the stairway or ramp is in opposite or approximately opposite directions

D4 MEASUREMENT OF DISTANCES FOR EXIT LOCATIONS

All Buildings

.1 The distance between exits is measured in a straight-line between the nearest parts of those exits.

.2 Only the shortest distance is taken along a corridor, hallway, external balcony or other path of travel that curves or changes direction.

.3 If more than one corridor, hallway, or other similarly defined internal path of travel connects required exits, the measurement is along the path of travel through the point at which travel in different directions to those exits is available.

.4 If a wall (including a demountable internal wall) that does not bound:

a) A room, or

b) A corridor, hallway or the like,

and causes a change of direction in proceeding to a required exit, the distance is measured along the path of travel past that wall

.5 If permanent fixed seating is provided, the distance is measured along the path of travel between the rows of seats.

.6 In determining the location of a required fire-isolated exit, the nearest part of an exit means:

a) The nearest part of the doorway providing access to a fire-isolated stairway, fire-isolated passageway, or fire-isolated ramp

b) The nearest part of the nearest riser in a non fire-isolated stairway

c) The nearest part of the junction of the floor of the ramp and the floor of the storey for a non fire-isolated ramp

d) The nearest part of a doorway opening to a road or open space

e) The nearest part of a doorway in a horizontal exit

f) Alternative required exits on the same storey must be located as far apart as practicable based on the occupancy and use of the building

Class 2, 3 and Class 4 part of building

.7 In the case of a room that is not a sole-occupancy unit in a Class 2 or 3 building or Class 4 part of a building, the distance includes the straight-line measurement from any point on the floor of the room to the nearest part of a doorway leading from it, together with the distance from that part of the doorway to the single required exit or point from which travel in different directions to 2 required exits is available.

.8 The distance from the doorway of a room or sole-occupancy unit in Class 2, 3 or 4 building is measured in a straight-line to the nearest part of the required single exit or point from which travel in different direction to 2 required exits is available.

D5 HORIZONTAL EXIT

.1 Class 2 to 8 buildings must be provided with a horizontal exit where there are adjoining fire compartments.

.2 A horizontal exit must have a clear area on each side of the fire wall to accommodate the total number of persons evacuating (calculated according to Section D3.1 Occupancy Table below), of not less than:

a) 2.5 m^3 per patient in a Class 9a health-care building or Class 9c aged-care building

b) 0.5 m^3 per person in any other case

.3 A horizontal exit between 2 parts of a building separated by a fire wall must not be counted as a required exit when:

a) Between sole-occupancy units, or

b) In a Class 9b building used as an early childhood centre, primary or secondary school

.4 In a Class 9a health-care building or Class 9c building, a horizontal exit may be counted as a required exit if the path of travel from a fire compartment leads by one or more horizontal exits directly into another fire compartment which has at least one required exit which is not a horizontal exit.

.5 A horizontal exit must not comprise more than 50% of the number of required exits from any part of a storey which has been divided by a fire wall.

D6 NON-REQUIRED STAIRWAY AND RAMP PLACEMENT

.1 A non-required, non fire-isolated stairway or pedestrian ramp:

a) Must not be placed in:

(i) A patient-care area in a Class 9a health-care building, or

(ii) A resident use area in a Class 9c building

b) May connect any number of storeys if they are:

(i) In an open spectator stand or indoor sports stadium, or

(ii) In a carpark or an atrium, or

(iii) Outside a building, or

(iv) In a Class 5 or 6 building that is sprinklered throughout

c) With the exception of permitted uses in Section (b) above, a non-required stairway or ramp must not connect, directly or indirectly:

(i) More than 3 storeys

(ii) More than 2 consecutive storeys unless one of the storeys is situated at a level with direct egress to a road, open space, or place of safety

D7 DOOR DIMENSIONS AND PLACEMENT

All buildings

.1 All interior and exterior doorways satisfy performance criteria if they comply with standards in Table D1.3 and Figures D1.1 to D1.5:

Table D1.3 Door Dimensions

Door	Accessible	Not Required to be Accessible
Door - width	• 915 mm minimum	• 750 mm minimum
Door width – patient care area Class 9a	• 1200mm if corridor width <2.2m • 1070 mm if corridor width >2.2 m • 915 mm for openable double door leaf	Same as Accessible
Door width – aged and child care Class 9c	• 1070 mm min at the entrance to a sole-occupancy unit from a public corridor • 915 mm in other resident use areas • 915 mm for openable double door leaf	Same as Accessible
Setback from top and bottom of a stairway or ramp	• 1200 mm minimum setback from tread or ramp that is clear of the opened door (see Figure D1.2)	• 750 mm minimum setback from tread or ramp that is clear of the opened door (see Figure D1.2)
Door handle and latching	• 800 - 900 mm from finished floor • Horizontal lever type handle only	• 900 – 1200 mm from finished floor • Any handle type
Threshold	• 1500 mm level (maximum 12mm rise) threshold on both sides of a doorway	• Level threshold (maximum 12 mm rise) on both sides of door; must be at least the width of the door to which it serves
Viewing Panel	• Zone of visibility between 0.5m to 1.5m, minimum width of 200 mm, see Safety Glass standards in Section G4	• No greater than 150 mm from the top or sides of the door and 600mm from the bottom of the door, see Safety Glass standards in Section G4
Manifestation	• Between 0.5 to 1.0m and 1.3 to 1.6m • See Section G4.	• Between 0.8 m and 1.2m, see Section G4

Accessible Entry Doors

.2 Accessible doorways and doors are required in:

a) All non-residential parts of in Class 2 to10 buildings used by the general public or employees

b) All residential parts of Class 2 to 10 used by the general public, except in sole occupancy units

c) All building entries used as a fire exit in Class 1 to 10 buildings including entries to sole occupancy units

.3 All accessible doorways must have a smooth, non-slip surface that can be traversed by a person in a manual wheelchair, walker, cane, crutches, or other assisted mobility device.

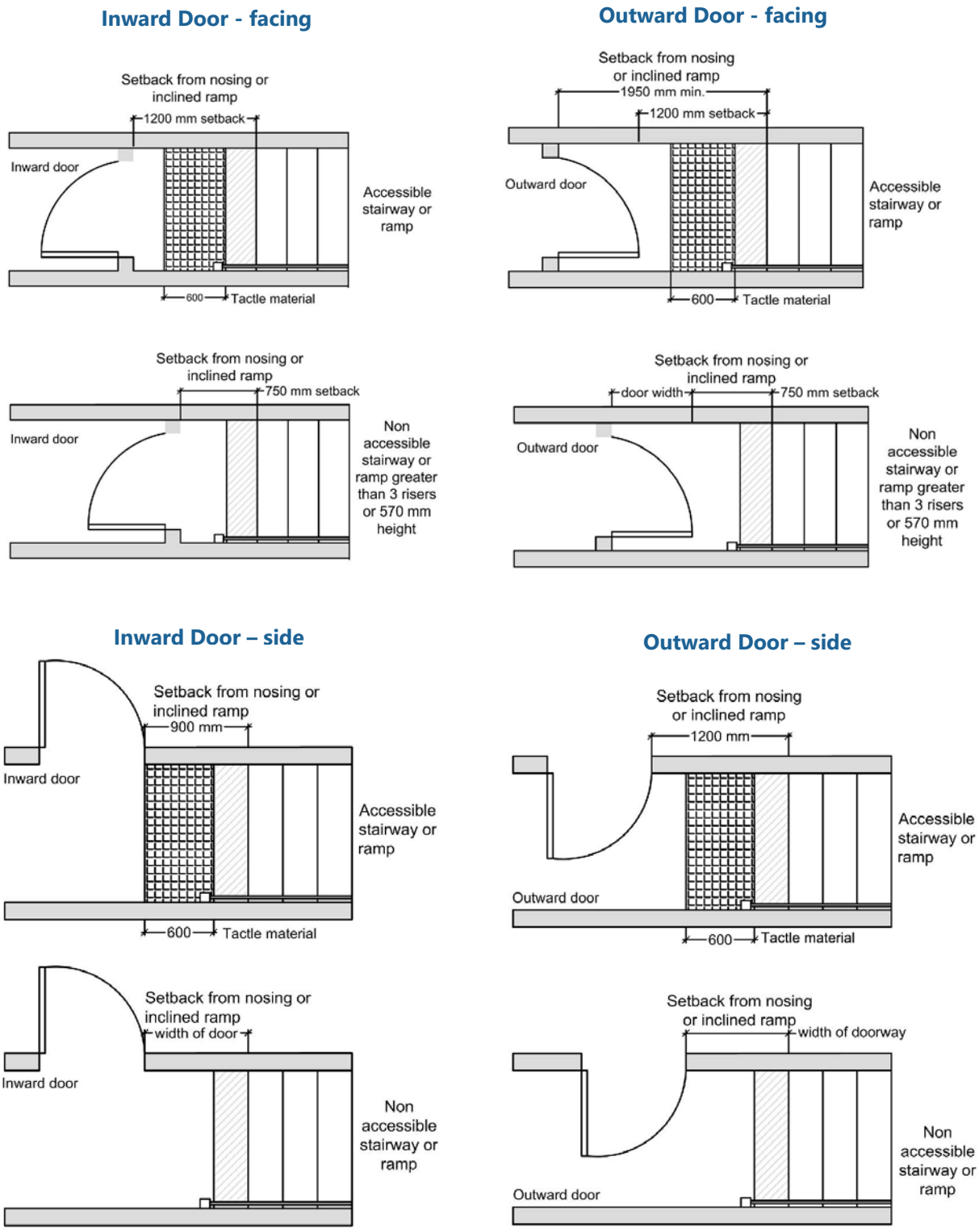
.4 Accessible doors must have:

a) A colour contrast that distinguishes the door and doorway from its surroundings

b) Information, direction or warning signs positioned at a height between 0.8m and 1.8m from the ground surface if the door is located within an evacuation route

c) Braille and auditory safety equipment if the door is location within an evacuation route

Figure D1.2 Setback for a Doorway Located near a Stairway or Ramp



Class 9 Buildings

.5 In a Class 9a building, a doorway serving as a required accessible exit or in a patient-care area:

a) Must not be fitted with a revolving door

b) Must not be fitted with a roller shutter or tilt-up door unless:

(i) It serves a Class 6, 7 or 8 building or part with a floor area not more than 200 m^2

(ii) The doorway is the only required exit from the building or part

(iii) It is held in an open position while the building or part is lawfully occupied

c) Must not be fitted with a sliding door unless:

(i) It leads directly to a road or open space

(ii) The door can be opened manually under a force of not more than 110 N

d) If fitted with a door which is power-operated:

(i) It must be able to be opened by hand under a force of not more than 110 N if there is a malfunction or failure of the power source

(ii) If it leads directly to a road or open space, it must open automatically if there is a power failure or on the activation of a fire or smoke alarm anywhere in the fire compartment served by the door

.6 A doorway in a residential use area of a Class 9c building must not be fitted with:

a) A sliding door, or

b) A sliding smoke door, or

c) A revolving door, or

d) A roller shutter door, or

e) A tilt-up door

D8 SWINGING DOOR

Class 2 to 9 Buildings

.1 A swinging door in a required exit or forming part of a required exit must not impede the path or direction of egress.

.2 A swinging door at an accessible exit must be automated and have accessible, instructional signage.

.3 A swinging door in a required exit or accessible exit must not encroach:

a) At any part of its swing by more than 500 mm on the required width of a required stairway, passageway or ramp, including the landings if it is likely to impede the path of travel of the people using the exit

b) When fully open, by more than 100 mm on the required width of the required exit

c) The measurement of encroachment in each case above is to include door handles or other furniture or attachment to the door

.4 A swinging door in a required exit or accessible exit must swing in the direction of egress unless:

a) It serves a building or part with a floor area not more than 200 m^2

b) It is the only required exit from the building or part and fitted with a device for holding it in the open position, or

c) It serves a sanitary compartment or airlock (in which case it may swing in either direction), and if it is a fire door, it has an automatic release

D9 LATCH AND HANDLE

Class 2 to 9 Buildings

.1 A required or accessible exit must have:

a) A door handle and latch located at a height of 900 to 1,200 mm from the floor

b) A single-hand downward handle or horizontal push handle

c) A latch that is readily operable without a key unless it complies with Clause D9.2 below

.2 A door with a latch openable with a key and the like must only be used where:

a) It serves a vault, strongroom, sanitary compartment, or the like, or

b) It serves only, or is within:

(i) A sole-occupancy unit in a Class 2 or 3 building or a Class 4 part, or

(ii) A sole-occupancy unit in a Class 5, 6, 7 or 8 building with a floor area not more than 200 m^2, or

(iii) A space which is otherwise inaccessible to persons at all times when the door is locked, or

c) It serves a bank or other occupancy where special arrangements for security are necessary and it can be immediately unlocked:

(i) By operating a fail-safe control switch, not contained within a protective enclosure, to actuate a device to unlock the door, or

(ii) By hand by persons specifically nominated by the owner and properly trained to assist people to escape the building if there is a fire or other emergency, or

d) It is fitted with a fail-safe device which automatically unlocks the door upon the activation of any sprinkler system or smoke or thermal detector system installed throughout the building

.3 All door locking in an accessible route must have automated activation to unlock the door from both sides.

.4 Automatic-closing doors shall close upon activation of a fire alarm system, an automatic sprinkler system, or both. Automatic hold-open doors shall be similarly activated. The automatic release of a hold-open device on one door shall release all such doors within the same smoke compartment.

.5 A building more than 25 m in effective height must have an automated system for all fire doors, smoke doors and required exits that unlocks doors in an evacuation route upon activation of a fire alarm.

D10 REQUIRED SIGNS ON DOORS

.1 In Class 2 to 9 buildings, a suitable warning sign to alert people of the operation of certain doors must be installed where it can readily be seen on or adjacent to the following:

a) A fire door providing direct access to a fire-isolated exit, except a door providing direct egress from a sole-occupancy unit in a Class 2 or 3 building or Class 4 part of a building

b) One side of a smoke door, or both sides if the smoke door swings in both directions

c) A fire door forming part of a horizontal exit

d) On each side of a door leading from a fire isolated exit to a road or open space

.2 A warning sign must be installed on the side of the door that faces a person seeking egress and, if the door is fitted with a device for holding it in the open position, on either the wall adjacent to the doorway or both sides of the door.

.3 A warning sign must be in capital letters not less than 20 mm high in a colour that highly contrasts with the background and include the following messaging:

a) For an automatic door held open by an automatic hold-open device:

(i) "**FIRE SAFETY DOOR—DO NOT OBSTRUCT**"

b) For a self-closing door:

(i) **"FIRE SAFETY DOOR**

DO NOT OBSTRUCT

DO NOT KEEP OPEN"

c) For a door discharging from a fire-isolated exit:

(i) **"FIRE SAFETY DOOR—DO NOT OBSTRUCT"**

.4 Warning signs on a door within an acceptable route must comply with Section D6.1 D2 below.

D11 LADDER

.1 A ladder may be used in lieu of a stairway to provide egress from:

a) A plant room with a floor area of not more than 100 m^2, or

b) All but one point of egress from a plant room, a lift machine room or a Class 8 electricity network substation with a floor area of not more than 200 m^2, and

(i) The height between the floors is not more than 2,800 mm

(ii) The ladder is inclined at an angle to the horizontal not less than 65 degrees nor more than 75 degrees

(iii) The distance between the front face of the ladder and any adjacent obstruction is not less than:

A. 960 mm, where the ladder is inclined 65 degrees to the horizontal, or

B. 760 mm, where the ladder is inclined 75 degrees to the horizontal, or

C. A distance that is determined by interpolating the values in A and B, where the ladder is inclined at any angle between 65 degrees and 75 degrees to the horizontal

D. A clear space not less than 600 mm exists between the foot of the ladder and any equipment

.2 A ladder permitted under Clause D11 D5.1 above:

a) May form part of an exit provided that in the case of a fire-isolated stairway it is contained within the shaft, or

b) May discharge within a storey in which case it must be considered as forming part of the path of travel

c) Must comply with **AS 1657 Fixed Platforms, Walkways, Stairways and Ladders- Design, Construction and Installation** regarding fall protection and safety

D12 ROOF HATCH EXIT

.1 A roof escape opening that serves as a required exit must have the following characteristics:

a) Openings such as a dormer window, skylight or roof hatch must not be higher than 900 mm from the landing surface unless a ladder, stair or ramp is provided

b) Openings must have a minimum dimension of 900 mm by 900 mm

c) Openings must be water-tight

d) Openings must have safety locks that prevent accidental opening by children

e) Openings must be installed a minimum of 2.4 m from the edge of the roof or have permanent fall protection installed between the hatch and the roof edge

.2 Maximum roof slope that does not require a fall protection barrier around the roof hatch is 30° (7/12 roof pitch), subject to complying with D1.2(3) above.

.3 Roof escape openings such as a skylight, shutters, and the like, must be capable of opening to 90° to the roof.

D2 STAIRWAY, RAMP AND BALCONY

D2.1 STAIRWAY CONSTRUCTION

Performance Requirements

(1) A stairway, ramp and/or balcony must provide for safe usage by people of all abilities

(2) A stairway and/or ramp must provide safe passage in relation to the nature, volume, frequency and mobility of occupants to which it serves

(3) A stairway and/or ramp must not be uncomfortable or strenuous to use

(4) A stairway, ramp and balcony must be slip-resistant

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Stairway performance requirements of D2.1 are satisfied if:

- **All of the following** deemed-to-satisfy provisions are successfully demonstrated for the type of stairway constructed
- **Specification D1.12** is complied with
- **Part 3.10.6** is complied with

D1 STAIRWAY SIZE AND CONFIGURATION

.1 Stairways must comply with standards in Table D2.1 and Figures D2.1 to D2.4:

Table D2.1 Stairway Dimensions

Stairway	Accessible	Non-Accessible
Stairway width	• 1,200 mm minimum (one-way) • 2,000 mm minimum (two-way)	Same as accessible
Top and bottom landings	• 1,200 mm min. (one-way) • 2,000 mm minimum (straight, zigzag, L-shared and scissor stairways) for two-way movement for wheelchairs	• 1,100 mm - Class 2 to 9, or width of stairway, whichever is greater • 750 mm - Class 1 and 10, Class 2 to 4 (residential sole occupancy units), or width of stairway, whichever is greater
Mid-flight landing	• 1,200 mm minimum plus width of the adjacent treads (straight + zigzag stairs) • 1,500 mm minimum plus width of adjacent treads (L-shaped, scissor, curved stairways) • Not applicable to circular stairways	• 900 mm minimum plus the width of the adjacent treads (all stairway types) • Not applicable to circular stairways
Handrail	• Both sides required • 60 – 100 mm setback from wall, • 910 – 1,000 mm ht. from nosing	• Both sides required for Class 2 – 9 • One side required for Class 1, 10, and Class 2 to 4 (residential single occupancy) • No setback required
Tread width	• 310 mm to 400 mm (straight, zigzag, L-shaped, scissor stairways) • 150 mm for inner tread width for curved stairways • 300 mm at mid-point of circular stairway	• 250 mm to 400 mm (straight, zigzag, L-shaped, scissor stairways) • 150 mm inner tread width for circular stairways • 300 mm at mid-point of spiral stairway
Riser height	• 100 mm to 180 mm	• 100 mm to 190 mm
Pitch	• 23° to 42°	• 23° to 45°
Encroachment into a corridor	• 1,200 mm minimum setback from corridor (including tread width)	• 400 mm

.2 A stairway in any building must have:

a) Between 2 - 18 risers in each flight

b) Minimum vertical clearance height of 2000 mm measured vertically from the nosing to a ceiling or other overhead construction

c) Treads of solid construction (not mesh or other perforated material) if the stairway connects more than 3 storeys

d) A cross fall between 1:100 and 1:50 for exterior stairs or where the stairway is subject to wetting

d) In a Class 9 building, not more than 36 successive risers and landings without a change in direction of at least 30°

e) Fall protection such as a handrail, wall, and the like, see Section D2.3

f) Mid-flight landings must be a continuous level and not include winder treads

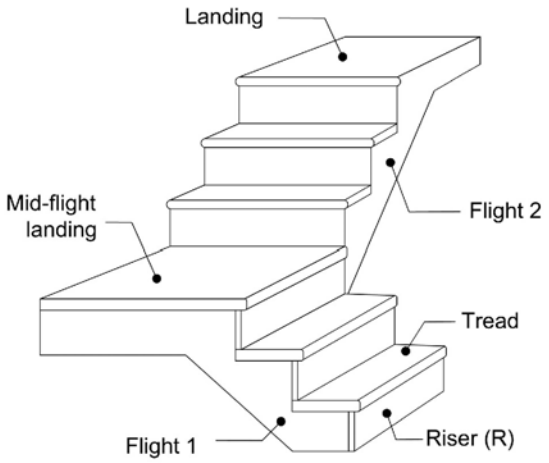
g) The same measurement for each going and each riser is required within a single flight of stairs, with a tolerance of:

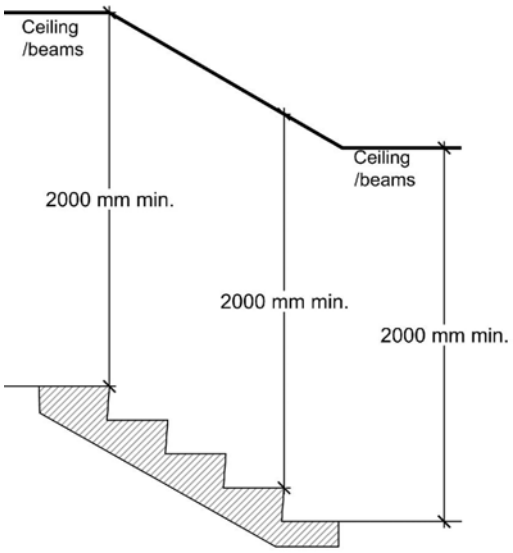
(i) 5 mm between adjacent tread and landing

(ii) 10 mm between the tallest and shortest risers in a flight

h) Riser spacing must not allow a 125 mm sphere to pass through

Figure D2.1 Stairway Configuration





.3 For an accessible stairway, safety must be assured by having:

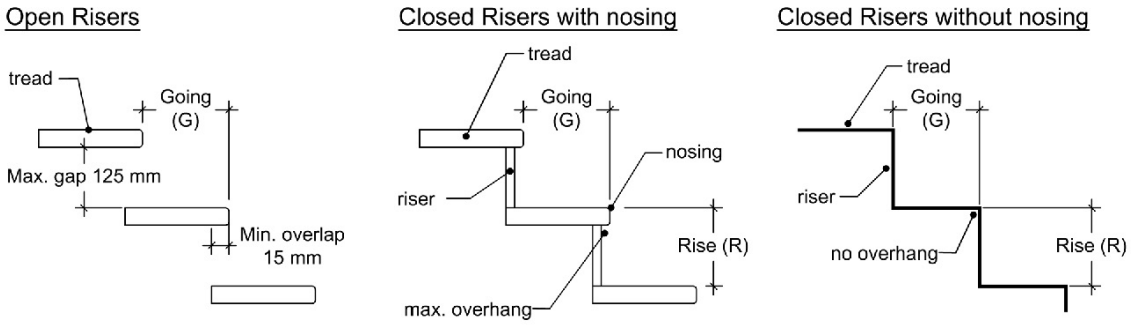
a) Closed risers, or

b) Riser openings that must not allow a 100 mm sphere to pass through, and

c) Goings must be of solid construction (not mesh or other perforated material) if the stairway connects more than 3 storeys

.4 Stairways with more than 3 risers require a handrail in accordance with Table D2.1.

Figure D2.2 Pitch, Going and Riser Dimensions



D2 NOSING

.1 All treads must have a nosing that indicates the outer edge of the tread.

.2 A nosing must have a curvature from the foremost projection of the tread.

.3 A nosing with an angled riser must have the lower end of the riser be recessed not more than 35 mm from the outermost plane of the nosing.

.4 A nosing that projects and is attached to a vertical riser must extend between 19 – 32 mm from the riser.

.5 Nosing projection and curvatures shall be of uniform size across the tread, and for all treads in the stairway.

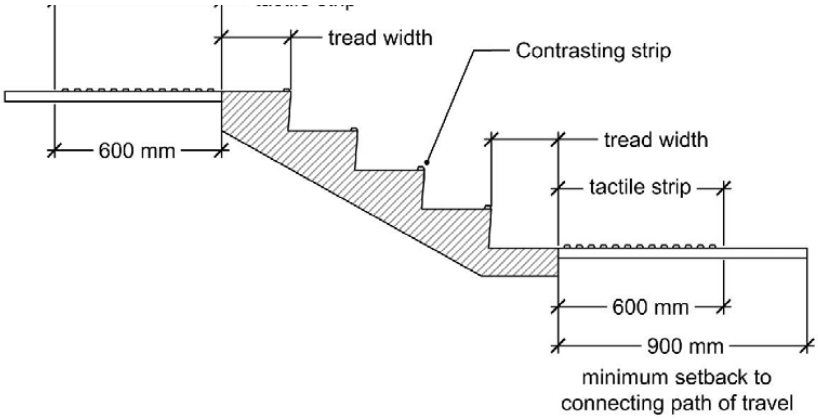
D3 SLIP RESISTANCE – PUBLIC STAIRWAY

.1 All stairways used by the public must have slip resistance that complies with **AS 4586 Slip Resistance Classification of New Pedestrian Surface Material.**

.2 Public stairways must have tactile ground surface indicators (TGSI) with a minimum width of 600 mm appropriately placed on the top and bottom landing of the stairway that comply with **AS 1428.4 Design for Access and Mobility, Part 4: Tactile Ground Surface Indicators.**

.5 Each tread must have a contrasting material strip that extends the length of the nosing with a minimum luminance contrast of 30% to the tread colour with a width of 50 – 75 mm, and shall be distinctively different in appearance from the tread.

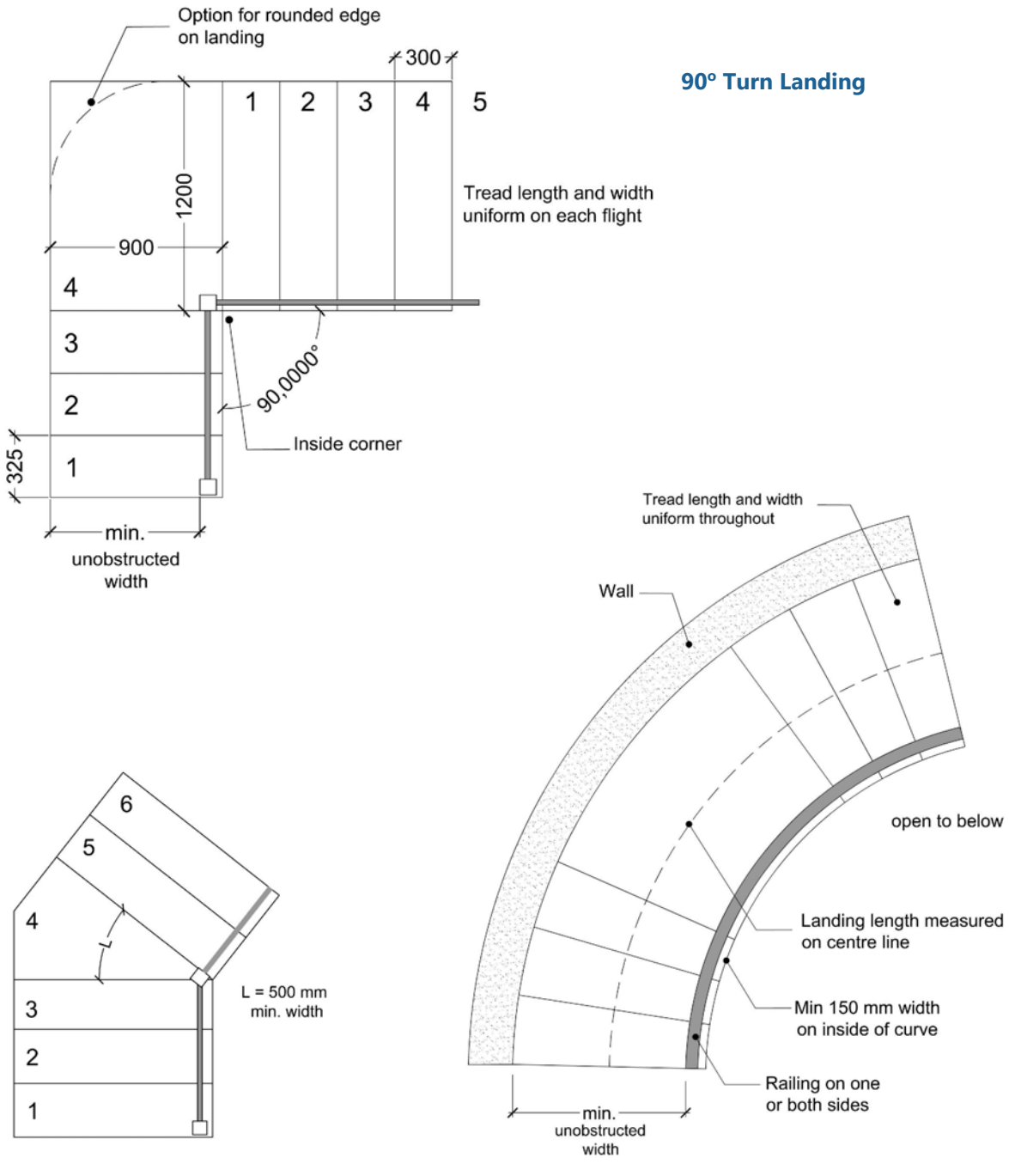
Figure D2.3 Top and Bottom Landings



D4 MID-FLIGHT LANDING STAIRWAY

.1 All stairs that change direction mid-flight must have a suitable mid-flight landing that matches the width of the adjacent stairway.

Figure D2.4 Mid-Flight Landing Stairs



D5 CURVED STAIRWAY

.1 Curved stairs must comply with the relevant requirements of Figure D2.5, as well as the following:

a) For the purposes of complying with Figure D2.5 the going must be measured:

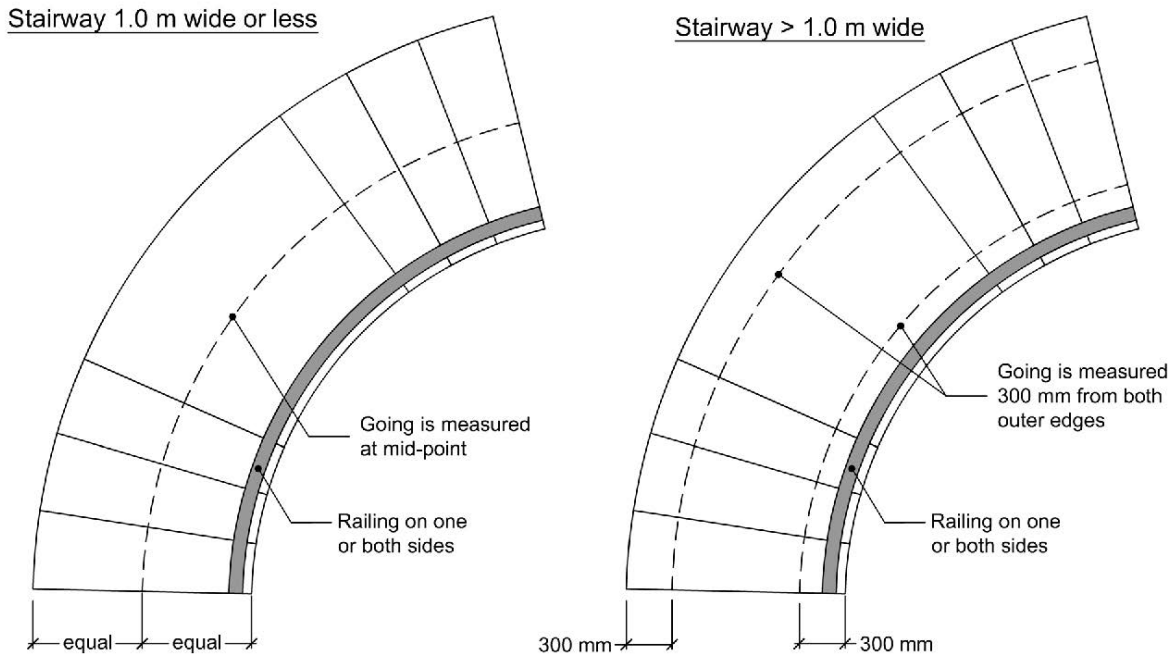
(i) Halfway across the width of the tread where the clear width is less than 900 mm

(ii) 300 mm from each side of the tread where the clear width is 900 mm or more

b) All curved or circular steps must have the same uniform taper (non-parallel edges that increase or decrease its run uniformly over its width

c) The going at the narrow end of the steps must be not less than 75 mm

Figure D2.5 Curved Stair Layout and Measurements



D6 CIRCULAR STAIRWAY

.1 A circular stairway must be:

a) Internal to the structure

b) Not be directly exposed to weather

c) Not be located in a fire-isolated passageway or as a means of egress on an evacuation route

.2 All treads must:

a) Have a clear tread width of 170 mm at a point measured 300 mm from the centre support pole

b) Have a minimum unobstructed width between the handrail or bounding wall of 660 mm

.3 Risers shall allow a minimum headroom of 1,980 mm.

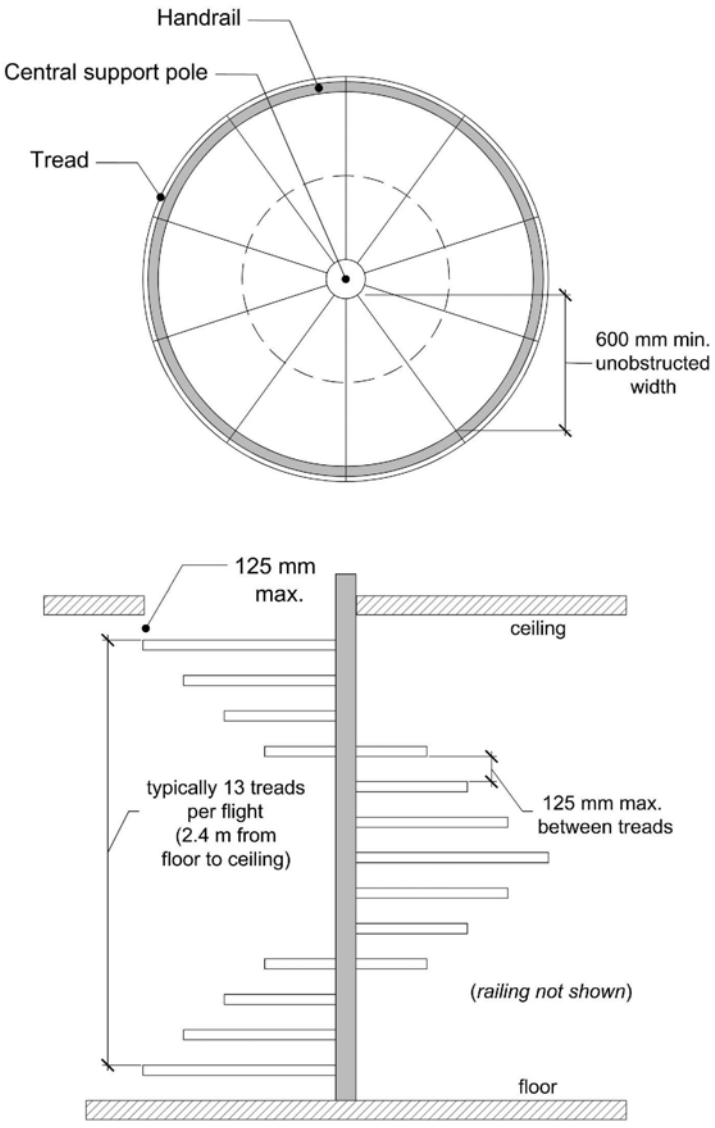
.4 Goings and risers must have the following dimensions:

Riser (R): 140 mm to 220 mm

Going (G): 210 mm to 370 mm

Slope: 590 to 680 (2R + G)

Figure D2.6 Circular Stair Layout



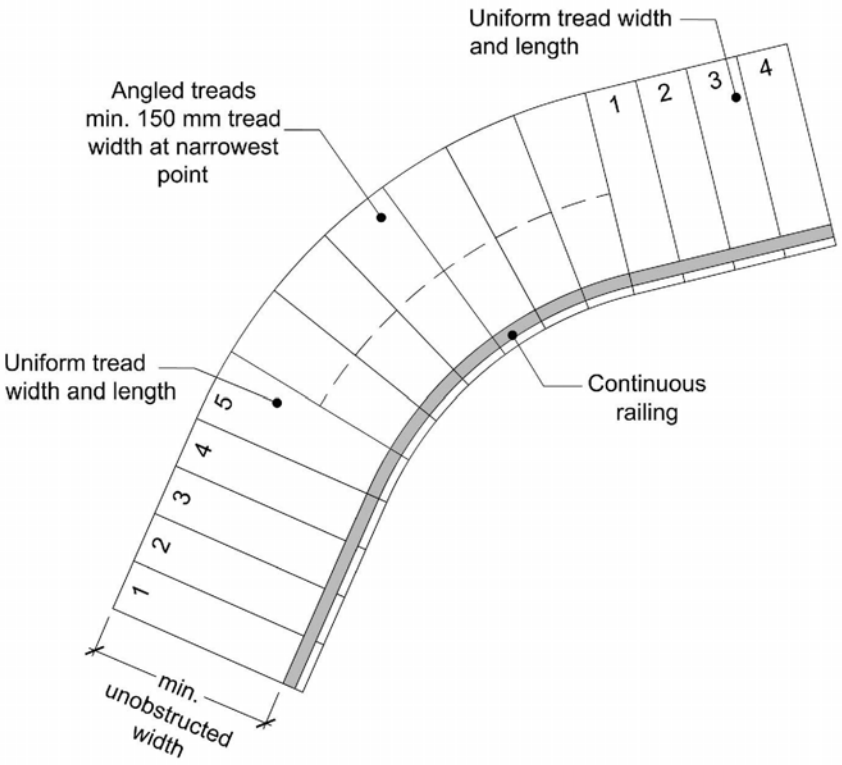
D7 MIXED GOING STAIRWAY

.1 Stairs with mixed going types (rectangular or tapered) must meet all requirements of Section D1 as well as:

a) Maintain width of stairway at junction of different tread types

b) Maintain uniform going height throughout stair flight

Figure D2.7 Uniform and Angled Tread Width and Length



D8 EXTERNAL STAIRWAY

.1 An external stairway can be used as a means of egress for the following:

a) Access to sole-occupancy units in Class 1 – 3 buildings

b) Emergency access

.2 An external stairway must comply with all relevant parts of Section B Structure.

.3 External stairways on a site with steep terrain must comply with AS 4678 Earth-Retaining Structures if any part of the stairway is used to retain earth in position from 800 mm to 15 m in height.

.4 An external stairway may serve as a required exit in a building with an effective height of not more than 25 m if it complies with fire-isolating construction standards in Section D5.1 D3.16.

D9 TOP AND BOTTOM LANDING

.1 Landings must be provided at the top and bottom of a stairway that is:

a) More than 3 risers in height, or

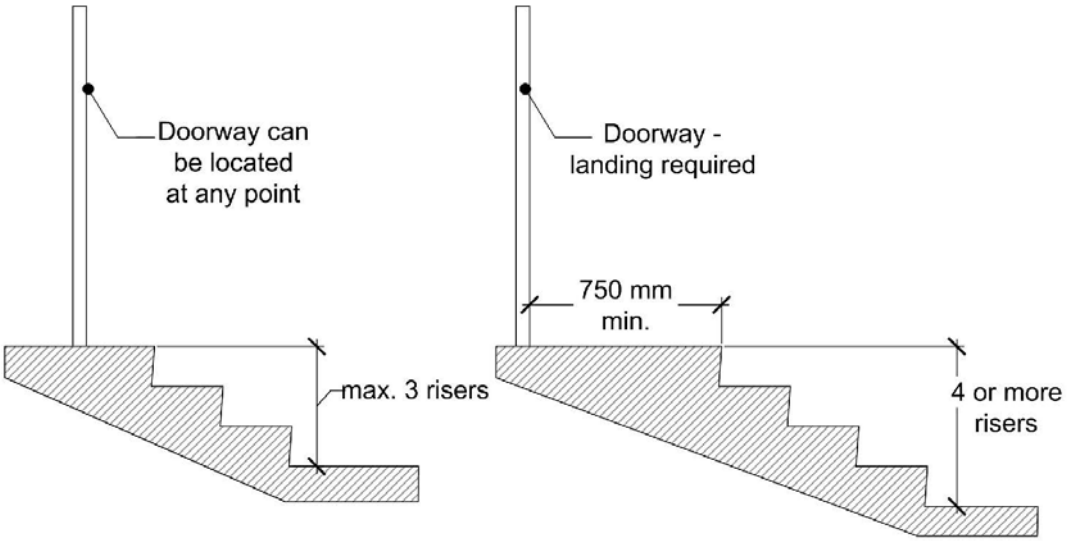
b) More than 570 mm in height

.2 A landing must:

a) Have a maximum 1:50 slope where drainage is required

b) Have a non-slip finish throughout or a suitable non-skid strip near the edge of the landing where it leads to a flight of stairs below

Figure D2.8 Top and Bottom Landings



.3 In a Class 9a building:

a) The area of any landing must be sufficient to move a stretcher (typical size of 2 m long and 600 mm wide) at an incline not more than the slope of the stairs, with at least one end of the stretcher on the landing while changing direction between flights, or

b) The stair must have a change of direction of 180°, and the landing a clear width of not less than 1.6 m and a clear length of not less than 2.7 m

D10 NON FIRE-ISOLATED STAIRWAY

.1 In a building having a rise of more than 2 storeys, a stairway (including landings and any supporting structural members) which are not required to be within a fire-isolated route, must be constructed of:

a) Non-combustible materials, and

b) Not cause structural damage to, or impair the fire-resistance of the fire-isolated route, or

c) Be constructed of:

(i) Reinforced or prestressed concrete, or

(ii) Steel in no part less than 5 mm thick, or

(iii) Timber that:

A. Has a finished thickness of not less than 40 mm

B. Has an average density of not less than 800 kg/m^3 at a moisture content of 12%

C. Has not been joined by means of glue unless it has been laminated and glued with resorcinol formaldehyde or resorcinol phenol formaldehyde glue

.4 In a Class 2, 3 or 9a building, a required non fire-isolated stairway or ramp must discharge at a point not more than:

a) 15 m from a doorway providing egress to a road or open space or from a fire-isolated passageway leading to a road or open space, or

b) 30 m from one of 2 such doorways or passageways if travel to each of them from the stairway or ramp is in opposite or approximately opposite directions

D11 ACCESSIBLE STAIRWAY

.1 Except for ramps and stairways in areas exempted by D3.4, an accessible stairway must comply with:

a) For a ramp, except a fire-isolated ramp, Clause 10 of **AS 1428.1 Design for Access and Mobility, Part 1: General Requirements for Access - New Building Work**

b) For a stairway, except a fire-isolated stairway, Clause 11 of **AS 1428.1 Design for Access and Mobility, Part 1: General Requirements for Access - New Building Work**

c) For a fire-isolated stairway, Clause 11.1(f) and (g) of **AS 1428.1 Design for Access and Mobility, Part 1: General Requirements for Access - New Buildings**

D12 ENCLOSED SPACE UNDER A STAIRWAY

.1 The space below a required fire-isolated stairway (including an external stairway) must not be enclosed to form a cupboard or other enclosed space unless:

a) The enclosing walls and ceilings have a FRL of not less than 60/60/60

b) Any access doorway to the enclosed space is fitted with a self-closing -/60/30 fire door.

2. Any space less than 2.1 m in height underneath a stairway that is part of an evacuation route or an accessible route must be demarcated by a suitable barrier that restricts access such as a handrail, knee wall, bollards, or the like.

D2.2 RAMP

Performance Requirements

(1) A ramp must be comfortable and easy to navigate, with sufficient rest areas

(2) Ramps must be configured for the intended use and intended users

(3) Ramps must be used in an accessible route and/ or fire-isolated route where there is a change in grade that warrants it

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Ramp performance requirements of D2.2 are satisfied if:

- **All of the following** deemed-to-satisfy provisions are successfully demonstrated, where appropriate
- **Specification D1.12** is complied with

D1 RAMP CONFIGURATION

.1 A ramp may be used in place of a stairway if all spatial and safety standards are satisfied.

.2 All ramps satisfy performance criteria for size if they comply with standards in Table D2.2 and D2.3, and Figure D2.9.

Table D2.2 Ramp Dimensions

Ramp	Accessible	Non-Accessible
Ramp width	• 915 mm between handrails (1-way) • 1850 mm between handrails (2-way)	• Same as accessible
Top and bottom landings	• 1,200 mm minimum (straight and zigzag ramp) • 1,500 mm (L-shaped and scissor ramp)	• Same as accessible
Mid-flight landing	• 1,200 mm minimum (straight and zigzag ramps) • 1,500 mm minimum (L-shaped, scissor ramps)	• Same as accessible
Handrail	• Both sides required • 60 – 100 mm setback from wall, where applicable • 900 – 1,000 mm ht. from ramp surface	• Both sides required for Class 2 – 9 • One side required for Class 1, 10, and Class 2 to 4 (residential single occupancy units) • No setback required • 910 – 1000 mm ht. from ramp surface
Encroachment into a corridor	• 1,500 mm minimum setback from ramp to corridor	• Same as accessible

.5 A ramp serving as a required exit must have a gradient of not more than:

a) 1:12 for all accessible ramps

b) 1:8 for ramps not required to be accessible

.6 Maximum rise for a ramp between landings is:

a) 750 mm for an accessible ramp

b) 1,500 mm for a ramp not required to be accessible

And the ramp cannot be greater than 9.0 m horizontal distance

.7 On an accessible route, a series of connected ramps must not have a combined vertical rise of more than 3.6 m.

.8 Where a ramp replaces a step in a path of travel, the landing for the ramp must not overlap a landing for another ramp.

.9 All ramps must be protected at the edge so there is no risk of falling off.

.10 The surface of a ramp must be slip-resistant in accordance with AS 4586 Slip Resistance Classification of New Pedestrian Surface Materials.

.11 All ramps must be designed to resist loading forces in accordance with Section B.

D2 OPEN ACCESS RAMP

.1 A required open access ramp or balcony must:

a) Have ventilation openings to the outside air which:

(i) Have a total unobstructed area not less than the floor area of the ramp or balcony

(ii) Are evenly distributed along the open side of ramp or balcony

b) Not be enclosed above the surface on its open sides above a height of 1 m except by an open grille or the like having a free air space of not less than 75% of its area

D3 SERVICE RAMP

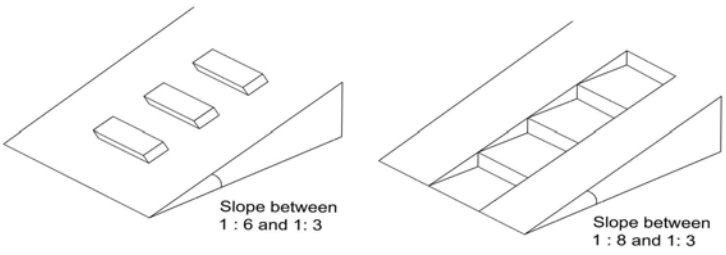
.1 Service ramps must not be steeper than 1:3.

.2 Where a service ramp is steeper than 1:8, cleats must be provided at the spacing shown in Table D2.3 and as illustrated in Figure D2.9.

Table D2.3: Spacing of Cleats for Service Ramps

Ramp slope not more than	CLEAT SPACING (mm)	
	Goods carried	No good carried
1:6	360	460
1:5	330	430
1:4	300	400
1:3	280	380

Figure D2.9 Service Ramp Types



D4 FIRE-ISOLATED RAMP

.1 A ramp (including any landings) that is required to be within a fire-resisting shaft must be constructed:

a) Of non-combustible materials

b) So that if there is local failure, it will not cause structural damage or impair the fire-resistance of the shaft

D5 NON FIRE-ISOLATED RAMP

.1 In a building having a rise of more than 2 storeys, a required ramp (including landings and any supporting structural members) which is not within a fire-resisting shaft must be constructed according to Section D4 Fire-Isolated Ramp above, or only of:

a) Reinforced or prestressed concrete, or

b) Steel in no part less than 5 mm thick, or

c) Timber that:

(i) Has a finished thickness of not less than 40 mm

(ii) Has an average density of not less than 800 kg/m^3 at a moisture content of 12%

(iii) Has not been joined by means of glue unless it has been laminated and glued with resorcinol formaldehyde or resorcinol phenol formaldehyde glue

D6 ACCESSIBLE RAMP AT FRONT ENTRANCE

.1 An accessible ramp complying with AS 1428.1 Design for Access and Mobility Part 1: General Requirements for Access - New Building Work can serve a single storey in the building entrance of a Class 5, 6, 7b or 8 building where it:

a) Contains 3 storeys or less

b) Has a floor area maximum size of 200 m^2 on each storey, excluding the entrance storey

D7 VEHICULAR RAMP

.1 Vehicle ramps and any floor to which vehicles have access must have kerbs or other barriers to separate pedestrians from vehicles and protect them from harm.

.2 Vehicle ramps with an accessible pedestrian route must have tactile surface warnings and warning signs to inform people of the upcoming ramp.

D2.3 FALL PROTECTION AND BALCONY

Performance Requirements

(1) Fall protection shall be provided where there is a vertical height difference of 1000 mm or more between the surface of a balcony, floor, walkway, roof, ramp or other travelled route and any surface directly below

(2) Fall protection measures must safeguard people from falling through an open window in:

a) A bedroom in a Class 1, 2, 3, 4, or 9b (early childhood centre) where the potential to fall is 2.0 m or more

b) Any building where the potential to fall is greater than 4.0 m

(3) A fall protection barrier on a path of travel or balcony must prevent, as far as practicable:

a) Children climbing over or through it

b) Persons or wheelchairs accidentally breaking through or falling

c) Harm from any protrusions or finishes in the fall protection barrier

(4) A fall protection barrier must comply with structural requirements of Section B Structure, and be of sufficient strength and rigidity to withstand the foreseeable impact of people and the static pressure of people pressing against it

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Fall protection performance requirements of D2.3 are satisfied if **all of the following** deemed-to-satisfy provisions are successfully demonstrated in addition to requirements of Section B.

D1 LOCATION REQUIREMENTS

.1 A continuous barrier must be provided along the side of:

a) A roof to which general access is provided

b) Stairway or ramp

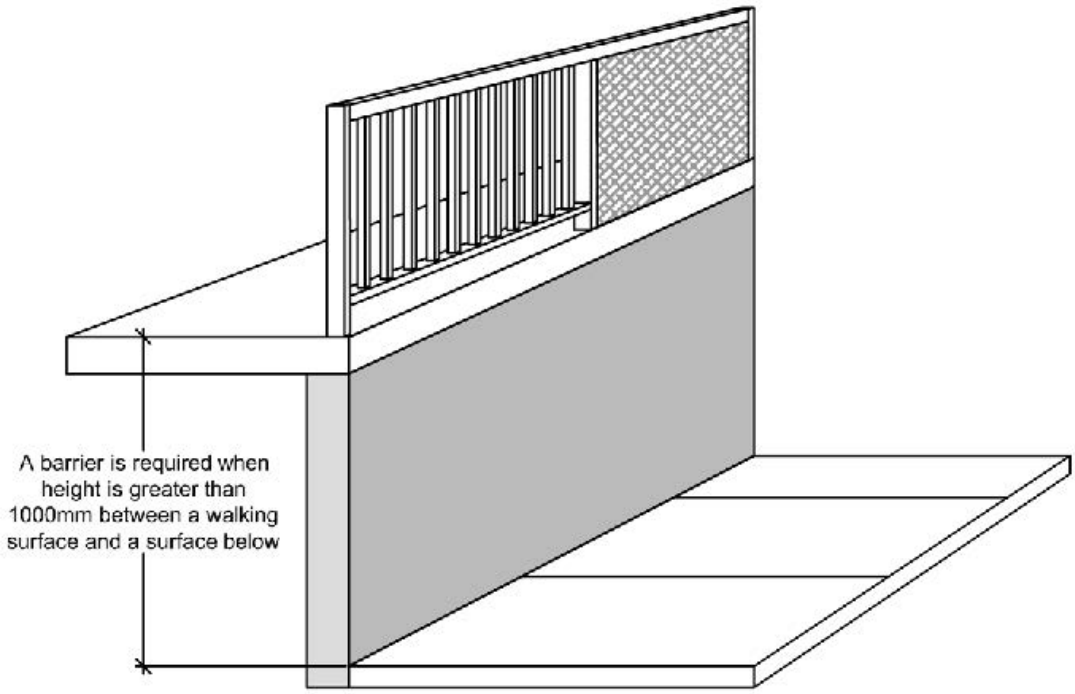
c) Balcony, deck, verandah, mezzanine, access bridge, or the like, where a change in level exceeds 1,000 mm

d) Any delineated accessible path of travel to a building

e) If the distance between the trafficable surface of any path of travel is 1 m or more above the surface beneath and there is the potential to fall

.

Figure D2.10 Minimum Height for Fall Protection



.2 The requirements of Section D2.3 D1 above do not apply to:

a) The perimeter of a stage, rigging loft, loading dock, or the like, or

b) Fixed platform, walkway, ladder

c) A retaining wall unless the retaining wall forms part of, or is directly associated with a delineated path of travel

d) A barrier provided to an openable window

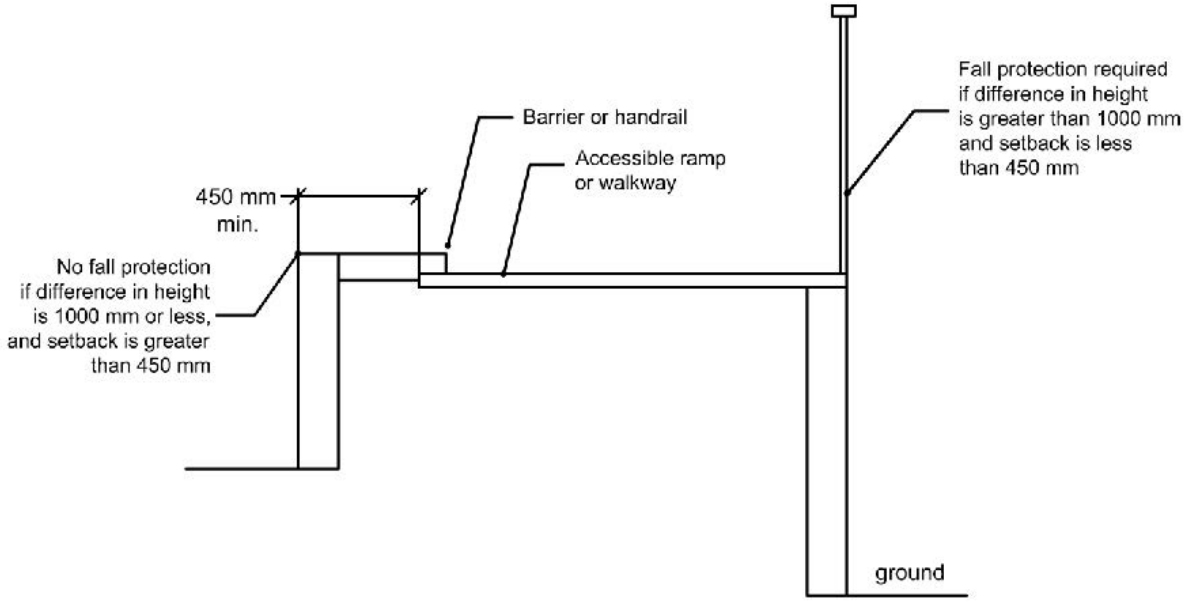
.3 Fall protection is required along exterior walkways where the difference in height is more than 1,000 mm, except for the following:

a) A minimum 450 mm of even topography is constructed between the walkway and the start of the downward slope

b) The walkway is protected by a kerb or other suitable barrier that would prevent a wheelchair from falling

c) The adjacent slope has a maximum 1v:3h grade

Figure D2.11 Maximum Height for Fall Protection



.4 Fall protection required for openable windows as per Performance Requirement P1 above shall be provided by:

a) For windows in a bedroom or Class 9b early childhood centre where the fall height is 2.0 m or greater:

(i) Placing the window so that the lowest part is a minimum of 1.7 m height from the ground floor along a solid external wall with no climbable elements, or

(ii) Installing a child-resistant window restriction for windows where the lowest part of the window is above 865 mm from the floor and there are no climbable elements, or

(iii) Installing a permanent window restriction for windows where the lowest part of the window is within 865 mm from the floor

b) For any openable window (other than in a bedroom) in a building where the fall height is greater than 4.0 m:

(i) Placing the window so that the lowest part is greater than 865 mm from the floor with no climbable elements that would permit someone to crawl through the window

(ii) Installing a permanent window restriction for windows where the lowest part is within 865 m of the floor level.

c) Windows that are low to the ground are required to be constructed with safety glass that provides fall protection, see Section G4 Lighting and Windows and Appendix B Glazing Tables

D2 BALUSTRADES

.1 A continuous balustrade (upright support allowing visibility) must be provided along the side of any stairway or ramp, or any corridor, hallway, balcony, bridge or the like, if:

a) It is not bounded by a wall

b) The change in level is more than 1 m.

.2 In stairways and ramps (including access bridges and landings), a balustrade must:

a) Have a minimum height of 865 mm above the nosings of the stair treads and the floor of the landings, balcony, corridor, hallway, access bridge and the like

b) Have balusters horizontally positioned so that the width of any opening in the balustrade (including any openable window or panel) is not more than 100 mm

c) Not provide a toe-hold which could be used to climb over the balustrade

.3 In balconies, a balustrade must:

a) Have a minimum height of 930 mm above the balcony floor

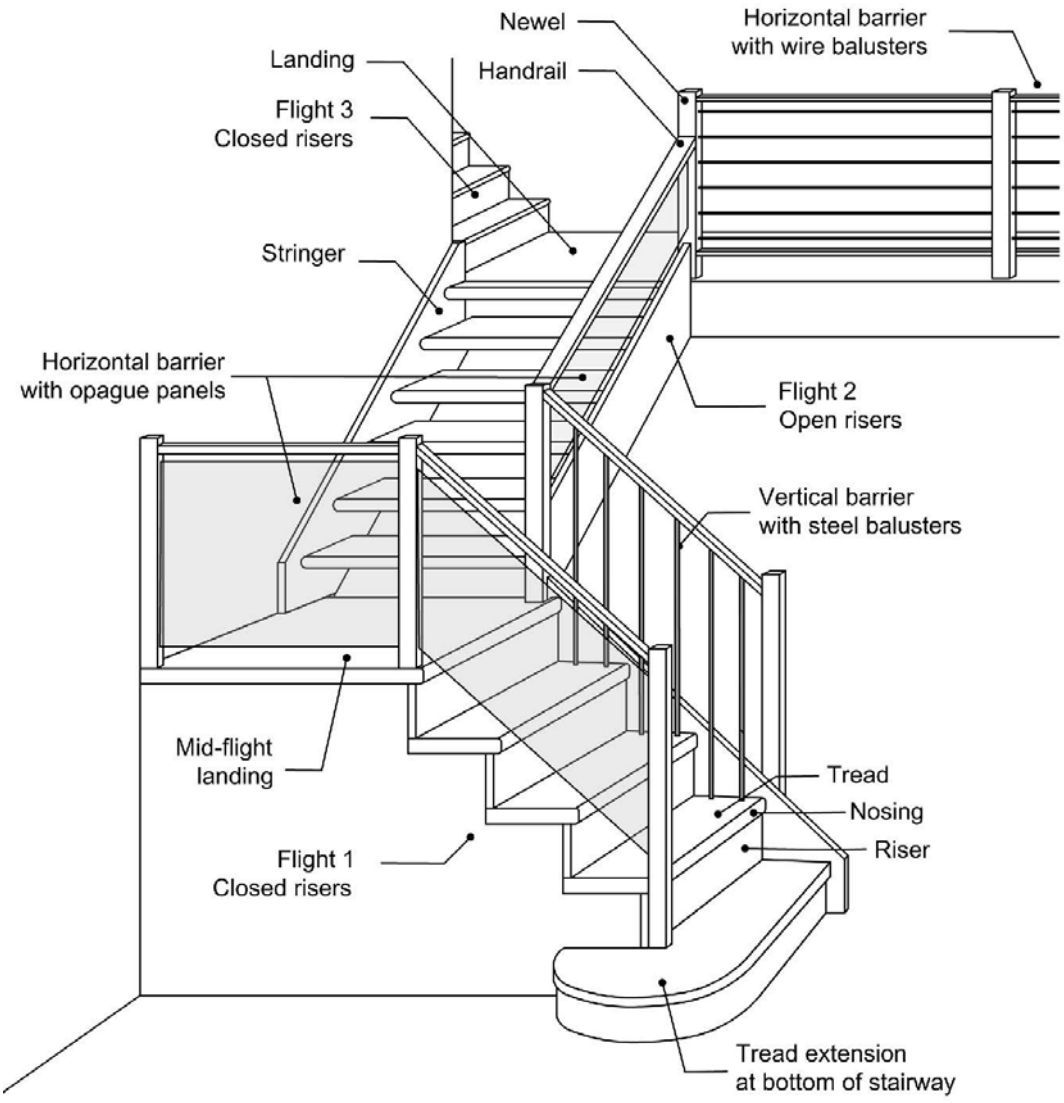
b) Have balusters horizontally positioned so that the width of any opening in the balustrade is not more than 100 mm

c) Not provide a toe-hold which could be used to climb over the balustrade

d) Not have any openings more than 100 mm wide

e) Not have horizontal balusters that would pose a climbing risk

Figure D2.12 Positioning of Handrails, Railings, Fall Barriers



D3 HANDRAIL

.1 Except in a sole-occupancy residential building or unit, a handrail provided for fall protection must be at a height of 850 mm to 1,000 mm measured from the ground surface or nosing of a riser.

.2 For a designated accessible route, a handrail must be provided at a height of 760mm in addition to fall protection provided.

.3 A handrail must have a smooth surface and be continuous.

.4 Handrails for a stairway or ramp must be:

a) Located along at least on one side of a flight of stairs for Class 1 buildings and within sole occupancy residential units of Class 2 – 5 buildings

b) Located on both sides of a stairway within a public path of travel or on an accessible route, or if the stairway is 2m wide or more

c) Located on both sides of a ramp, unless fall protection is provided on one side

d) Continuous between stair flight landings and have no obstruction that will break a hand-hold

e) Free from any obstruction on or above the stairway or ramp that could break a handhold, except for newel posts, ball type stanchions, or the like.

.2 Handrails in a Class 9a health-care building must be provided along at least one side of every passageway or corridor used by patients, and must be:

a) Fixed not less than 100 mm clear of the wall

b) Continuous for the full length

.3 For a Class 9b building used as an early childhood centre or a primary school, one handrail must be fixed at a height of 865 mm to 1,000 mm, and a second handrail must be fixed at a height between 565 mm and 750 mm. Both must be measured from the nosing of a stair tread or the floor surface of a ramp, landing, and the like.

.4 Handrails serving an area required to be accessible must be designed and constructed to comply with **AS 1428.1 Design for Access and Mobility, Part 1: General Requirements for Access - New Building Work.**

.5 A balustrade with a height exceeding 1,000 mm must have a separate handrail installed with:

a) A smooth surface that is attached to the balustrade at a height between 850 mm to 1,000 mm from the ground surface, and/or a height of 760 mm to meet accessibility requirements

b) A 100 mm clear space must be maintained between the balustrade and the inside of the handrail

D4 FIXED PLATFORM, WALKWAY AND LADDER

.1 Fixed platforms, walkways, non-required stairways, handrails, balustrades and ladders must comply with **AS 1657 Fixed Platforms, Walkways, Stairways and Ladders – Design, Construction and Installation** in:

a) Machinery rooms and/or lift-machine rooms

b) Boiler houses

c) Plant-rooms, and the like, or

d) Non-habitable rooms such as attics, storerooms and the like that are not used on a frequent or daily basis in the internal parts of a sole-occupancy unit in a Class 2 or Class 4 part of a building

D5 PARAPET ON A FLAT ROOF

.1 Where a flat roof or other elevated place has regular access to a parapet or balustrade of not less than 1 m height above the surface of the roof or elevated place must be provided.

.2 The width of any opening in the parapet or balustrade must not exceed 100 mm.

Table D2.4(a) Barrier Details

1. Barrier Heights	
Location	**Minimum height**
a) Stairway or ramps with a gradient of 1:20 or steeper.	900 mm
b) Landings to a stair or a ramp where the barrier is provided along the inside edge of the landing and does not exceed 500 mm in length.	
c) In front of fixed seating on a mezzanine or balcony within an auditorium in a Class 9b building, where the horizontal projection extends not less than 1 m outwards from the top of the barrier	700 mm
d) In all other locations	1 m
Notes: 1. Heights measured vertically from surface beneath, except that stairway height must be measured above the nosing line of the stair treads. 2. A transition zone may be incorporated where the barrier height changes from 865 mm on a stair flight or ramp to 1 m at a landing or floor.	
2. Barrier Openings	
Location	**Maximum Opening**
a) Fire-isolated stairways, fire-isolated ramps and other area used primarily for emergency purposes, excluding:	A 300 mm sphere must not be able to pass through any opening
(i) External stairways	
(ii) External ramps.	Where rails are used:
b) Class 7 (other than carparks) and Class 8 buildings	(i) A 150 mm sphere must not be able to pass through the opening between the nosing line of the stair treads and the rail or between the rail and floor of the landing or balcony
	(ii) Opening between rails must be less than 460 mm.
c) In all other locations	A 125 mm sphere must not pass through the opening.
Note: The maximum 125 mm barrier opening for a stairway, is measured above the nosing line of the stair treads.	
3. Barrier Climbability	
Location	**Requirement**
a) Fire-isolated stairways, fire-isolated ramps and other areas used primarily for emergency purposes, excluding (i) external stairways, and (ii) external ramps.	No requirement
b) Class 7 (other than carparks) and Class 8 buildings	
c) Floors more than 4 m above the surface beneath in all other locations	Any horizontal or near horizontal elements between 150 mm and 760 mm above the floor must not facilitate climbing

d) Where a required barrier is constructed of wire, it is deemed to meet the requirements of Table D2.3.1a 2(c) if it is constructed in accordance with the following:

(i) **For horizontal wire systems:** When measured with a strain indicator, it must be in accordance with the tension values in Table D2.3.2b, or must not exceed the maximum deflections in Table D2.3.4d.

(ii) **For non-continuous vertical wire systems**, when measured with a strain indicator, must be in accordance with the tension in Table D2.3.2b **(see Note 4).**

(iii) **For continuous vertical or continuous near vertical sloped wire systems:**

(A) Must have wires of no more than 2.5 mm diameter with a lay of 7 x 7 or 7 x 19 construction

(B) Changes in direction at support rails must pass around a pulley block without causing permanent deformation to the wire

(C) Must have supporting rails, constructed with a spacing of not more than 900 mm, of a material that does not allow deflection that would decrease the tension of the wire under load

(D) When the wire tension is measured with a strain indicator, it must be in accordance with the tension values in Table D2.3.3c and measured in the furthermost span from the tensioning device

Table D2.4(b) Wire barriers – Required Tension for Stainless Steel Horizontal Wires

Wire dia. (mm)	Lay	Wire spacing (mm)	Clear distance between posts (mm)								
			600	800	900	1000	1200	1500	1800	2000	2500
			Minimum required tension (N)								
2.5	7x7	60	55	190	263	415	478	823	1080	1139	X
		80	382	630	730	824	1025	1288	X	X	X
		100	869	1218	1368	X	X	X	X	X	X
2.5	1x19	60	35	218	310	402	585	810	1125	1325	X
		80	420	630	735	840	1050	1400	1750	X	X
		100	1140	1565	X	X	X	X	X	X	X
3.0	7x7	60	15	178	270	314	506	660	965	1168	1491
		80	250	413	500	741	818	1083	1370	1565	X
		100	865	1278	1390	1639	X	X	X	X	X
3.0	1x19	60	25	183	261	340	520	790	1025	1180	X
		80	325	555	670	785	1015	1330	1725	1980	X
		100	1090	1500	1705	1910	X	X	X	X	X
4.0	7x7	60	5	73	97	122	235	440	664	813	1178
		80	196	422	480	524	760	1100	1358	1530	2130
		100	835	1182	1360	1528	1837	2381	2811	3098	X
4.0	1x19	60	5	5	10	15	20	147	593	890	1280
		80	30	192	300	415	593	1105	1303	1435	1844
		100	853	1308	1487	1610	2048	2608	3094	3418	3849
4.0	7x19	60	155	290	358	425	599	860	1080	1285	1540
		80	394	654	785	915	1143	1485	1860	2105	2615
		100	1038	1412	1598	1785	2165	2735	X	X	X

Notes:

(1) Lay = number of strands by the number of individual wires in each strand. For example, a lay of 7x19 consists of 7 strands with 19 individual wires in each strand.

(2) Where a change of direction is made in a run of wire, the tensioning device is to be placed at the end of the longest span

(3) If a 3.2 mm wire is used the tension figures for 3.0 mm wire are applied

(4) This table may also be used for a set of non-continuous (single) vertical wires forming a barrier using the appropriate clear distance between posts as the vertical clear distance between the rails

(5) X = Not allowed because the required tension would exceed the safe load of the wire

(6) Tension measured with a strain indicator

Table D2.4(c) Continuous Wire barrier – Vertical or Near Vertical Stainless-Steel Wires

Wire dia. (mm)	Lay	Wire spacing (mm)	Minimum required tension (N)
			900
			Required tension (N)
2.5	7x19	80	145
		100	310
		110	610
2.5	7x7	80	130
		100	280
		110	500

Notes:

(1) Lay = number of strands by the number of individual wires in each strand. For example, a lay of 7x19 consists of 7 strands with 19 individual wires in each strand.
(2) Vertical wires require two pulley blocks to each 180° change of direction in the wire.
(3) Near vertical wires may only require one pulley block for each change of direction
(4) Tension measured with a strain indicator
(5) The table only includes 7x7 and 7x19 wires due to other wires not having sufficient flexibility to make the necessary turns.

Table D2.4(d) Wire barrier – Maximum Permissible Deflection for Stainless Steel Wires

Wire dia. (mm)	Wire spacing (mm)	Clear distance between posts (mm)					
		600	900	1200	1500	1800	2000
		Maximum permissible deflection of each wire in mm when a 2 kg mass is suspended at mid span					
2.5	60	17	11	9	8	8	8
	80	7	5	5	5	X	X
3.0	60	19	13	8	7	7	7
	80	8	6	6	5	5	5
4.0	60	18	12	8	8	7	7
	80	8	6	4	4	4	4

Notes:

(1) Where a change of direction is made in a run of wire the 2 kg mass must be placed at the middle of the longest span
(2) If a 3.2 mm wire is used the deflection figures for 3.0 mm wire are applied
(3) This table may also be used for a set of non-continuous (single) vertical wires forming a barrier using the appropriate clear distance between posts as the vertical clear distance between the rails. The deflection (offset) is measured by hooking a standard spring scale to the mid span of each wire and pulling it horizontally until a force of 19.6 N is applied
(4) X = Not allowed because the required tension would exceed the safe load of the wire
(5) This table has been limited to 60 mm and 80 mm spaces for 2.5 mm, 3 mm and 4 mm diameter wires because the required wire tensions at greater spacings would require the tension to be beyond the wire safe load limit, or the allowed deflection would be impractical to measure.

D3 OCCUPANCY AND MEASUREMENT

Performance Requirements

(1) Buildings must be designed and constructed to safely accommodate the number of people for which the use is intended on any given day or time

(2) Buildings must be designed accurately to ensure all safety standards are achieved

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Occupancy and measurement performance requirements of D3 are satisfied if **all of the following** deemed-to-satisfy provisions are successfully demonstrated.

D1 MAXIMUM OCCUPANCY

Class 1 buildings and sole-occupancy residential units in Class 1 buildings

.1 Occupancy of residential buildings and sole-occupancy residential units shall be based on two persons per bedroom or sleeping area.

Class 2 to 9 buildings

.2 Expected occupancy used to determine appropriate size for a room, floor or mezzanine and the appropriate emergency evacuation routes can be determined by:

a) Calculating the sum of the occupants obtained by dividing the floor area of each part of the storey by the number of square metres per person listed in Table D3.1 below according to the use of the part, excluding spaces set aside for:

(i) Lift, stairs, ramps and escalators, corridors, hallways, lobbies, and the like

(ii) Service ducts and the like, sanitary compartments or other ancillary uses

(iii) Reference to the seating capacity in an assembly building or room, or

(iv) Any other suitable means of assessing its capacity

b) Expected occupancy for mixed use buildings shall have the occupancy load of each use calculated separately and summed together

.

Table D3.1 Occupancy Table: Area Per Person According to Use

Type of Use	m^2 per person
Art gallery, exhibition area, museum	4
Bar – standing	0.5
Bar – other	1
Board room	2
Boarding house	15
Cafe, church, dining room	1
Carpark	30
Computer room	25
Court room – Judicial area	10
Court room – Public seating	1
Dance floor	0.5
Dormitory	5
Early childhood centre	4
Factory:	
(a) Machine shop, fitting shop, or like place for cutting, grading, finishing or fitting of metals or glass, except in the fabrication of structural steelwork or manufacture of vehicles or bulky products	5
(b) Areas used for the fabrication and processing other than those in (a)	50
(c) A space in which the layout and natural use of fixed plant or equipment determine the number of persons which will occupy the space during working hours	Area per person determined by the use of the plant or equipment
Gymnasium	3
Hospital ward area	10
Hostel, hotel, motel, guest house	15
Indoor sports stadium- arena	10
Kiosk	1
Kitchen, laundry (other than domestic) and laboratory	10
Library – Reading space	2
Library – Storage space	30

Type of Use	m^2 per person
Office, including one for typewriting or document copying	10
Plant room – Ventilation, electrical or other service units	30
Plant room – Boilers or power plant	50
Reading room	2
Restaurant	1
School – General Classroom	2
School – Multi-purpose hall	1
School – Staff room	10
School – Trade and practical area: Primary	4
School – Trade and practical area: Secondary	As for workshop
Shop – space for sale of goods:	
At a level entered direct from the open air or any lower level	3
All other levels	5
Showroom – display area, covered mall or arcade	5
Skating rink, based on rink area	1.5
Spectator stand, audience viewing area:	
Bench seating	450 mm/person
Fixed seating	Per number of seats
Removable seating	1
Standing view area	0.3
Storage space	30
Swimming pool, based on pool area	1.5
Switch room, transformer room	30
Telephone exchange – private	30
Theatre and public hall	1
Theatre dressing room	4
Transport terminal	2
Workshop:	
For maintenance staff	30 (in the whole area)
For manufacturing processes	As for factory

D4 EVACUATION ROUTE

Performance Requirements

(1) Reasonable provision must be made in the design of a building and site for people of all abilities to safely evacuate the building and site during a disaster or emergency

(2) An evacuation route must be provided within Class 2 to 9 buildings to allow occupants sufficient time to evacuate safely, with the number, location and dimensions of the evacuation route appropriate to:

a) Travel distances

b) Number, mobility and other characteristics of the occupants

c) Function and use of the building

d) Building height

e) Whether the exit is above or below ground level

f) Number of storeys connected to the evacuation route

g) The fire safety system installed in the building

h) Fire brigade capacity

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Evacuation route performance requirements of D4 are satisfied if **all of the following** deemed-to-satisfy provisions are successfully demonstrated.

Applies to Class 2 to 9 buildings only.

D1 EVACUATION ROUTE DIMENSIONS

.1 A building and site must have a sufficient number of evacuation (fire-isolated) routes and efficient placement appropriate to building type, function, configuration and occupancy.

.2 The unobstructed width of an evacuation route must not diminish in the direction of travel from the building to a road or place of safety.

.3 Size and configuration of an evacuation route and non-accessible path of travel must comply with criteria in Table D4.1.

Table D4.1 Evacuation Route Dimensions

Evacuation Route	Accessible	Non-Accessible Path of Travel
Unobstructed width	• 2 m for two-way movement; 1.2m if a 1/5m x 1.5m turning place for a wheelchair is provided at 10 m intervals	• 1.2 m
Unobstructed height	• 2 m	• 2 m
For 100 – 200 people	• 2.0 m (two-way accessible)	• 1.2m for up to 100 people • 1.5 m for up to 101 to 150 people • 2.0 m for 151 – 200 people
For > 200 people	• Same as non-accessible	• 2 m + 0.5m for every 75 persons • 2 m + 0.5m for every 60 persons if egress has a stairway or ramp > 1:12
For > 2,000 people	• Same as non-accessible	• 17 m + number of excess persons divided by 600

D2 EVACUATION ROUTE PLACEMENT

.1 A fire-isolated evacuation route must be installed in Class 2 to 9 buildings and have:

a) At least one fire-isolated exit that opens to the exterior of the building or a place of safety

b) A connection to all interior rooms, stairways, ramps, lifts and sole-occupancy units within the building

.2 A fire-isolated evacuation route must be provided without passing through another sole-occupancy unit, such that every occupant has access to an accessible exit (connecting to an open space or place of safety).

.3 A fire-isolated evacuation route must not pass through:

a) A kitchen or food preparation area

b) Any other room containing a potential fire source such as a boiler room, air-conditioner room, furnace room, and the like

.3 Each fire-isolated evacuation route must provide independent egress from the storey served and discharge:

a) Directly, or by way of a fire-isolated passageway, to a road or open space, or

b) Into a storey or space within the confines of the building that is enclosed for not more than 1/3 of its perimeter and only if used for pedestrian movement, car parking, or the like, to a point where an unimpeded path of travel not further than 20 m is available to a road or open space, or

c) Into a covered area that:

(i) Adjoins a road or open space

(ii) Is open for at least 1/3 of its perimeter

(iii) Has an unobstructed clear height throughout, including the perimeter openings of not less than 3 m

(iv) Provides an unimpeded path of travel from the point of discharge to the road or open space of not more than 6 m

.4 Where a fire-isolated path of travel passes within 6 m of any part of an external wall of the same building measured horizontally at right angles to the path of travel, that part of the wall must have:

a) An FRL of not less than 60/60/60

b) Any openings protected internally in accordance with Section C3.4

c) The exit must be pressurised in accordance with **AS 1668.1 The Use of Air Conditioning and Ventilation in Buildings, Part 1: Fire and Smoke Control in Buildings**

Class 2 and 3 Buildings

.5 For Class 2 and 3 buildings, every stairway or ramp serving as a required exit must be fire-isolated where there are:

a) More than 3 consecutive storeys in a Class 2 building

b) More than 2 consecutive storeys in a Class 3 building

.6 For Class 2 and 3 buildings, a fire-isolated route is not required if:

a) The story accommodates only motor vehicles and/or other ancillary use

b) The building has a sprinkler system complying with Specification E1.5 Fire Sprinkler Systems

c) A storey is protected by:

(i) Fire-resisting, non load-bearing walls, ceilings, and/or floors with an FRL of 60/60/60, or

(ii) Fire-resisting, load-bearing walls, ceilings and/or floor with an FRL of 90/90/90, and

(iii) Openings that do not permit the passage of fire or smoke

Class 5 to 9 buildings

.7 Every stairway or ramp serving as a required exit must be fire-isolated unless:

a) It is part of an open spectator stand, or

b) A sprinkler system is installed throughout the building that complies with Specification E1.5 Fire Sprinkler Systems, or

c) The required exit does not provide access to an extra storey and is separated from the extra storey by:

(i) Fire-resisting, non load-bearing walls, ceilings, and/or floors with an FRL of -/60/60, or

(ii) An FRL of 90/90/90 for Type A construction or 60/60/60 for Type B or C construction if load-bearing, and

(iii) Openings that do not permit the passage of fire or smoke

D3 FIRE ISOLATED ROUTE COMPONENTS

Passageway

.1 The top-construction of a fire-isolated passageway need not have an FRL if the walls of the fire-isolated passageway extend to the underside of:

a) A non-combustible roof covering, or

b) A ceiling having a resistance to the incipient spread of fire of not less than 60 minutes separating the roof space or ceiling space in all areas surrounding the passageway within the fire compartment

Smoke Lobby

.2 If there are more than 2 access doors for a fire-isolated passageway that opens onto a common space, other than from a sanitary compartment and the like:

a) A smoke lobby must be provided,

b) The exit must be pressurized and fire-resistant

c) It must comply with Section D4 D4 below

Internal Stairway

.3 An internal stairway (including any landings) that is required to be within a fire-isolated route must be constructed:

a) Of non-combustible materials

b) So that if there is a local failure it will not cause structural damage to, or impair the fire-resistance of, the fire-isolated route

.4 If an internal stairway serving as an exit is required to be fire-isolated:

a) There must be no direct connection between a flight of stairs rising from a storey below the lowest level of access to a road or open space, and a flight of stairs descending from a storey above that level

b) Any construction that separates or is common to the rising and descending flights of stairs must be non-combustible and have a FRL of not less than 60/60/60

External Stairway

.5 An external stairway may serve as a required exit in lieu of a fire-isolated exit serving a storey below an effective height of 25 m, if the stairway is:

a) Non-combustible throughout

b) Protected if it is within 6 m of, and exposed to any part of the external wall of the building it serves by fire-resisting construction of 60/60/60

c) Provides access to:

(i) Sole-occupancy units in Class 1 to 3 buildings

(ii) All other building classes if the building is 3 storeys or less

d) Provides emergency access

.6 No openings are permitted less than 3 m from an external stairway, except a doorway with:

a) Non-combustible construction with an FRL of not less than 60/60/60

b) A fire door with an FRL of -/60/30 that is self-closing or automatic closing

c) Internal or external wall-wetting sprinklers for doors that are self-closing or automatic closing, and are located on the side exposed to the external wall

.7 Any openings located 3 m to 6 m from the external stairway must be protected as follows:

a) For windows:

(i) Internal or external wall-wetting sprinklers must be used that are automatic closing or permanently fixed in the closed position, or

(ii) -/60/- fire windows must be used that are automatic closing or permanently fixed in the closed position, or

(iii) -/60/- automatic closing fire shutters must be used

b) Other Openings:

(i) Excluding voids – internal or external wall-wetting sprinklers must be used, as appropriate, or

(ii) Construction having an FRL not less than -/60/- must be used

.8 In an open spectator stand containing more than one tier of seating, every tier must have not less than 2 stairways or ramps, each forming part of the path of travel to not less than 2 exits.

.9 A wall, roof, floor or other shielding element that creates separation between any openings in an external wall and an external stairway, must have the following characteristics:

a) An FRL of 60/60/60 or greater

b) No openings in the shielding barrier are permitted within 3 m of the external wall or external stairway unless it is a fire-isolated doorway serving the exit

c) Any openings in the shielding barrier within 3m to 6 m of the external wall or external stairway must comply with D4.7 above

Ramp

.10 A ramp must be provided at any change in level less than 600 mm in a fire-isolated passageway.

.11 A fire isolated ramp may be substituted for a fire isolated stairway if the construction enclosing the ramp and the width and ceiling height comply with requirements for a fire-isolated stairway.

.12 Where an open access ramp or balcony is provided to meet smoke hazard management requirements, it must:

a) Have ventilation openings to the outside air which:

(i) Have a total unobstructed area not less than the floor areas of the ramp or balcony

(ii) Are evenly distributed along the open sides of the ramp or balcony

b) Not be enclosed on its open sides above a height of 1 m except by an open grille or the like having a free air space of not less than 75% of its area

Doorway

.13 A doorway from a room must not open directly into a stairway, passageway or ramp that is required to be fire-isolated unless it is from:

a) A public lobby, public corridor, hallway, and the like

b) A sole-occupancy unit occupying all of a storey, or

c) A sanitary compartment, airlock, and the like

.14 The unobstructed height of a doorway may be reduced to not less than 1980 mm if the passageway is 2.0m in height.

Roof

.15 If an exit discharges to a roof of a building as part of the fire-isolated route, the roof must have an FRL of not less than 120/120/120.

.16 All structural building elements of walls, floors, ceilings, hallways must have a minimum FRL of 120/120/120 if situated below a roof that is part of a fire-isolated route.

.17 A roof must not have any roof lights or other openings within 3 m of a fire-isolated route used as an evacuation route to reach a place of safety.

Services

.18 Services or equipment that are not permitted to be installed in a required exit or fire-isolated route include:

a) Gas or other fuel services

b) Electricity meters, distribution boards or ducts

c) Central telecommunications distribution boards or equipment

d) Electrical motors or other motors serving equipment in the building

e) Access to service shafts and services other than for fire-fighting or detection equipment

.19 An opening to any chute or duct intended to convey hot products of combustion from a boiler, incinerator, fireplace or the like, must not be located in any part of a required exit, fire-isolated route, and any connecting corridor, hallway, lobby, and the like.

.20 Electrical wiring may be installed in a fire-isolated route if the wiring is associated with:

a) A lighting, detection, or pressurization system serving the exit, or

b) A security, surveillance, or management system serving the exit, or

c) An intercommunication system or an audible or visual alarm system, or

d) Monitoring equipment for hydrant or sprinkler isolating valves

D4 SMOKE LOBBY

.1 A smoke lobby, consisting of a pressurised, fire and smoke isolated room or stairway, must provide a place of refuge for people to escape to until help arrives in case of a fire or other emergency.

.2 A smoke lobby is required:

a) If the building is more than 2 storeys (5 m in height) and more than 2 fire-isolated routes converge in any one location on the same storey

b) In Class 5 buildings (highrises) that are greater than 25 m in height

.3 A smoke lobby must:

a) Have a floor area not less than 6 m^2

b) Be separated from the occupied areas in the storey by walls which are impervious to smoke, and:

(i) Have an FRL of not less than 60/60/- (which may be fire-protective grade plasterboard, gypsum block with set plaster, face brickwork, glass blocks or glazing)

(ii) Extend from floor to floor, or to the underside of a ceiling with a resistance to the incipient spread of fire of 60 minutes which covers the lobby

(iii) Construction joints between the top or the walls and the floor, roof or ceiling must be smoke sealed with intumescent putty or other suitable material

c) At any opening from the occupied areas, have smoke doors that comply with Specification C3.4 which are self-closing or held open by a fall-safe automatic magnetic release device

d) Be pressurised if the exit is required to be pressurized.

.4 A portion of a smoke lobby must be designated to be a place of refuge for people with disabilities and comply with Section D6 D2 below.

D5 LIGHTING AND SERVICING IN VARIOUS PATHS OF TRAVEL

.1 Services or equipment comprising:

a) Electricity meters, distribution boards or ducts, or

b) Central telecommunication distribution boards or equipment, or

c) Electrical motors or other motors serving equipment in the building

May be installed in:

d) A required exit, except for fire-isolated exits, or

e) In any corridor hallway, lobby or the like leading to a required exit, if the services or equipment are enclosed by non-combustible construction or a fire-protective covering with doorways or openings suitably sealed against smoke spreading from the enclosure

.2 Paths of travel that are public corridors must be well-illuminated through a combination of natural daylight (where available) and artificial lighting, providing a minimum luminance of 100 lux.

D6 SLIP RESISTANCE

.1 All paths of travel that are part of an evacuation route or place of safety must have a non-slip surface.

.2 All paths of travel for non-domestic buildings and sites must have a non-slip surface where there is a possibility that the surface could be exposed to moisture.

.3 Where applicable, all paths of travel required to be slip resistant must comply with:

a) **AS 1428.1 Design for Access and Mobility Part 1: General Requirements for Access - New Building Work**

b) **AS 2049 Roof Tiles**

c) **AS 4586 Slip Resistance Classification of Pedestrian Surface Materials**

d) **AS/NZS 4663 Slip Resistance of Existing Pedestrian Surfaces**

D5 AUTOMATED ACCESS

Performance Requirements

(1) Automated access must provide for the safe and easy movement of people of all abilities, maintenance personnel and deliveries relevant to occupancy, scale and function of the building

(2) The following automated access equipment must be fabricated, installed and operated to avoid the likelihood of people falling, tripping, becoming caught, being struck by moving parts, sharp edges or projections under both normal conditions and if part of a required exit:

a) Lifts and inclined platform lifts

b) Escalators

c) Moving walkways and ramps

d) Conveyor belts and the like

e) Automatic doors, windows, shutters

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Automated access performance requirements of D5 are satisfied if:

- **All of the following** deemed-to-satisfy provisions are successfully demonstrated
- **Section C1** Fire Resistance and Stability, **and C3** Protection of Openings are complied with
- **Specification C1.1, E3.1, E1.5, E2.2b** and **Schedule 5** are complied with
- **Applies to Class 2 to 9 buildings only**

D1 REQUIRED USAGE

.1 Automated access is deemed to be required in the following instances based on building size, occupancy, and safety during normal operations and in case of an emergency:

a) Required accessible buildings in Class 2 to 9 greater than one storey in height and where other accessible access is not provided

b) When deemed to be a necessary part of a required or accessible exit

c) In Class 9a health-care and Class 9c aged-care buildings greater than one storey in height

d) In all buildings greater than 4 storeys in height

e) In any building where it is an essential part of the occupancy

D2 OVERALL SAFETY MEASURES

.1 Automated access must have the following safety features to protect people during normal operations and in the event of an emergency:

a) Adequate automatic and manual movement control to ensure people's safety throughout any operation involving starting, stopping or changing the direction of travel

b) Notification of the device's location within the building when people are fully enclosed and it serves more than two levels

c) Information and warning signs describing the use of any automated access device during normal hours and during a fire or emergency

.2 Automated access devices must be designed for loads up to and including 25% in excess of the rated load.

.3 Automated access equipment must be placed safely and appropriately within a building to:

a) Be setback appropriately from paths of travel, hazards, and obstacles that could impede the safe movement of people or goods to and from the equipment

b) Provide access to main entry points and/or key destinations

.4 Automated access equipment must have adequate fall protection for entry, exit and use of the equipment.

.5 Automated access equipment must have adequate fire resistance and include safety measures to prevent unwanted ignition.

.6 All electrical components used to operate the automated access must be concealed except for emergency stop mechanisms that must be in highly visible and accessible locations with signage and auditory messaging providing instructions on how to operate it.

.7 Noise and vibration produced by the operation of the automatic access equipment must be at a safe and comfortable level.

.8 Easy access for periodic maintenance must be available throughout the lifespan of the equipment.

D3 LIMITATIONS ON USE

.1 The number and type of automated access used in a building or on a site must be appropriate to the occupancy and capacity of the people using it.

.2 Automated access will be deactivated in a fire or other emergency and must not impede the movement of people travelling to a place of safety.

.3 Automated access must comply with the limitations in Table D5.1.

Table D5.1 Lift Type and Limitations on Use

	Lift Type	Limitation on Use
Lift	**Vertical passenger lift with an integrated shaft**	No limitation
	Vertical platform lift (no shaft) for passengers	Must not serve more than 3 storeys
Travelator	**Stairway platform lift (escalator)**	Must not: (a) Be used in a high traffic public use area where passengers waiting to use the lift will disrupt the use of adjacent paths of travel (b) When in the folded position, must not encroach on the minimum width of a stairway
	Inclined lift	No limitation within an atrium; must not serve more than 2 storeys in a building without a sprinkler system; must not serve more than 3 storeys in a building with a sprinkler system
	Moving sidewalk	No limitation
Automated access equipment must be selected based on the recommended capacity (number and type of passengers, number of storeys served) issued by the manufacturer.		

D5.1 LIFTS

Performance Requirements

(1) Where a lift is intended to be used in addition to stairways and/or ramps to assist occupants to evacuate a building safely, the type, number and location of lifts must be appropriate to:

a) The function or use of the building

b) The travel distance and travel time to the lift

c) The number, mobility and other characteristics of occupants

d) The number of storeys that would be connected by the lift

e) The fire safety system and fire-resisting construction used in the building, and intended emergency procedures and evacuation routes

f) The number and location of fire compartments and exits

(2) For buildings taller than 25 m, and Class 9a health-care buildings that have two or more storeys, at least one lift that serves every floor must be fitted as an emergency lift to facilitate activities of emergency responders

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Lift performance requirements of D5.1 are satisfied if:

- **All of the following** deemed-to-satisfy provisions are successfully demonstrated
- **Section C1.1** Fire Resistance and Stability, **Section C3** Protection of Openings, and **Section E** Electrical are complied with
- **Specification D3.6, E1.5, E2.2a, E2.2b, E3.1, and Part E4** must be complied with

D1 ACCESS AND SAFETY

.1 Lifts are required to:

c) Be accessible for people with disabilities unless the function is primarily for movement of goods

d) Contain mobility aids and design features listed in Table D6.2.1

e) Be of and adequate size for emergency access

f) Be connected to a standby power supply system where installed

g) Have an emergency call button that is operational and connects to the National Fire Authority of Fiji's emergency system

h) Have emergency lighting that:

(i) Comes on automatically upon failure of the normal lighting supply

(ii) Provides at least 20 lux of lighting for two hours when activated, or other time interval based on fire-resisting construction used

i) Be close to flush with the landing to avoid a tripping hazard (less than 12 mm difference in height)

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D2 REQUIRED LIFTS

.1 A passenger lift must be provided in buildings greater than 10m (4 storeys) in height above ground, and for all levels below ground in Class 2, 3, 5, 6, 7 and 8 buildings.

.2 For Class 5, 6, 7b (car park) or 8 buildings, a passenger lift need not be provided if the floor area of each storey is less than 200 m^2 and the building is no greater than 10m (4 storeys) in height.

.3 Where residents in a Class 9c residential care building are on levels which do not have direct access to a road or open space, the building must be provided with:

a) At least one lift to accommodate a stretcher in accordance with Specification E3.2b Smoke Exhaust Systems, or

b) A ramp in accordance with **AS 1428.1 Design for Access and Mobility, Part 1: General Requirements for Access - New Building Work**, and the lift or ramp must discharge at a level providing direct access to a road or open space

c) All passenger lifts must comply with Specification E3.1 Lift Installations

D3 FIRE PROTECTION FOR LIFTS

.1 For fire protection, all vertical passenger lifts and platform lifts must comply with standards in Section C2.D9 Fire Compartments and Separations – Separation of Lift Shafts.

.2 All lifts must have:

a) A compliant sprinkler system at the top and bottom of the shaft that complies with **AS 2118.1 Automatic Fire Sprinkler Systems, Part 1: General Systems**

b) Protected service openings in the fire-isolated shaft that comply with Section C3 Protection of Openings

c) Warning signs that comply with approved standards regarding size, wording, colours, letter type, etc., displayed near every call button for a single lift or a group of lifts throughout the building intended for occupants

.3 All buildings with a lift must be fitted with an automatic or manual activation device that restricts movement of the lift during a fire or other emergency without trapping people inside the lift, appropriate to the building size, scale and use.

D4 SERVICE AND CONTROL SWITCH

Fire Service Recall Control Switch

.1 Where a lift serves any storey above an effective height of 10 m, a fire service recall control switch must be provided for:

a) A group of lifts

b) A single lift not in a group that serves the storey

.2 Each group of lifts must be provided with one fire service recall control switch that activates the fire service recall operation. The switch must:

a) Be located at the landing nominated by the approval authority

b) Be labelled "FIRE SERVICE" in indelible white lettering on a sign with a red background

c) Have two positions with an "OFF" and an "ON" position identified

d) Be operable only by the use of a key that is removable in either the "OFF" position or the "ON" position. The key must be able to turn all fire service recall control switches in the building and must have a different key combination to other keys used for lifts in the building.

.3 The fire service recall operation must be activated by:

a) Switching the fire service recall control switch to "ON", or

b) A signal from a fire management system approved by the appropriate authority.

.4 The activation of the fire service recall operation must:

a) Cancel all registered car and landing calls

b) Inactivate all door reopening devices that may be affected by smoke

c) Ensure lift cars travelling toward the nominated floor continue to the nominated floor without stopping

d) Ensure lift cars travelling away from the nominated floor stop at or before the next available floor without opening the doors (either automatically or by the door open button), reverse direction and travel without stopping to the nominated floor

e) For lifts stopped at a floor other than the nominated floor, close the doors and travel without stopping to the nominated floor

f) Ensure that lifts stay on the nominated floor with doors open

g) Permit all lifts to return to normal service if the fire service recall control switch is switched to the "OFF" position during or after the fire service recall operation

.5 The requirements of Clause D4.4(e) above do not apply to lifts on inspection service or when the lift car fire service control switch is in the "ON" position.

.6 Lifts having manual controls must signal an alert to the lift for the lift to return to the nominated floor containing the recall switch that activated the signal.

Lift car fire service drive control switch

.7 A lift car fire service drive control switch must be activated from within the lift car. The switch must:

a) Be located between 600 mm and 1,200 mm above the lift car floor

b) Be labelled "FIRE SERVICE" by indelible white lettering on a sign with a red background

c) Have two positions with an "OFF" and an "ON" position identified

d) Operate only by the use of a key that is removable in either the "OFF" position or the "ON" position

.8 When the lift car fire service drive control switch is turned to the "ON" position, the lift must:

a) Not respond to the fire service recall control switch

b) Cancel all registered lift car and landing calls

c) Override all lift car call access control systems

d) Inactivate all door reopening devices that may be affected by smoke

e) Allow the registration of lift car call by lift car call buttons, however the lift doors must not close in response to the registration of lift car calls

f) Activate door closing by constant pressure being applied on the "door close" button unless the button is released before the doors are fully closed, in which case the doors must reopen, and any registered lift car calls must be cancelled

g) When the doors are closed, move the lift in response to registered lift car calls while allowing additional lift car calls to also be registered

h) Travel to the first possible floor in response to registered lift car calls and cancel all registered lift car calls after the lift stops

i) Ensure doors do not open automatically

.9 The above requirements do not apply to a lift operating on inspection service.

.10 A multi-deck lift installation must have systems in place that:

a) Can communicate to the fire officer that the fire service drive control switch will not operate until all decks have been cleared of passengers

b) Ensure there is an appropriate method of clearing all deck landings of passengers

c) Maintain all doors to deck landings not containing the fire service control switch closed and inoperative while the lift is on fire service drive control

D5 ACCESSIBLE LIFT

.1 All passenger lifts must comply with accessibility requirements for people with disabilities contained in Table D5.2.

.2 Lift doors must have a clear, unobstructed minimum width of 915 mm for wheelchair access.

.3 Lifts must contain audible, tactile and visual information at accessible heights to identify:

a) The floor level and any other pertinent locational information

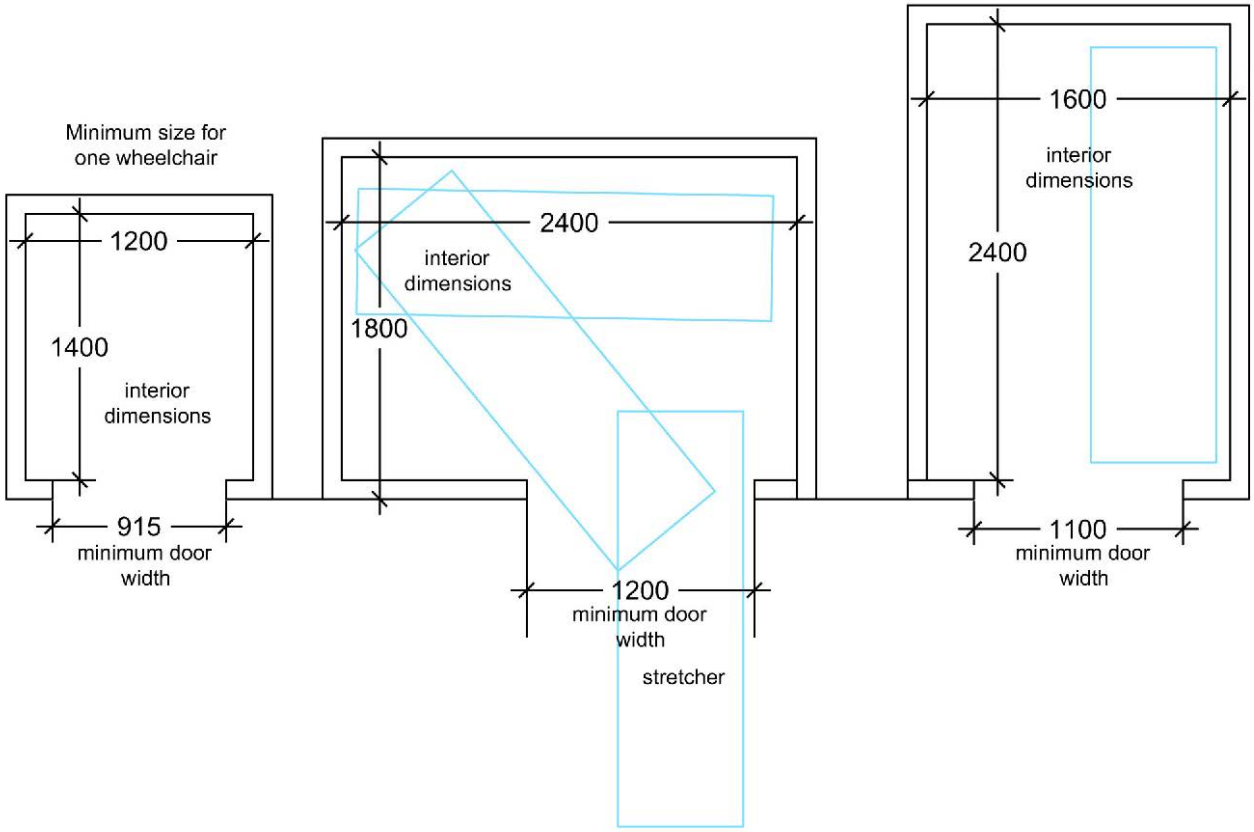
b) Safety and emergency procedures

.4 An emergency accessible lift may be combined with a passenger lift, so long as the lift is sized to accommodate a wheelchair and a stretcher as indicated in Table D5.2.

Table D5.2 Lift Accessible Design Features

Accessible Design Feature	Application
Handrail on all walls (except the door) located 900 mm above the floor of the lift (must comply with **AS 1735.12 Lifts, Elevators and Moving Walks, Parts 12: Facilities for Persons with Disabilities**	All passenger lifts that are accessible
Minimum lift floor area of 1,400 mm wide by 1600 mm deep	All lifts that travel > 12 m
Minimum lift floor area of 1,200 mm wide by 1400 mm deep	All lifts that travel < 12 m
Minimum lift floor area of 1,800 mm wide by 2,250 mm	Accessible emergency lift
Minimum clear door opening of 915 mm to accommodate a wheelchair; larger width may be required for a stretcher	All lifts
Passenger protection system complying with **AS 1735.12 Lifts, Elevators and Moving Walks, Parts 12: Facilities for Persons with Disabilities**	All lifts with a power operated door
Lift landing doors at the upper landing	All lifts
Lift car and landing control buttons complying with **AS 1735.12 Lifts, and Moving Walks, Parts 12: Facilities for Persons with Disabilities**	All lifts ft
Lighting in accordance with **AS 1735.12 Lifts, Elevators and Moving Walks, Parts 12: Facilities for Persons with Disabilities**	All lifts
(a) Automatic audible information within the lift car to identify level each time the car stops (b) Audible and visual indication at each lift landing to indicate the arrival of a lift car (c) Audible information and indication in (a) and (b) provided in the range of 20-80 dB(A) at a maximum frequency of 1,500 Hz	All lifts serving more than 2 levels
Emergency hands-free communication, including a button that alerts the fire-department (NFA) of a problem and indicator light located between 900 – 1,100 mm above the floor of the lift	All lifts
Mirrors installed on lift interior to provide visibility of floor identify indicator	All lifts

Figure D5.1 Minimum Dimensions for Accessible Lifts



D5.2 TRAVELATORS

Performance Requirements

(1) Where a travelator (moving sidewalk, moving ramp, escalator, or inclined ramp) is intended to be used in addition to stairways and/or ramps to assist occupants to move through and evacuate a building safely, the type, number and location must be appropriate to:

a) The function or use of the building

b) The travel distance and travel time to the travelator

c) The number, mobility and other characteristics of occupants

d) The number of storeys that would be connected by the travelator

e) The fire safety system and fire-resisting construction used in the building, and intended emergency procedures and evacuation routes

f) The number and location of fire compartments and exits

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Travelator performance requirements of D5.2 are satisfied if:

- **All of the following** deemed-to-satisfy provisions are successfully demonstrated
- **Section C1** and **Section C3** are complied with
- **Specification C1.1 and D3.6** are complied with
- **Applies to Class 2 to 9 buildings only**

D1 LOCATION AND CONNECTIONS

.1 Escalators and moving walkways:

a) Must not be used in a ward area in a Class 9a building or in overnight accommodation areas in a Class 9c building

b) May connect any number of storeys if they are:

(i) In a carpark, or

(ii) In an atrium, or

(iii) Outside a building, or

(iv) In an open spectator stand or indoor sports stadium

c) Must not connect, directly or indirectly, more than 2 consecutive storeys at any level in a Class 5, 6, 7, 8 or 9 building that does not have a sprinkler system

d) Does not negate the requirement to provide a lift as per Section D5.1 above

.2 In a Class 5 or 6 building that is protected with a sprinkler system throughout, travelators may connect up to 3 storeys providing that they comply with Specification D1.12 Non-Required Stairways, Ramps and Escalators.

.3 Travelators must not impede movement within an accessible route or evacuation route.

.4 Travelators must be installed with all safety precautions provided by the manufacturer.

D6 ACCESSIBILITY

D6.1 UNIVERSAL ACCESS

Performance Requirements

(1) Reasonable provision must be made in the design of all buildings to facilitate use, access, and circulation by people with disabilities, except for the following:

a) Class 10 buildings that are non-habitable

b) Areas where access would be inappropriate or unsafe for people with disabilities

c) Instances where unjustifiable hardship would fall upon a person due to compliance with accessibility standards

(2) Required accessible buildings must provide access and use of the building and site to people with disabilities according to:

a) Function scale, layout, use and occupancy

b) Provisions in approved accessibility standards and guidelines acceptable to the Government of Fiji

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Universal access performance requirements of D6.1 are satisfied if:

- **All of the following** deemed-to-satisfy provisions are successfully demonstrated
- **Section D1** is complied with
- **Specification D3.6** is complied with

D1 GENERAL BUILDING ACCESS REQUIREMENTS

.1 Buildings and parts of buildings are required to be accessible according to requirements in Table D6.1, unless:

a) The building or allotment contains an area where access would be inappropriate because of the particular purpose for which the area is used

b) The building or allotment contains an area that would pose a health or safety risk for people with disabilities

c) The building or allotment contains a path of travel exclusively leading to (a) or (b) above

.2 Buildings and sites required to be accessible must comply with standards in:

a) AS 1428.1 Design for Access and Mobility General Requirements for Access – New Building Work, and/or

b) NZS 4121 Design for Access and Mobility – Buildings and Associated Facilities, and

c) Access Audit Toolkit published by the Pacific Disability Forum

.4 All accessibility standards in this document take precedence over standards in the three above-noted documents.

D2 BUILDINGS REQUIRED TO BE ACCESSIBLE

.1 Building types, size and function required to be accessible must comply with standards in Table D6.1 below.

Table D6.1 Requirements for Access for People with Disabilities

Class of building	Access requirements
Class 1b	
(a) Dwellings located on one allotment and used for short-term holiday accommodation, consisting of:	
(i) 4 to 10 dwellings	1 accessible dwelling required
(ii) 11 to 40 dwellings	2 accessible dwellings required
(iii) 41 to 60 dwellings	3 accessible dwelling required
(iv) 61 to 80 dwellings	4 accessible dwelling required
(v) 81 to 100 dwellings	5 accessible dwelling required
(vi) more than 100 dwellings	5 accessible dwelling required plus 1 additional dwelling for every additional 30 dwellings or part thereof in excess of 100 dwellings
(b) A boarding house, bed and breakfast, guest house, hostel or the like, other than those listed above • 1 accessible bedroom and associated sanitary facilities • Not less than 1 of each type of room or space for use in common by residents or guests, including an accessible cooking facility and accessible opportunities in common areas like a sauna, gymnasium, swimming pool, laundry, games room, eating area and the like • Access to common areas must be provided by an accessible ramp or passenger lift *Note 1: A community or strata-type subdivision or development is considered to be on a single allotment*	
Class 2 – Common Area • From a pedestrian entrance required to be accessible to at least 1 floor containing sole-occupancy units and to the entrance doorway of each sole-occupancy unit located on that level • To and within not less than 1 of each type of room or space for use in common by the residents, including a cooking facility, sauna, gymnasium, swimming pool, common laundry, games room, individual shop, eating area, or the like. • Where a ramp complying with AS 1428.1 or a passenger lift is installed: (a) to the entrance doorway of each sole-occupancy unit (b) to and within rooms or spaces for use in common by the residents, • Located on the levels served by the lift or ramp.	
Class 3 • From a pedestrian entrance required to be accessible to at least 1 floor containing sole-occupancy units and to the entrance doorway of each sole-occupancy unit located on that level • To and within not less than 1 of each type of room or space for use in common by the residents, including a cooking facility, sauna, gymnasium, swimming pool, common laundry, games room, TV room, individual shop, dining room, public viewing area, ticket purchasing service, lunch room, lounge room, or the like. • Where a ramp complying with AS 1428.1 or a passenger lift is installed, an accessible route must be provided on the levels served by the lift or ramp: (a) to the entrance doorway of each sole-occupancy unit (b) to and within rooms or spaces for use in common by the residents	
Class 3 - Sole-occupancy units – if the building or group of buildings contain:	
1 to 10 sole-occupancy units	1 accessible sole-occupancy unit
11 to 40 sole-occupancy units	2 accessible sole-occupancy units
41 to 60 sole-occupancy units	3 accessible sole-occupancy units
61 to 80 sole-occupancy units	4 accessible sole-occupancy units
81 to 100 sole-occupancy units	5 accessible sole-occupancy units
101 to 200 sole-occupancy units	5 accessible sole-occupancy units plus 1 additional accessible sole-occupancy unit for every 25 units or part thereof in excess of 100
201 to 500 sole-occupancy units	9 accessible sole-occupancy units plus 1 additional accessible sole-occupancy unit for every 30 units or part thereof in excess of 200

Class of building	Access requirements
More than 500 sole-occupancy units	• 19 accessible sole-occupancy units plus 1 additional accessible sole-occupancy unit for every 50 units or part thereof in excess of 500 • Not more than 2 required accessible sole-occupancy units may be located adjacent to each other. • Where more than 2 accessible sole-occupancy units are required, they must be representative of the range of rooms available.
Class 5, 6, 7a, 7b, 8, 9a and 9c	
Schools and early childhood centres	To and within all areas normally used by the occupants
An assembly building not being a school or an early childhood centre	• Wheelchair seating spaces provided in accordance with D3.9. • To and within all other areas normally used by the occupants, except that access need not be provided to tiers or platforms of seating areas that do not contain wheelchair seating spaces.
Class 9c - Common areas • From a pedestrian entrance required to be accessible to at least 1 floor containing sole-occupancy units and to the entrance doorway of each sole-occupancy unit located on that level • To and within not less than 1 of each type of room or space for use in common by the residents, including a cooking facility, sauna, gymnasium, swimming pool, common laundry, games room, TV room, individual shop, dining room, public viewing area, ticket purchasing service, lunch room, lounge room, or the like. • Where a ramp complying with AS 1428.1 or a passenger lift is installed: (a) to the entrance doorway of each sole-occupancy unit (b) to and within rooms or spaces for use in common by the residents, • Located on the levels served by the lift or ramp.	
Class 9c - Sole-occupancy units - If the building or group of buildings contain:	
1 to 10 sole-occupancy units	1 accessible sole-occupancy units
11 to 40 sole-occupancy units	2 accessible sole-occupancy units
41 to 60 sole-occupancy units	3 accessible sole-occupancy units
61 to 80 sole-occupancy units	4 accessible sole-occupancy units
81 to 100 sole-occupancy units	5 accessible sole-occupancy units
101 to 200 sole-occupancy units	5 accessible sole-occupancy units plus 1 additional accessible sole-occupancy unit for every 25 units or part thereof in excess of 100
201 to 500 sole-occupancy units	9 accessible sole-occupancy units plus 1 additional accessible sole-occupancy unit for every 30 units or part thereof in excess of 200
More than 500 sole-occupancy units	19 accessible sole-occupancy units plus 1 additional accessible sole-occupancy unit for every 50 units or part thereof in excess of 500 Where more than 2 accessible sole-occupancy units are required, they must be representative of the range of rooms available.
Class 10a • Non-habitable building located in an accessible area intended for use by the public and containing a sanitary facility, change room facility or shelter (a) an accessible sanitary facility (b) a change room facility (c) a public shelter or the like	
Class 10b – Swimming Pool • To and into swimming pools with a total perimeter greater than 40 m, associated with a Class 1b, 2, 3, 5, 6, 7, 8 or 9 building that is required to be accessible, but not swimming pools for the exclusive use of occupants of a Class 1b building or a sole-occupancy unit in a Class 2 or Class 3 building.	

D3 SIGNAGE

.1 Signage in an evacuation route and/or accessible route must comply with standards in the Accessibility Took Kit published by the Pacific Disability Forum with respect to dimensions, materials, content, accessibility symbols, font size and colour contrast and with Section D1 D12.

.2 Signage attached to any door, wall, lift and the like shall be placed so that the bottom edge of the sign is located a minimum of 900mm from the floor and the top edge of the sign no higher than 1,800 mm from the floor.

.3 In a building required to be accessible, braille and tactile signage complying with Specification D3.6 Braille and Tactile Signs must identify each:

a) Sanitary facility, except a sanitary facility associated with a bedroom within a Class 1 building or a sole-occupancy residential or accommodation unit in a Class 2 to 9 building

b) Location containing a hearing augmentation system

c) Accessible adult change facility within the building

d) Accessible route

e) Evacuation route and all pertinent components (accessible entry doors, stairways and ramps, place of safety)

f) Other accessible location identified by the Government of Fiji

.3 An exit sign on an accessible route or evacuation route must clearly state:

a) "**Exit"**

b) "**Level"**, and either:

(i) The floor level number, or

(ii) A floor level descriptor, or

(iii) A combination of the above

.4 Signage must be provided within a room containing a hearing augmentation system identifying:

a) The type of hearing augmentation

b) The area covered within the room

c) If receivers are being used and where the receivers can be obtained

.5 Signage in portions of a building that are accessible must:

a) Identify all ambulant accessible sanitary compartments, and sanitary compartments with accessible features

b) Direct people to the nearest accessible entrance at entries that are not accessible

c) Identify the location of accessible lifts, stairways, and automatic access equipment in the building and on the site

D4 HEARING AUGMENTATION

.1 If a hearing augmentation system is required, an inbuilt amplification system, other than one used only for emergency warning, must be installed:

a) In a room in a Class 9b building, or

b) In an auditorium, conference room, meeting room or room for judicatory purposes, or

c) At any ticket office, teller's booth, reception area or the like, where the public is screened from the service provider

.2 If a hearing augmentation system required by D6 D4.1(a) above is:

a) An induction loop, it must be provided to not less than 80% of the floor area of the room or space served by the inbuilt amplification system, or

b) A system requiring the use of receivers or the like, it must be available to not less than 95% of the floor area of the room or space served by the inbuilt amplification system, and the number of receivers provided must not be less than:

(i) If the room or space accommodates up to 500 persons, 1 receiver for every 25 persons or part thereof, or 2 receivers, whichever is the greater

(ii) If the room or space accommodates more than 500 persons but not more than 1,000 persons, 20 receivers plus 1 receiver for every 33 persons or part thereof in excess of 500 persons

(iii) If the room or space accommodates more than 1,000 persons but not more than 2,000 persons, 35 receivers plus 1 receiver for every 50 persons or part thereof in excess of 1,000 persons

(iv) If the room or space accommodates more than 2,000 persons, 55 receivers plus 1 receiver for every 100 persons or part thereof in excess of 2,000 persons

.3 The number of persons accommodated in the room or space served by an inbuilt amplification system must be calculated according to D3 Occupancy and Measurement.

D5 TACTILE INDICATORS

.1 For a building required to be accessible, tactile ground surface indicators must be provided to warn people who are blind or have a vision impairment that they are approaching:

a) A stairway (see requirements and diagram in Section D2.D3)

b) An escalator

c) A passenger conveyor or moving walk

d) A ramp other than a fire-isolated ramp, step ramp, kerb ramp or swimming pool ramp

e) In the absence of a suitable barrier:

(i) An overhead obstruction less than 2.1 m above ground level, other than a doorway

(ii) An accessway meeting a vehicular way adjacent to any pedestrian entrance to a building, excluding a pedestrian entrance serving an area referred to in D3.4, if there is no kerb or kerb ramp at that point, except for areas exempted by D3.4

.4 Tactile ground surface indicators must be located a minimum of:

a) One tread width from the top and bottom risers of a stairway

b) 350 mm from the entrance and exit to a ramp, escalator or travelator

c) 350 mm from the door to a lift on all sides

d) 350 mm from an obstruction

.5 Material and finish of tactile ground surface indicators must be non-slip and comply with Sections 1 and 2 of **AS/NZS 1428.4.1 Design for Access and Mobility, Part 4.1: Means to Assist the Orientation of People with Vision Impairment - Tactile Ground Surface Indicators.**

.6 A tactile ground surface must not project into an adjacent corridor or walkway.

.7 A tactile ground surface must be located a minimum of 915 mm from an allotment boundary.

.8 A stairway is not required to have a tactile indicator at the top and bottom of the stairway if the handrails are a raised dome type and project a minimum of 450mm beyond the upper and lower treads for the following building types:

a) A hostel (Class 2 building) for the aged

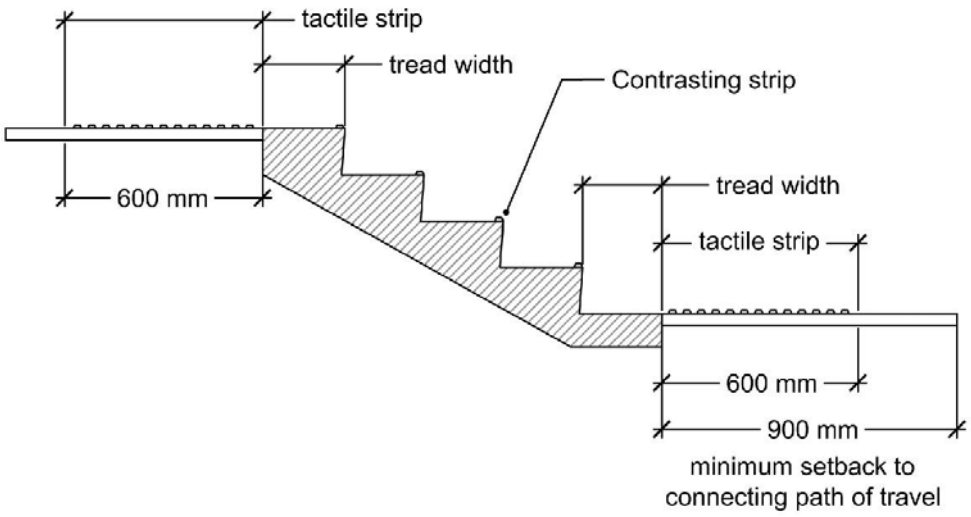
b) A nursing home (Class 9c building) for the aged

c) Residential accommodation (Class 3 building) for the aged

d) Class 9a health-care building

.9 The above clause is only applicable where the use of tactile indicators can potentially impede the safe movement of people who are elderly, infirm, or use mobility aids.

Figure D6.1 Tactile Material Setback



D6 WHEELCHAIR SPACES IN ASSEMBLY BUILDINGS

.1 Where fixed seating is provided in a Class 9b assembly building, wheelchair seating spaces complying with AS 1428.1 Design for Access and Mobility, Part 1: General Requirements for Access - New Building Work must be provided in accordance with the following criteria:

a) The number and grouping of wheelchair seating spaces must be in accordance with Section D3 Occupancy and Measurement per building type

b) In a cinema:

(i) With not more than 300 seats — wheelchair seating spaces must not be located in the front row of seats

(ii) With more than 300 seats — not less than 75% of required wheelchair seating spaces must be located in rows other than the front row of seats

Table D6.2 Wheelchair Seating Spaces in Class 9b Assembly Buildings

Number of fixed seats in a room or space	Number of wheelchair seating spaces	Grouping and location
Up to 150	3 spaces	1 single space 1 group of 2 spaces
151 to 800	3 spaces, plus	Not less than 1 single spaces
	1 additional space for each additional 50 seats or part thereof in excess of 150 seats	Not less than 1 group of 2 spaces
		Not more than 5 spaces in any other group
801 to 10,000	16 spaces, plus	Not less than 2 single spaces
	1 additional space for each additional 100 seats or part thereof in excess of 800 seats	Not less than 2 groups of 2 spaces
		Not more than 5 spaces in any other group The location of spaces is to be representative of the range of seating provided
More than 10,000	108 spaces, plus	Not less than 5 single spaces
	1 additional space for each additional 200 seats or part thereof in excess of 10,000 seats	Not less than 5 groups of 2 spaces
		Not more than 10 spaces in any other group The location of spaces is to be representative of the range of seating provided

D7 SWIMMING POOLS REQUIRED TO BE ACCESSIBLE

.1 A swimming pool must have at least one accessible water entry/exit if:

a) The perimeter is more than 70 m

b) It is used for commercial, public recreation, sport, health or therapeutic purposes by patients or the public

c) It is not primarily for use by the owner or tenants of a sole occupancy residential unit or building

.2 An accessible entry/exit for a swimming pool must consist of:

a) A fixed or movable ramp and an aquatic wheelchair, or

b) A zero-depth entry and an aquatic wheelchair, or

c) A platform swimming pool lift and an aquatic wheelchair, or

d) A sling-style swimming pool lift, and

e) Must comply with Specification D3.10 Accessible Water Entry/Exit for Swimming Pools

.3 Latching devices on gates and doors forming part of a swimming pool safety barrier need not comply with **AS 1428.1 Design for Access and Mobility, Part 1: General Requirements for Access - New Building Work.**

See Section E2.D8, pg E-20 Wet Areas and Swimming Pools (electrical safety)

See Section G7.D7, pg G-47 Swimming Pool Heating and Pumping

D6.2 EXTERIOR ACCESSIBILITY

Performance Requirements

(1) A building and site must be designed to allow people with disabilities to safely access:

a) An allotment entry, parking, and building entrance

b) Outdoor activities and amenities

c) A place of safety

d) Public transit

e) Vehicular drop-off areas

(2) Allotments designed to be accessible must safeguard people with disabilities from potential harm due to falling, disorientation, or harm from vehicles or other equipment

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Exterior accessibility performance requirements of D6.2 are satisfied if:

- **All of the following** deemed-to-satisfy provisions are successfully demonstrated
- **Section D1.1** Access and Movement and **Section D4** Evacuation Route are complied with
- **Specification D1.12 and D3.6** are complied with

• D1 EXTERIOR ACCESSIBLE ROUTE

.1 An accessible route outside the building must provide smooth, level and unobstructed access that permits manual wheelchair and assisted mobile devices to freely and safely use paths of travel.

.2 An exterior accessible route must:

a) Extend from the point of entry to the allotment and connect to:

(i) Accessible parking

(ii) Outdoor activities and amenities

(iii) At least one accessible building entry

(iv) Accessible vehicular drop-off areas

(v) Accessible public transit, if applicable

b) Be a minimum 2.0 m wide with a hard surface, slip-resistant finish

c) Have no vertical obstructions for a height of 2.5 m from the ground surface

d) Have a safe cross fall and slope in the direction of travel

e) Contain tactile indicators (raised bumps, rough texture, painted surface, and the like):

(i) Where the accessible route meets a change in level (stairway or ramp)

(ii) At pedestrian crossings

(iii) At accessible building entries

f) Have a ramp for changes in grade that complies with Section D2.2

g) Have a kerb and fall-protection where there is a change in level of 1.0 m in height or greater

.3 Stormwater management hardware such as gratings and manholes must be located outside of the accessible route to ensure that water does not accumulate on the path of travel.

.4 A pedestrian ramp within an exterior accessible route must be located:

a) To provide a smooth transition between parking lots and walkways where there is a sudden change in elevation

b) No closer than 1065 mm to an accessible building entrance

D2 VEHICULAR DROP-OFF AREA

.1 A vehicular drop-off area for required accessible buildings must:

a) Be located within 30 m of an accessible building entrance, and as close as possible to the accessible building entrance

b) Be a minimum of 3.2 m wide

c) Provide a smooth, level transition from the roadway to the accessible route

d) Be clearly indicated through:

(i) Signage that restricts the use to an accessible drop-off space

(ii) Pavement markings, textures, and/or auditory messaging

D3 ACCESSIBLE CARPARKING

.1 Accessible carparking must be provided in accordance with Table D6.3, and:

a) Be on the same allotment as the building required to be accessible

b) Must comply with **AS/NZS 2890.6 Parking Facilities, Part 6: Off-Street Parking for People with Disabilities**

.2 Accessible carparking spaces need not be provided in a Class 7a building or a carparking area where a parking service is provided and direct access to any of the carparking spaces is not available to the public.

.3 The accessible route within a carparking area must be:

a) Appropriately demarcated with a painted colour and/or texture that contrasts with the pavement

b) Have directional signage and/or traffic control signals with appropriately-located push buttons, audible and visual signals, and time intervals to allow safe crossing, where deemed appropriate

D4 BUILDING ENTRANCE

.1 An unobstructed, hard surface path of travel to the building entrance must be provided that will accommodate people with disabilities.

.2 A threshold with a maximum rise of 5 mm must be installed on both sides of the building entrance door for a distance of at least 1.0m on both sides of the doorway.

.3 A ramp, if needed, must be setback a minimum of 1,100 mm from the threshold.

.4 The door should be easy to open and close, and preferably automatic.

.5 An accessible door must have glazing installed at a height that will permit a person in a wheelchair to be easily seen.

.6 The doorway must have a colour contrast between the door, door frame, wall and path of travel to assist people with vision impairments.

.7 A tactile ground indicator (see Section D6.1 D5 above) must be installed on both sides of the doorway.

.8 Where an accessible building entrance has multiple doorways:

a) If the pedestrian entrance consists of 3 doorways or less, at least one of those doorways must be accessible

b) If a pedestrian entrance consists of more than 3 doorways, at least 50% of those doorways must be accessible.

Table D6.3 Accessible Carparking

Class of building to which carpark or carparking area is associated	Number of accessible carparking spaces required
Class 1b and 3	
(a) Boarding house, guest house, hostel, lodging house, backpackers accommodation, or the residential part of a hotel or motel.	To be calculated by multiplying the total number of carparking spaces by the percentage of: (i) Accessible sole-occupancy units to the total number of sole-occupancy units, or (ii) Accessible bedrooms to the total number of bedrooms the calculated number is to be taken to the next whole figure.
(b) Residential part of a school, accommodation for the aged, disabled or children, residential part of a health-care building which accommodates members of staff or the residential part of a detention centre.	1 space for every 100 carparking spaces or part thereof.
Class 5, 7, 8 or 9c	
	1 space for every 100 carparking spaces or part thereof.
	1 bedroom and associated sanitary facilities
Class 6	
(a) Up to 1000 carparking spaces	1 space for every 50 carparking spaces or part thereof.
(b) For each additional 100 carparking spaces or part thereof in excess of 1000 carparking spaces.	1 space
(c) A boarding house, bed and breakfast, guest house, hostel or the like, other than those described in (a)	To and within
Class 9a	
(a) Hospital (non-outpatient area)	1 space for every 100 carparking spaces or part thereof.
(b) Hospital (outpatient area):	1 space for every 50 carparking spaces or part thereof.
(c) Nursing home	1 space for every 100 carparking spaces or part thereof.
(d) Clinic or day surgery not forming part of a hospital.	1 space for every 50 carparking spaces or part thereof.
(i) Up to 1000 carparking spaces	1 space for every 50 carparking spaces or part thereof.
(ii) For each additional 100 carparking spaces or part thereof in excess of 1000 carparking spaces.	1 space.
Class 9b	
(a) School	1 space for every 100 carparking spaces or part thereof.
(b) Other assembly building:	
(i) Up to 1000 carparking spaces	1 space for every 50 carparking spaces of part thereof.
(ii) For each additional 100 carparking spaces or part thereof in excess of 1000 carparking spaces.	1 space.

D6.3 INTERIOR ACCESSIBILITY

Performance Requirements

(1) Reasonable provision must be made in the design of a building to facilitate access and circulation by people with disabilities

(2) Interior accessible routes must safeguard people from harm

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Interior accessibility performance requirements of D6.3 are satisfied if:

- **All of the following** deemed-to-satisfy provisions are successfully demonstrated
- **Section D1.1** is complied with
- **Specification D3.6, E4.8, and Part E4** are complied with

D1 INTERIOR ACCESSIBLE ROUTE

.1 Buildings in Class 1 to 10 must provide an accessible route to accommodate people of all abilities as follows:

Class 1 Residential and sole-occupancy residential Units in Class 2, 3, 4 and 5

a) An accessible route must be provided from an accessible building entry or sole-occupancy unit entry to:

(i) The primary living space

(ii) A sanitary compartment

(iii) At least one bedroom per occupant with a disability

And comply with requirements in Table D6.1

All Other Building Classes for a building required to be accessible according to Table D6.1

b) An accessible route must be provided in accordance with Table D6.1 and generally as follows:

(i) Through not less than 50% of all pedestrian entrances including the principal pedestrian entrance

(ii) For retail, commercial and industrial buildings, from required accessible entrances to all activity areas and public washrooms

(iii) For office buildings, from required accessible entrances to all offices, storage rooms, auxiliary rooms, and public washrooms

(iv) For Class 9 buildings, from required exits to all patient-care rooms, aged-care rooms, child-care rooms, waiting rooms, classrooms, auxiliary rooms, and public washrooms

(v) For Class 10 buildings, from the main entrances to the activity area for habitable buildings

(vi) In a building with a total floor area of more than 500 m^2, a maximum separation distance of 50 m is required between an accessible exit and required exit

.2 Passageways, ramps, steps or kerb ramps, passenger lifts, signs, doorway and other parts of the building required by this Part must comply with relevant standards in Section C and D, and with the provisions of:

a) **AS 1428.1 Design for Access and Mobility, Part 1: General Requirements for Access - New Building Work,** or

b) **NZS 4121 Design for Access and Mobility: Buildings and Associated Facilities** and **NZS 4122 Guide to Approachability, Accessibility and Usability of Buildings**, excluding any references to **AS 1735.12 Lifts, Escalators and Moving Walks, Part 12: Facilities for Persons with Disabilities.**

.3 A passing space for people in a wheelchair along an interior accessible route may consist of one or a combination of:

a) An intersection of accessible routes

b) A turning space with a minimum size of 1.5m by 1.5m

.4 A passing space must be placed at maximum 10 m intervals on those parts of an accessible route where a direct line of sight is not available.

.5 A passing space must comply with **AS 1428.1 Design for Access and Mobility, Part 1: General Requirements for Access - New Building Work.**

.6 A carpet in an accessible route shall have a pile height that does not exceed 11 mm and carpet backing thickness shall not exceed 4 mm. Carpet pile height does not affect the size of an accessible route.

D2 PLACE OF REFUGE

.1 A place of refuge where people with disabilities can wait until help arrives in the event of a fire or other emergency, must be provided for all Class 2 to 9 buildings that are:

a) Two storeys in height or greater

b) Have access to upper floors by way of an internal stairway or lift

.2 A place of refuge can be a part of a smoke lobby located near a lift or in a stairway.

.3 A place of refuge must be protected by way of:

a) Fire resisting construction with an FRL of at least 60/60/60

b) Resistance to the spread of smoke

.4 A place of refuge must contain:

a) A demarcated area that is a minimum of 0.9m by 1.2m in area to accommodate a single wheelchair, or greater area appropriate to the occupancy of the building

b) An identity sign that states "REFUGE AREA" and displays the international symbol of accessibility

c) A two-way communication system installed at a height of 1.0m from the ground floor with information sign and audio on how to use it

D3 BUILDING LOBBY

.1 A building with an accessible main entrance shall provide the following elements within the lobby:

a) Accessible doorway and entrance with an accessible. unobstructed route to the building activity and amenity areas, sanitary compartments and evacuation route

b) Be sufficient in gross floor area to allow comfortable, safe movement for people with wheelchairs or other assisted mobility devices

c) Have any public uses such a mailbox, public telephone, water fountain, and the like, have controls at an accessible height between 850 mm and 1100 mm from the ground level

d) Be free from obstructions or projections that could affect safe movement

e) Have adequate slip-resistant surfaces

f) Have visual and auditory information for sight and hearing impaired persons describing how to access activity areas, businesses, recreational activities, public washrooms, and the like

g) Have visual, braille, and auditory information for emergencies, including:

(i) Identification of fire and smoke alarm locations and usage

(ii) Identification of accessible exits

(iii) Identification of places of safety

(iv) Instructions for how to contact emergency responders

(v) Identification of first aid equipment

(vi) Identification of areas of refuge

h) Have seating and/or clear areas for people in a wheelchair

i) Be well-illuminated

D4 ACCESSIBLE SOCKETS AND SWITCHES

.1 Electrical switches in a room or path of travel required to be accessible must be placed at a height between 0.9 m to 1.2 m from the ground floor.

.2 Electrical sockets must not be placed less than 0.4m from the floor or more than 1.2 m from the floor.

.3 Both electrical sockets and switches must be located more than 0.4 m from room corners.

D5 ACCESSIBLE EMERGENCY EQUIPMENT

.1 Emergency fire protection equipment in a building that is accessible for people with disabilities must have:

a) Fire alarms installed no higher than 1,200 mm from the ground level and have a pull lever that requires no more than 2.5 kg to activate it

b) A fire hose reel with an access door and handle that is no higher than 1,200 mm from the ground level

c) A fire extinguisher installed within reach of a person in a wheelchair

d) Evacuation maps and emergency procedures posted no higher than 1,200 mm from the ground level

e) Any other firefighting or smoke management equipment identified visually and audibly posted no higher than 1,200 mm from the ground level

SPECIFICATIONS

D

Access & Egress

D1.12 Non-Required Stairways, Ramps and Escalators
D3.6 Braille and Tactile Signs
D3.10 Accessible Water Entry/Exit for Swimming Pools

E3.1 Lift Installations
E4.8 Photoluminescent Exit Signs

See Section C Specifications for:
Part E4 Visibility in an Emergency, Exit Signs and Warning Systems

SPECIFICATION D1.12
Non-required stairways, ramps and escalators

1. SCOPE

This Specification contains the requirements to allow non-required stairways, ramps or escalators to connect any number of storeys in a Class 5 or 6 building. The requirements do not apply in an atrium or outside a building.

2. REQUIREMENTS

An escalator, moving walkway or non-required non-fire-isolated stairway or pedestrian ramp must comply with the following:

a) The escalator, walkway, stairway or ramp must be bounded by a shaft of:

   i. Construction with an FRL of not less than 120/120/120 if load-bearing or –/120/120 if non load-bearing, and if of lightweight construction, must comply with Specification C1.8 Structural Tests for Lightweight Construction, or

   ii. Glazed construction with an FRL of not less than –/60/30 protected by a wall-wetting system in accordance with Clause 2 of **Specification G3.8 Fire and Smoke Control Systems in Buildings Containing Atriums**

b) The void of each non-required stairway, ramp or escalator must not connect more than 2 storeys

c) Rising and descending escalators, walkways, stairways and ramps within one shaft must be separated by construction with an FRL of not less than –/60/30

d) Openings into the shaft must be protected by fire doors with an FRL not less than –/60/30

e) When the fire door is in the closed position, the floor or any covering over the floor beneath the fire door must not be combustible

f) Fire doors must be fitted with smoke seals and the assembly must be tested in accordance with **AS 1530.4 Methods for Fire Tests on Building Materials, Components and Structures, Part 4: Fire Resistance Tests for Elements of Construction**

g) Fire doors must be:

   i. Closed and locked for security reasons, or

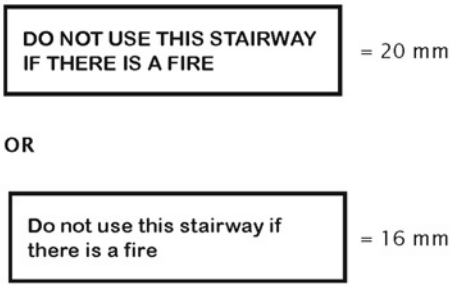
   ii. Held open and be automatic closing

h) Smoke detectors must be installed on both sides of the opening, and not more than 1.5 m horizontal distance from the opening

i) In the closed position, fire doors must be openable on a single hand downward action or horizontal pushing action on a single device within the shaft and by key only from outside the shaft, and must meet accessibility requirements

j) A warning sign must be displayed where it can readily be seen outside the shaft near all fire doors opening to the shaft. The sign must comply with the details and dimensions of Figure 2.

Figure 1 Warning Sign for Non-required Stairway, Ramp or Escalator



k) All doors opening into the shaft must be within 20 m of a required exit

l) Signs showing the direction of the nearest required exit must be installed where they can be readily seen

m) Materials attached to any wall, ceiling or floor within the shaft must comply with Specification C1.10 Fire Hazard Properties

n) Emergency lighting must be installed in the shaft in accordance with Section C: Part E.4 Visibility in an Emergency, Exit Signs and Warning Systems

o) No step or ramp may be closer to the threshold of the doorway than the width of the door leaf

SPECIFICATION D3.6

Braille and tactile signs

1. SCOPE

This Specification sets out the requirements for the design and installation of braille and tactile signage as required by D2.21, D3.6 and Specification F2.9.

2. LOCATION OF BRAILLE AND TACTILE SIGNS

.1 Signs including symbols, numbering and lettering must be designed and installed as follows:

a) Braille and tactile components of a sign must be located not less than 1200 mm and not higher than 1600 mm above the floor or ground surface

b) Signs with single lines of characters must have the line of tactile characters not less than 1250 mm and not higher than 1350 mm above the floor or ground surface

.2 Signs identifying rooms containing features or facilities listed in this Specification must be located:

a) On the wall on the latch side of the door with the leading edge of the sign located between 50 mm and 300 mm from the architrave

b) Where (i) is not possible, the sign may be placed on the door itself

.3 Signs identifying a required exit door must be located:

a) On the side that faces a person seeking egress

b) On the wall on the latch side of the door with the leading edge of the sign located between 50 mm and 300 mm from the architrave

c) Where (ii) is not possible, the sign may be placed on the door itself

3. BRAILLE AND TACTILE SIGN SPECIFICATION

.1 Tactile characters must be raised or embossed to a height of not less than 1 mm and not more than 1.5 mm.

.2 Title case must be used for all tactile characters, and:

a) Upper case tactile characters must have a height of not less than 15 mm and not more than 55 mm, except that the upper case tactile characters on a sign identifying a required exit door must have a height of not less than 20 mm and not more than 55 mm

b) Lower case tactile characters must have a minimum height of 50% of the related upper case characters

.3 Tactile characters, symbols, and the like, must have rounded edges.

.4 The entire sign, including any frame, must have all edges rounded.

.5 The background, negative space or fill of signs must be of matt or low sheen finish.

.6 The characters, symbols, logos and other features on signs must be matt or low sheen finish.

.7 The minimum letter spacing of tactile characters on signs must be 2 mm.

.8 The minimum word spacing of tactile characters on signs must be 10 mm.

.9 The thickness of letter strokes must be not less than 2 mm and not more than 7 mm

.10 Tactile text must be left justified, except that single words may be centre justified.

.11 Tactile text must be Arial typeface.

4. LUMINANCE CONTRAST

.1 The following applies to luminance contrast:

a) The background, negative space, fill of a sign or border with a minimum width of 5 mm must have a luminance contrast with the surface on which it is mounted of not less than 30%

b) Tactile characters, icons and symbols must have a minimum luminance contrast of 30% to the surface on which the characters are mounted

c) Luminance contrasts must be met under the lighting conditions in which the sign is to be located

5. LIGHTING

Braille and tactile signs must be illuminated to ensure luminance contrast requirements are met at all times during which the sign is required to be read.

6. BRAILLE

.1 The following applies to braille:

a) Braille must be grade 1 braille (uncontracted) in accordance with the criteria set out by the Australian Braille Authority

b) Braille must be raised and domed

c) Braille must be located 8 mm below the bottom line of text (not including descenders)

d) Braille must be left justified

e) Where an arrow is used in the tactile sign, a solid arrow must be provided for braille readers

f) On signs with multiple lines of text and characters, a semicircular braille locator at the left margin must be horizontally aligned with the first line of braille text

SPECIFICATION D3.10
Accessible water entry/exit for swimming pools

1. SCOPE

This Specification sets out the requirements for different types of accessible water entry/exit for swimming pools.

2. FIXED OR MOVEABLE RAMP

.1 A fixed or moveable ramp must:

a) Have a slip-resistant surface

b) Have a maximum gradient of 1:14

c) Have handrails complying with the requirements for ramps in **AS 1428.1 Design for Access and Mobility Part 1: General Requirements for Access - New Building Work,** installed on both sides of the ramp

d) Have kerbs in accordance with the requirements for ramps in **AS 1428.1 Design for Access and Mobility Part 1: General Requirements for Access - New Building Work**

e) Extend to a depth of not less than 900 mm and not more than 1100 mm below the stationary water level

f) Have landings in accordance with the requirements for ramps in **AS 1428.1 Design for Access and Mobility Part 1: General Requirements for Access - New Building Work**, with a landing located at the bottom and top of each ramp and a landing must be located at a level between 900 mm and 1100 mm below the stationary water level

3. ZERO DEPTH ENTRY

.1 A zero depth entry must have:

a) A slip-resistant surface

b) A maximum gradient of 1:14

c) A single handrail complying with the requirements for handrails in **AS 1428.1 design for access and mobility Part 1: General Requirements for Access - New Building Work,** from the top of the entry point continuous to the bottom level area

d) A level area that is:

i. 1500 mm long for the width of the zero depth entry at the entry point

ii. Located at the bottom of the zero depth entry at a level between 900 mm and 1100 mm below the stationary water level

4. PLATFORM SWIMMING POOL LIFT

.1 A platform swimming pool lift must be:

a) Capable of being operated from the swimming pool surround, within the swimming pool, and on the platform

b) Located where the water depth is not more than 1300 mm

c) Designed to withstand a weight capacity of not less than 160 kg and be capable of sustaining a static load of not less than 1.5 times the rated load

5. SLING-STYLE SWIMMING POOL LIFT

.1 A sling lift must comply with the following:

a) A sling lift must be located where the water depth is not more than 1300 mm

b) When the sling is in the raised position and in the transfer position, the centreline of the sling must be located over the swimming pool surround and not less than 450 mm from the swimming pool edge

c) The surface of the swimming pool surround between the centreline of the sling and the swimming pool edge must have a gradient of not more than 1:50 and must be slip-resistant

d) A clear space must be provided that:

i. Is not less than 900 mm x 1300 mm

ii. Has a gradient of not more than 1:50

iii. Has a slip-resistant surface

iv. Is located so that the centreline of the space is directly below the lifting point for the sling

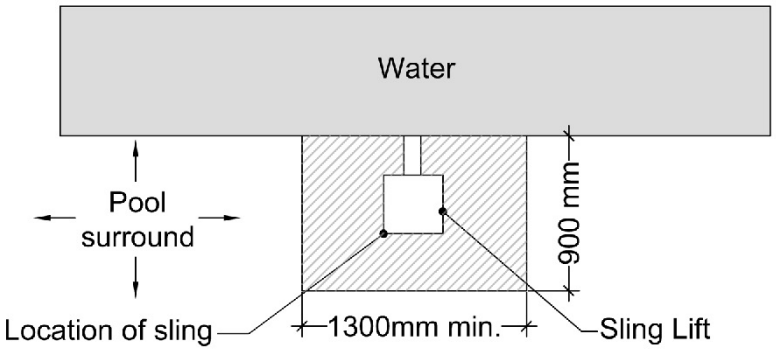
e) A sling lift must be capable of being operated from the swimming pool surround, within the swimming pool and from the sling, (see Figure 5)

f) A sling must be designed so that it will submerge to a water depth of not less than 500 mm below the stationary water level

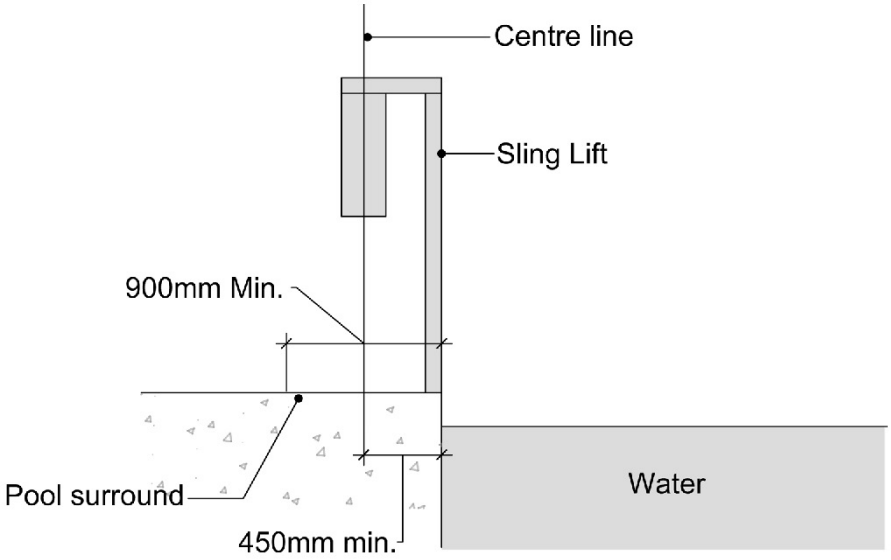
g) A sling lift must be designed to withstand a weight of not less than 136 kg and be capable of sustaining a static load not less than 1.5 times the rated load

Figure 1 Clear Swimming Pool Surround Space for Sling Lift in the Transfer

Position Plan view



Sectional elevation



6. AQUATIC WHEELCHAIR

.1 An aquatic wheelchair must comply with the following:

a) The height of the top surface of the seat must be not less than 430 mm

b) The seat width must not be not less than 480 mm

c) A footrest must be provided

d) Armrests must be located on both sides of the seat and must be capable of being moved away from the side of the chair to allow a person to transfer on and off the seat

Specification E3.1

Lift installations

1. SCOPE

This Specification contains requirements for electric passenger lift installations and electrohydraulic passenger lift installations.

2. LIFT CARS EXPOSED TO SOLAR RADIATION

.1 A lift car exposed to solar radiation directly or indirectly by re-radiation must have:

a) Mechanical ventilation at a rate of one air change per minute, or

b) Mechanical cooling

.2 A 2-hour alternative power source for ventilation or mechanical cooling must be provided in the event of normal power loss.

3. LIFT CAR EMERGENCY LIGHTING

.1 A lift car must have an emergency lighting system designed:

a) To come on automatically upon failure of the normal lighting supply

b) To provide at least 20 lux of lighting for 2 hours on the alarm initiation button

4. COOLING OF LIFT SHAFT

.1 While a lift in a lift shaft is in service, the cooling of the lift shaft must:

a) Ensure that the dry bulb air temperature in the lift shaft does not exceed 40°C

b) If the cooling is by a ventilation system, be provided with an air change rate determined using a temperature rise of no more than 5 K

5. LIFT FOYER ACCESS

.1 Where there is a security foyer in a building, locked security doors must have:

a) The ability to revert to an unlocked state in the event of a power failure or fire alarm

b) A closed circuit television and intercom system visible to a 24-hour staffed location

6. EMERGENCY ACCESS DOORS IN A SINGLE ENCLOSED LIFT SHAFT

.1 Where a lift is installed in a single enclosed lift shaft having a distance between normal landing entrances greater than 12.2 m, emergency access doors must be provided and constructed as follows:

a) The clear opening size of emergency doors must be not less than 600 mm wide x 980 mm high

b) Hinged doors must not open towards the interior of the lift shaft

c) Doors must be self-closing and self-locking

d) Doors must be marked on the landing side with the letters not less than 35 mm high:

"DANGER LIFTWELL ACCESS"

"KEEP FURNITURE AND FIXTURES CLEAR"

.2 Doors from the landing side must only be openable by a tool.

.3 Each emergency door must be provided with a positive breaking electrical contact, wired into the control circuit to prevent movement of the lift until the emergency door is both closed and locked.

.4 In single enclosed lift shafts where:

a) Ropes are installed

b) The vertical distance between the lift car sill and the landing door head is less than 600 mm

c) The counterweight is resting on its fully compressed buffer,

The following applies:

d) Emergency egress from the lift car must be provided in the form of an interlocked door with clear opening dimensions not less than 600 mm x 600 mm, accessible from the lift car entrance or the lift car roof (where the door is located in the wall of the lift shaft).

SPECIFICATION E4.8

Photoluminescent exit signs

1. SCOPE

This Specification contains requirements for photoluminescent exit signs.

2. APPLICATION

A photoluminescent exit sign must comply with Section 5 and Appendix D of **AS/NZS 2293.1 Emergency Lighting and Exit Signs for Buildings Part 1: System Design, Installation and Operation,** except where varied by this Specification.

3. ILLUMINATION

.1 A photoluminescent exit sign must:

a) Be maintained in a continuously charged state by a minimum illumination of 100 lux at the face of the sign by a dedicated light source with a colour temperature not less than 4000 K

b) In the event of a power failure, continue to provide a minimum luminance of 30 mcd/m^2 for not less than 90 minutes

c) Have its performance verified by testing in accordance with **ASTM E2073-10 Standard Text Method for Photopic Luminance of Photoluminescent Markings**, except the activation illumination in clause 8.3 is replaced with 54 lux.

4. PICTORIAL ELEMENTS

.1 Pictorial elements on a photoluminescent exit sign must:

a) Where the colour white is used, be replaced with a photoluminescent material

b) Be not less than 1.3 times larger than that specified in table 5.1 of **AS/NZS 2293.1 Emergency Lighting and Exit Signs for Buildings Part 1: System Design, Installation and Operation**

c) Have a border of photoluminescent material that extends not less than 15 mm beyond the pictorial elements

5. VIEWING DISTANCE

The maximum viewing distance in clause 5.6 of **AS/NZS 2293.1 Emergency Lighting and Exit Signs for Buildings Part 1: System Design, Installation and Operation** must not be more than 24 m

6. SMOKE CONTROL SYSTEMS

Smoke control systems required by clause 5.3 of **AS/NZS 2293.1 Emergency Lighting and Exit Signs for Buildings Part 1: System Design, Installation and Operation** do not apply to a photoluminescent exit sign.

Section E

Electrical

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SPECIFICATIONS

No specifications in this section

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OBJECTIVES

All electrical work associated with a building or structure must meet the following objectives:

(1) Electrical work must prevent electrocution, burns or fire

(2) Electrical work must satisfy the reasonable expectations of the occupants by ensuring that it is adequate for their intended use, both current and anticipated

E1 ELECTRICAL SYSTEM DESIGN AND INSTALLATION

Performance Requirements

(1) An electrical installation shall be designed to:

a) Protect people, livestock and property from harmful effects

b) Function correctly as intended

c) Connect, operate safely and be compatible with the electricity distribution system or other source of supply to which the electrical installation is to be connected

d) Facilitate safe operation, inspection, testing and maintenance

e) Reduce inconvenience in the event of a fault

(2) Electrical systems shall be designed and installed to prevent injury or property damage because of any harmful influence between:

a) Different electrical installations

b) Different circuits of the same electrical installation

c) Electrical and non-electrical installations

d) The structure on which the electrical installation is installed

(3) Electrical system design and installation must comply with **AS/NZS 3000 Australia and New Zealand Wiring Rules**

(4) Every alteration or addition to an existing electrical system is considered to be a new installation and must comply with the standards in this Code, including connections to the existing system and safety for the overall system

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Performance requirements of E1 are satisfied if **all of the following** Deemed-to-Satisfy provisions are successfully demonstrated, as well as performance requirements of E2 and E3.

D1 INSTALLATION REQUIREMENTS

.1 All electrical installers must be adequately trained and qualified to design and install electrical installations according to policy and standards of the relevant power authority and the Government of Fiji.

.2 Electrical equipment must be safely installed by:

a) Following manufacturer's instructions

b) Following appropriate construction safety measures to protect building elements, building material and site servicing from fire and damage

c) Providing adequate and safe access or working space for installation and maintenance personnel

d) Ensuring adequate strength and appropriateness of fixings, fastenings and supports

e) Not permitting use of semi-enclosed re-wireable fuses

f) Ensuring that socket-outlets are polarised in accordance with the product specification

g) Selecting an appropriate location for exterior electrical equipment

h) Proving additional protection against electric shock where the presence of water or high humidity presents an increased risk

i) Preventing solid foreign bodies from entering the electrical system

.3 Techniques and devices to prevent or remove hazards associated with electrical installation that must be provided during construction include:

a) Slope retention / shoring, where needed

b) Restricted access to live parts

c) Isolating every circuit from each of the supply conductors, including a group of circuits

d) Isolating by a common switch

e) Supplying warning notices anywhere that live parts connect to more than one supply indicating the need to isolate those parts unless they are suitably isolated

f) Preventing electrical equipment from being inadvertently energised by providing a padlock, warning tags and/or notices, or location in locked room or enclosure

g) Other safety measures deemed necessary by the relevant power authority or a registered professional consultant (electrical)

D2 LAYOUT, PLACEMENT AND OPERATION

All Buildings

.1 Design and installation of electrical installations, wiring, components and equipment must protect people from shock or other harm by ensuring:

a) Electrical fittings and appliances are safely isolated

b) Current does not exceed the installation rating and safe operation limits

c) Temperature increases from heat transfer or electric arcing are within expected safety ranges

d) Electrical system operates safely within its intended environment

e) Appropriate setback from allotment boundary

f) Appropriate setback from nearby existing electrical systems

.2 Connections made to a reticulated electrical supply must protect the safety of the reticulated electrical system.

.3 Electrical equipment shall be selected, installed and protected so that the equipment will not:

a) Obstruct or enter evacuation routes, either directly or by the products of combustion

b) Contribute to or propagate a fire

c) Attain a temperature high enough to ignite adjacent material

d) Adversely affect means of egress from a structure

.4 All parts of an electrical system must be adequately protected against damage from exposure to:

a) Weather

b) Water

c) Temperature

d) Trees, vegetation and other landscape elements

e) Seismic activity

f) Corrosive fume

g) Galvanic action

h) Accumulation of dust, steam, oil and the like

i) Explosive atmospheres

j) Vibration

.5 The meter must be located in a position from which it can easily be read. If the main switches and circuit breakers/fuses are not located along with the meter they must be located at a height of not less than 1.8 m from the floor where they can be found easily in the dark.

Class 2-9 Buildings

.6 The electrical supply system must:

a) Have suitable devices of adequate interruptive duty to automatically shut off the supply in the event of a fault or overload. Such devices must allow easy reinstatement of the supply after interruption

b) Have devices which are clearly identified and easily reached to isolate live parts from the incoming supply

c) Ensure that the main switch is normally accessible only to occupants

d) Provide for a safe supply and distribution of electricity from a reticulated electricity supply or renewable energy system (such as solar panels, wind turbines, geothermal source, biomass source)

.7 Electrical systems for emergency equipment, fire isolated routes, and places of safety must be isolated from the main system and designed to operate independently in case of a fire, disaster or other emergency.

.8 Electrical systems, wiring, components and equipment must be installed so that they can be effectively accessed by emergency responders.

.9 The electrical system for a building or structure must include the following components:

a) **Service entry cable** - connection from the energy supplied to the site to the transformer or directly to the electricity meter if a transformer is not required, or to the main switchboard for renewable energy systems

b) **Transformers**, where needed - to lower voltage from the electrical supply to an appropriate voltage for usage

c) **Electric meter** - mounted on, close to, or inside the building or on-site power consumption apparatus

d) **Main switchboard** - provides switches for power distribution to rooms, units or on-site power consumption apparatus, circuit-breakers, emergency system controls, fuses to protect from over-heating

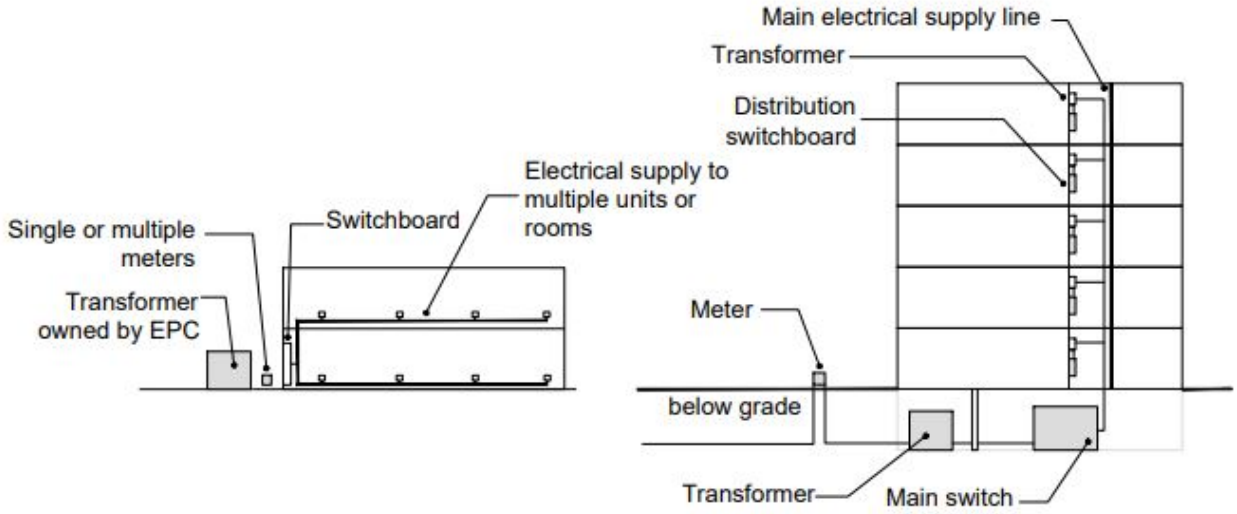
e) **Distribution switchboards,** where deemed appropriate - for multiple unit buildings, safe operation of industrial processes, handling of hazardous substances, or other use whose operation depends on it having a switchboard specifically for its use

f) **Circuits** - a system consisting of conductors, cables and wiring, junction boxes, and the like, that provide power from a switchboard to room, units or on-site power consumption equipment

g) **Plugs/wall outlets/sockets** - devices through which appliances, machinery, lighting and communication equipment can be powered by electricity

h) **MEN (Multiple Earth Neutral)** grounding system that conforms with AS/NZS 3000 Australia and New Zealand Wiring Rules

Figure E1.1 Electrical System Components



D3 VOLTAGE

All Buildings

.1 The nominal voltage and tolerance for low voltage supply systems and electrical installations are:

a) 240/415 V + 6% to -6% (in Accordance with Fiji Grid Code)

.2 To permit a connection to the reticulated electrical supply, electrical installations and systems must be designed to support the voltage supplied by the relevant power authority as follows:

a) LV (low voltage) single phase: EPC 240V

b) LV (low voltage) three phase: 415

.3 The electrical installation shall be designed and installed to ensure that the voltage at the terminals of electrical appliances and equipment is suitable for nominal operating voltage of the appliances and equipment.

.4 The connected load (total electric power consumption of all devices in an electrical system) must be calculated for all outlets in rooms, occupancy units, and any on-site power consumption apparatus, and approved by the relevant power authority.

.5 Protection against harm due to the effects of a fault between live parts of circuits supplied at different voltages must be provided by:

a) Separation

b) Installation of devices for protection against overvoltage such as transformers, fuses, and the like

Class 2 to 9 Buildings

.6 Maximum electricity demand for a building, facility and/or site must be determined according to methods acceptable to the relevant power authority, and be appropriate to the:

a) Capacity (power mains, submains, electrical equipment type and size)

b) Physical distribution of electrical equipment and wiring

c) Intended use of the building, structure and site

.7 Voltage, voltage rating, and current at the terminals of electrical appliances and equipment outlets must be suitable to:

a) Normal operation of the appliances and equipment supplied

b) Circuit to which it is connected

c) Capacity of the electrical system

D4 CIRCUITRY

All Buildings

.1 Every electrical installation must be divided into circuits, as necessary, to:

a) Avoid danger and minimise inconvenience in the event of a fault

b) Facilitate safe operation, inspection, testing and maintenance of the electrical system

c) Promote energy efficiency by locating plugs, sockets and switches in appropriate locations and with a layout that follows the main night time circulation routes such as from the entrance hall to the living area to the bedrooms to the bathroom and toilet.

.2 The number of circuits in an electrical system or installation must be appropriate to:

a) Electrical equipment type, size, function operational requirements and load

b) Function and use of the building, facility and/or site

.3 Circuitry must provide:

a) Electrical continuity

b) An appropriate level of insulation that complies with AS/NZS 3000 Australia and New Zealand Wiring Rules and standards of the relevant power authority with respect to:

(i) Prevention of electrical shock, short circuits and other electrical hazards

(ii) Suitability for the voltage levels present in the circuit

(iii) Withstanding the expected temperatures in the circuit

(iv) Provision of mechanical protection such as the use of conduit, ducting or protective coverings

(v) Fire-resistance of the building component to which it is attached

(vi) Site influences that may affect the performance of the insulation such as the presence of moisture, chemicals, hazards, vermin, extreme temperatures or other factors that may degrade insulation over time

c) Switches at the top and bottom of all stairways

Class 2 to 9 Buildings

.4 Design of the circuitry network must incorporate means to effectively deal with:

a) Consequences of circuit failure including loss of supply to essential facilities and equipment, overload and ability to locate a fault

b) Required maintenance, including alterations and additions needed without interrupting the electrical supply elsewhere

.5 Electrical installations operated by remote control must be clearly identified in appropriate locations, and must:

a) Cause the main switch to isolate supply to the associated parts of the installation

b) Be designed and installed to prevent inadvertent closing because of a fault or malfunction in circuitry or auxiliaries

c) Have the capability to be locked in the open position, or the closed position, but with an over-riding switch that can be operated in emergencies

D5 SWITCHBOARDS

All Buildings

.1 A switchboard shall be provided in an electrical installation for the mounting or the enclosure of switchgear and protective devices.

.2 A main switchboard that connects to an incoming electrical power supply (from a relevant power authority and/or a renewable energy system) must be:

a) Divided into separate circuits each of which is controlled and protected by fuses or switchgear of the switchboard, and/or

b) Safely connected to one or more distribution switchboards for each sole occupancy unit that it serves

.3 All switchboards must be:

a) Appropriately sized and rated to handle the electrical load

b) Protected from rodents and other vermin

c) Have adequate ventilation to dissipate heat and prevent accumulation of flammable gases through the use of ventilation fans, louvers, vents, and the like

d) Protected against the effects of moisture by a suitable covering

e) Constructed with suitable protective devices (circuit breakers or fuses) to interrupt the flow of excessive current in the event of a fault

f) Located so that access is not obstructed by building materials, assemblies, site servicing, fittings, fixtures, doors, or any other building element

g) Installed so there is 1.0 m distance from all faces of a closed switchboard (Class 2 to 9 buildings) and 0.6 m distance for a residential switchboard (Class 1 and 10 buildings)

h) Installed at a height from the ground or floor of:

(i) No higher than 1.2 m to the bottom of the switchboard for a building required to be accessible so that a person with a disability can operate the main switch

(ii) No higher than 2.0 m to the bottom of the switchboard in other circumstances than above

i) Permanently marked as "main switchboard", "distribution switchboard" and/or "secondary switchboard", and have appropriate instructional signage for occupancy and use

.4 All switchboards must **not** be located:

a) Above open water containers or fixed or stationary cooking appliances

b) In cupboards unless explicitly designed to house a switchboard or in a separate section of the cupboard where only the switchboard will be located

c) Where there are projections that obstruct access for the operation and maintenance of the switchboard

d) Within 0.3 m of a floor or wall that is part of a wet area or within 3.0 m of a swimming pool

e) Within a refrigeration room

f) Within a fire-isolated route, and within any other part of an evacuation route unless it is located in a fire-resistant compartment with doors that are sealed against the spread of smoke

g) Within a cupboard containing a fire hose reel

h) Near automatic fire-sprinklers if they are connected to the main switchboard or ones which supply power for safety services during emergencies

i) In parts of a building, facility or site where hazardous substances are stored, processed or transported, unless installed in accordance with **AS/NZS 2381 Electrical Equipment for Explosive Gas Atmosphere Selection, Installation and Maintenance** and specifically designed for that purpose

.5 Switchboards that are imported as a complete unit must be installed according to manufacturer's specifications and **AS/NZS 3000 Australia and New Zealand Wiring Rules.**

.6 Switchboards that are designed and constructed in Fiji must comply with **AS/NZS 3439.1 Low-voltage Switchgear and Control Gear Assemblies** and **AS/NZS 3000 Australia and New Zealand Wiring Rules.**

Class 2 to 9 Buildings

.7 A main switchboard must:

a) Control the supply of incoming electrical power (from a relevant power authority and/or a renewable energy system)

b) Have a main switch controlling all electrical supply where there is the potential for the power supply to present an unexpected danger to people, property or the environment

.8 In a building with multiple occupancy units:

a) A main switchboard must be connected to a distribution switchboard supplied in each unit and/or in a common area of the building, and have:

(i) Ready access to an isolating switch or switches controlling supply to the unit, or

(ii) Ready access to the main switch or switches, and

b) One main switch must be located separately or as part of the main switchboard:

(i) For each separately metered supply

(ii) For each separately controlled supply per meter

c) The number of main switches must be kept to the minimum practicable to provide for effective operation in an emergency

.9 All main switchboards must have emergency equipment switchgear separated by metal partitions from the other switchgear in the main switchboard for the following:

a) Water supply pumps for fire hydrant boosters, main risers, compliant sprinkler systems, fire hose reels and any other electronically activated pump in the fire safety system

b) Air handling systems designed to exhaust and control the spread of fire and smoke

c) Emergency lifts, automated doors, fire doors, and emergency exits

d) Control and indicator equipment for the fire safety system and security system

e) Sound systems and intercom systems used for emergency purposes

.10 A main switch must:

a) Be capable of breaking the full-load current of the relevant parts of the electrical installation

b) Be manually operated when directly interrupting the main circuit

c) Be provided with means of remaining in the "off" or "stop" position

d) Not re-energise the relevant part of the electrical installation upon release of the device

e) Be capable of being reset manually

f) Not consist of plugs and socket-outlets unless a switch is provided for each

g) Not be located where unauthorized access may impair safety

h) Be red in colour with a contrasting background and be accompanied by informative signage

.11 Main switches must be clearly marked so that they can be accessed by emergency responders as follows:

a) "Main Switch" must be labelled and readily distinguishable by means of grouping, contrasting colours, or other suitable means

b) Where there is more than one main switch, each one must be marked to indicate the electrical installation that it controls

c) Prominent notice must be provided for main switches that bring into operation a renewable energy supply

d) Each main switchboard in a building, facility and site must have prominent notice indicating the location of other electrical supplies and distribution switchboards on the property

e) Remote control of the main switch or switches must have the following safety features:

(i) Operation shall cause the main switch to isolate supply to the associated parts of the electrical installation

(ii) Remote control shall be designed, arranged and installed to prevent inadvertent closing because of a fault or malfunction of the control circuit wiring or auxiliaries

(iii) The main switch shall be capable of being locked in the open position

(iv) The main switch shall not be capable of being overridden or bypassed by programmable control systems or the like

(v) Shall meet all other identification and safety requirements as a manual main switch

D6 PLUGS, SOCKETS AND SWITCHES

.1 Plugs and sockets must have a minimum 10 Amperes capacity to serve the reasonable anticipated needs of the occupants, and all must have an on/off switch for each connection.

.2 Plugs must have the appropriate current rating and comply with **AS/NZS 3112 Approval and Test Specification – Plugs and Socket-Outlets.**

.3 Plugs must be resistant to heat, fire and mechanical stress, and be properly insulated.

.4 Plugs must have the proper polarity for wiring, as follows:

a) Active (live) wire – carries the current from the power source to the socket, red or brown colour

b) Neutral wire – carries current from the socket to the power source, blue or black in colour

c) Earthing wire – provides a pathway for a fault to safely exit the circuit, green or green/yellow colour

.5 A socket must have its individual switch be located so that:

a) Cords need not be taken across doorways

b) Trailing cords do not have to cross circulation routes

c) They are not located behind door-swings

.6 In an indoor kitchen, sockets and switches must be located:

a) A minimum of 150 mm above a counter top

b) A minimum of 250 mm from a heat source

c) A minimum of 250 mm from a wall edge

d) A minimum of 300 mm from a sink or other water source and be of a water-resistant type complying with Table E2.3 below

e) Not be located within a cupboard, closet or other concealed place

.7 In an outdoor kitchen, all of the location criteria in D6.6 above applies, and all outlets and switches must have a rating of:

a) IPX7 if located on a wall that is not prone to flooding

b) IPX8 if located on a wall that is prone to flooding

.8 In a sanitary compartment, laundry room or other wet area, sockets and switches must be located with appropriate setbacks from a water source and be of a water-resistant type complying with Table E2.3 below.

.9 In a swimming pool or spa area, sockets and switches must comply with Table E2.4 below.

E2 SAFETY AND GROUNDING

Performance Requirements

(1) Protection shall be provided against shock current arising from contact with:

a) Parts that are live in normal service, or

b) Parts that become live under fault conditions

(2) Electrical installations shall be arranged so that there is no risk of ignition of flammable materials because of high temperature or electrical arc in normal service, or risk of people or animals suffering burns

(3) Protection shall be provided against injury or property damage due to excessive temperatures or electromechanical stresses cause by overcurrents

(4) Earthing arrangements shall be selected and installed to safeguard people, property, animals and the environment from potential harm from contact with live electrical parts

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Performance requirements of E2 are satisfied if **all of the following** Deemed-to-Satisfy provisions are successfully demonstrated, as well as performance requirements of E1 and E3.

D1 BASIC AND FAULT PROTECTION

All Buildings

.1 Basic protection against dangers that may arise from contact with live electrical installations must include:

a) Insulation that completely covers live parts capable of withstanding the mechanical, chemical, electrical and thermal influences they may be subjected to in normal service

b) Barriers or enclosures firmly secured in place that completely surround live parts to provide a degree of protection of at least:

(i) IPXXB or IP2X

(ii) IP4X for horizontal top surfaces that are readily accessible

c) Non-conductive obstacles placed to prevent unintentional contact with live parts

d) Placement of electrical installations with live parts such that different voltages shall not be placed within arm's reach (2.5 m), and this minimum distance shall increase:

(i) Where an object with a degree of protection less than IPXXB or IP2X is placed within arm's reach of the electrical installation, the 2.5 m separation distance shall extend from the object

(ii) To accommodate bulky or long conductive objectives

.2 Fault protection shall be provided by one or a combination of the following methods:

a) Automatic disconnection of electrical supply when there is an imbalance in current flow, using one or a combination of:

(i) Equipotential bonding connected to a protective earthing conductor

(ii) Disconnection of the fault by a Residual Current Device and the like

(iii) Conveyance of a fault to an earthing conductor

b) Protection using Class II equipment or equivalent insulation by one of the following:

(i) Equipment having double or reinforced insulation (Class II equipment)

(ii) Switchgear assemblies having total insulation in accordance with either **AS/NZS 3439.1 Low-Voltage Switchgear and Control Gear Assemblies Part 1: Type-Tested and Partially Type-Tested Assemblies** or **AS/NZS 61439.1 Low-Voltage Switchgear and Control Gear Assemblies Part 1: General Rules.**

(iii) Equipment having basic insulation with appropriate supplementary insulation applied during installation

(iv) Equipment having uninsulated live parts with appropriate reinforced insulation applied during installation

c) Protection by electrical separation of live parts within an individual circuit

d) Protection by electrical separation of live parts from being connected to earth or to another circuit

.3 Separated extra-low voltage (SELV) or protected extra-low voltage (PELV) systems may be used to provide both basic and fault protection subject to the following conditions:

a) Nominal voltage shall not be capable of exceeding the limits for extra-low voltage (50 V a.c. or 120 V ripple-free d.c.) and the source of supply is arranged so that it cannot exceed these values

b) Circuits shall be electrically segregated from each other and from circuits at higher voltages

c) Live parts of SELV circuits shall not be connected to earth or to protective earthing conductors that are part of other circuits or to other live parts

d) Live parts of PELV circuits shall be protected from direct contact by barriers or insulation unless the voltage does not exceed 25 V a.c. or 60 V ripple-free d.c. in dry areas where a large contact area with the human body is not expected or 6 V a.c. or 15 V ripple-free d.c. in all other areas

D2 RESIDUAL CURRENT DEVICE (RCD)

.1 RCDs shall be installed for additional protection of the following:

a) Circuits, socket-outlets, lighting points and hand-held equipment

b) Wiring systems

c) Electric heating cables

d) Electrical equipment, including socket-outlets, installed in damp situations (bathrooms, kitchens, and the like)

e) Specialised electrical installations according to the following standards:

(i) **AS/NZS 3001 Electrical Installations – Transportable Structures and Vehicles including their Site Supplies**

(ii) **AS/NZS 3002 Electrical Installations – Shows and Carnival Events**

(iii) **AS/NZS 3003 Electrical Installations – Patient Areas**

(iv) **AS/NZS 3004 Electrical Installations – Marinas and Pleasure Craft at Low Voltage**

(v) **AS/NZS 3012 Constructions Electrical Installations**

(vi) **AS/NZS 4249 Electrical Installations and Safety Practices**

.2 No earthing or protective bonding conductor shall pass through the magnetic circuit of an RCD.

.3 RCDs located beside a socket-outlet or incorporated into a switched socket-outlet (SRCD) shall interrupt all live (active and neutral) conductors.

D3 EARTHING

All Buildings

.1 Earthing arrangements shall be selected and installed to perform the following functions:

a) Enable automatic disconnection of supply

b) Enable equipment requiring an earth reference to function correctly

c) Mitigate voltage differences between exposed conductive part of electrical equipment and conductive parts

d) Provide effective and reliable low impedance fault path capable of carrying earth fault and earth leakage current without danger or failure from external influences

e) Provide for the connection of exposed and extraneous conductive parts

f) Not include sprinkler pipes, or pipes conveying gas, water, flammable liquid or other conductive non-electrical utilities

.2 All conductive metallic parts in a building must be connected to an earthing system and/or have an equipotential bond (see Section E2 D4) to reduce the potential for harm from electric shock and provide a safe path for the dissipation of fault currents, lightning strikes, static discharges, and EMI and RFI signal interferences.

.3 The main earthing conductor, protective earthing conductors and any other parts that carry an earth fault current must be capable of carrying that current without attaining excessive temperature.

.4 All parts of the earthing system must comply with **AS/NZS 3000 Australia and New Zealand Wiring Rules**

.5 Metallic parts and fittings that are not exposed to electricity and are effectively isolated and/or insulated from the potential of receiving electrical current from an external source need not be bonded.

.6 All protective earthing conductors must have appropriate insulation, except for the following:

a) Aerial conductors

b) Flat braided conductors

c) Busbars

d) Sheaths of MIMS (Mineral Insulated Metal Sheathed) cable

e) Conductive framework and wiring enclosures deemed to be a protective earthing conductor

f) Copper protective earthing conductors buried direct in the ground

g) Catenary wires, provided that:

(i) It has not less than seven strands

(ii) It is supported by means of suitable anchorages

(iii) It has nominal cross-sectional areas of not less than 8.5 mm^2 if constructed of hard-drawn copper or galvanized low carbon (mild) steel

(iv) It has appropriate resistance

(v) It is identified as an earthing conductor within the earthing system design

.2 The earthing system for a building must be independent for the earthing system for the following:

a) Lightning and static electricity protection

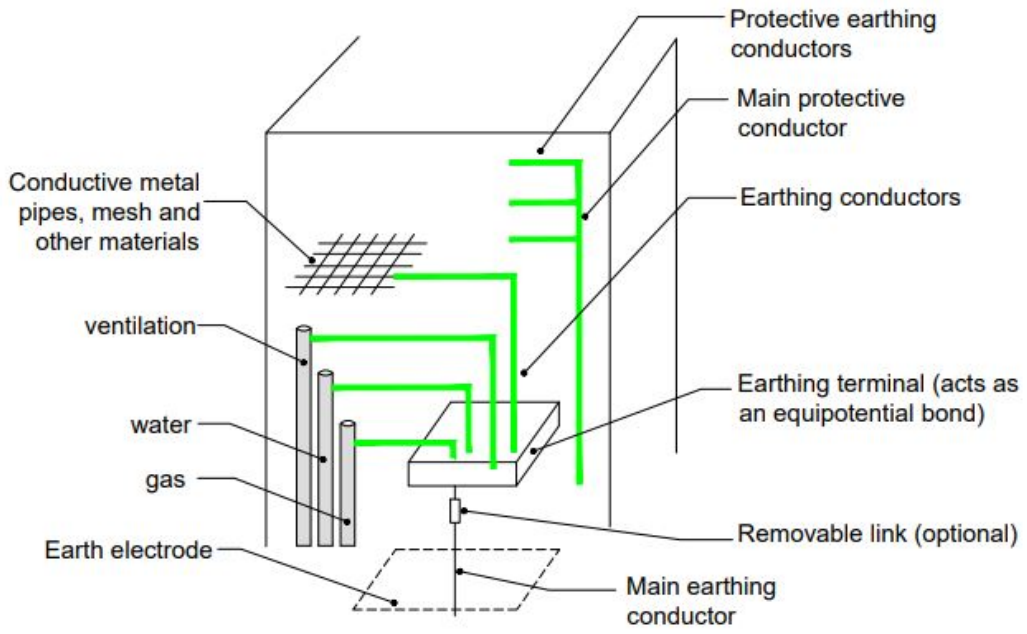
b) Radio frequency interference installations

c) Information technology installations

d) Explosion protection systems

e) Cathodic protection systems

Figure E2.1 Earthing Components



.8 Notwithstanding the above standard, a telephone and telecommunication earthing system may be connected to the main earthing system if it is connected:

a) At an enclosed terminal that is:

(i) Connected by means of a protective earthing conductor to the main earthing conductor

(ii) Not installed in a switchboard

(iii) Sited in a convenient and accessible location

(iv) Has a minimum cross-section area of 6 mm^2

b) Directly to the earth electrode by an independent connecting device and is clearly identified, and/or

c) In compliance with AS/CA S009 Installation Requirements for Customer Cabling

.9 Conductive building materials must be earthed where:

a) Risk of contact with live parts of electrical equipment or insulated, unsheathed cables exists, and/or

b) Double insulation of cables in contact with structural metalwork is not provided, and/or

c) Structural metal forms the framework of a residential building

AND

d) The earthing system must consist of the following as illustrated in Figure E2.1:

(i) Protective earthing conductors connecting exposed conductive parts to the earthing terminal

(ii) Main earthing conductor

(iii) Main earthing terminal, connection or bar

(iv) Connection from the reticulated electrical supply to the main earthing terminal, connection or bar, and the supply neutral bar

(v) Earth electrode

(vi) Equipotential bonding of extraneous conductive parts, and other required parts

.10 Types of conductive material in an earthing system must include one or a combination of the following:

a) Singular conductor fabricated from either:

(i) High conductivity copper in the form of stranded circular braided or solid conductors with a cross-sectional area of at least 10 mm^2 and a thickness of at least 1.5 mm, or

(ii) Corrosion-resistant aluminum conductors installed above-ground and away from wet areas, or

(iii) Other material with the same conductor resistance as a copper protective earthing conductor

b) More than one live conductor in a common protective enclosure

c) Multi-core cables

d) Busbars

And the following in accordance with provisions described in **AS/NZS 3000 Australian and New Zealand Wiring Rules**

e) Conductive conduit, tube, pipe, trunking and similar wiring enclosures

f) Conductive sheaths, armours and screens of cables

g) Conductive framework used for mounting electrical equipment

h) Catenary wires for the support of cables

.11 Earth electrodes must be installed:

a) In a suitable location that:

(i) Maintains contact with moist soil that is not subject to excessive drying out

(ii) Is separated from conductive enclosures of other buried plumbing and utilities

(iii) Is easily accessed for maintenance and replacement

b) At a minimum depth of 1.8 m for vertical-type earth electrodes

c) In a horizontal trench laid at a depth with a minimum cover of 0.5 m and a minimum horizontal length of 7.5 m for strip-type earth electrodes

d) In multiple locations for large-scale buildings and sites at a frequency appropriate to the size

e) No closer than at least a 1.0 m setback from the sphere of influence around each earth electrode

f) In accordance with approved testing procedures for soil resistance in compliance with the requirements of the relevant power authority

.12 An earth electrode must be made of highly conductive / low resistance material such as steel or copper, and contain the following three components:

a) Ground conductor

b) Connection between the ground conductor and the ground electrode

c) Ground electrode, the size and material in compliance with **AS/NZS 3000 Australia and New Zealand Wiring Rules**

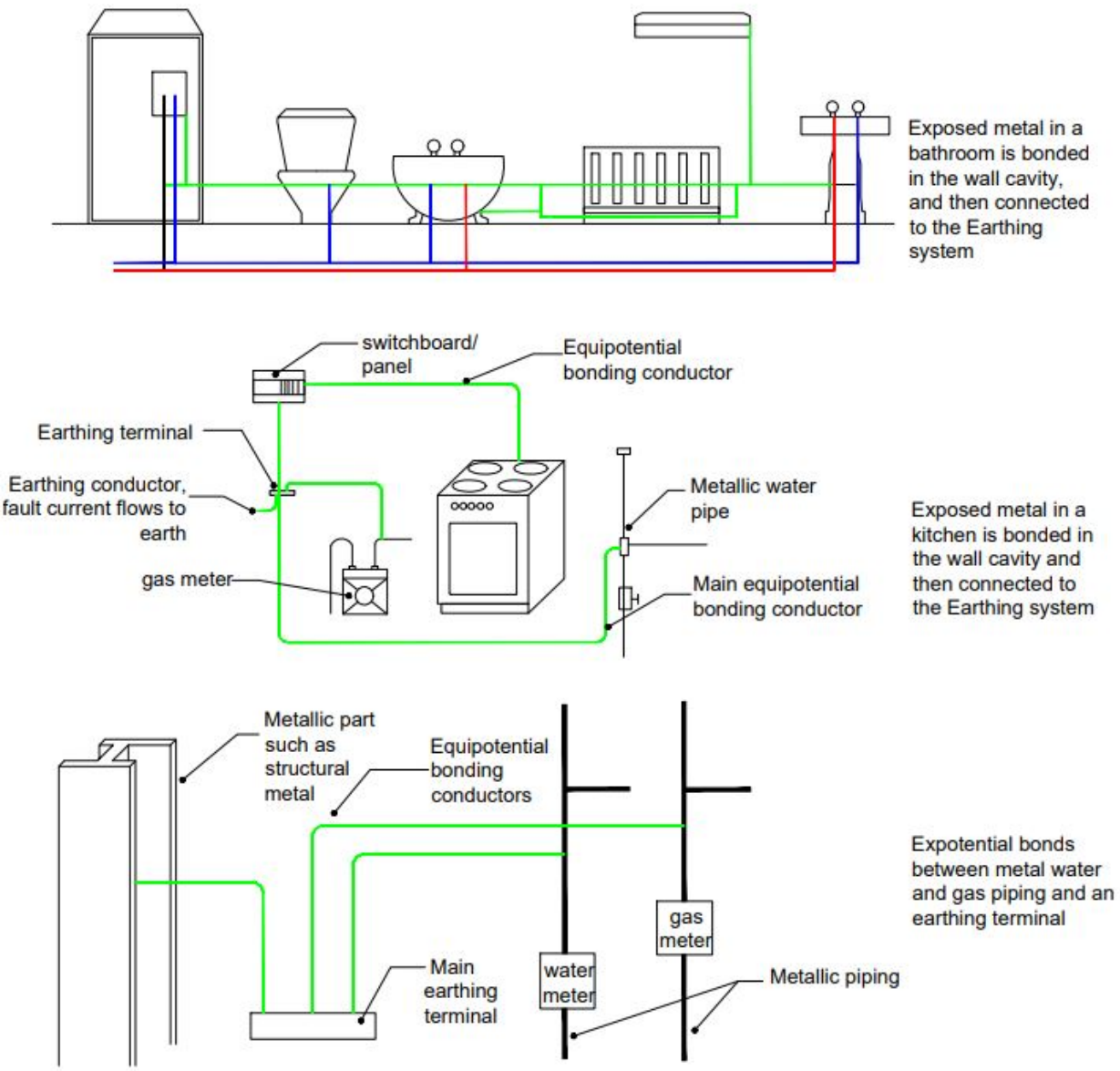
D4 EQUIPOTENTIAL BONDING

.1 Equipotential bonding must be used to separate conductive sheath, armour or wiring enclosures operating at above extra-low voltage where located in close proximity to conductive pipes containing flammable agents such as gas or oil, unless one of the following is provided:

a) Rigid separation spacing of 25 mm in air, or

b) Durable insulating material with a minimum thickness of 6 mm

Figure E2.2 Equipotential Bonding



.2 Equipotential bonding must be used for the following items to bring exposed conductive parts or extraneous conductive parts to the same or approximately the same potential, in kitchens, bathrooms, and wherever a difference in voltage or frequency could occur:

a) Water supply, gas, and other metal pipes, and ducting that enter the external wall of the building or facility, or are located internal to the structure, as shown in Figure E2.2

b) Conductive piping associated with fire sprinklers, gas or other flammable liquid that are in contact with exposed conductive parts of wiring enclosures and/or cable components, except where the piping is effectively earthed

c) Metal central air conditioning systems

d) Exposed metal structural parts of the building

e) Lightning protection systems

.3 Equipotential bonding conductors must not carry current in typical use of the building, structure or site.

.4 Equipotential bonding in a building, facility or site must comply with the following standards:

a) Patient care areas of hospitals, medical and dental practices, must comply with **AS/NZS 3000 Australia and New Zealand Wiring Rules**

b) Explosive atmosphere locations must comply with **AS/NZS 2381 Electrical Equipment for Explosive Atmospheres and AS/NZS 6124 Electrical apparatus for Use in the Presence of Combustible Dust**

c) Telecommunications installations must comply with **AS/NZS 3015 Electrical Installations – Extra-Low Voltage D.C. Power Supplies and Service Earthing Within Public Telecommunications Network**

d) Film, video and television sites must comply with **AS/NZS 4249 Electrical Installations and Safety Practices – Film, Video and Television Sites**

e) Photovoltaic arrays must comply with **AS/NZS 5033 Installations and Safety Requirements for Photovoltaic (PV) Arrays**

f) Elevated, general access floors must comply with **AS 4154 General Access Floors** (elevated floors)

D5 SHOCK PROTECTION

All Buildings

.1 Direct or indirect contact with live parts of an electrical installation and overcurrent's during normal use of the building, structure or site must be avoided by providing one or a combination of the following:

a) Placement of suitable fire-resistant obstacles that prevent access / contact with live parts, except by a qualified professional for maintenance

b) Bonding exposed conductive parts to a protective earthing conductor

c) Use of appropriate insulation for the electrical component

d) Provision of automatic disconnection devices in locations suitable to prevent unexpected current flows to exposed parts, and to prevent current flows that exceed safe voltage levels, in addition to at least one other measure in (a) to (e) above

e) Limiting the maximum overcurrent to a safe value and duration

.2 When the neutral of the supply is earthed, have socket outlet or plug-socket adaptor construction which would ensure that the live, neutral and earth conductors can only be connected to the corresponding live, neutral and earth conductors of the plug.

.3 Live parts of a separated circuit must not be connected to the earth or to another circuit at any point.

.4 Contact with live parts at a termination must be avoided by:

a) Restraining the conductor by tying, lacing or clipping, or

b) Containing the conductor within a non-conductive shroud or wiring enclosure

Class 2 to 9 Buildings

.5 Barriers or enclosures to prevent access to live parts must be firmly secured in place, have adequate structural stability, and have appropriate warning labels / signs.

.6 Electrical systems and installations must be provided with control and isolation devices that:

a) Are separate from other equipment

b) Interrupt all active conductors

c) Do not interrupt a protective earthing conductor

.7 Different methods of shock protection applied to the same electrical installation must have no influence on each other such that failure of one method could impair the operation of the other.

D6 AERIAL CONDUCTORS

.1 Fabrication and installation of aerial conductors must comply with:

a) **AS/NZS 2008 Electrical Installations – Selection of Cables**

b) **AS 3007 Electrical Installations – Surface Mining**

.2 Appropriate material for aerial conductors is one or a combination of the following:

a) Hard-drawn bare conductors

b) Polymeric insulated cables

c) Neutral-screened cables

d) Parallel-webbed, twisted, or bundled insulated cables

.3 Aerial conductors must be installed to establish safe working distances between aerial conductors and areas accessible to people, vehicles or other equipment.

.4 Aerial conductors should be suitably supported by poles, towers, and the like, that ensure stability, prevent sagging, avoid excessive tension, and adhere to load-bearing capacity and structural integrity.

.5 Aerial conductors must be insulated with material suitable for outdoor conditions and capable of withstanding environmental factors such as UV expose, moisture, and temperature variations.

.6 Aerial conductors must be insulated where:

a) The conductor is attached to a building and/or facility

b) The conductor is within arm's reach of any building and/or facility

c) In bushfire-prone areas

d) Above areas where sailing craft or irrigation pipes are used

.7 Adequate mechanical protection such as proper spacing, insulation coverings and support clamps must be provided.

.8 Aerial conductors may not be installed over a swimming pool, hot tub, spa or other recreational body of water, and must be installed a minimum of 5.0 m from any existing tree trunks.

.9 Connections to aerial conductors must be reliable and adequately protected against the effects of movement, exposure to direct sunlight, and water penetration.

.10 Suitable devices or notices warning people about the presence of aerial conductors must be erected in locations where such conductors are erected:

a) Above areas used by sailing craft

b) Where long lengths of conductive piping may reasonably be expected to be raised or handled

c) Where loading or unloading of vehicles is likely to occur in other locations where the risk of inadvertent contact with aerial conductors is anticipated

d) Where aerial conductors cross a waterway

e) Where aerial conductors are located in the vicinity of an aerodrome, airport or landing strip

.11 Minimum clearances for aerial conductors from buildings, facilities and conductive materials located outdoors are shown in Table E2.1 below, and must satisfy the following provisions:

a) Clearances must be maintained in any direction and from any position to which any part of the aerial conductor may sag or move as a result of wind pressure

b) Additional clearances greater than that shown in Table E2.1 must be provided to ensure the minimum clearances can be maintained up to a maximum conductor temperature of 115°C

c) Suitable clearance to prevent contact of an aerial conductor with a building or structure must be installed where aerial conductors terminate above or to the side of a building

.12 The size and maximum span of aerial conductors must comply with Table E2.1, unless detailed engineering studies demonstrate that a greater span can be installed and maintain the safety standards associated with the spans in Table E2.

.13 Supports for aerial conductors must be insulators or purpose-designed fittings suitable for the type of cable with which they are to be used.

.14 Any joints and connections, and hardware or fittings used to secure aerial conductors must be of corrosion-resistant material and must comply with Section E3 Wiring below.

.15 Size, depth into soil, and material for support poles must comply with Appendix D Minimum Size Poles and Struts for Aerial Line Conductors in AS/NZS 3000 Australia and New Zealand Wiring Rules.

.16 Low voltage aerial conductors must be adequately spaced to prevent contact with each other under all conditions of swag and sway, and comply with the minimum spacing shown in Table E2.2 below.

Table E2.1: Minimum Safety Clearances for Aerial Conductors (all dimensions are in metres)

Aerial Conductor Type	Minimum height above buildings, structures, ground or elevated areas					
	Over areas used by vehicles	Over areas not used by vehicles	Over roofs used for traffic or resort	Over other roofs and structures	Over swimming pools, hot tubs, spas, recreational body of water	Above areas used by sailing craft or irrigation pipes
Bare live conductors	5.5	5.0	3.7	3.0	Not permitted	Not permitted
Insulated and unsheathed live conductors	4.5	3.0	3.0	2.0	3.0	5.5
Neutral-screened cable	4.6	3.0	2.7	0.5	3.0	4.5

Aerial Conductor Type	Minimum height from a conductive outdoor element	
	From clothes lines, television /radio aerials, counterpoise, stay wires	From telecommunications lines and in accordance with AS/CA S009
Bare live conductors	2.0	2.0
Insulated and unsheathed live conductors	1.0	2.0
Neutral-screened cable	1.0	2.0

Note:

1. *When erecting aerial conductors, an allowance for sag and sway under normal operating conditions must be added to ensure that clearances are maintained.*
2. *Further information regarding required clearances for crossing telecommunication lines is contain in AS/CA S009 Installation Requirements for Customer Cabling (Wiring Rules).*
3. *Warning notices shall be erected in locations listed.*
4. *Increased distances may be required over public roadways.*

Aerial Conductor Type	Size (mm^2)	Maximum span (m)
Insulated annealed copper including neutral-screened	≥ 6	20
Bare hard-drawn copper	≥ 6	60
Insulated hard-drawn copper including two-, three- and four-core twisted but excluding neutral -screened	6 10 ≥ 16	40 50 60
Neutral-screened cables with hard-drawn copper conductors		
Two conductors	6 or 10	40

Aerial Conductor Type	Size (mm^2)	Maximum span (m)
Three conductors	6 or 10	60
Four conductors	6 or 10	50
Two, three or four conductors	16	60
Insulated or bare aluminium excluding neutral-screened	16 ≥ 25	50 60
Aerial bundled cables (aluminium conductor)	≥ 25	60

Table E2.2 Minimum Spacing between Aerial Conductors at Supports

Span	Spacing (m)	
	Insulated Conductors	Bare Conductors
≤ 10	0.2	0.4
> 10 to ≤ 25	0.3	0.5
> 25 to ≤ 45	0.4	0.6
> 45 to ≤ 60	0.5	0.7

.17 Minimum spacing for high voltage aerial conductors must comply with standards of the relevant power authority.

D7 LIGHTNING PROTECTION

All Buildings

.1 Lightning protection for buildings, facilities and sites must provide a point of contact for a lightning stroke (lightning rod or air terminals), with equipment to safely conduct the lightning current to the ground while minimising the potential of side-flash and magnetic induction to other conductive material in the structure.

.2 A lightning rod and air terminals must be placed to protect the most vulnerable parts of the roof (points and corners) of the building at or close to the highest point, and should have:

a) A minimum length above the roof of 0.5 m and placed within 1.0 m of the part it is to protect if it is installed vertically

b) Connect to one or more continuous down-conductors

.3 Down-conductors must be located:

a) On the exterior of the external walls of the building and/or facility, or

b) Within the cavity of external walls in a non-conductive, non-combustible duct, but only when external routes for down-conductors are impracticable or inadvisable

Class 2 to 9 Buildings

.4 The lightning protection system for a building, facility and/or site must have the following (see Figure E2.3):

a) Lightning capture device (lightning rod) and/or a series of air terminals connected together

b) Single or multiple down-conductors designed to convey the lightning current to earth

c) "Crow's foot" earth leads connected together at the terminus of each down conductor

.5 Equipotential bonding (see previous section) between all metallic frames and the earth leads number of down-conductors must be appropriate to the desired level of protection for the type and occupancy of the building, facility or site, and in all cases must be placed no further than 20 m apart.

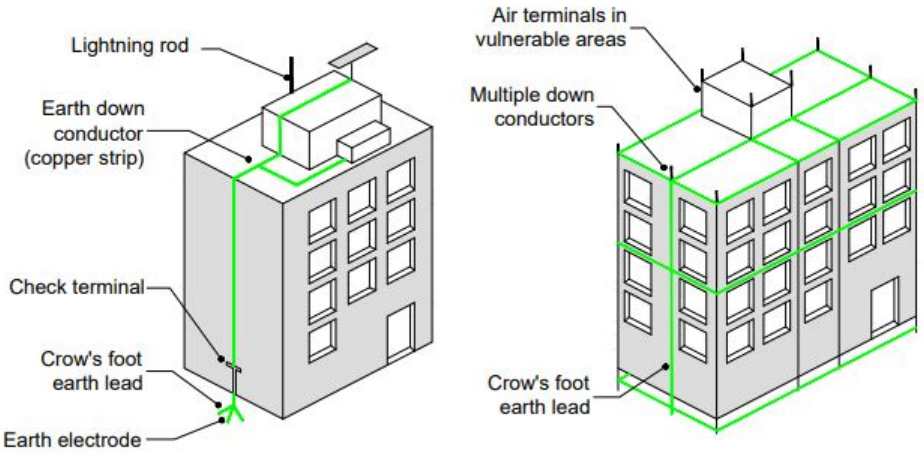
.6 At least one termination must be installed at the end of each down-conductor.

.7 Internal cables, electrical equipment, switchboards and switches used by emergency responders must be separated from the lightning protection system to protect them from the elevated electromagnetic field generated by lightning rods, air terminals, down-conductors and earthing systems during lightning strikes.

.8 Metallic conductive objects such as architectural features, flagpoles, metal railings, metal fences, steel plant surrounds, and roof access ladders may be used as air terminals to protect a planar roof surface as part of the overall lightning protection plan.

.9 During construction, structural rebar within the concrete may be used to carry lightning current to the ground where continuity of rebar from roof to ground is clearly demonstrated.

Figure E2.3 Lightning Protection Systems



.10 If the air terminal is a strip conductor, it must be directly located on the part it is to protect.

.11 Lightning protection must achieve the recommended interception efficiency according to the RSM (Rolling Sphere Method) specified in AS 1768 Lightning Protection, as amended.

D8 WET AREAS AND SWIMMING POOLS

All Buildings

.1 Wet areas (including indoor bathrooms, showers, laundries, spas, hot tubs, food preparation areas) and swimming pools (including hot tubs and spas) must be protected from the possibility of electric shock by:

a) Adhering to the appropriate setbacks and IPX standards shown in Table E2.3 for outlets, switches, lighting, and other electrical equipment

b) Use of appropriate waterproof material and equipment

c) Protecting electrical equipment, circuitry, and switchboards from water penetration

d) Connecting all exposed conductive metals to earthing through equipotential bonding

e) Use of RCD protection in close proximity to sources of water and condensation

.2 Sockets and outlets must not be installed within 0.3 m of the floor of a wet area or swimming pool, regardless of the degree of protection of the socket or outlet.

Table E2.3: Electrical Installation in Wet Areas

	Zone 0 water immersion area (min. IPX7)	Zone 1 1.2 lineal m from Zone 0, and max. 2.4 m ht. floor to ceiling	Zone 2 0.6 lineal m from Zone 1, and max. 2.4 m ht. floor to ceiling	Zone 3 2.4 lineal m from Zone 2, and max. 2.4 m ht. floor to ceiling
Socket-outlets	Not permitted	Not permitted	• Shaver-outlet with automatic switching (AS/NZS 3194 Approval and Test Specification), or • RCD (fixed rate residual current 30 ma max.) enclosed in a water resistant cupboard	• RCD (with fixed rate residual current 30 mA), or • supplied on a separate circuit, or • supplied as a SELV or PELV system
Switches / Accessories	Not Permitted	• 0.3 m minimum distance from wet surface area (floor, sink, bath, shower, spa) • protected to a minimum of IPX4		• 0.3 m minimum distance from wet surface area - floor, bath, sink, shower; spa
Luminaires	• IPX7 required and must be designed for wet area use • nominal voltage not exceeding 12 V a.c., or 30 V ripple-free d.c. • SELV or PELV system from outside of Zone 0	• IPX4 required • IPX5 for communal bath/showers	• IPX 4, or IPX5 for communal bath/ showers, or • double or reinforced insulation, or • SELV or PELV recessed in ceiling	no IP rating
Other	• IPX7 required and must be designed for wet area use • nominal voltage not exceeding 12 V a.c., or 30 V ripple-free d.c. • SELV or PELV system from outside of Zone 0	• IPX4 required • IPX5 for communal bath/showers	• IPX4 or recessed in ceiling • IPX5 for communal bath/shower or recessed into ceiling	no IP rating
		• Heating cable systems in the floor and suitably protected are permitted		
Switchboards	Not permitted	Not permitted	Not permitted	Not permitted

Note: *Zone 0 includes: enclosed showers, floors of open showers, baths, sinks in bathrooms and food preparation areas, hot tubs and spas < 500 L capacity, laundry sinks, washing machines, and other equipment designed to retain water deemed appropriate by Government of Fiji*

RCD *- residual current device - a device intended to disconnect supply to protected circuits, socket-outlets or electrical equipment in the event of a leakage current flow that exceeds a predetermined value*

Ripple-free d.c *- a ripple current not exceeding 10% r.m.s. where maximum peak value does not exceed 140 V for a nominal 120 V ripple-free d.c. system, and 70 V for a nominal 60 V ripple-free d.c. system*

PELV *- Protected Extra-Low Voltage -an extra-low voltage system not electrically separated from earth, but otherwise satisfies all requirements for SELV*

SELV *- Separated Extra-Low Voltage - an extra-low voltage system that is electrically separated from earth and other systems in such a way that a single fault cannot give rise to the risk of electric shock*

IPX3 *- weatherproof socket, outlet or switch that can withstand vertically dripping water (example - IP53)*

IPX4 *- weatherproof socket, outlet or switch with 100% protection of enclosure (example - IP54)*

IPX5 *- weatherproof socket with a spring latched cover over the plugging (example - IP55)*

IPX6 *- weatherproof, can withstand strong jets of water (fire hose) from all directions (example - IP66)*

IPX7 *– allows temporary immersion in water to a depth between 15 cm and 1 m (example - IP67)*

IPX8 *- rating allows for continuous immersion under significant pressure – pool lights (example - IP68)*

To interpret the Table, diagrams found in AS/NZS 3000 Australian and New Zealand Wiring Rules provide dimensions of Zones 0 - 3 that must be used to determine extent of zones.

.3 Wiring and cable must be installed to prevent entry of moisture at connections and water siphoning through any wiring enclosure in a wet area or within 3.0 m of a swimming pool.

.4 Equipotential bonding for wet areas and swimming pools must be:

a) Accessible for monitoring and maintenance purposes

b) Protected against mechanical damage and corrosion

c) Provide appropriate level of electrical conductivity

d) Be installed according to manufacturer's specification

.5 Electrical safety for swimming pools must be ensured by:

a) Equipotential bonding of all metal work within 3.5 m of the swimming pool, hot tub or spa, including ladders, diving boards, piping, fencing, permanently attached metal seating, light standards, and connected to an earthing system separate from the building.

b) Providing a protected safety switch connected to all electrical equipment

c) Protecting electrical equipment from water penetration by one or a combination of the following:

(i) Protective and waterproof covers

(ii) Locating equipment where it cannot come into contact with, fall or slide into water

(iii) Waterproof equipment room

d) IPX-rated sockets / outlets and switches appropriate to the distance from the pool, hot tub or spa as shown in Table E2.3

e) IPX-rated luminaires designed specifically for pools, hot tubs and spas appropriate to the distance from the standing water

f) Submersible pumps and lighting using extra low voltage and designed specifically for swimming pool, hot tub or spa usage

.6 Where electrical equipment is in contact with pool water, protective measures must include one or a combination of the following:

a) Locating the electrical equipment at a safe distance from the pool with all plumbing connections made of non-conductive materials

b) Metal grids or barriers inserted in any plumbing connections between the electrical equipment and pool and connected to the equipotential bonding system

c) Use of RCD with a fixed rated residual current not exceeding 30 mA to protect circuits supplying Class 1 (earthed conductive parts) equipment

.7 Clear marking and signage must be installed to indicate the presence of aerial conductors and warn against potential hazards.

Table E2.4: Electrical Protection for Swimming

	Zone 0 Water immersion area	Zone 1 Setbacks 2.0 lineal m from Zone 0, and 2.5m height	Zone 2 Setbacks 1.5 lineal m from Zone 1, and 2.5m in height
Socket-outlets	Not permitted	**Type:** pool equipment use only **Waterproof Protection:** IPX5 **Location:** • Either 0.45 m minimum from ground and 1.25 m minimum from pool edge, or • 0.5 m minimum under edge of a fixed continuous barrier greater than 1.45 m wide **System Type Options:** • separated • SELV or PELV supply • RCD	**Type**: pool equipment use and general use **Waterproof Protection**: IPX4 **System Type Options:** • separated • SELV or PELV supply • RCD
Switches / Accessories	Not Permitted	**Waterproof Protection**: IPX5	**Waterproof Protection:** IPX4
Luminaires / Appliances / Other Equipment	**Type:** must be specifically designed for pools, hot tubs, spas • must not have earthing cover **Waterproof Protection**: IPX8 **Voltage:** 12 V a.c. and/or 30 V d.c. **System Type Options:** • SELV or PELV supply from an outside source • RCD	**Waterproof Protection:** IPX5 **System Type Options:** • SELV or PELV supply from an outside source • Class II Construction (double or reinforced insulation) • Class I Construction (earthed conductive parts) fixed in position and with RCD protection	**Waterproof Protection:** IPX4 **System Type Options:** • SELV or PELV supply • separated supply • Class II Construction (double or reinforced insulation) • Class I Construction (earthed conductive parts) fixed in position and with RCD protection
Switchboards	Not permitted	Not permitted	Not permitted

Note:

- *Zone 1 includes 1.5 m horizontal distance around a diving board, spring board, diving block or slide*
- *Spa pools attached to a swimming pool are considered to be an extension to the swimming pool*
- *Spa pools greater than 5,000 L in capacity have the same zones as a swimming pool*
- *Spa pools from 500 to 5,000 L in capacity have Zone 0 as the area inside the spa pool and Zone 1 as an area 2.5 m from the edge of the spa horizontally and 1.25 m in height*
- *Spa pools less than 500 L capacity will have the same requirements as a bath in a wet area*

IPX3 *- weatherproof socket, outlet or switch that can withstand vertically dripping water (example - IP53)*
IPX4 *- weatherproof socket, outlet or switch with 100% protection of enclosure (example - IP54)*
IPX5 *- weatherproof socket with a spring latched cover over the plugging (example - IP55)*
IPX6 *- weatherproof, can withstand strong jets of water (fire hose) from all directions (example - IP66)*
IPX7 *– allows temporary immersion in water to a depth between 15 cm and 1 m (example - IP67)*
IPX8 *- rating allows for continuous immersion under significant pressure – pool lights (example - IP68)*
*To interpret the Table, diagrams found in **AS/NZS 3000 Australian and New Zealand Wiring Rules** provide dimensions of Zones 0 - 3 that must be used to determine extent of zones.*

D9 REFRIGERATION ROOMS

.1 Electrical equipment permitted within a refrigeration room must have an IP degree of protection of at least IP4B or IP24.

.2 Wiring selected for the supply, control and protection of electrical equipment within a refrigeration room must:

a) Not be affected by the operating temperature of the room

b) Not provide pockets or channels in which moisture might accumulate

c) Be designed for use in a refrigeration room or associated with the electrical equipment for a refrigeration room

.3 Permanent wiring types include:

a) Unenclosed sheathed cables including served MIMS cables

b) Insulated, unsheathed or sheathed cables enclosed in a wiring enclosure with adequate drainage

c) Other wiring systems that can achieve the performance levels demonstrated in (a) and (b) above

d) But not PVC insulated, unsheathed or sheathed cables not in a wiring enclosure that would be subject to bending, flexing or vibration at low temperatures

.4 A water-resistant sealant that does not set hard must be provided:

a) For each wiring enclosure where the wiring passes from a refrigerated to a non-refrigerated space

b) At the point of entry of cables into motors, luminaires, switches or other electrical equipment

.5 Fixed electrical appliances must provide a degree of protection suitable for the conditions in a refrigeration room such as the provision of internal heaters or an enclosure that would prevent the retention of moisture.

.6 Any heating element in a refrigeration room door seal must be provided with an RCD outlet with a fixed rated residual current not exceeding 30 mA.

.7 A switchboard is not permitted in a refrigeration room.

E3 WIRING

Performance Requirements

(1) Wiring shall be selected and installed to perform the following functions:

a) Protect against physical contact with live parts

b) Satisfy current-carrying capacity, voltage drop and other minimum size requirements for conductors

c) Provide reliability and electrical continuity of connections, joints and terminations

d) Provide adequate strength of support, suspensions, and fixings

e) Suit intended use

f) Protect against mechanical damage, environmental and other external influences

g) Be suitable for the highest and lowest local ambient temperatures

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Performance requirements of E3 are satisfied if **all of the following** Deemed-to-Satisfy provisions are successfully demonstrated, as well as performance requirements of E1 and E2.

D1 CABLE AND CONDUCTOR IDENTIFICATION

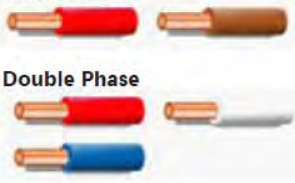
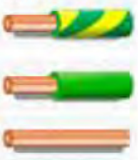
All Building Types

.1 Wiring must be clearly identified to indicate its function as active, neutral, earthing or equipotential bonding according to the following colour coding system and as shown in Figure E3.1 below:

a) Main earthing conductor, protective earthing (PE) conductor, and equipotential bonding (EPB) conductor shall be green, green/yellow or a combination.

b) Live conductors shall not be insulated or sheathed with green, yellow, or green/yellow combination colors.

Table E3.1 Wiring Types

	Single Phase Double Phase	Neutral	Protective earth/ ground
Fixed Cables (in, on or behind the wall)			
Flexible Cables (extension cords, power line cords, lamp cords	All Phases		

D2 WIRING INSTALLATION

All Building Types

.1 Wiring systems must be selected and installed to minimise damage to cable insulation, sheathing, connections and components due to mechanical damage or vibration, by provision of:

a) Supports (continuous or at appropriate intervals) appropriate for the mass of the cable

b) Suitable fixings for the cable size and type to hold the cable firmly in position

c) Suitable connections for the cable size and type to reduce mechanical strain at joints and terminations

d) Adhering to the bending radius limits of cables when installing

e) Flexibility to accommodate movement and tension

.2 Wiring systems must be supported at appropriate intervals in the following locations:

a) Surface of a wall, or underside of a ceiling or roof

b) Space between a floor and the ground to which a person may gain entry

c) Ceiling space exceeding 0.6 m high

d) Within 2.0 m of any access to any space to which a person may gain entry

e) Below raised floors

.3 Wiring is permitted to be installed in suspended ceilings constructed of timber if it meets the following criteria:

a) Wiring is sufficiently separated from potential fire hazards

b) Cables are provided with additional protection against mechanical injury where there is potential contact with conductive ceiling support members

c) Wiring is fixed at regular intervals to prevent sagging and contact with the suspended ceiling material

d) Wiring within the suspended ceiling is supported by the suspended ceiling manufacturer specifications

.4 Wiring systems must not be installed through any space formed between:

a) Roofing material and its immediate supporting member, or

b) Wall-lining material and its immediate supporting member

.5 Wiring systems must be protected against the effects of heat from external sources, including solar gain, by any one or a combination of the following:

a) Shielding

b) Placement of a sufficient distance from the source of heat

c) Selecting a system designed specifically for such use

d) Limiting the current to be carried by the cable to reduce its operating temperature

e) Appropriate insulating material

f) Painted with a light-coloured water-based acrylic paint

.6 Wiring systems installed vertically must have cable supports installed every 8.0 m or less.

.7 Conduit for underground low voltage electrical cable must be orange in colour and have the following separation distance from other utilities:

a) 100 mm in any direction, where the electrical supply cable is either indicated along its length or provided with mechanical protection (concrete slabs, continuous concrete pour, bricks designed for protecting electrical supply cables, other approved method), or

b) 300 mm in any direction where the electrical supply cable is neither indicated or protected

.8 Installation of above-ground low voltage (LV) wiring systems must achieve the following separation distances for above-ground utilities:

a) **Gas services** - 25 mm minimum separation distance from gas services installed according to AS 5601 Gas Installations

b) **Water services** - 25 mm minimum separation distance and installed according to AS/NZS 3500 Plumbing and Drainage

c) **Telecommunication services**:

(i) 50 mm minimum separation and installed in accordance with AS/CA S009 Installation Requirements for Customer Cabling (Wiring Rules), or

(ii) 25 mm minimum separation if the low voltage wiring is affixed with a suitable barrier of durable insulating material or earthed metal, and the telecommunications cable is in a conduit

.9 Minimum depth of cover for electrical cable and/or conduit exterior to the building or facility must be:

a) Where located beneath the ground or below any poured concrete (other than a building foundation):

(i) 300 mm under a poured concrete slab of 75 mm minimum thickness

(ii) 500 mm with no surface covering

b) Where located under a building or facility:

(i) 0 mm under a poured concrete slab of 75 mm minimum thickness

(ii) 500 mm with no surface covering

.10 Minimum depth of cover for wiring encased in rock with a concrete enclosure is 50 mm from the ground where there is no surface covering.

D3 WIRING CONNECTIONS

All Buildings

.1 Selection of the method of connection shall be based on:

a) Appropriate material of the conductor and insulation

b) Number and shape of the wires forming the conductor

c) Cross-sectional area of the conductor

d) Number of conductors being connected together

e) Temperature attained by terminals in normal service such that the effectiveness of the insulation of the conductors is not impaired at the point where insulation is relied upon

f) Prevention of entry of moisture and the siphoning of water through any cable or wiring enclosure

.2 Connections between wiring cables must avoid the possibility of loosening from vibration, alteration of materials or temperature variations through appropriate selection of connection materials that are:

a) Enclosed in a junction box, or the like, or

b) Fabricated of suitable mechanical protection, or

c) Effectively insulated to at least the equivalent of the cable insulation, or

d) Enclosed by an installation coupler complying with AS/NZS 61535 Installations Couplers Intended for Permanent Connection and Fixed Installations

.3 Connections must not be made between the following types of wiring cable, when in tension:

a) Parallel-webbed or insulated twisted aerial cables

b) Neutral-screened cables

c) Multi-core cables

d) Conductors of different metals

.4 For a soldered connection, the design must consider the mechanical stress, creep and temperature rise under fault conditions and must not be clamped under a screw or between metal surfaces.

.5 When making a connection, the insulation on a conductor must not be removed any further than is necessary to make the connection, and the connection must be insulated to at least the same degree of protection as that of the conductors being connected.

.6 Any flexible cable must be installed so that undue stress on its connections because of a pull on the cable is alleviated by a non-conductive part of the building construction (for example, a pillar, post, grip, fastener, or other effective means), and not by knotting.

.7 Conductors joined or terminated by a crimp (compression) connection must be secured within a suitable fire-resistant crimping device that:

a) Is a product acceptable to the Government of Fiji and installed according to manufacturer's specifications

b) Is not dependent upon compression of insulating material to achieve the connection

c) Prevents the spreading or escape of individual strands

d) Has a short-circuit rating suitable for the application

e) Has a long-term current-carrying capacity not less than that of the conductors

f) Suffers no deterioration in performance when re-used

.8 Disconnected, redundant or unused conductors must be terminated and protected at both ends in the same manner as required for live conductors.

D4 ABOVE-GROUND WIRING ENCLOSURE

.1 Wiring systems must be suitably protected against hazards, wind, rain, and the presence of nearby utilities in normal use by one or a combination of the following in an appropriate capacity:

a) Setback a sufficient distance from other utilities and the allotment boundary

b) In a wiring enclosure that is:

(i) Water resistant

(ii) Has structural stability

(iii) Composed of suitable non-conductive material

(iv) Maintains mechanical and electrical continuity, unless it is not required to be earthed

(v) Ensures no loss of integrity to cables due to length, alignment, bends or changes in direction

(vi) Terminates in such a manner to fully protect the enclosed cables

c) Has RCD with a maximum rated operating current of 30 mA

.2 Wiring enclosures are required for insulated, unsheathed cable unless the cable is:

a) Insulated and meets combustible requirements of AS/NZS 5000 Electric Cables series

b) In an enclosed wall cavity between an accessory and a wiring enclosure, or within 100 mm of the hole over which the accessory is mounted, or

c) Within a switchboard, meter and/or other similar enclosure provided that such cable is not exposed to touch during normal use, or

d) An extra-low voltage circuit

.3 A cable in a wiring enclosure must not be in contact with other services such as water, gas hydraulic or communication systems.

.4 Acceptable materials for wiring enclosures include:

a) Conduits that comply with **AS 2052 Metallic Conduits and Fittings** including:

(i) Steel or other metal conduit or metal tubing

(ii) Flexible metal conduit

(iii) Rigid and flexible insulating conduit

(iv) Corrugated insulating conduit

b) Cable trunking systems (with or without compound filling) that comply with **AS/NZS 4296 Cable Trunking Systems**

c) Other systems that provide equivalent mechanical protection acceptable to the relevant power authority

.5 Any change from one type of wiring enclosure to another must:

a) Be made at a switchboard, or

b) Must use a suitable device providing complete protection of the conductor insulation and adjoining wiring enclosures

.6 Conductors that form part of a multiple electrical installation must be separated where they terminate in the same wiring enclosure.

.7 Cable of high voltage, low voltage, and extra-low voltage circuits must not be enclosed in the same wiring enclosure, however, low voltage and extra-low voltage circuits may be in the same enclosure provided:

a) The low voltage cables have double insulation, or

b) All cables or each conductor of a multi-core cable are sufficiently insulated to the highest voltage present

.8 Wiring enclosures must be fabricated and installed so that the removal or opening of the enclosure, or withdrawal of parts of enclosures (doors, casings, lids, covers and the like), is only permitted if:

a) The use of a key or tool is required

b) An interlocking device is fitted that requires:

(i) Switching off, or automatic disconnection, of the supply to all live parts protected by the barrier or enclosure that might be touched accidentally during or after the removal, opening or withdrawal process

(ii) Electrical supply to be switched off before the door is opened or parts are removed

c) An intermediate barrier is provided that prevents contact with all live parts when the enclosure is removed, and requires the use of a key or tool to remove

.9 Insulating coverings for enclosures must not contain metal screws or bolts.

.10 Where lids or doors in any insulating enclosure can be opened without the use of a tool or key, conductive parts shall be located behind an insulating barrier that provides a degree of protection not less than IPXXB or IP2X and which shall be removable only by use of a tool.

D5 UNDERGROUND WIRING PROTECTION

.1 Cables installed underground shall be:

a) Suitable for the environment in which they are placed

b) Provided with protection against inadvertent damage likely to be caused by manual or mechanical excavation work

c) Provided with suitable warnings, marking or other means to minimize the risk of inadvertent damage likely to be caused by manual or mechanical excavation works

.2 In a shared underground trench, a minimum distance of 50 mm must be maintained between conduit for low voltage wiring, and conduit for telecommunication wiring.

.3 Cables not installed in a wiring enclosure must be laid on a bed of not less than 50 mm depth of sand or friable soil free of sharp stones and covered by not less than 50 mm of the same material.

.4 Wiring enclosures must be constructed of appropriate materials and strength for the particular type of cable and/or conductor and comply with Table E3.2 below.

.5 Underground cables must be clearly marked prior to construction and after, with signage (in English or pictograms) a minimum of 800 mm in height and containing legible, permanent markings on non-combustible hard-surface material, in the following locations:

a) Above or adjacent to the cable in compliance with **AS 4799 Installation of Underground Services**

b) At points of entering and leaving the site

c) At changes in direction

d) Every 200 m or less if the line of sight is blocked by siteworks or other feature

Table E3.2 Electrical System Components

	Heavy duty conduit; Medium-duty conduit encased in concrete	Heavy-duty fibre cement conduit; Fibre cement conduit encased in concrete; Medium-or heavy-duty galvanised pipe	Medium-duty corrugated or flexible conduit	Conduit buried directly into the rock with no enclosure	Chased in rock with no enclosure and covered in concrete
Insulated, unsheathed conductors	A		B		
Insulated, sheathed conductors	A	A	B	B	
Sheathed, armoured and served cables	A	A	A	A	A
Neutral-screened cables suitable for underground	A	A	A	A	
Neutral-screened cables	A	A	B	B	
Served MIMS cables	A	A	B	B	A
Aluminium sheathed or strip armoured cables with PVC sheath	A	A	B	B	A

A – No additional protection required

B – Mechanical Protection required, must be one of the following:

*a) Precast concrete slabs having a minimum thickness of 40 mm and a classification of not less than grade 20 in accordance with **AS 3600** or **NZS 3104***

b) Concrete slabs cast on-site having a thickness of not less than 100 mm

c) Continuous concrete pour having a thickness of not less than 75 mm

d) Fibrous cement slabs having a thickness of not less than 12 mm

e) Bricks manufactured specifically for the protection of electric cables

*f) Polymeric cable cover strip complying with **AS 4702 Polymeric Cable Protection Covers***

g) Other materials that provide the same degree of protection of the above

Mechanical protection must:

a) Be placed no more than 75 mm above the wiring system

b) Be no less than 150 mm wide

c) *Overlap the wiring system by at least 40 mm on each side*

Section F

Health & Amenity

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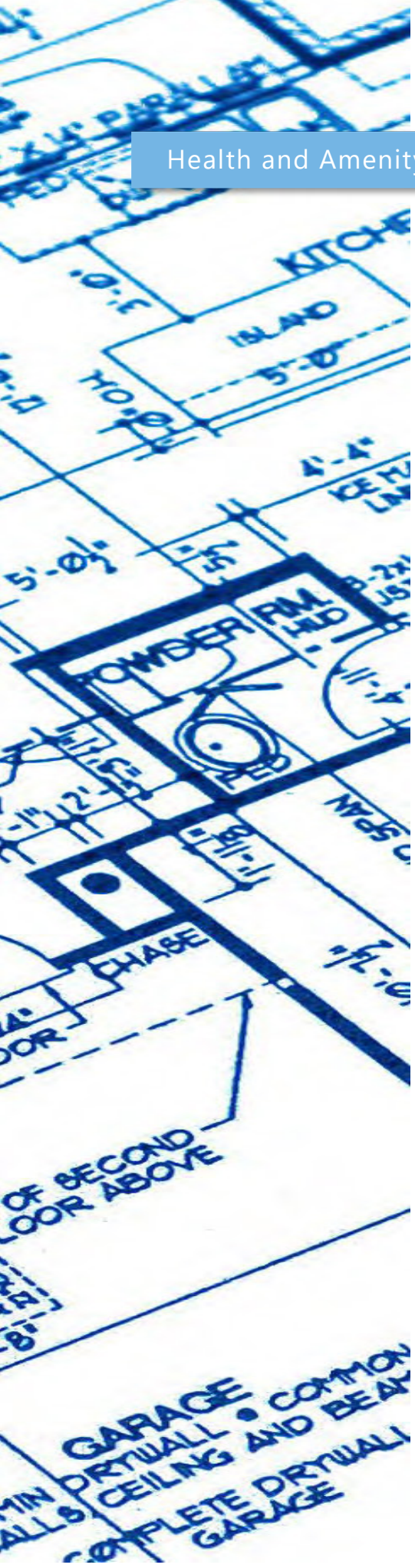


OBJECTIVES

(1) All buildings must be sited, designed and equipped to:

a) Prevent water entry, water absorption and transmission of precipitation, storm surge or surface water that can cause structural damage

b) Prevent accumulation of water and moisture in building interiors that could cause illness, injury, or loss of amenity

c) Allow for dissipation of precipitation, storm surge and/or surface water so it does not damage the site or adjacent allotments

(2) Water supply and wastewater services must be designed and installed to:

a) Safeguard people from illness, injury, or loss of amenity

b) Conserve water, energy and the environment

c) Safeguard public and private infrastructure

(3) All single and multiple occupancy residential buildings must have a sufficient quantity of:

a) Proper facilities for the preparation and cooking of food and cleaning of utensils, personal washing, and washing of clothes

b) Hygienic sanitary compartments with adequate privacy which will not be a nuisance to occupants or other people

c) Sufficient living space for privacy and comfort

F1 DAMP AND WEATHER PROOFING

Performance Requirements

(1) Buildings must be designed to prevent damage from:

a) Storm surge and precipitation

b) Runoff from upland elevations and river overflows

c) Groundwater saturation due to a rise in the water table during storm events

(2) Buildings in coastal areas must be designed to:

a) Safeguard humans and property from the predicted rise in sea level resulting from climate change

b) Avoid damage to the foundation, utility connections, the floatation, collapse and lateral movement of the elevated portion of the building

(3) A building must have weatherproofing that resists:

a) Rainwater coming through the roof, walls or openings

b) Surface water from storms, floods or storm surge from penetrating habitable rooms

c) Water leakage from wet areas within buildings

(4) Buildings exempt from weatherproofing include:

a) A garage, tool shed, sanitary compartment, or the like, forming part of a building used for other purposes

b) A Class 7, 8 or 10 building if the use of the building is such that there is no necessity for compliance

c) An open spectator stand or open deck car park, except if there are rooms or space for storage or human activity below the stands or within the parking structure

(5) Buildings and site works must not damage neighbouring property caused by redirected surface water

(6) Overflow from a bathroom, laundry facility or other interior or exterior wet area must not cause damage or health-risks to people and property

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Damp and weather proofing performance requirements of F1 are satisfied if

- **All of the following** Deemed-to-Satisfy provisions are successfully demonstrated
- Performance requirements of **Section B** Structure regarding site works, building materials, and termite protection
- Performance requirements of **Section G** Energy Efficiency regarding low carbon building materials and heat gain reduction

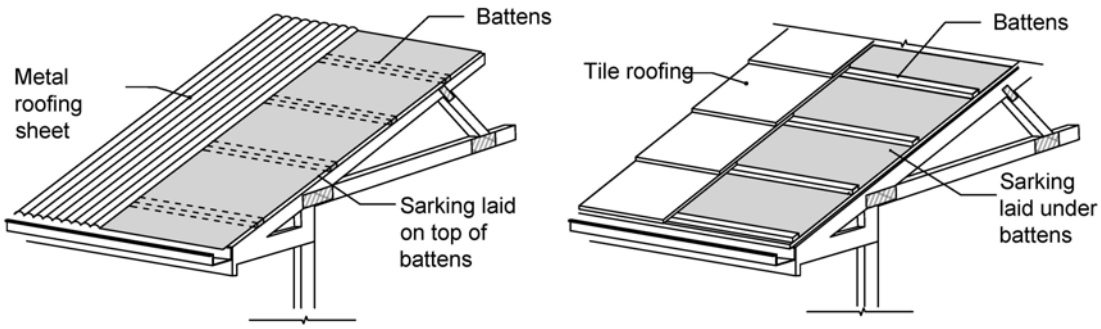
D1 WEATHER-PROOF ROOF AND OPENINGS

.1 Roofs must have a continuous water-proofing membrane (pliable sarking type material) applied as follows:

a) Over the battens and under metal sheet roofing, or

b) Under the battens for roofing shingles

Figure F1.1 Water-proofing Membrane on Roof



.2 Pliable roof sarking-type material used under roof or wall coverings must comply and be fixed in accordance with:

a) AS/NZS 4200 Pliable Building Membranes and Underlays: Materials

b) AS/NZS 4200.1 Pliable Building Membranes and Underlay, Part 1: Installation

or

c) AS 4654.1 Waterproofing Membranes for External Above-Ground Use, Part 1: Materials

d) AS 4654.2 Waterproofing Membranes for External Above-Ground Use, Part 2: Design and Installation

.3 Sarking (water-proof membrane) must be installed with each adjoining sheet or roll:

a) Overlapped a minimum of 150 mm

b) Taped together

c) With no sags in the sarking (membrane) greater than 40 mm

d) Affixed to supporting members at not more than 300 mm centres

e) Attached and sealed as per manufacturer's instructions

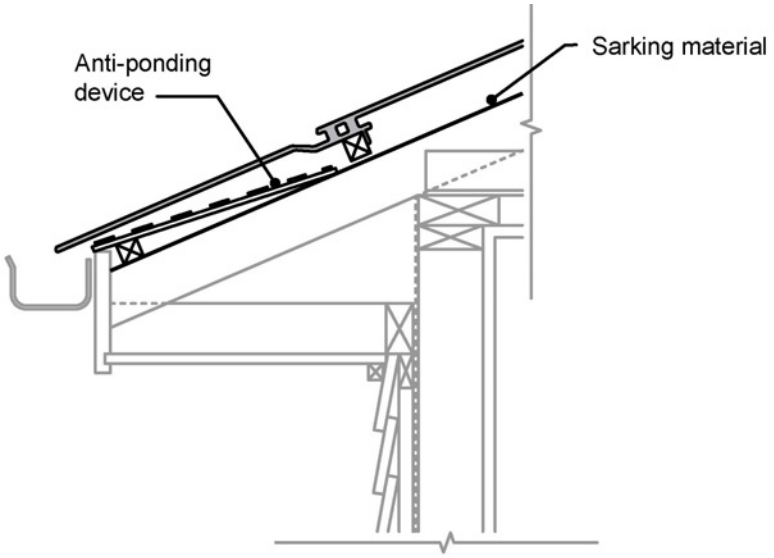
.4 An anti-ponding device/board must be provided where sarking is installed on:

a) Roofs with a pitch less than 20°

b) Roofs with no eaves overhang, regardless of the roof pitch

.5 An anti-ponding device must be water resistant and fixed along the eaves line from the top of the fascia back up the rafter with a clearance of approximately 50 mm below the first batten as shown in Figure F1.2

Figure F1.2 Typical Installation of Anti-ponding Device / Board



.6 Flashing for all roof openings must comply with D2 below.

D2 FLASHING

.1 Flashing must be installed on openings in roofs and roof edges, external walls and floors so that precipitation and surface water do not penetrate into the interior of the building in the following locations:

a) Roof/wall junctions where not protected by eaves or overhang

b) Changes in cladding type, roofing materials, change of direction in cladding or roofing materials

c) Intersections in roofing or cladding materials between sole occupancy units in a building

d) Openings in roofs or external walls, including windows, doors, vents and servicing penetrations

.2 Flashing must have the following dimensions:

a) Minimum 150 mm in width surrounding the penetration

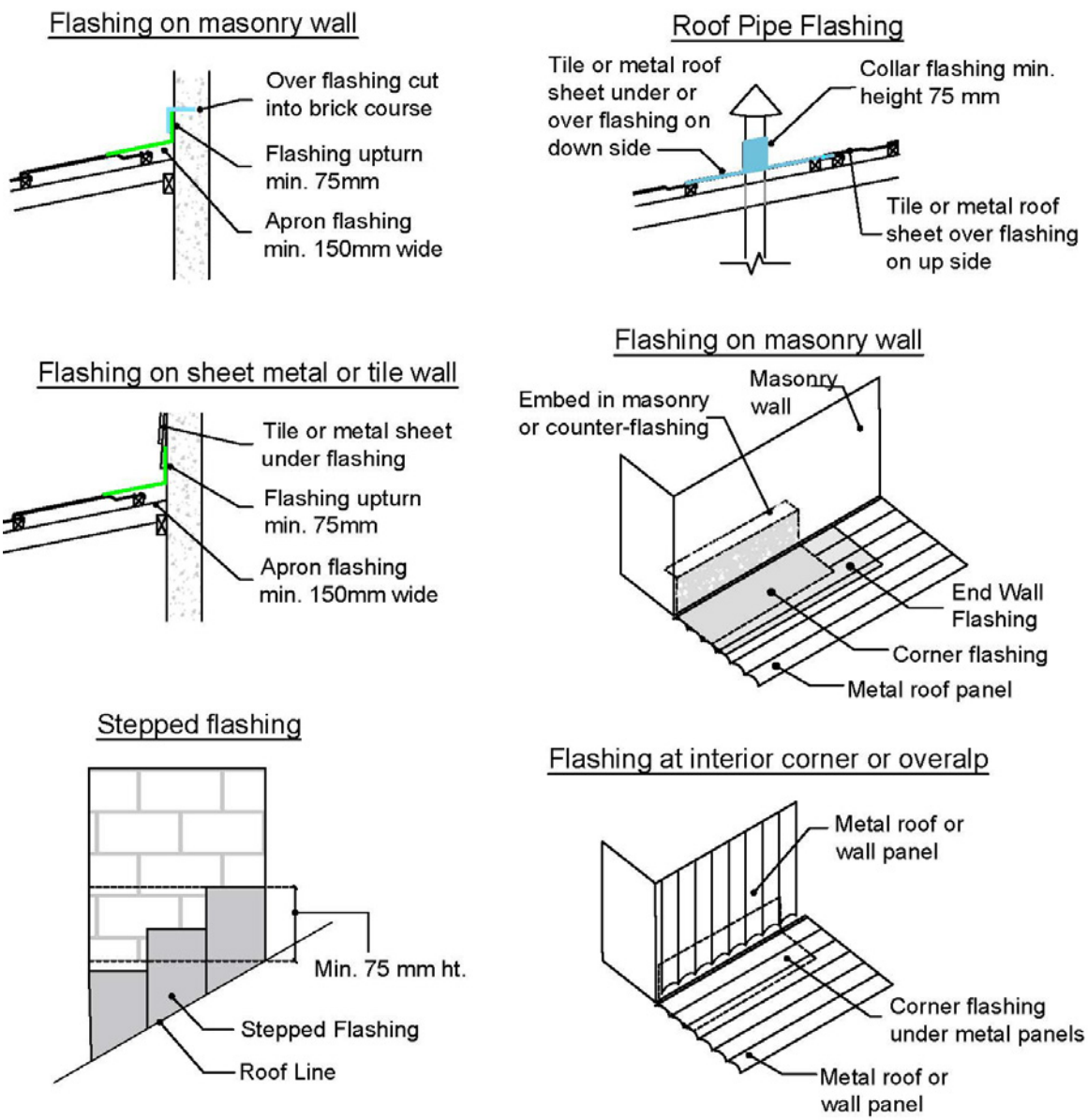
b) Minimum upturn of not less than 75 mm width

c) 75 mm overlap at joints

d) Minimum 150 mm width on roof openings

.3 Flashing material must provide a 100% barrier for moisture and in no case shall lead flashing be used on a roof that is part of a drinking water catchment area.

Figure F1.3 Flashing Examples



.4 Window and door frames must have flashing installed on the interior and exterior, and provide a complete water-proof barrier, except where the materials are designed for periodic and long-term contact with water.

Figure F1.4 Flashing for Windows

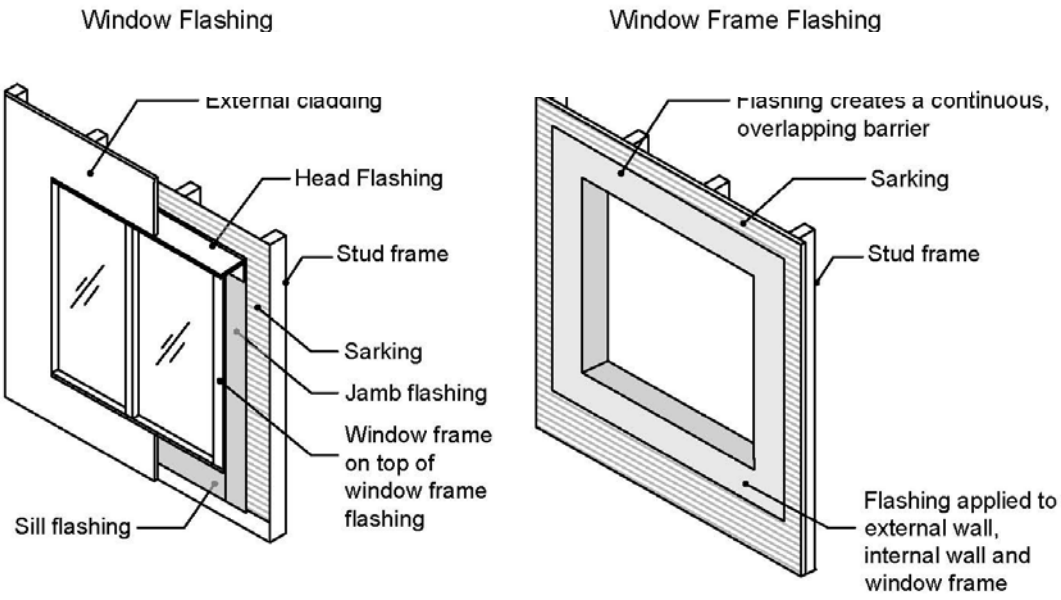
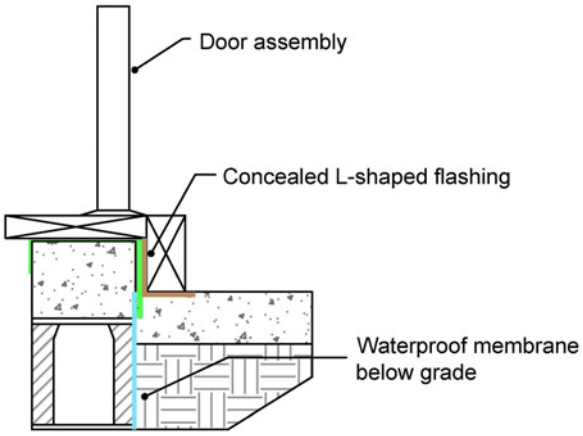


Figure F1.5 Waterproof Membrane and Flashing for Door Stoop



D3 PROTECTION FROM SURFACE WATER

.1 Weatherproofing to protect buildings from surface water must include one or a combination of the following:

a) Ensure floor assembly of all habitable rooms is located above the Flood Hazard Level in accordance with Section B1 and B3

b) Ensure site grading slopes away from the building such that stormwater will not enter the building and a suitable damp-proof course is applied

c) Apply a continuous moisture barrier that prevents water from entering the building at a height that respects the Flood Hazard Level and expected sea level rise in Section B3

d) Use materials that are not adversely affected by water (dimensionally stable and do not deteriorate or lose structural integrity when flooded) and do not absorb water readily for load-bearing floors or walls located within the Designed Flood Level according to Table F1.1

.2 The subfloor space between a suspended floor and the ground must be constructed:

a) To be clear of all building debris and vegetation

b) To be cross ventilated by evenly spaced ventilation openings allowing unobstructed air flow

c) To contain no dead air spaces

d) To prevent surface water from ponding under the structure

e) To have a damp-proof course that prevents water from entering the building, see Section D4 below

Table F1.1 Material Suitable for 96-hour Immersion in Surface Water

Material Suitable for 96-hour Immersion in Surface Water		
Floor, Sub-floor Structure	• Concrete slab-on-grade with damp proof course • Suspended concrete	
Walls, Support Structure	• Reinforced or mass concrete	
Wall and Ceiling Linings	• Fibre cement sheet • Face brick or blockwork • Cement render • Ceramic wall tiles • Galvanised steel sheet • Glass and glass block	• Stone, solid or veneer • Plastic sheeting or tiles with waterproof adhesive • Reinforced concrete • Galvanised metal construction
Roof Structure	• Reinforced concrete • Galvanised metal	
Doors	• Solid panel with waterproof adhesive • Flush marine ply with closed cell foam • Aluminium or galvanised steel frame	
Windows	• Aluminum frame with stainless steel or brass rollers • Flashing	
Insulation	• Plastic / polystyrene boards • Closed cell solid insulation	
Bolts, Hinges, Nails, Fittings	• Brass, nylon / stainless steel, removable pin hinges	
Floor Covering	• Clay / concrete tiles • Epoxy or cementitious floor toppings on concrete • Rubber sheets (chemically set adhesives) • Vinyl sheet (chemically set adhesives)	
Note: Choice of building material must comply with performance requirements of Section B3 Storm Surge and Flooding Protection, Section B8 Building Materials, and Section G5 Low Carbon Building Materials. All Section B and Section G performance requirements shall over-ride permissions in this table.		

.3 If the lowest habitable floor is to be constructed directly on the ground and is required to be weather proofed, moisture from the ground must be prevented from reaching the upper surface of the floor and adjacent walls by:

a) Insertion of a vapour barrier in accordance with AS 2870.1 Residential Slabs and Footings, Part 1: Construction, or

b) Other suitable means

Table F1.2 Water-Resistant Building Materials

Water-Resistant Building Materials (for portions of a building exposed to rainfall, but not to flooding)	Floors	Walls / Ceilings
Structural Materials (Floor slabs, beams, subfloors, framing and interior/exterior sheathing)		
Brick – face or glazed		•
Cast stone (in waterproof mortar)		•
Cement board / fiber-cement board		•
Clay tile, structural glazed		•
Concrete – precast or in situ	•	•
Concrete Block		•
Gypsum – water-resistant, fiber-reinforced exterior sheathing		•
Plywood – marine grade	•	•
Plywood – preservative-treated, Borate	•	•
Recycled plastic lumber (RPL)		
Commingled, with 80-90% Polyethylene (PE)	•	
Fibre-reinforced, with glass fibre strands	•	
High-density polyethylene (HDPE), up to 95%	•	
Stone – natural or artificial non-absorbent solid or veneer with waterproof grout	•	•
Structural Building Components		
Floor trusses – steel or decay-resistant, preservative solid wood	•	
Headers and Beams – steel, or decay-resistant, preservative-treated solid wood or plywood		•
Wood – solid, decay-resistant, preservative-treated	•	•
Finish Materials (Floor coverings, wall / ceiling finishes, insulation, cabinets, doors, partitions, windows)		
Concrete tile with mortar set	•	
Doors – epoxy, formed-in-place		•
Glass Block		•
Insulation – sprayed polyurethane foam (SPUF) or closed-cell plastic foams	•	•
Mastic flooring, formed-in-place	•	
Metals – ferrous		•
Paint – polyester-epoxy, oil-based, other waterproof types applied to concrete walls		•
Partitions – metal, wood-frame, glass		•
Polyurethane, formed-in-place	•	
Rubber sheets or tiles with chemical-set adhesive	•	
Silicone – formed-in-place	•	
Steel panel, trim, tile with waterproof adhesives		•
Stone (maximum 6% absorption rate)	•	•
Vinyl sheet (non-asbestos) with heat or solvent-welded joints applied to concrete floor or walls	•	•

.4 All cooling, ventilation and electrical components must be located a minimum of 300 mm above the known flood elevation to reduce the potential for ignition.

.5 Equipment such as air-conditioners, electrical components, water storage and sanitary openings must be:

a) Installed a minimum of 300 mm above the known Flood Hazard Level

b) Have adequate weather protection such as an awning, roof overhang, enclosure, and/or tarp, and the like

Class 1 Buildings

.1 Notwithstanding Section D2.1 if a floor of a room in a residential building is laid on the ground or on fill, a moisture barrier must be applied in accordance with **AS 2870.1 Residential Slabs and Footings, Part 1- Construction** or other suitable means.

D4 DAMP-PROOF COURSE

.1 A damp-proof course (DPC) consisting of material that complies with **AS 2904 Damp Proof Courses and Flashing** must be applied:

a) In a continuous barrier for all parts of buildings within the known flood elevation

b) To the underside of a floor assembly extending up adjoining external walls to a minimum of 150 mm above the known flood level

.2 A Damp-proof course must be installed on a masonry wall or pier, or between a wall or pier and a floor to prevent the upward migration of water for buildings required to have weatherproofing.

.3 A Damp-proof course must be applied to the top of footings, piles, base walls to prevent rising excess moisture from entering the buildings.

.4 A Damp-proof course must consist of:

a) A material that complies with **AS 2904 Damp Proof Courses and Flashing**, and one or a combination of:

(i) Embossed black polyethylene film of high impact resistance and low slip with a nominal thickness of 0.5 mm prior to embossing, or

(ii) Aluminium not less than 0.1 mm thick coated on both sides with bitumen adhesive enclosed in polyethylene film not less than 0.1 mm thick on each face a nominal total thickness of not less than 0.5 mm prior to embossing, or

(iii) Bitumen impregnated materials of not less than 2.5 mm thickness, that meet the requirements of the relevant Standard (Clause 7.5 of **AS/NZS 2904 Damp Proof Courses and Flashing**), when used in walls that are not higher than 7.8 m above the level of the DPC

(iv) Other suitable material approved by the Government of Fiji

b) Termite shields (with no penetrations) continuous throughout the wall or pier that comply with Section B9 Termite Protection

D5 INTERIOR WET AREAS

.1 Overflow from a bathroom, laundry facility or other interior wet area must be prevented from penetrating into:

a) Another sole-occupancy unit

b) Any room in a storey below the wet area

c) A public space

d) Fittings, linings and concealed spaces in wet areas

.2 The following parts of a building must be impervious to water:

a) Floor surface or substrate in a shower enclosure

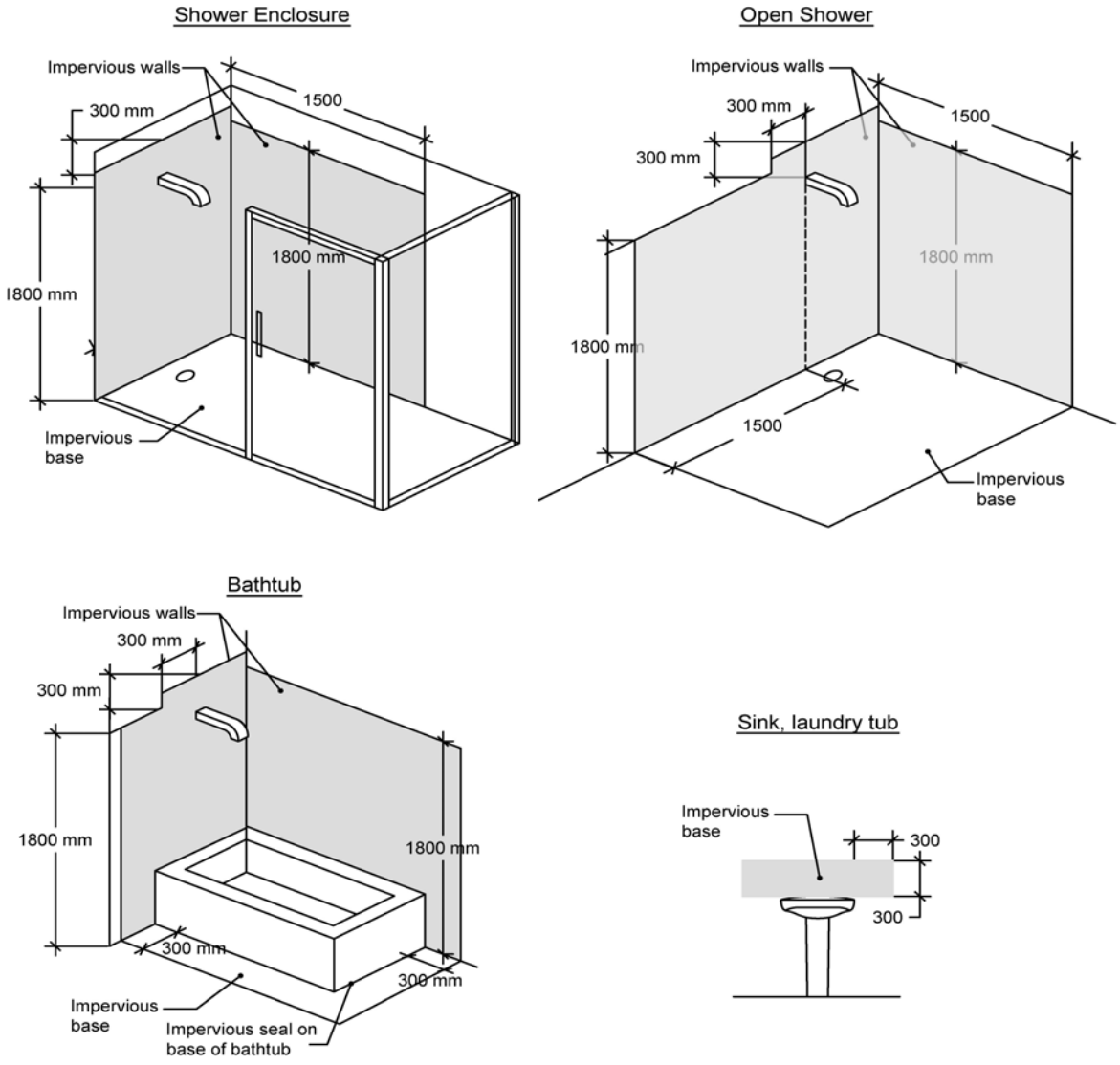
b) 1.5 m measured horizontally from a point vertically below the shower, if there is no enclosure

c) 1.8 m above the floor of a shower enclosure required to be impervious

d) Wall behind a bath trough, basin, sink or similar fixture extending from the top and exterior sides of the fixture for a minimum of 300 mm

e) Junction between the wall and fixture if the wall is required to be impervious to water

Figure F1.7 Interior Wet Area Protection



.3 Wet areas must be protected from water damage as indicated in Table F1.3:

Table F1.3 Waterproof and Water-Resistant Requirements for Interior Wet Areas

Wet Area	Floors	Walls	Penetrations/ Junctions/ Joints	Ceilings
Shower	Waterproof, sloped with floor drain	Waterproof (minimum 1.8 m above finished floor)	Waterproof	Mechanical vent if no window in the wall of bathroom
Bathroom sink, vanity and storage areas	Waterproof, or water-resistant with floor drain	300 mm water-resistant splash zone above sink or water source adjacent to wall	Waterproof plumbing fixtures, water-resistant for others	Mechanical vent required if there is no window in wall
Sanitary compartment (single or multiple toilets, urinals, bidets)	Waterproof, sloped with floor drain	In public sanitary compartments, walls must be waterproof behind and at the sides of the fixture from the floor to 300 mm minimum above fixture	Waterproof	Mechanical vent required if there is no window in wall
Bathtubs and Spas	Waterproof, sloped with floor drain	300 mm water-resistant splash zone above tub or spa adjacent to the wall	Waterproof	Mechanical vent required if there is no window in wall
Laundries	Waterproof, or water-resistant with floor drain	300 mm water-resistant splash zone above sink or water source adjacent to wall	Waterproof plumbing fixtures, water-resistant for others	Mechanical vent required if there is no window or wall
Kitchens	Water-resistant	300 mm water-resistant splash zone above sink or water source adjacent to wall	Waterproof plumbing fixtures, water-resistant for others	Mechanical vent required over stove that outlets to the outdoors

Note: *for standards related to ceilings and mould prevention as indicated in the last column in the above table, refer to Section G6 Heat Gain Reduction*

.4 In addition to Table F1.3 above, sanitary compartments in buildings and facilities must not permit water penetration:

a) For urinals, by wall constructed of waterproof material or protected with a waterproof membrane that extend a minimum of 1.2 m above the floor drains and not less than 225 mm on each side of the urinal

b) For multiple toilet stalls, by waterproof interior walls

c) For wall and floor penetrations, by waterproof sealants

.5 Where a slab or stall type urinal is installed, the floor surface of the room containing the urinal must:

a) Be an impervious material

b) Be graded to a floor drain so that there is no standing water

F2 COOKING AND SANITARY FACILITIES

Performance Requirements

(1) Suitable cooking and sanitary facilities for personal hygiene must be provided in a convenient location within or associated with a building appropriate to:

a) Function or use of the building

b) Number and gender of the occupants

c) Disability or particular needs of the occupants

(2) Cooking and sanitary facilities must be constructed in accordance with the Public Health Act and related regulations

(3) Cooking and sanitary facilities must be designed and installed to reduce potential harm from:

a) Unsafe, slippery floors

b) Scalding hot water

c) Spread of disease

(4) Buildings and facilities used for food preparation, food processing and refrigeration must be designed, constructed and operated to:

a) Safeguard people from contamination and transmittance of water-borne diseases

b) Safeguard people from injury during normal operations

c) Safeguard the site and neighbouring properties from contamination or hazardous substances

d) Maximise food safety

(5) Buildings and facilities used for commercial food preparation and food processing must be designed and constructed with the following features:

a) Access to adequate sanitary compartments for personal hygiene

b) Adequate supply of potable water where water or ice is required for food business operations

c) Adequate space and facilities for the hygienic storage, preparation and cooking of food appropriate to the use of the building

d) Adequate facilities to hygienically store and dispose of food waste

e) Facilities to adequately ensure proper temperature control of food, where required

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Performance requirements of F2 are satisfied if:

- **All of the following** Deemed-to-Satisfy provisions are successfully demonstrated
- Requirements for sanitation in the Public Health Act are complied with

F2.1 COOKING FACILITIES

D1 KITCHEN SAFETY AND HYGIENE

All Buildings

.1 Design and construction of kitchens and food processing areas must permit the premises to be effectively cleaned and, if necessary, sanitised and:

a) Discourage accumulation of dirt, dust, fumes, smoke and other contaminants

b) Not permit the entry of pests

c) Not provide harbourage for pests

.2 Food preparation facilities must include:

a) Space for a refrigerator, or a perishable food storage area capable of being cooled and protected from vermin and insects

b) Means for food rinsing, utensil washing and wastewater disposal

c) Means for cooking food

d) Sufficient space and a working surface for food preparation made of smooth, impervious material that can be easily cleaned, maintained and disinfected

e) Means for temporary storage of food waste and recyclable material

f) Protection from water damage

g) Drinking water supply

h) Anti-slip resistant flooring in wet area

Class 3 to 9 Buildings

.3 Commercial kitchens must be designed and constructed according to standards of the Ministry of Health and include:

a) Adequate air movement through natural or mechanical ventilation to effectively remove fumes, smoke, steam and vapours from the food premises

b) Refrigerators that maintain a temperature of 5°C (40°F) so that food won't spoil

c) Enclosed garbage or recyclable bins, or other means of keeping pests and animals away

d) Fixtures and fittings and equipment designed, constructed, located and installed so that:

(i) There is no likelihood that they will cause food contamination

(ii) They are able to be easily and effectively cleaned

(iii) Adjacent floors, walls, ceilings and other surfaces are able to be easily and effectively cleaned

(iv) They are unable to absorb grease, food particles and water if there is a likelihood of causing food contamination

(v) They are made of material that will not contaminate food

e) Hand washing facilities that are:

(i) Easily accessible by food handlers

(ii) Permanent

(iii) Connected to or provided with a supply of warm running potable water

(iv) Clearly designated for the sole purpose of washing hands, arms and face

f) Hot boxes and ovens capable of holding food at 60˚C or above (hot hold)

g) Surfaces of walls, partitions, and floors made of impervious, non-hazardous materials

h) Walls and partitions with a smooth surface up to a height appropriate to the operation

i) Floors with adequate drainage and cleaning

j) Windows, where provided, must be easy to clean, constructed to minimise build-up of dirt, and fitted with removable and cleanable insect-proof screens

k) Doors with smooth, non-absorbent surfaces that are easy to clean

.4 Adequate setbacks from swinging doors at kitchen entrances must be provided to allow for safe passage to adjacent doorways, halls, closets, food storage or other activity.

.5 Temporary kitchens (including food trucks containing a kitchen) must have:

a) Space for a refrigerator, or a perishable food storage area capable of being cooled and protected from vermin and insects

b) Means for washing and wastewater disposal

c) Means for cooking / heating food

d) Space and a surface for food preparation made of impervious materials that can be easily cleaned

e) Means for temporary storage of food waste and recyclable material

.6 Movable food carts (including food trucks containing a kitchen) must be able to:

a) Store and serve food at acceptable temperatures to prevent contamination

b) Be constructed of smooth, hygienic surfaces where there is contact with food

c) Have a means for storage of food waste and recyclable material

D2 COMMERCIAL AND INDUSTRIAL REFRIGERATION SYSTEMS

Class 3 to 9 Buildings

.1 Refrigeration equipment in all buildings and facilities must:

a) Be energy efficient and contain visible energy rating labels demonstrating acceptable performance

b) Allow safe isolation and access for service personnel and replacement of equipment

c) Include devices to monitor and control temperature

d) Have appropriate safeguards when utilising toxic or flammable refrigeration agents

.2 Refrigerants used in commercial kitchens and for commercial or industrial operations must have zero or "near-zero" (less than 0.03) Ozone Depletion potential (ODP) for cooling equipment (not including equipment with less than 0.5 kg (1 lb.) of refrigerant – e.g., refrigerators, temporary cooling equipment).

.3 Refrigerants must have a low Global Warming Potential (GWP500 or less).

.4 Refrigeration rooms used in commercial kitchens and for commercial or industrial operations must be airtight and tested prior to being permitted to operate according to GreenChill Best Practices Guideline Ensuring Leak-Tight Installations of Commercial Refrigeration Equipment or other Best Practices acceptable to the Government of Fiji.

.5 Refrigeration rooms must have leak detectors capable of detecting leakage rates down to 2.0% per year for each refrigerant

.6 An alarm system capable of alerting the building operators to leakage thresholds must be part of the refrigeration system.

.7 Walk-in refrigerators used in commercial kitchens and for commercial or industrial operations must be designed and constructed according to **IRHACE - Institute of Refrigeration, Heating, Air Conditioning Engineers of New Zealand - Code of Practice, 2001**, as amended, or an approved equivalent.

.8 A walk-in refrigerator or cooling chamber must:

a) Have a door which is in an opening with a clear width of not less than 600 mm and a clear height of not less than 1.5 m

b) At all times, be able to be opened from inside without a key

D3 VENTILATION IN FOOD PREMISES

All Buildings

.1 All kitchens, domestic or commercial, must have adequate means of natural or mechanical ventilation to:

a) Prevent air-borne contamination of food, and contamination of food from condensation

b) Control temperature and humidity to an acceptable level for human comfort and health

c) Control odours

d) Expel air to an appropriate location that will not harm humans, the environment or adjacent properties

.2 Ventilation must expel air outside of the building or facility.

F2.2 SANITARY COMPARTMENTS AND FIXTURES

D1 SANITARY FIXTURES FOR RESIDENTIAL BUILDINGS

Class 1 to 9 Buildings (residential portion)

.1 Sole-occupancy units must be provided with:

a) A kitchen sink and facilities for the preparation and cooking of food

b) A shower

c) A closet pan (toilet)

d) A washbasin

.2 Laundry facilities must be provided:

a) For each sole-occupancy unit:

(i) Clothes washing facilities, comprising at least one washtub (other than a kitchen sink or washbasin in a sanitary compartment) and a space for a washing machine

(ii) Clothes drying facilities comprising clothesline or a hoist with not less than 7.5 m of line, or space for one heat-operated drying cabinet or appliance in the same room as the clothes washing facility

b) For each 4 sole-occupancy units that do not have individual clothes washing facilities, a separate communal laundry must be provided that contains:

(i) Clothes washing facilities comprising at least one washtub (other than a kitchen sink or washbasin in a sanitary compartment) and a space for a washing machine

(ii) Clothes drying facilities comprising a clothesline or a hoist with not less than 7.5 m of line per sole occupancy unit, or space for one heat-operated drying cabinet or appliance

.3 If the building contains more than 32 sole occupancy units, or if a group of Class 2 buildings on the one allotment contains in total, more than 32 sole occupancy units, a closet pan and washbasin in a compartment or room at or near ground level and accessible to employees must be provided without having to enter a sole occupancy unit.

Class 3 Buildings

.4 Each building, other than residential care, must contain the following for each 10 residents for whom private facilities are not provided:

a) A shower

b) A closet pan except that if one urinal is provided for each 25 males up to 50 and one additional urinal for each additional 50 males or part thereof, one closet pan for each 12 males may be provided

c) A washbasin

d) Sanitary facilities must be conveniently accessible if situated outside the building

.5 Each residential care building must contain the following for whom private facilities are not provided:

a) A shower, closet pan and wash basin for each 8 residents or part thereof

b) A suitable bath for each 30 residents or part thereof

Class 4 Buildings

.6 Each sole occupancy unit must contain:

a) A kitchen sink and facilities for the preparation and cooking of food

b) A shower

c) A closet pan
d) A washbasin
e) Clothes washing facilities, comprising a washtub (other than a kitchen sink or washbasin in a sanitary compartment) and space in the same room for a washing machine
f) A clothesline or hoist, or space for a heat-operated drying cabinet or similar appliance for the exclusive use of the occupants

Class 9c Buildings (care of children, elderly and people with a disability)

.7 Each building or group of buildings must contain the following where private facilities are not provided:
a) A closet pan and wash basin for each 6 residents or part thereof (apart from the number of urinals provided)
b) A shower for each 7 residents or part thereof
c) A suitable bath, fixed or mobile

.8 Each building or group of buildings must contain the following communal facilities:
a) One kitchen or other adequate facility for the preparation and cooking or reheating of food including a kitchen sink and washbasin
b) Laundry facilities for the cleansing and drying of linen and clothing or adequate facilities for holding and dispatch or treatment of soiled linen and clothing and the like, and the receipt and storage of clean linen
c) One clinical hand washing basin for each 15 residents or part thereof

.9 All septic sanitary disposal systems for the disposal and treatment of blackwater must comply with Specification F2.1 Sanitation Systems.

D2 SANITARY FIXTURES FOR NON-RESIDENTIAL BUILDINGS

Class 3 to 9 Buildings (public portion of the building)

.1 Separate sanitary facilities for males and females must be provided for Class 3 to 9 buildings (excluding Class 4) in accordance with Table F2.1, and the following criteria:
a) A unisex facility can only be provided in:
(i) A patient care room in a hospital and/or nursing home that is used for overnight accommodation
(ii) Any other building type as permitted in the Public Health Regulations

.2 Adequate means of disposal of sanitary products must be provided in sanitary facilities intended to be used by females.

.3 Separate sanitary facilities for males and females need not be provided for patients in a ward area of a Class 9a building

.4 Not less than one washbasin must be provided where closet pans or urinals are provided.

Table F2.1 Minimum Number of Sanitary Fixtures per Building Type

Building Class	User Group	Closet Pans		Urinals		Washbasins	
		1 per	+ 1 every	1 per	+ 1 every	1 per	+ 1 every
Class 3, 5, 6 9 - other than schools	**Employees**						
	Males	20	20	25	50	30	30
	Females	15	15	-	-	30	30
Class 7 and 8 (except electricity network substation)	**Employees**						
	Males	20	20	25	50	20	20
	Females	15	15	-	-	20	20
Class 6 - department stores, shopping centres and, individual shops in excess of 900m^2 total floor area	**Patrons**						
	Males	1200	1200	600	1200	600	1200
	Females	300	300	-	-	600	1200
	None required if total number of persons is not more than 600						
Class 6 - restaurants, cafes, bars, public halls, function rooms and 9aout patients	**Patrons**						
	Males	100	100	50	50	50	200
	Females	25	50	-	-	50	150
	None required if total number of persons is less than 21						
Class 9a - health care buildings (other than for out-patients)	**Resident Patients**						
	Males	8	8	-	-	8	8
	Females	8	8	-	-	8	8
Class 9b - schools (not being early childhood centres)	**Staff + employees**						
	Males	20	20	20	30	30	30
	Females	5	15	-	-	30	30
	Students						
	Males	25	75	50	75	10	50
	Females	10	25	-	-	10	50
Class 9b - early childhood centres	**Children**	15	15	-	-	15	15
	Must be junior pans, washbasin with rim height not more than 600 mm						
Class 9b – theaters with multiple auditoria, art galleries and the like	**Participants**						
	Male	20	20	10	10	10	10
	Female	10	10	-	-	10	10
	Spectators						
	Male	250	400	100	100	150	150
	Female	10	60	-	-	80	175
Class 9b – single auditorium theatres and cinemas	**Patrons**						
	Male	250	350	50	100	150	150
	Female	50	75	-	-	150	150
Class 9b – sports venues and the like	**Participants**						
	Male	20	20	10	10	10	10
	Female	10	10	-	-	10	10
	Spectators						
	Male	250	250	100	100	150	150
	Female	30	70	-	-	100	150
Class 9b – churches, chapels and the like	**Patrons**						
	Male	300	150	200	200	250	250
	Female	150	150	-	-	250	250
Class 9b – public halls, function rooms and the like	**Patrons**						
	Male	100	200	50	50	50	150
	Female	25	75	-	-	50	150

.4 A Class 9a health-care building must be provided with:

a) One kitchen or other adequate facility for the preparation and cooking or reheating of food including a kitchen sink and washbasin

b) Laundry facilities for the cleansing and drying of linen and clothing or adequate facilities for holding and dispatch or treatment of soiled linen and clothing, sanitary products and the like and the receipt and storage of clean linen

c) One shower for each 8 patients or part thereof

d) One island-type plunge bath in each storey containing a ward area

.5 Class 9b Early Childhood Centres must have sanitary fixtures accessible from both indoor and outdoor play areas, and contain the following:

a) A kitchen or food preparation area with a kitchen sink, separate hand washing facilities, space for a refrigerator and space for cooking facilities with:

(i) The facilities protected by a door or gate with child proof latches to prevent unsupervised access to the facilities by children younger than 5 years old

(ii) The ability to facilitate supervision of children from the facilities if the early childhood centre accommodates children younger than 2 years old

b) One bath, shower, or shower-bath

c) If the centre accommodates children younger than 3 years old:

(i) A laundry facility comprising a washtub and space in the same room for a washing machine

(ii) A bench type baby bath, which is within 1 m of the nappy change bench

(iii) A nappy changing bench which:

A. Is within 1 m of separate adult hand washing facilities and bench type baby bath

B. Must be not less than 0.9 m^2 in area and at a height of not less than 850 mm, but not more than 900 mm above the finished floor level

C. Must have a space not less than 800 mm high, 500 mm wide and 800 mm deep for the storage of steps

D. Is positioned to permit a staff member changing a nappy to have visibility of the play area at all times

.6 Where the nature of employment is such that a shower is highly desirable at the end of the work (e.g., cooks and kitchen hands), showers must be provided for each 10 such male or female employee in any one shift.

.7 Class 9b theatres and sporting venues must be provided with one shower for each 10 participants or part thereof.

D3 CONFIGURATION OF SANITARY COMPARTMENTS

All Buildings

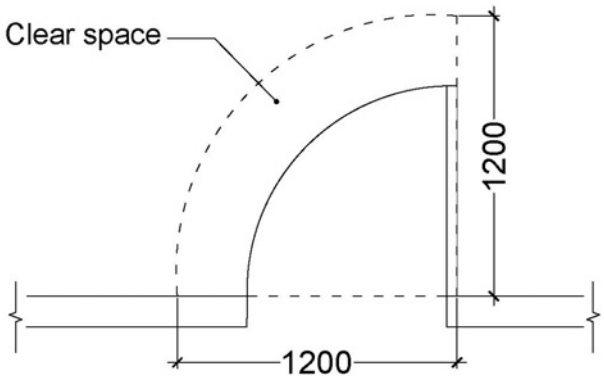
.1 The door to a fully enclosed sanitary compartment must:

a) Open outwards, or

b) Slide, or

c) Open inward with a clear space of a minimum of 1.2 m between the closet pan and the doorway

Figure F2.1 Minimum Door Clearance in a Sanitary Compartment



.2 Minimum clear opening of a doorway to a sanitary compartment shall be:

a) Minimum 915 mm for an accessible sanitary compartment

b) Minimum 750 mm for a sanitary compartment not required to be accessible

Communal Washrooms

.3 Sanitary compartments, other than in any early childhood center, must have doors and partitions must separate adjacent compartments and extend:

a) From floor level to the ceiling in the case of a unisex facility, or

b) To a height of not less than 1500 mm above the floor if primary school children are the principal users, or 1800 mm above the floor in all other cases

.4 In an early childhood centre, each sanitary compartment for use by children must be screened by a partition which, except for the doorway, is opaque for a height of at least 900 mm but not more than 1200 mm above the floor level.

.5 A urinal must be:

a) An individual stall, and/or

b) Wall-hung urinal with a minimum length of 600 mm per person, or

c) A closet pan used in place of a urinal

.6 A washbasin may either be:

a) An individual basin, and/or

b) A part of a hand wash trough served by at least a single water tap

.7 Hot water, warm water and cooling water systems must be installed in accordance with AS/NZS 3661.1 Slip Resistance of Pedestrian Surfaces, Part 1: Requirements.

D4 SANITARY FIXTURES FOR PEOPLE WITH DISABILITIES

All Buildings

.1 Buildings required to be accessible according to Section D Accessibility (Table D6.1) must provide a sufficient number of accessible sanitary fixtures per building type and occupancy as follows:

a) Wherever toilets are provided, at least one shall be accessible and comply with NZS 4121 Design for Access and Mobility: Buildings and Associated Facilities

b) All accessible toilets and sanitary compartments must have a continuous accessible route leading to it and extending to the exit from the building and site

.2 The construction and layout of sanitary compartments for use by people with a disability must comply with:

a) AS 1428.1 Design for Access and Mobility, Part 1: General Requirements for Access - New Building Work, or

b) NZS 4121 Design for Access and Mobility: Buildings and Associated Facilities and NZS 4122 Guide to Approachability, Accessibility and Usability of Buildings

.3 An accessible sanitary compartment must have the following clearances:

a) Clear unobstructed width in the doorway of 915 mm

b) An outward swinging door, or an inward swinging door and clear unobstructed area of 1.2 m as illustrated in Figure F2.1

c) A clearance zone with a 1.125 m radius between all fixtures in the interior of the sanitary compartment as illustrated in Figure F2.2

.4 The toilet pan must be installed so that:

a) The front edge of the pan is 800 mm (±10 mm) from the rear wall

b) The top of the seat is between 460 mm and 480 mm above finished floor level

c) There is a minimum clearance of 900 mm, measured horizontally, between each side of the pan and any adjacent wall or privacy screen

.5 Sanitary fixtures such as grab rails, toilet paper holders, soap dispensers, sanitary towel supply, hand-dryers, etc., must be positioned to be 900 mm to 1400 mm above the finished floor and not encroach into wheelchair maneuvering space as illustrated in Figure F2.2.

.6 Accessible wash basins must be installed so that the rim is between 800 mm to 830 mm above the finished floor.

.7 Accessible change tables must be installed to not encroach into the clearance zone for wheelchair movement and at a maximum height of 820 mm with a minimum clearance underneath of 720 mm.

.8 An accessible shower must have a clear area of 1500 mm by 900 mm.

.9 The door latch must be able to be:

a) Operated without harm to people with disabilities

b) Opened from the outside in case of an emergency

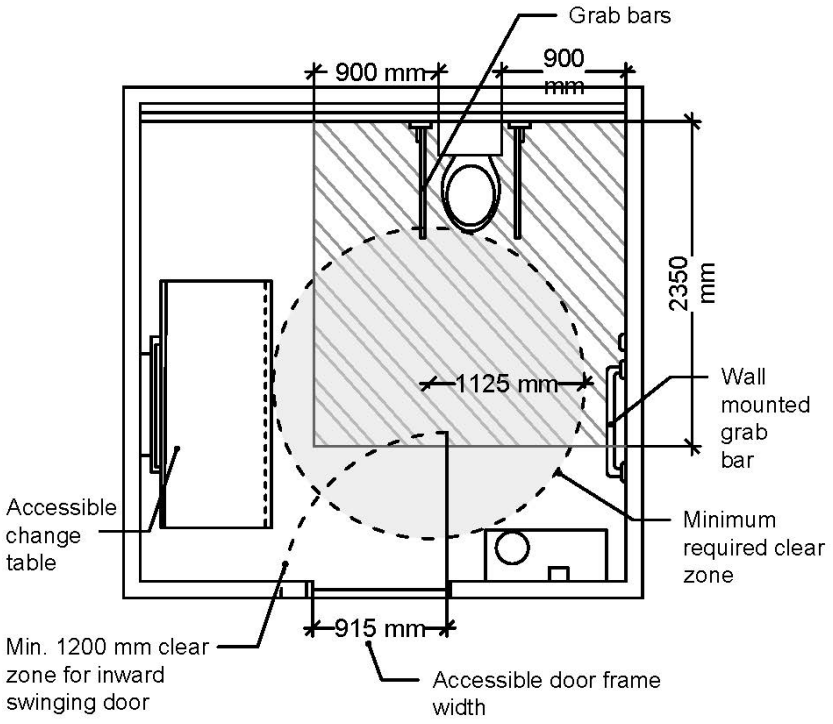
.10 The flush control for the toilet must be at a height of 1,100 mm from the floor surface.

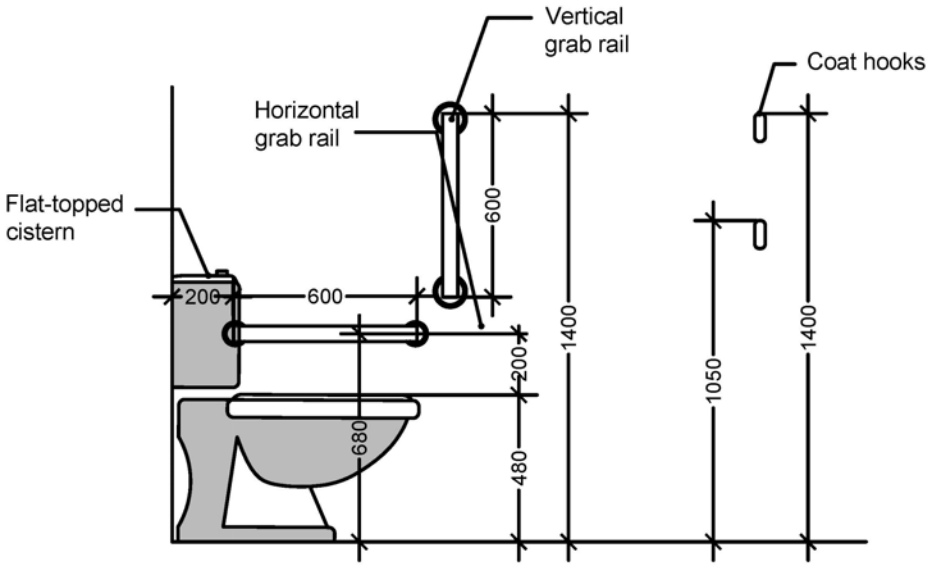
.11 Horizontal handrails may be attached to the wall, or placed on either side of the toilet.

.12 For public sanitary compartments, an alarm button must be provided within the accessible sanitary compartment with instructional signage.

.13 A colour contrast between the sanitary fixtures, wall and floor must be provided.

Figure F2.2 Accessible Features and Layout in a Sanitary Compartment





F3 ROOM DIMENSIONS

Performance Requirements

(1) The floor area, plan dimensions and ceiling heights of habitable rooms must provide:

a) Sufficient living space for privacy and comfort

b) Sufficient space to support its intended function

(2) The floor area, plan dimensions and ceiling heights of habitable rooms must support:

a) Number and gender of the occupants

b) Disability or particular needs of the occupants

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Performance requirements of F3 are satisfied if **all of the following** Deemed-to-Satisfy provisions are successfully demonstrated.

D1 ROOM HEIGHT

All Buildings

.1 The minimum room height shall comply with the minimum heights in Table F3.1.

.2 A 2.1 m height from floor to ceiling is the minimum standard for:

a) A bathroom, shower room, sanitary compartment, non-commercial (domestic) kitchen and non-commercial (domestic) laundry

b) Ancillary uses such as a tea preparation room, pantry, storeroom, garage carparking area, and the like

.3 The minimum height above a stairway, ramp and the like measured vertically above the nosing line of a stairway tread or the surface of the ramp is 2.0 m.

.4 Ceiling fans and other such appliances must have a minimum vertical clearance of 2.1 m from the floor to the underside of the ceiling fan.

Class 2, 3 or 4 building

.5 In a room or space with a sloping ceiling or projections below the ceiling line, the height of rooms and other spaces must not be less than:

a) In a habitable room:

(i) In an attic – a height of not less than 2.2 m for not less than two-thirds of the floor area of the room or space

(ii) In other rooms – a height of not less than 2.4 m for not less than two-thirds of the length or width of the floor area of the room or space

b) In a non-habitable room – a height of not less than 2.1 m for not less than two-thirds of the floor area of the room or space, but not including any part of a ceiling with a height of less than 1.5 m

Table F3.1 Room Sizes

Building Classes	Minimum Height from Floor to Ceiling		
	Habitable Room	Laundry	Corridor
Class 1 to 8	• Habitable room - 2.4 m • Residential private kitchen – 2.1 m • Commercial kitchen – 2.4 m	• Domestic - 2.1 m • Commercial – 2.4 m	2.1 m
Class 9a healthcare	• Habitable room – 2.4 m • Ward, treatment room, clinic, waiting room – 2.4 m • Operating theatre or delivery room – 3.0 m	2.4 m	2.4 m
Class 9b building	• School classroom or other assembly building or part accommodating not more than 100 persons – 2.4 m • Theatre, public hall, or other assembly building or part accommodating more than 100 persons – 3.0 m	2.4 m	• 2.4 m if it serves not more than 100 persons • 2.7 m if it serves more than 100 persons
Class 9c Care of elderly, children, people with disability	• Habitable room - 2.4 m • Kitchen for patrons – 2.1 m • Commercial kitchen – 2.4 m	• Domestic - 2.1 m • Commercial – 2.4 m	2.4 m

D2 ROOM AREA (NOT ACCESSIBLE)

.1 In a Class 1 building or sole occupancy unit (residential), the minimum standards for room areas are:

a) The minimum floor area of any habitable room, excluding a kitchen, is 6 m^2

b) The minimum floor area for a sanitary compartment with a toilet is 1.5m x 0.9m

c) The minimum floor area of a shower cubicle is 0.9m x 0.9m

d) The minimum area of a kitchen is an area that can accommodate:

(i) A counter for food preparation

(ii) A cooking utensil such as an oven or hot plate

(iii) A refrigerator

(iv) A dining area

(v) An area for kitchen food waste disposal

D3 ROOM AREA (ACCESSIBLE)

.1 In a Class 1 building or sole occupancy unit (residential) that is accessible, the minimum room area is:

a) The minimum floor area of any habitable room, excluding a kitchen, is 9 m^2

b) The minimum floor area for a sanitary compartment with a toilet is 1.5m by 2.2m

c) The minimum floor area of a shower is 1.5m by 0.9m

d) The minimum floor area of a kitchen is the same as in Section F3 D2.1d above, and it must include a 1.5m by 1.5m clear space with no obstacles as a turning area for a wheelchair

F4 WATER PLUMBING

Performance Requirements

(1) An appropriate, safe and hygienic system of collection, storage and plumbing of water for drinking and hygiene must be provided to all habitable buildings

(2) Water supply services must be conveyed through plumbing installations in a way that minimises:

a) Adverse impact on health and safety of building occupants

b) Disruption of function or use of the building

c) Harm to public infrastructure, property and the environment

(3) Rainwater harvesting for water supply must have suitable safety guards to ensure that unsafe or unhygienic materials do not enter the supply system

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Performance requirements of F4 are satisfied if:

- **All of the following** Deemed-to-Satisfy provisions are successfully demonstrated
- Performance requirements of **Section F6** Roof Drainage and Materials

D1 GENERAL REQUIREMENTS

All Buildings

.1 The plumbing work for water supply must ensure:

a) The appropriateness of the materials and products used to ensure that unsafe or unhygienic materials have no chance of entering the water supply system

b) The correct sizing of water services for the intended use

c) Adequate connections to sanitary services without endangering health and hygiene, the control of cross-connections and prevention of backflow

d) Adequate care in the installation of the services

e) Suitable provision of main and subsidiary storage as required

f) Adequate connections to sanitary services without endangering health and hygiene

g) Avoidance of failure or uncontrolled discharge

.2 The installation of hot water systems must not impair the safety of the users.

.3 All concealed and difficult to access plumbing work must be suitably protected so that there is no likelihood of damage and leakage.

.4 Plumbing must take into account current and anticipated needs of the users and allow for the simultaneous use of the connected system by others.

.5 Where rainwater from the roof runoff is the source of supply, gear must be exercised to ensure there is no reasonable chance for the water to become contaminated

.6 Allowance must be made for lean years of rainfall.

D2 MEANS OF COMPLIANCE

All Buildings

.1 Performance requirements are satisfied if all plumbing for water supply is carried out to the relevant provisions of:

a) AS 3500 Plumbing and Drainage, Part 1: Water Services
b) AS 3500 Plumbing and Drainage, Part 4: Heated Water Services
c) AS 3500 Plumbing and Drainage, Part 4 for Installation of a Household Water Heater

.2 Further standards for water supply installation are found in Table F4.1:

Table F4.1 Water Service and Supply Standards within the FNBC

Item	FNBC (Class 2 to 9 Buildings)	FNBC (Class 1 and 10 Buildings)
Excavations for pipework adjacent to a building and footings	F5 Waste Removal and Treatment	F5 Waste Removal and Treatment
Termite management for attachments to buildings and penetrations through a slab	B9 Termite Protection	B9 Termite Protection
Penetrations for pipework through a vapour barrier	E2 Safety and Grounding F1 Damp and Weatherproofing	
Pipework in timber bearers and joists of solid timber or engineered wood products	C4 Fire Fighting Equipment and Operations	
Fittings, fixtures and pipework installations in steel framed construction	B8 Building Materials	
Penetrations through a fire-resisting wall or floor	C3 Protection of openings Specification NC3.15	
Fixtures or fittings in a wet area	E2 Safety and Grounding D8 Wet Areas and Swimming Pools	
Service pipework external to the building and penetrations through roof cladding in a bushfire prone area	E2 Safety and Grounding D6 Aerial Conductors	
Pipework sound insulation	Section F Health and Amenity	Section F Health and Amenity
Power supply to boiling and/or chilled water storage units	Section E Electrical Section F Health and Amenity	Section E Electrical Section F Health and Amenity

D3 ACCESS TO DOMESTIC-TYPE WATER HEATERS

All Buildings

.1 A household water heater which is installed in a building must:

a) Be supported on construction sufficient to carry its full capacity weight and any worst-case combination from wind loading and earthquake action
b) Be positioned to enable adequate access for operation, maintenance and removal
c) Provide suitably for any overflow, especially if installed in a concealed location

D4 DRINKING WATER SUPPLY

.1 A cold-water service must ensure the following:

a) Water is provided at required flow rates and pressures for the correct functioning of fixtures and appliances

b) Access for maintenance of mechanical components and operational controls

c) The system, appliances and devices can be isolated for testing and maintenance

d) The efficient use of drinking water

.2 Water supplied by the grid must be connected to a storage tank of a suitable size to supply drinking water to occupants in case of a failure of the grid supply system or other emergency.

.3 A water storage tank referred to in D4.2 above must:

a) Be sized to provide 200 L of drinking water per person for the expected occupancy

b) Be installed:

(i) On a level base according to Water Authority of Fiji standards, or

(ii) On an elevated surface above the expected flood level according to Water Authority of Fiji standards

c) Be entirely separated from rainwater harvesting or greywater supply systems so that there is no possibility of cross-contamination

d) Comply with rainwater harvesting standards in Section F7 D1

D5 HEATED WATER SUPPLY

.1 Containers used for producing and/or storing heated water must:

a) Relieve excessive pressure

b) Limit temperatures to avoid flash steam production in the event of rupture

.2 Heated water must be stored and delivered under conditions which avoid the likelihood of the growth of Legionella bacteria.

.3 Where both a heated and a cold water tap are installed, the heated water tap must be installed to the left of, or above, the cold water tap if:

a) Each tap controls a separate outlet, or

b) Both taps control a combined flow of water delivered through a single outlet

.4 The outlet of a shower, basin, kitchen sink, or laundry trough must comply with Section G7 Efficient Water Use.

.5 The delivery temperature of heated water at the outlet of each sanitary fixture must be:

a) Not more than 45°C in any:

(i) Residential part of an aged-care building

(ii) Patient care area in a health-care building

(iii) Part of an early childhood centre, or primary or secondary school, that is used by children

(iv) Designated accessible facility in a common area of Class 2 building, or in any part of a Class 3, 5, 6, 7, 8, 9a, 9b, 9c or 10 building

AND

(v) The temperature control device used to deliver heated water must be a:

A. Thermostatic mixing valve, or

B. Thermostatically controlled tap

b) Not more than 50°C in all other cases

AND

c) A temperature control device used to deliver heated water must be a:
   (i) Thermostatic mixing valve, or
   (ii) Thermostatically controlled tap, or
   (iii) Tempering valve, or
   (iv) Temperature limited water heater

.6 Containers used for producing and/or storing heated water must be provided with temperature and pressure relief devices in accordance with **AS/NZS 3500.4 Plumbing and Drainage Part 4: Heated Services**

D6 NON-DRINKING WATER

.1 Non-drinking water must be supplied through plumbing installations in a way that avoids the likelihood of inadvertent contamination of any drinking water service, and minimises any adverse impact on building occupants, infrastructure of the Water Authority of Fiji, property and the environment.

.2 A non-drinking water service, including pipes, pipe outlets, fittings, storage and holding tanks, must only be connected to outlets clearly identified for non-drinking use and be clearly identified.

.3 A non-drinking water service must not have a cross-connection with a drinking water service.

.4 A non-drinking water service must not be connected to any outlet that supplies water for:
   a) Human consumption
   b) Food preparation
   c) Food utensil washing
   d) Personal hygiene

.5 The design, construction, installation, replacement, repair, alteration and maintenance of a non-drinking water service must be in accordance with Section 9 of **AS/NZS 3500.1 Plumbing and Drainage, Part 1: Water Services.**

D7 FIREFIGHTING WATER SYSTEM

.1 A supply of water for firefighting must be provided for the following building types:
   a) Class 5 buildings
   b) Class 6, 7 and 8 buildings that are large-scale and/or store, use or manufacture hazardous substances (if water is a valid method of suppressing associated dangers)
   c) Class 9a health-care buildings and Class 9c aged-care buildings
   d) Class 9b stadiums, assembly buildings

.2 Water supplied for firefighting must have a flow rate for its intended purpose

.3 All associated equipment for firefighting water supply must be provided either within the building or on the site.

.4 A fire-fighting water system must be installed according to **AS/NZS 3500.1 Plumbing and Drainage, Part 1: Water Services** and comply with provisions in Section C Fire Protection.

F5 WASTE REMOVAL AND TREATMENT

Performance Requirements

(1) An appropriate, safe and hygienic system of collection, removal and/or treatment of human waste must be provided for all habitable buildings and sites.

(2) Human waste must be collected, conveyed, removed and/or treated in a way that minimises:

a) Adverse impact on health and safety of building and site occupants

b) Disruption of function or use of the building or site

c) Harm to public infrastructure, property and the environment

(3) Sanitary fixtures and appliances for human waste removal must be designed and capable of being maintained for the serviceable life of the building and site.

(4) A plumbing system for the collection, removal and/or treatment of human waste must avoid:

a) Damage to existing buildings or site works

b) Damage to the reticulated water supply, sewage disposal and stormwater disposal systems or other on-site sanitary or stormwater disposal system.

(5) The size of drains and the layout of their connections must reasonably ensure the current and anticipated needs of the users.

(6) On-site treatment and disposal of human waste must not result in:

a) Harm on the environment

b) Contamination of groundwater and surface water

c) Disease or health consequences for humans and animals

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Performance requirements of F5 are satisfied if:

- **All of the following** Deemed-to-Satisfy provisions are successfully demonstrated
- **Specification F2.1 Sanitation Systems** is complied with

D1 GENERAL REQUIREMENTS

All Buildings

.1 A plumbing system for the collection, removal and/or treatment of human waste must ensure:

a) Sewage or sullage is transferred to a sanitary drainage system or an approved on-site sanitary disposal system

b) Access for maintenance of mechanical components, operational controls and for clearing blockages

c) Adequate ventilation is provided to avoid foul air and hydraulic load imbalance

d) Effective and efficient use of water

e) Protection against internal contamination

f) Appropriateness of the products and materials used

g) Correct sizing of drainage services for the intended use

h) Adequate care in the installation of the services including the provision of appropriate grades

i) That foul gases are not allowed to produce unhygienic conditions or any nuisance

.2 A plumbing system for the collection, removal and/or treatment of human waste must avoid:

a) Blockage and uncontrolled discharge

b) Damage from root penetration, superimposed loads or ground movement

c) Entry of water, foul air and gases from the system into buildings

d) Entry of surface water, sub-surface water and stormwater into the system

.3 Requirements of F5 D1.1 are satisfied if all sanitary plumbing and drainage works are carried out to the relevant provisions of **AS/NZS 3500.2 Plumbing and Drainage, Part 2: Sanitary Plumbing and Drainage**.

.4 Where there is no public sewerage and treatment system available, one of the following methods may be used for the treatment of sewage:

a) Packaged treatment plants

b) Septic tanks or septic fields that comply with Specification F2.1

c) Any other method acceptable to the Approval Authority

Class 2 to 9 Buildings

.5 Any trade waste unacceptable to the Approval Authority having jurisdiction must be pretreated before it enters the disposal system, and must comply with the provisions of Section H Hazardous Substances.

D2 SANITARY FIXTURES AND APPLIANCES

.1 Fixture unit rate targets for the expected flow capacity and usage shown in Table F5.1 must be used to calculate the total load of a building's sanitary system and for sizing of pipes, drains, vents, and the like.

Table F5.1 Fixture Unit Ratings

Fixture	Nominal size of trap outlet and fixture discharge pipe	Fixture unit rating
Basin	DN30 or DN40	1
Bath (with or without shower)	DN40	4
Bidet	DN40	1
***Clothes washing machine**	DN40	5
***Dishwashing machine**	DN40	3
Floor waste gully - **Without fixture** - **With fixture**	 DN50 DN40 or DN50	 0 As per fixture rating
Laundry trough	DN40 or DN50	5
Shower	DN40 or DN50	2
Sink - **Less than 45 litres** - **More than 45 litres**	 DN40 DN50	 2 3
Water closet pan	DN80 or DN100	5

(i) When clothes washing machine connects to a trough trap, only the trough unit fixture rating is considered
(ii) When a dishwashing machine connects to a sink trap only the sink fixture unit rating is considered

D3 TRAPS

.1 The discharge from all sanitary fixtures and appliances must pass through a fixture trap before entering the drain, soil pipe or waste pipe.

.2 The fixture trap must retain a water seal of:

a) 50 mm for traps of size DN50 or less

b) 75 mm for traps of size greater than DN 50

c) 65 mm for all other traps

.3 The fixture trap must be located as close as possible to the fixture and not farther than 600 mm from the fixture outlet, except in case of permitted fixture pairs and floor waste gullies.

.4 The following fixtures may be connected in pairs to a single fixture trap:

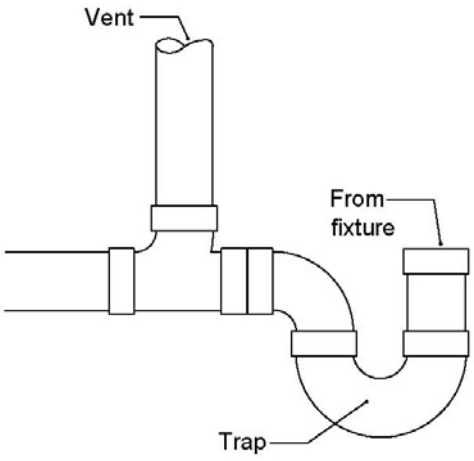
a) Wash basins

b) Sinks

c) Laundry troughs

d) Showers

Figure F5.1 Fixture Trap



.5 The fixture must be connected so that the centre-to-centre distance between their outlets is no more than 1.2 m.

.6 Fixture discharge pipes must have accessible cleaning eyes at bends.

.7 A suitable grease trap must be installed where the nature of the occupancy is such that the wastewater contains grease, fats or oils to levels unacceptable to the Approval Authority.

.8 Accumulated grease and oils must be removed at intervals sufficient to prevent their escape into the disposal system.

.9 After removal, the grease and oils must be suitably disposed off.

D4 DRAIN PIPES

.1 A drain pipe from a sink, bathtub, shower, floor drain or outdoor drain must not be less than the size of the fixture traps to which it is connected.

.2 Drain pipe size must be determined from considering the fixture unit rating in Table F5.1, and take into consideration:

a) The sum of the fixture unit rating of all fixtures connected to the pipe

b) The proposed pipe gradient

.3 Drain pipes must be installed according to the minimum grades shown in Table F5.2 to maintain an adequate flow rate.

Table F5.2 Minimum Grades of Discharge Pipes

Nominal size	Minimum grade
DN30	1 in 30
DN40	1 in 40
DN65	1 in 40
DN80	1 in 50
DN100	1 in 60

.4 The connection of any fixture pipe to a graded drain pipe or between two graded drain pipes must be as follows:

a) With 45º or sweep junction fittings

(i) Where the pipes are different sizes, the soffits of both must be in continuous alignment

(ii) Where an unequal junction fitting is used, the soffit of the branch pipe must be at the same level or higher than the soffit of the pipe to which it connects

b) The level of trap or floor waste gully weir must be at a higher level than the soffit of the grated discharge pipe to which it connects

.5 Where the risk of escape of dangerous and unpleasant gases into occupied premises is minimal, the venting of branch drains is not required if the following conditions are met:

a) The connection of any unvented drain to a vented drain must be located at the ground floor level and the vented drain installed on grade below or above ground

b) In the case of an unvented drain receiving discharge from only waste fixtures, it must connect to a gully

c) An unvented drain other than in (b) must connect to a disconnector gully, or

d) The connection must be from a discharge pipe serving a single fixture and the length of the discharge pipe is:

(i) Less than 3.5 m when serving a waste fixture, or

(ii) Less than 3.0 m when serving a soil fixture

.6 The length of an unvented branch drain together with that of the fixture discharge pipe must not exceed:

a) 8.5 m from the weir of the fixture trap

b) 10 m to a disconnector gully or overflow relief gully

c) 2.5 m from the reducer to the weir of the trap where the fixture discharge pipe is of smaller size than the unvented branch drain

.7 The nominal size of any unvented branch drain must comply with the limitations given in Table F5.3:

Table F5.3 Size of Unvented Branch Drains

Nominal size	Maximum sum of fixture unit loadings discharging into the branch drain
DN65	5 (but not from a water closet pan) or 8 from one floor waste gully
DN80	12 (no more than 1 water closet pan connected)
DN100	30 (no more than 2 water closet pans connected)

.8 The maximum vertical drop from the crown of the trap to the top of the vented drain to which the unvented branch drain connects must not exceed:

a) 1.5 m in the case of basins and bidets

b) 2.5 m in the case of all other fixtures

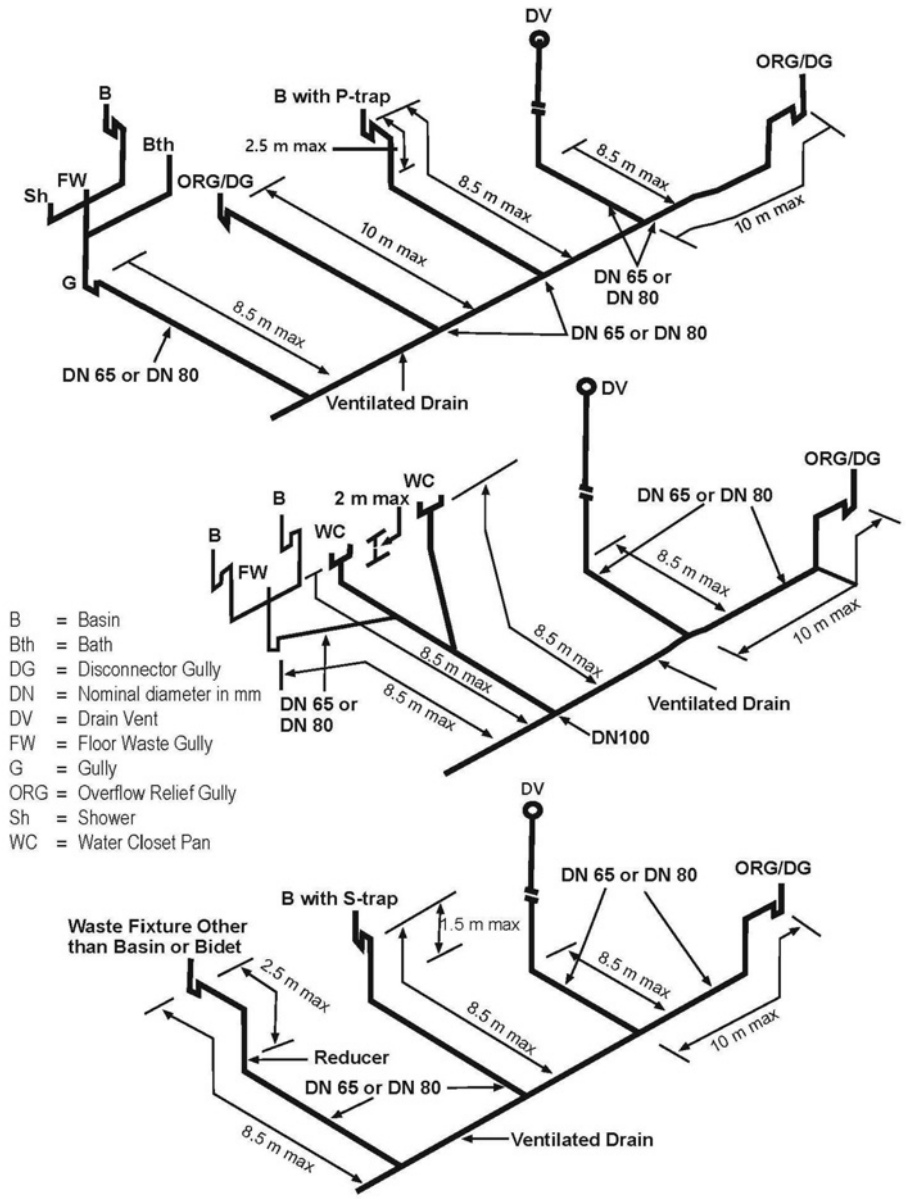
.9 The total combined number of long bends in a fixture drain pipe and unvented branch drain, up to the connection with a vented drain must be limited to:

a) 2 horizontal and 2 vertical with basins and bidets

b) 2 horizontal and 3 vertical with all other fixtures. The distance between any adjacent horizontal bends must be not less than 300 mm and the vertical drop between two adjacent vertical bands must not exceed 2 m

c) A bend of 45º or less is not considered to be a bend for the purposes of this clause

Figure F5.1 Limitations on Unvented Branch Drains



.10 A drain must be protected against any mechanical damage and deformation resulting from the loads over them.

.11 Adequate cover must be provided over drains connecting to the building as indicated in Table F5.4 to protect the drain from damage.

Table F5.4 Minimum Depth of Cover Over Drains

Location	Minimum cover from top of pipe socket to ground surface (mm)	
	Pipes of cast iron or ductile iron	Pipes of other materials
Household driveways	300	450
Other locations where no vehicular loadings are expected	Nil	300

.12 Where it is not practical to provide the minimum cover shown in Table F5.4, drains must be covered by a sandy overlay of at least 50 mm around the circumference of the pipe and provided with:

a) 75 mm thick concrete paving where light vehicular traffic may be expected

b) 50 mm thick concrete paving at other locations where vehicular traffic is not expected

.13 Paving over a drain pipe must be symmetric to the drain alignment and must have a minimum width equal to the depth of the base of the drain from the top of the paving plus 300 mm.

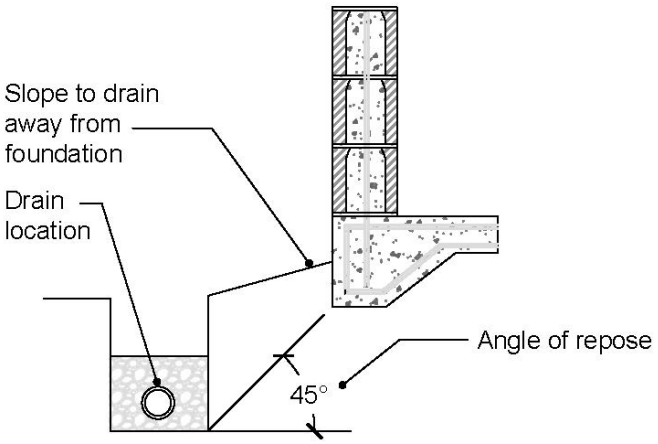
.14 Where it cannot reasonably be avoided, drains may be laid below ground under buildings in which case:

a) Inspection openings must be provided at both ends of the drain adjacent to the building

b) A minimum of 50 mm cover of sandy overlay provided over the pipe and below it a reinforced concrete floor slab

.15 Where a drain is to be laid parallel to a footing, the excavation for it must clear a line at 45° from the extremity of the footing as illustrated in Figure F5.2.

Figure F5.2 Drain Parallel to Footing



.16 Where a drain crosses a strip footing, the angle of crossing must not be less than 45° and the top of the drain must clear the bottom of the footing by not less than 50 mm.

D5 TRAP VENT

.1 In order to prevent the escape of dangerous and unpleasant gases into occupied premises and to ensure that water seats in traps are not destroyed by siphonage, adequate venting must be provided for all fixture discharge pipes and drains except as allowed by Clause F5.D4.3 above for low-risk branch drains.

.2 The minimum size of a trap vent must be related to the nominal size of a fixture trap as shown in Table F5.5:

Table F5.5 Minimum Size of a Trap Vent

Size of Fixture Trap	Size of Trap Vent
DN30 or DN40	DN30
DN50 to DN100	DN40

.3 Every trap vent must extend upward at least 50 mm above the flood level rim of the fixture by one of the following methods:

a) As a vertical vent to open air, the outlet of which is no closer than 900 mm from any opening to the building,

b) On an ascending grade of at least 1:80 and then:

(i) As a vertical vent to open air, or

(ii) To a connection with a vertical or branch vent

c) Extend the vent above the flood level rim of the fixture, then loop it down either vertically or on a downward grade of 1:80, and connect to a vertical or branch vent

.4 Trap vents must be located no closer than 75 mm and no farther than 1,500 mm from the crown of the trap.

.5 A bend of 45º or less is not considered to be a bend for the purposes of this clause.

D6 DRAIN VENT

.1 Vents in drains must be provided:

a) At the upstream end of any drain

b) At the upstream end of any branch drain to which a fixture trap or floor waste gully is connected and if the distance from the weir of the trap to the vented drain exceeds 8.5 m

c) At the upstream end of any DN100 branch drain to which 3 or more water closet pans are connected

d) At the upstream end of any DN80 branch drain to which no more than 2 water closet pans are connected

.2 Vent pipes from waste fixtures discharging into disconnector gullies and from gullies located within buildings must be vented independently and not be interconnected to any other system vent.

.3 The upstream vent of any drain must be connected:

a) At or close to the end of the drain, or

b) At the vent extension of a stack located at or near the upstream end of the drain

.4 An unvented length of drain can be situated upstream of the vent connection if the unvented length complies with Clause F5:D4.3 above.

.5 The minimum size of an upstream vent of any drain is DN50.

.6 Vent ratings associated with vent size and number of fixture units must comply with Table F5.6.

Table F5.6 Size and Rating of Drain Vents

Fixture units discharging into drain	Vent rating	Vent size
1 to 10 (incl)	0.5	DN40
10 (excl) to 30 (incl)	1	DN50
30 (excl) to 175 (incl)	2	DN65
175 (excl) to 400 (incl)	3	DN80

.7 When two or more vents are directly connected to the drain these can take the place of single vent, provided the sum of their ratings is not less than the rating required for venting the drain.

D7 TERMINATION OF VENT

.1 Vent pipes from waste fixtures must terminate in the open air:

a) At a height of at least 50 mm above the overflow level of the associated fixture

b) At least 900 mm from any opening to the building which is within a horizontal distance of 3 m from the vent

c) Not less than 150 mm above its point of penetration through any roof covering

.2 Vents other than in Clause D7.1(a) above must terminate in the open air:

a) Not less than 600 mm above any opening into any building which is within a horizontal distance of 3 m from the vent

b) Not less than 150 mm above its point of penetration through any roof covering

c) Not less than 3 m above any trafficable roof deck which is within a horizontal distance of 3 m from the vent

d) Not less than 2 m above or 600 mm below any chimney or similar opening within a horizontal distance of 3 m from the vent

e) Not less than 5 m from any air intake

f) Not less than 600 mm above any eave, coping or parapet which is within a horizontal distance of 600 mm from the vent

D8 DISCHARGE PIPES

.1 Discharge pipes that connect to a toilet, washing machine, dishwasher, sump pump or commercial fixture must not be less than the size of the fixture traps to which they are connected.

.2 Discharge pipe size must be determined from Table F5.1, and take into consideration:

a) The sum of the fixture unit rating of all fixtures connected to the pipe

b) The proposed pipe gradient

c) The maximum fixture unit loadings shown in Table F5.7

Table F5.7 Maximum Fixture Unit Loadings for Graded Discharge Pipes

Grade	Nominal pipe size (mm)				
	40	50	65	80	100
1 in 20	6	15	51	65	376
1 in 30	5	10	29	39	248
1 in 40	4	8	21	27	182
1 in 50	X	X	X	20	142
1 in 60	X	X	X	16	115

Note:
a) X indicates that the combination of pipe size and gradient is not permitted
b) Not more than 2 w.c. pans are to be connected to any 80 mm pipe

.3 The size of a vented discharge pipe must be determined by taking into account the total number of fixture units (obtained from Table F5.1) discharging into the drain.

.4 The minimum gradient of a discharge pipe must be as given in Table F5.8.

Table F5.8 Minimum Gradient of Discharge Pipes

Nominal size (mm)	Minimum grade
80	1 in 60
100	1 in 60
125	1 in 80
150	1 in 100

.5 Fixture unit loadings for vented discharge pipes must not exceed the values given in Table F5.9 for the size and grade of the drain shown.

Table F5.9 Maximum Fixture Unit Loadings for Vented Discharge Pipes

Grade	Nominal pipe size (mm)			
	80	100	125	150
1 in 20	215	515	1450	2920
1 in 30	140	345	1040	2200
1 in 40	100	255	815	1790
1 in 50	76	205	665	1510
1 in 60	61	185	560	1310
1 in 70	50	140	485	1180
1 in 80	42	120	425	1040
1 in 90	X	X	380	935
1 in 100	X	X	340	855
1 in 120	X	X	X	725
1 in 150	X	X	X	595

Note: *x indicates that the combination of nominal size and grade is not permitted.*

.6 Where the minimum grades given in Table F5.9are not achievable, a discharge pipe may be laid at the reduced grades shown in Table F5.10.

.7 Minimum fixture unit loadings given in Table F5.10 must be connected in advance of the top end of the reduced grade. Where these reduced grades cannot be achieved, provision must be made for regular and automatic flushing of the drain.

Table F5.10 Minimum Fixture Unit Loadings for Reduced Grade Drains

Reduced Grade	Nominal pipe size (mm)			
	80	100	125	150
	Minimum fixture unit loading			
1 in 70	9	10	See Table F5.7	
1 in 80	10	18	-	-
1 in 90	X	X	27	-
1 in 100	X	X	38	-
1 in 120	X	X	X	75
1 in 150	X	X	X	160

Note: *x means that the grade is not permitted unless special automatic flushing arrangements are made.*

.8 A discharge pipe must not be oversized for the only purpose of using a lower gradient than the minimum gradient given in Table F5.10.

.9 The size of a discharge pipe must not reduce in the direction of flow.

D9 GULLY

.1 At least one waste fixture of any type (including a shower outlet), must be connected to a floor waste gully in order to maintain the water seal.

.2 A gully must be installed such that:

a) It is supported on a minimum 75 mm thickness of concrete at 17.5 MPa

b) It is protected from damage at floor level by a concrete surround of minimum width and depth of 75 mm

.3 The following discharges must not be allowed into a gully:

a) From any soil fixture

b) Any rainwater drainage from the roof or ground

.4 The gully must have its water seal maintained from a waste fixture or floor waste gully.

.5 The maximum length of unvented waste pipe discharging into the gully must be:

a) 2.5 m from basins or bidets

b) 6 m from all other waste gullies and fixtures with DN50 or smaller pipes

c) 8.5 m from floor waste gullies and fixture with DN65 or larger pipes

.6 At least one overflow relief gully must be installed in a drain which is connected to a public sewer according to the following:

a) Size of the overflow relief gully must be relative to the size of the main drain or discharge pipe for drains up to DN100 in size

b) Must be located:

(i) Within the property

(ii) External to the building

(iii) As far as practicable from the downstream end of the drain so that the top of the gully is accessible and positioned where any overflow can be easily noticed

c) Minimum height of 150 mm must be kept between the top of the overflow gully riser and the lowest fixture connected to the drain and comply with Table F5.11:

Table F5.11 Permitted Overflow Level of Soil and Sanitary Fixtures

Fixture	Point of measurement
Soil fixture with integral trap	Level of water seal surface
Floor waste gully or shower outlet	Top surface level of grate
Other fixtures	Top surface level of fixture outlet

.7 A gully trap may be used:

a) As an overflow relief gully in the event of sewage surcharge, or

b) To provide disconnection between waste discharges and the remainder of the sewerage installation (disconnector gullies)

.8 Where installed within a building, a disconnector gully trap must:

a) Have the gully riser extend to floor level and be sealed with an airtight removeable cover

b) Have a DN50 vent pipe branch from the riser at an upward grade of not less than 1 in 80 and terminate with a grating at an external wall of the building above any likely floor level, or

c) Have a terminus for the vent pipe complying with size and setback criteria in F5:D7.1

d) Not have another fixture or appliance connected to the vent pipe

.9 No trap is required other than for discharge outlets from basins.

.10 Maximum length of the untrapped waste pipe must not exceed 1.2 m, except for basins.

.11 If a fixture is trapped, the maximum length of the waste pipe is allowed to be up to 2.5 m.

.12 Traps must not be vented, with the exception of allowed fixture pairs, and each fixture must connect individually with the gully at a grade of not less than 1 in 40.

.13 A waste fixture must have an accessible, removable grate for maintenance access.

.14 The outlet size of a floor waste gully trap is based on the total fixture units of the fixtures and appliances discharging into it. The outlet size must be:

a) DN50 for a total fixture unit rating of 3 units or less

b) DN65 to DN100 for a total fixture unit rating of 10 or less

.15 A DN50 outlet and DN50 riser may be used if the sole function of the gully is to dispose of water spillage and washdown water. All other gullies must have a minimum riser size of DN80 at floor level.

.16 The minimum height of the gully riser from the top of the water seal to the floor surface must comply with Table F5.12. The maximum height must not exceed 600 mm.

Table F5.12 Minimum Height of Floor Waste Gully Risers

Fixture connected	Minimum height from water seal to floor level (mm)	
	Waste pipe entry at 88.5°	Waste pipe entry at 45°
Shower	150	100
Bath (only one)	250	200
Clothes washing machine	300	250
Other waste fixtures	250	150

D10 JUNCTIONS

.1 A Junction of drains must:

a) Be swept in the direction of flow or have an oblique junction fitting with an upstream angle of no more than 60°

b) Not be a Y junction in the horizontal plane

c) Where unequal junctions are used, have the soffit of the branch in level with or higher than the soffit of the larger size

.2 A square junction of drains must only be used:

a) At the connection of an inspection shaft to a graded drain, or

b) As the inlet riser of a gully or a floor waste gully, or

c) As an inspection opening, or

d) At the top of a drop junction in place of a bend and inspection opening

D11 INSPECTIONS

.1 Plumbing must have inspection openings including:

a) Inspection branches or square junctions, or

b) Inspection chambers

.2 Inspection openings must be provided as illustrated in Figure F5.3 and as follows:

a) Outside the building on each branch connecting one or more water closet pans

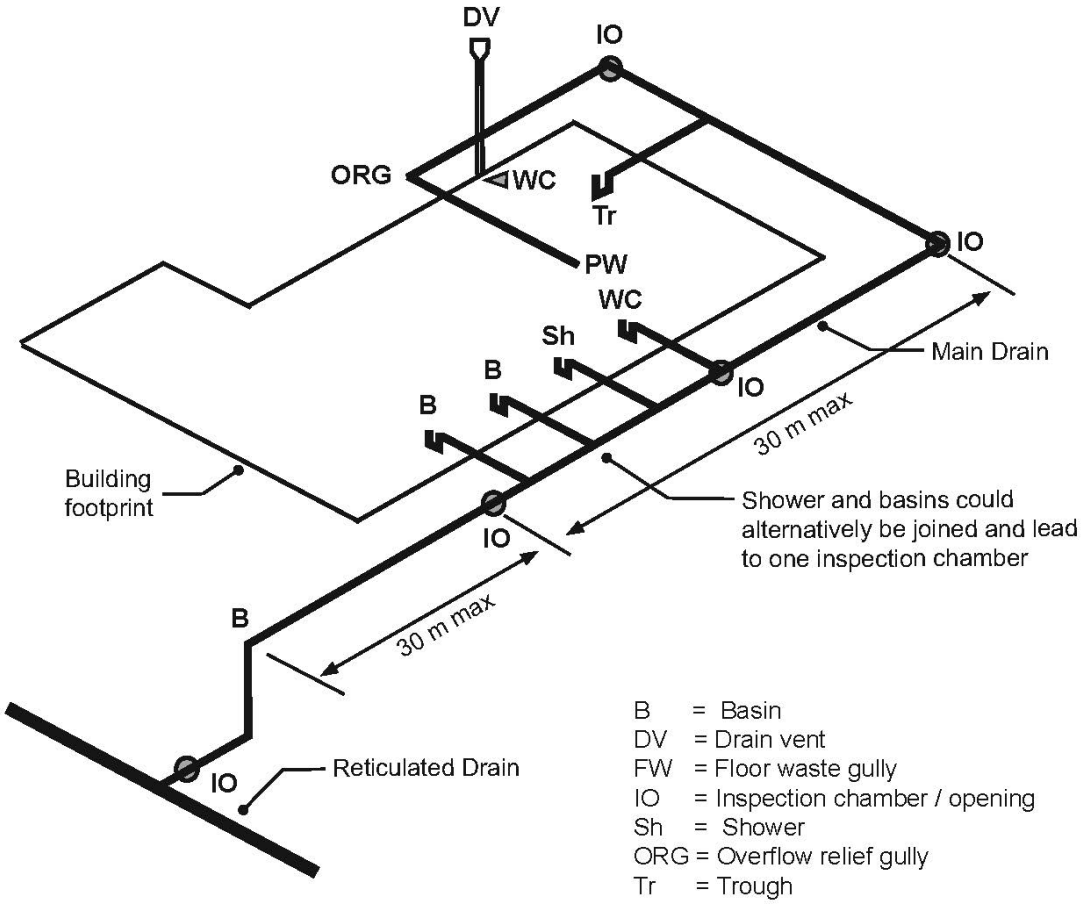
b) At intervals of not more than 30 m

c) Downstream and upstream ends of any section of drain that passes under a building

d) Where any new section of drain is connected to an existing drain

e) At the connection to the reticulated wastewater system

Figure F5.3 Location of Inspection Openings



.3 The size of the inspection branches or square junctions must be:

a) The same size as the drain for drains up to DN150

b) Not less than DN150 for larger drains

.4 The dimensions of inspection chambers must comply with Table F5.13:

Table F5.13 Size of Inspection Measurement (mm)

Minimum internal measurement (mm)			
Depth to floor of chamber	Rectangular		Circular Diameter
	Length	Width	
Less than 600	600	450	600
600 to 900	900	600	900
More than 900	1200	750	1050

.5 When located inside buildings, inspection branches and square junctions must have airtight removeable caps or plugs with gaskets, rubber rings or such other accessories to maintain tightness. When the caps or plugs are removed for inspection/maintenance, the gasket/rubber ring must be replaced with a new one.

.6 An inspection chamber is required where an inspection branch or square junction:

a) Cannot accommodate all the convergent drains, or

b) Will not permit proper inspection or the clearing of obstructions

.7 An inspection chamber must have the following features:

a) Floor must slope at a grade of between 1 in 10 and 1 in 15 towards the channel

b) Any formed junction must have a centre line radius of not less than 300 mm.

c) A fall of at least 30 mm in the invert of any channel that curves through 45º or more

d) A circular or rectangular access opening of 530 mm minimum and fitted with a removable watertight cover located at surface level

e) A cover designed and installed to take any likely load on it

f) Where the size of the inspection chamber is larger than the size of the access opening, the top section of the chamber may be suitably tapered, and must maintain the full dimensions of the chamber for a height of at least 1.5 m from the chamber floor and the depth of the narrower shaft at the top does not exceed 350 mm. The minimum dimension of the shaft except at the opening must be 600 mm.

.8 Where the depth of the chamber exceeds 1.2 m, rungs or rung ladders must be provided that comply with **AS 1657 Fixed Platforms, Walkways, Stairways and Ladders - Design, Construction and Installation.**

.9 Inspection chambers must have their base and walls of a minimum thickness of 150 mm and constructed of:

a) Base – concrete at 20MPa grade, suitably reinforced

b) Walls – concrete at 20MPa grade or fully grouted concrete block masonry

c) Access rungs or ladder - galvanised steel

d) Cover and any frame to seal it - reinforced concrete or cast iron with a safe lifting device

e) The walls and base of any inspection chamber must be cement rendered to a smooth finish, including a suitable waterproof finish according to Section F1 and as follows:

(i) The application of a suitable bonding agent around the pipes, fittings, and openings

(ii) Caulking the annular space between the wall and the pipe or fitting with a stiff mix of one part cement and 2 parts sand

(iii) Sealing with an epoxy based or other suitable sealant, or

(iv) A combination of these method

F6 ROOF DRAINAGE AND MATERIALS

Performance Requirements

(1) Roof drainage and materials must minimise:

a) Adverse impact on health and safety of building occupants

b) Disruption of function or use of the building

c) Harm to public infrastructure, property and the environment

(2) Roof drainage must safeguard people and the environment:

a) From harmful consequences associated with precipitation from storms and cyclones

b) Protect occupants and belongings

(3) Any known local variation in rainfall intensity must be considered and sufficient allowance made for the possibility of overflow into the building due to ripples and turbulence in the flowing water during cyclonic winds

(4) Rainwater from the room must not be permitted to pond around the building

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Performance requirements of F6 are satisfied if:

- **All of the following** Deemed-to-Satisfy provisions are successfully demonstrated
- **Section B8** Building Materials and **Section G5** Low Carbon Building Materials are complied with
- **Specification F7.2** Sizing of Gutters and Downpipes is complied with

D1 GENERAL REQUIREMENTS

.1 Gutters and downpipes, where provided, must have sufficient capacity to reasonably prevent the overflow of rainwater into the building.

.2 Internal stormwater drains, gutters and downpipes are prohibited unless a detailed report indicates that no other design solution can be reasonably achieved.

.3 The roof drainage system must be capable of handling peak intensities of rainfall as follows:

a) Eaves gutters and downpipes - a 20-year return intensity

b) Internal box gutters, valley gutters and downpipes - 100-year return intensity

.4 The peak intensity of rainfall that gutters and associated downpipes must be able to handle are prescribed in Specification F7.2 Sizing of Gutters and Downpipes.

.5 Eaves gutters other than for temporary buildings must have a designed freeboard of 25 mm and box gutters, 35 mm.

.6 Eaves gutters and all other metal roof drainage gear must comply with AS 2179 - Specification for Rainwater Goods Accessories and Fasteners and AS 2180.1 - Metal Rainwater Goods - Selection and Installation.

.7 Zinc or aluminium/alloys must not have direct contact with:

a) Copper or copper alloys

b) Some grades of stainless steel

.8 Water discharged from a gutter / valley or downpipe onto a tiled roof must be prevented from inundating or penetrating the tiling by the provision of:

a) A spreader pipe, or

b) Flashing, or

c) Impervious sarking-type material installed so there is a width of 1800 mm on either side of the point of discharge and extended down to the eaves gutter

D2 ROOF GUTTERS

.1 Roof gutters, where provided, must be sized according to Specification F7.2 Sizing of Gutters and Downpipes.

.2 Gutters must have a minimum slope of:

a) 1 in 500 for eaves gutters

b) 1 in 200 for internal box gutters

.3 The slopes indicated in Clause F6 D2.2 above must increase where there is any material risk of clogging of the gutters and downpipes with leaves and other such matter.

.4 Where high-fronted gutters are installed, provision must be made to avoid any overflow back into the roof or building structure by incorporating overflow measures or the like.

.5 An adequate overflow system must be provided if the size and capacity of drainage components to remove all water anticipated during heavy rain periods cannot accommodate the expected volume.

.6 Building material for gutters, downpipes and flashings must be compatible with roofing materials and comply with:

a) Metal components - **AS/NZS 2179.1 Specifications for Rainwater Goods, Accessories and Fasteners, Part 1: Metal Shape or Sheet Rainwater Goods, and Metal Accessories and Fasteners**

b) uPVC components - **AS 1273 Unplasticised PVC (uPVC) Down Pipe and Fittings for Rainwater**

.7 Lead material will not be used on a roof forming part of a potable water catchment area.

D3 DOWNPIPES

.1 Downpipes, where provided, must be sized according to Specification F7.2 Sizing of Gutters and Downpipes.

.2 Downpipes must be spaced:

a) No greater than 12 m apart

b) No greater than 1.2 m from a valley gutter, unless the gutter is sized to accommodate additional overflow

D4 METAL ROOFING

.1 Metal roofing materials must comply with **AS 1562.1 Design and Installation of Sheet Roof and Wall Cladding, Part 1: Metal.**

.2 Metal sheet roofing must be suitably protected from corrosion.

.3 Where different metals are used in a roofing system, including flashing, fasteners, guttering, downpipes, they must be compatible with each other, and:

a) No lead materials can be used upstream from aluminium / zinc coated materials

b) No copper materials can be used upstream from galvanized coated materials

.4 Minimum end overlap for roof sheets and tiles must be:

a) For roof slopes greater than 15 degrees – 150 mm

b) For roof slopes between 5 – 15 degrees – 200 mm

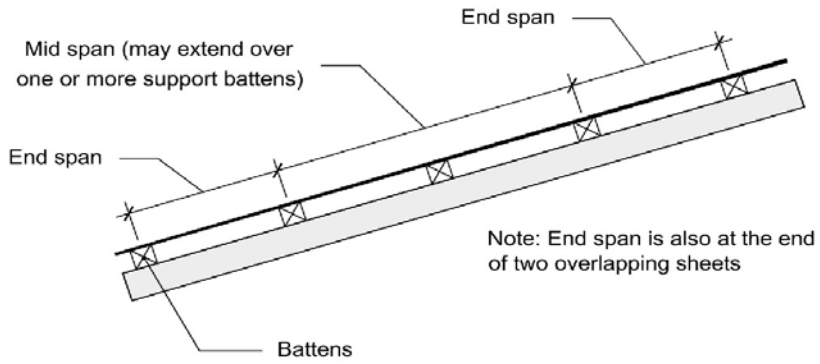
.5 Metal sheet roofing must comply with the maximum span limitations between roofing supports in accordance with Table F6.2

Table F6.1 Maximum roofing spans between supports

Sheet roofing profile	Sheet roofing base metal thickness (mm)	Max. end span (mm)	Max. internal span (mm)
Corrugated	0.42	900	1200
Close pitched trapezoidal	0.42	1800	2400
Trapezoidal	0.42	1300	1700
Concealed fasteners – narrow sheet	0.42	1750	2100
Concealed fasteners – wide sheet	0.48	1800	2100

.6 Maximum sheet run for pierced fixed metal roofing profiles must be not greater than 25 m when measured between the fasteners at the ends of the sheet.

Figure F6.1 Maximum Span for Roofing Between Battens



.7 Metal sheet roofing must:

a) Be either fixed through the roofing (crest fastening) or have concealed fasteners

b) Be fixed at spacings in accordance with Table F6.2

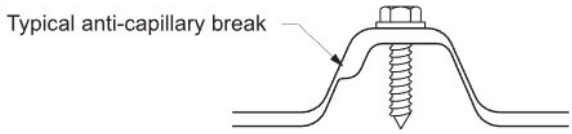
c) Use fixings of a compatible material

d) When using both clipped and pierced fastening systems, employ an anti-capillary feature in the side lap of the sheet as shown in Figure F6.2

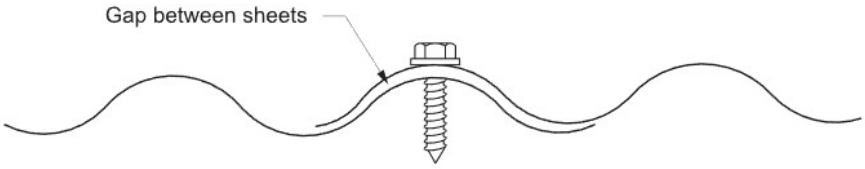
Table F6.2 Fixing Requirements for Sheet Roofing

Sheet roofing profile	Fixing: End span	Fixing: Internal spans
Corrugated	Side lap and every second rib	Side lap and every third rib
Close pitched trapezoidal	Side lap and every second rib	Side lap and every third rib
Trapezoidal	Every rib	Every rib
Concealed fasteners	Every rib	Every rib

Figure F6.2 Side Lap Fastening Detail



(a) Trapezoidal profile



(b) Corrugated profile

.8 Sheet metal roof flashings and cappings must comply with the following (in addition to Section F1 D2 Flashing):

a) Roof flashings and cappings must be purpose-made, machine-folded sheet metal sections of material compatible with up and downstream metal roof covering materials and fasteners

b) Fastener and fixing frequency for flashings and cappings must comply with Table F6.2

c) Joints in flashing and cappings must be not less than 75 mm, lapped in the direction of the fall of the roof, and fastened at intervals not more than 40 mm

d) Wall and step flashings must be fastened into masonry walls with galvanized or zinc/aluminium sheet metal wedges at each end of each length and at intermediate intervals of not more than 500 mm and must overlap by not less than 75 mm in the direction of flow

e) Lead flashings must not be used with prepainted steel or zinc/aluminium steel or on any roof if the roof is part of a drinking water catchment area

f) Flashing must be installed in accordance with Figure F6.3 and be:

(i) For flat surfaces – 10 mm / with a 30 degree fold

(ii) At other surfaces – 10 mm / with a 90 degree or 135 degree fold

g) Parapet flashing for the junction of the metal roof sheet and adjacent masonry wall must include anticapillary breaks as illustrated in Figure F6.4 and F6.5.

Figure F6.3 Flashing at Roof Edge

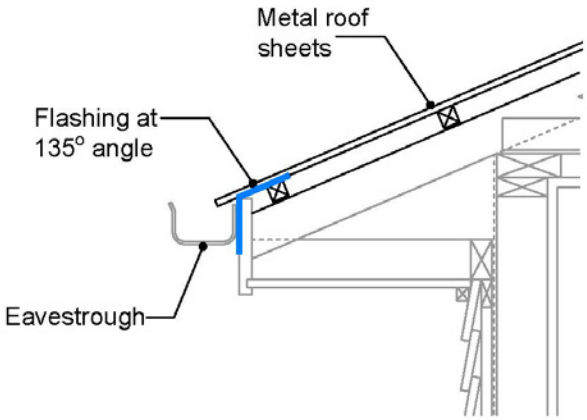


Figure F6.4 Parapet Flashing – Option 1

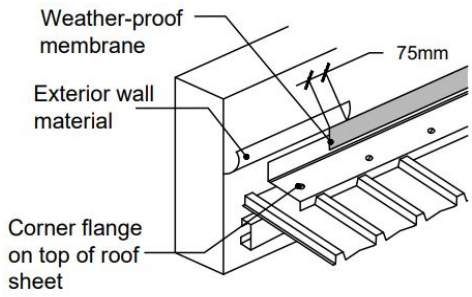
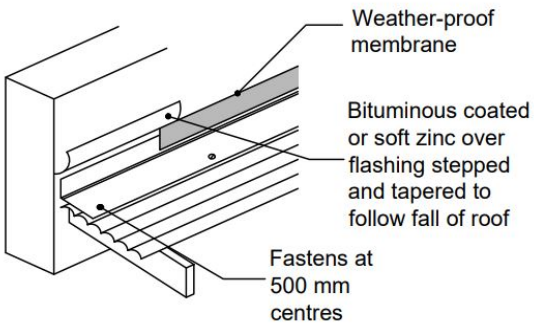


Figure F6.5 Parapet Flashing – Option 2



.9 Flashing of penetrations on metal sheet roofing must comply with the following:

a) Collar flashings must permit the total drainage of the area above the penetration

b) On completion of installation, the roof structure must be restored to its original strength by installing roof trimmers and soaker supports as necessary

Figure F6.6
PVC Apron for Typical Roof Penetration

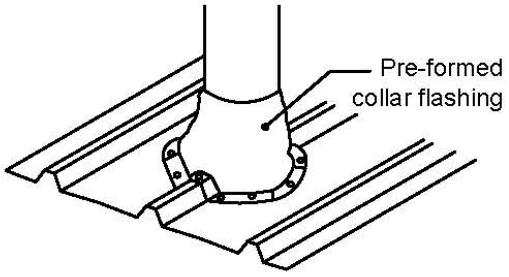


Figure F6.7
Collar Flashings for Typical Roof Penetration

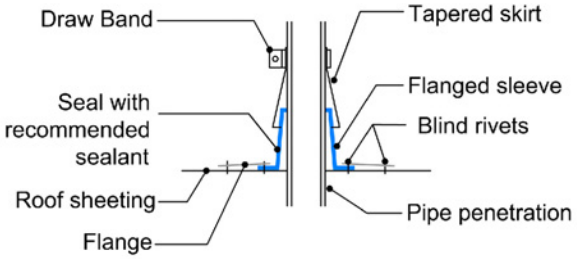
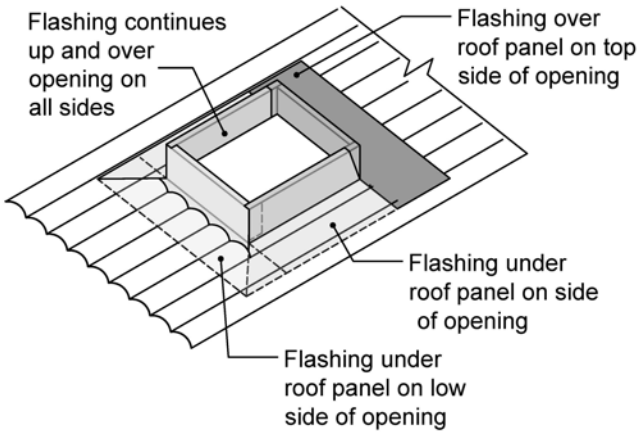


Figure F6.8 Roof Flashing for Large Penetrations



F7 SUSTAINABLE WATER USE

Performance Requirements

(1) A system for the collection, storage and re-use of rainwater within the building and on site must be designed, manufactured and installed in a way that minimises:

a) Adverse impact on health and safety of building occupants

b) Disruption of function or use of the building

c) Harm to public infrastructure, property and the environment

(2) A rainwater harvesting system must be designed, constructed and installed to:

a) Avoid the likelihood of contamination of water within the rainwater harvesting system, the water service, the reticulated water, waste and stormwater systems

b) Provide water to fixtures and appliances at flow rates and pressures required for the correct functioning of the fixtures and appliances under normal conditions

c) Avoid the likelihood of failure and uncontrolled discharge

d) Facilitate the efficient use of drinking water

e) Allow access, as required, for maintenance of mechanical components and operational controls

f) Allow the system, appliances and backflow prevention devices to be isolated for testing and maintenance, where required

(3) Sustainable water uses in a building or on a site must demonstrate:

a) A means of decreasing the daily demand for water derived from the reticulated water system

b) A means of decreasing flooding or erosion

c) A means of increasing water availability during the dry season

d) A means of improving groundwater quality and availability

(4) All Class 9 buildings used as an Evacuation Centre must be equipped with water collection and storage tanks sufficient to provide for basic cleaning and cooking for the period until help arrives.

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Performance requirements of F7 are satisfied if:

- **All of the following** Deemed-to-Satisfy provisions are successfully demonstrated
- **Specification F5.5A** Rainwater Storage is complied with

D1 RAINWATER HARVESTING

General

.1 A rainwater harvesting system, consisting of water collection tanks, plumbing and sanitary fixtures, may be installed in the interior or exterior of the building, as a stand-alone structure, or underground.

.2 Testing of water from the following sources must be conducted and approved prior to considering the use of it for a water collection tank:

a) Surface water

b) Deep groundwater aquifers

.3 Sizing of the water collection tank must comply with standards of the Approval Authority.

.4 Plumbing and outlets for rainwater harvesting system must comply with Section 16 of **AS/NZS 3500.1 Plumbing and Drainage Part 1: Water Service.**

.5 Identification of rainwater pipework and outlets in accordance with Clause 16.3.2 of **AS/NZS 3500.1 Plumbing and Drainage, Part 1: Water Services** is not required if the rainwater harvesting system is the only water supply available on the site.

Water Collection Tanks

.6 Water collection tanks must be designed, constructed and installed to minimise risk of contamination from industrial pollutants, dust, leaves, pollen, pesticide sprays, fertilisers, debris, vermin, birds, small animals and insects, and must prevent the possibility of becoming a breeding site for mosquitos.

.7 Water collection tank installation must not damage or interfere with the operation of a reticulated water supply.

.8 Water collection tanks must be fabricated of the following material:

a) Reinforced concrete with a waterproof exterior surface that complies with Section B Structure

b) A tested and verified prefabricated tank from a manufacturer acceptable to the Approval Authority, including Roto Moulding Plastic Tank (food grade), that have a satisfactory thickness and achieve energy efficiency standards in Section G9 Green Building Materials

c) An alternative solution acceptable to the Approval Authority

.9 Water collection tanks must have the following features:

a) A "first-flush system" or other diversion system that will prevent the first flush of water from entering the tank

b) A backflow prevention device that prevents contaminated water from flowing into the water collection tank, an on-site water supply system or a reticulated water supply system

c) Inlets protected by a screen to prevent material, such as leaves etc., from being washed into the tank and a mesh covering to prevent access of mosquitos and other insects

d) Easy access for maintenance of mechanical components and operational controls

e) The ability to have appliances and devices be isolated for testing and maintenance

f) Pipes that are properly labelled for incoming and outgoing water

.10 Water tank material and fabrication must prevent infestation from mosquitos by:

a) Ensuring all parts are airtight except for inlets and overflows

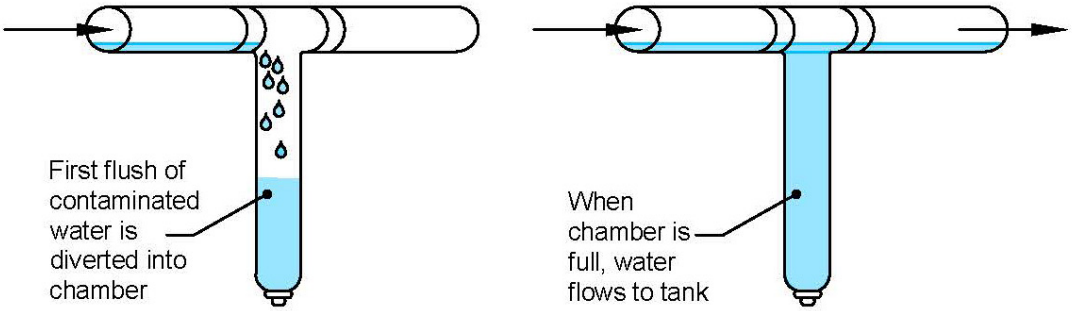
b) Using a close-fitting lid sufficiently sealed to prevent mosquitos from entering

c) Using tight-fitting mesh for inlets, overflows with openings to prevent mosquitos

d) Ensuring a positive slope of 2% minimum such that runoff, stormwater or overflow water does not pond near the tank

e) Shading to protect an exterior tank from sunlight to minimise algal growth

Figure F7.1 First-flush System



.11 Outdoor, above-ground water collection tanks must be:

a) Securely anchored against storm, wind loads and uplift forces (for empty tanks)

b) Grounded to prevent lightning damage

.12 Underground water collection tanks must:

a) Be protected against entry of runoff, groundwater, animal or human faecal material

b) Provide access for maintenance and cleaning

.13 For the purposes of Section 16 of AS/NZS 3500.1 Plumbing and Drainage, Part 1: Water Services, the following applies:

a) A rainwater tank that is set into and completely covered by earth is a 'buried tank'

b) A rainwater tank that is not in any way set into the ground is an 'above-ground tank'

c) A rainwater tank not matching the above two descriptions is a 'partially buried tank'

d) In determining the appropriate description applicable under this clause, access openings, inlets and outlets to a tank may be ignored

Roof Catchment Area

.14 Roof catchment areas for water collection tanks must be free from these sources of contamination:

a) Overhanging vegetation

b) Flues and chimney residue

c) Overflows / discharges / bleed-off pipes from roof-mounted appliances, such as evaporative air conditioners, hot water supply, and solar heaters

d) Uncoated lead flashing

e) Exposed preservative-treated timber

f) Solar hot water systems

.15 Roof catchment areas for water collection tanks must not be installed on:

a) Recently painted roofs (until after the first few rainfalls)

b) Timber roofs preserved with chemicals

c) Roofs coated with lead flashings, lead-based paints or tar-based coatings

d) Parts of roofs near flues, smokestacks and chimneys

.16 Open, u-shaped gutters used for rainwater collection must be protected from contamination by mesh, screens or leaf and litter diverters.

D2 GREYWATER

.1 A greywater system, consisting of pipes, greywater diversion device, backflow preventer, filtration and discharge area, must be used to reduce the amount of wastewater conveyed to a reticulated wastewater systems where required by the Government of Fiji or when conservation of energy, natural resources and the environment is desired.

.2 A non-drinking water supply, including greywater, must only be connected to outlets clearly identified for such use and is limited to the following re-use:

a) Garden watering
b) Toilet and urinal flushing
c) Clothes washing
d) Industrial purposes
e) Firefighting
f) Dust suppression
g) Any other use authorised by the Government of Fiji

.3 Drinking water and greywater must not have a cross connection with drinking water supply, or discharge directly in any soil used for vegetable or fruit production.

.4 A continuous flow of non-drinking water and/or greywater must be provided by:

a) Minimum 2% slope for all pipes
b) No u-pipes or other complicated pipes that trap solids
c) 35 - 50 mm dia. pipes or
d) Pressurised pipes

.5 Where a property is served by a non-drinking water supply and/or greywater system:

a) A backflow prevention device suitable for the degree of hazard and sized to suit the capacity of the drinking water supply must be fitted to the potable water pipes at:

(i) The meter, or
(i) The point of connection, where a meter is not installed

b) A backflow prevention device must be fitted to each external drinking water hose tap outlet

.6 A greywater system must:

a) Be installed only where sufficient land area exists to safely dispose off greywater on the site
b) Only use water from acceptable sources that are not exposed to industrial toxins or chemical compounds other than for personal hygiene

.7 Setbacks for greywater discharge areas include:

a) Minimum 30 m from a waterbody (stream, river, lake) or a well
b) Minimum 15 m from a habitable building
c) Minimum 15 m from the site boundary

D3 EFFICIENT WATER USE

All Buildings

.1 A cistern or flushing valve used for the purpose of flushing a toilet must have a dual flushing mechanism that, when operated, discharges at a rate of:

a) 6L for full flush
b) 3L for half flush (base case 8L and 4L

.2 The volume of water discharged to flush a urinal must not exceed 2.5 litres for each:

a) Single urinal stall, or
b) 600 mm length of a continuous urinal wall, or part thereof

.3 Showerheads in a public or private bathroom must have a maximum flow rate of 6L/min (base case 8L/min), when operating at pressure of 3bars (43.5psi), with the exception of a shower intended to provide rapid drenching of a person for emergency purposes, such as chemical removal.

.4 Faucets in public and private bathrooms must have a maximum flow rate of 2L/ min (base case 6L/min) while operating at full pressure of 3bars (43.5psi).

.5 Faucets in kitchen sinks in residential (non-commercial) buildings must have a maximum flow rate of 8L/min (base case 10L/ min) while operating at full pressure of 3bars (43.5psi).

.6 A heater water service, including any associated distribution system and components, must ensure the efficient use of energy and water.

.7 Water supply for washing machine, main kitchen sink and dishwashers must have:

Class 1 to 4 Residential

a) High WELS star rating (Water Efficiency Label Standard as set out in Australia's Water Efficiency Labeling and Standards Act 2005) or equivalent

b) Low flow rates (L/min) - below 9 L/min – according to the WELS star rating

All other Buildings

c) Energy efficiency labelling acceptable to the Approval Authority

.8 Automatic or set-cycle cisterns must not be installed.

Class 1 and 10 only

.9 To reduce greenhouse gas emissions, to the degree necessary, a heated water service must:

a) Be capable of efficiently using energy

b) Obtain its heating energy from:

(i) A low greenhouse gas intensity energy source, or

(ii) An on-site renewable energy source, or

(iii) Another process as reclaimed energy

.10 A heated water system must be appropriate to the following:

a) The heated water service and its usage

b) The geographic location of the building

c) The location of the heated water service

d) The energy or water source

.11 A heated water service, including any associated distribution system and components, must obtain heating energy from one, or a combination, of the following:

a) A source that has a greenhouse gas intensity up to and including 100 g CO_2-e/MJ of thermal energy load

b) An on-site renewable energy source

c) Another process as reclaimed energy

F8 SANITARY PLUMBING AND DRAINAGE

Performance Requirements

(1) Sanitary plumbing and drainage must ensure:

a) The appropriateness of the products and materials used

b) The correct sizing of drainage services for the intended use

c) Adequate care in the installation of the services including the provision of appropriate grades

d) That foul gases are not allowed to produce unhygienic conditions or any nuisance to people or property

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Performance requirements of F8 are satisfied if:

- **All of the following** Deemed-to-Satisfy provisions are successfully demonstrated
- Sanitary plumbing and drainage works are carried out to the **relevant provisions of** AS 3500 – Part 2 – Sanitary Plumbing and Sanitary Drainage
- **Specification F2.1** Sanitation Systems for septic systems is complied with

D1 FLOORS TO BE DRAINED

.1 In a Class 2, 3 or 4 Part of a building, the floor of each bathroom and laundry in a sole-occupancy unit must be graded to permit drainage to a floor waste gully.

D2 TRADE WASTE AND SMALL TREATMENT PLANTS

.1 Where there is no public sewerage and treatment system available one of the following methods may be used for the treatment of sewage:

a) Packaged treatment plants

b) Septic tanks.

c) Any other suitable method

D3 SEPTIC TANKS

.1 Design, fabrications and installation of septic tanks must comply with Specification F2.1 Sanitation Systems, or an approved alternative standard acceptable to the Government of Fiji.

SPECIFICATIONS

F

Health & Amenity

F2.1 Sanitation Systems
F2.9 Accessible Adult Change Facilities
F5.2 Sound Insulation for Building Elements
F5.5 Impact Sound - Test of Equivalence
F5.5A Rainwater Storage
F7.2 Sizing of Gutters and Downpipes

SPECIFICATION F2.1

Sanitation Systems

1. SCOPE

This Specification sets out the requirements in relation to the location and types of sanitation systems in areas where there is no piped water supply.

2. PRECAUTIONS

Care must be exercised to ensure that:

a) Disease transmitting flies and other insects do not have access to the excreta

b) There is no nuisance to the public or the neighbours

c) The sub-soil water is not polluted if it is likely to be used for domestic purposes

d) The biological oxygen demand (BOD) of any resulting effluent is limited to the requirements of the Department of Health so that streams rivers and oceans are not polluted

3. LOCATION

The toilets must be screened from public view and be located not less than:

a) 6 metres from the front of street boundary of the allotment

b) 3 metres from any boundary other than the front or street boundary

c) 3 metres from any dwelling within or outside the allotment

4. TYPES OF SANITATION SYSTEMS

The following sanitation systems and disposal methods can be used:

a) Compost toilet

b) Pour flush toilet / flush toilet with a septic tank

c) Soak pit and land application system

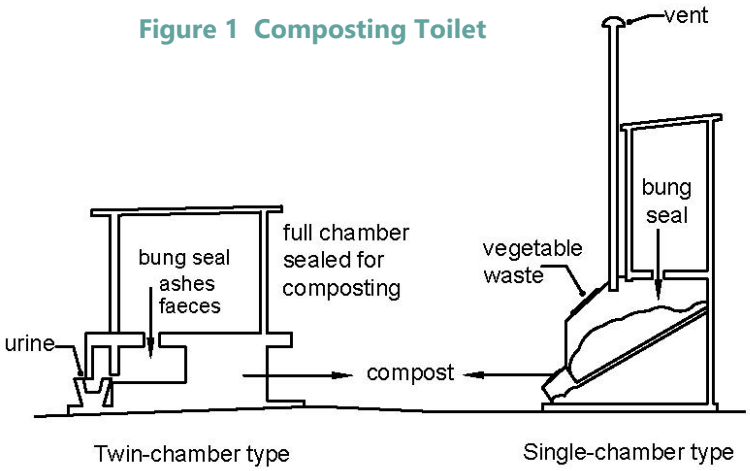
d) Biodigester

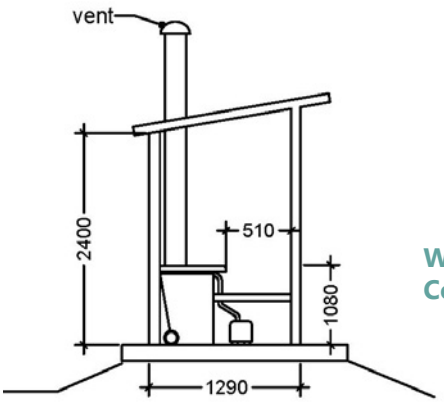
All these disposal methods rely on the reduction of BOD by aerobic bacteria (where free oxygen is available) and/or anaerobic bacteria (where free oxygen is excluded).

.1 COMPOST TOILET

Compost toilets are of two types, the single-vault continuous operation type and alternative twin-vault batch system.

Figure 1 Composting Toilet





Wheelie Bin Type Composting Toilet

Continuous operation types utilize aerobic bacteria to act on excreta and vegetable wastes suspended on a rack above the floor of the ventilated vault. Urine is evaporated off or drained away. As the mixture decomposes, it falls through the rack and is removed for use as fertilizer.

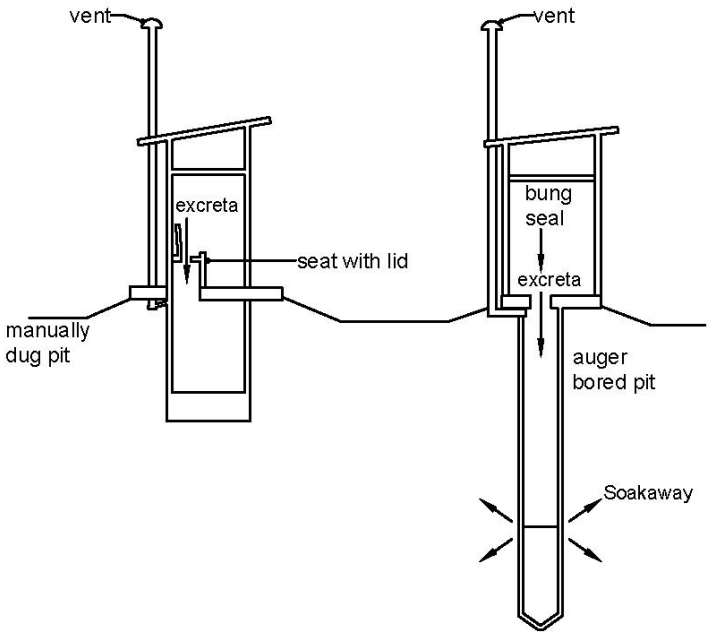
In the alternating twin-vault type, one vault at a time receives excreta. Urine is drained away in a separate surface channel. The excreta are covered with loose earth, ashes, or sawdust to reduce odors. When the vault is nearly full, it is sealed with lime mortar and left for a few months to compost by anaerobic bacterial action. Contents are then removed and used for fertilizer. During this time the other vault is used as the latrine. Both types work best in warm climates and with little or no urine loading.

.2 POUR FLUSH TOILETS

Pour flush toilets are bucket-flushed, water-sealed, floor-pan latrines with a soak-away pit in porous soil. Digestion of excreta is by anaerobic bacteria below water level. The lower section of the pit is lined to retain water when the pit does not reach the water table. Gases from the digestion are vented through the tall pipe.

For more details of a pour flush toilet see Annexure 1 to this specification.

Figure 2 Pour Flush Toilet



.3 SEPTIC TANKS

Septic tanks are single or multiple chambered tanks through which wastewater is allowed to flow slowly to allow suspended matter to settle and be retained so that organic matter contained therein can decompose (be digested) by anaerobic bacterial action in the liquid. The effluent is piped into absorption trenches.

Septic tanks include all tanks used to treat wastewater, greywater and blackwater.

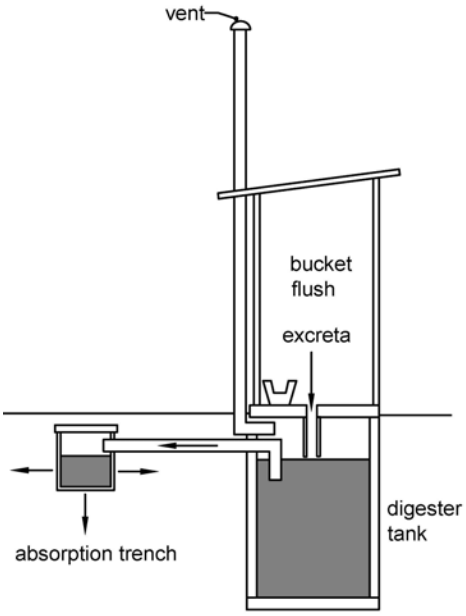
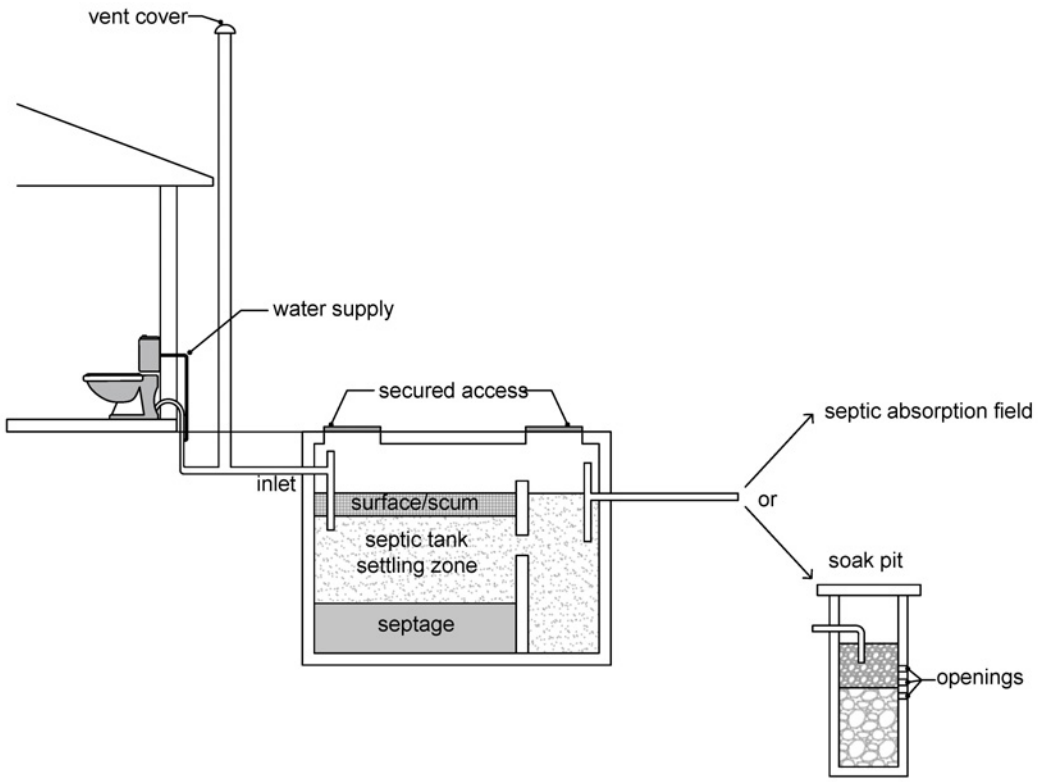


Figure 3a Pour Flush or Cistern Assisted Single Chamber Septic Tank

Figure 3b Pour Flush or Cistern Assisted Double Chamber Septic Tank

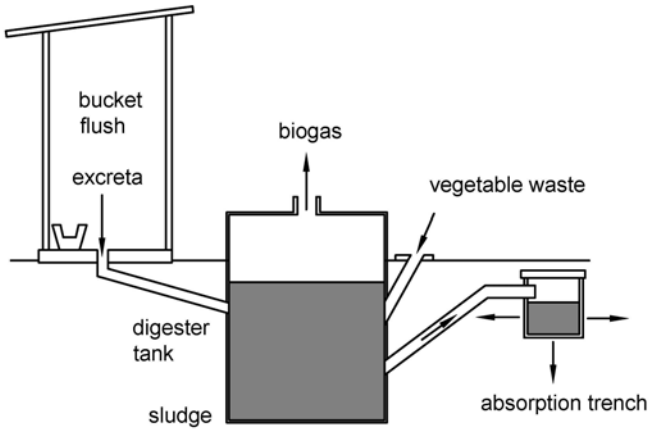


.4 BIOGAS DIGESTER

Biogas operates similarly to a single-chamber anaerobic septic tank, but provision is made to trap the gas, which is largely methane, given off during digestion. The methane gas can be used as fuel for cooking and lighting buildings. For efficient gas production, the content of the digestor tank should have a carbon: nitrogen ratio of approximately 30:1. Vegetable wastes are usually adopted to the excrement to raise the carbon content in the tank. Excess effluent from the tank is often drained into ponds, where algae are grown as feed for domestic animals such as ducks. The digestor tank requires desludging periodically.

The choice of septic tank is determined by local ground conditions, rainfall, water table, water supply, ground temperature range, and social, cultural, and religious influences within the community.

Figure 4 Biogas Digester



ANNEXURE 1

POUR FLUSH TOILET WITHOUT CONSTRUCTED CHAMBERS

1. INTRODUCTION

This specification covers the details of a pour flush toilet. The nuisance from flies and bad odours can be substantially reduced when correctly constructed according to this specification and details available from the approval authority, and when properly maintained.

2. LOCATION

A pour flush toilet must be located:

a) 3 m away from any dwelling within or outside the allotment

b) Preferably at a lower ground level than where a potable source of water is located

c) Such that it is accessible to the household at all times

d) So that the prevailing wind around the toilet is not obstructed

Where the pit (dugout) penetrates through fissured rock or coral through which liquids from the pit might pass unfiltered, advice of the approval authority must be sought on the location, otherwise all the fissures must be closed with concrete or cement mortar.

The site must be on firm ground which will not cave in or slump while digging the pit. If there is some problem in this regard, one solution could be to line the affected area with an old drum with both ends removed. The site should not be subject to flooding or remain water-logged.

3. CALCULATION OF DIMENSIONS

The pit volume depends on the number of users, the period for which it is used and a freeboard allowance of 0.5 m depth. In pour flush toilets or where washing water is allowed to enter it, the accumulation rate could be taken as 0.05 m^3.

For example, for a family of 5 which plans to use the pit for 5 years, the volume required to hold the sludge would be:

For a pour flush pit: volume of sludge – 5 x 0.05 x 5 = 1.25 m^3

For a pit diameter of 1 m, the area of cross section – 1m x 1m x 3.14/4 – 0.785 m^3

Depth of pit for sludge – 1.25/0.785 – 1.6m

Add freeboard – 0.5m

Total depth – 2.1m

4. CONSTRUCTION

.1 DIGGING THE PIT

The pit may be dug manually in which case it is usually rectangular or square. A power operated or hand auger can be used to dig circular pits. Whichever method is used, care must be exercised to ensure that the dimensions at the top remain true. Otherwise, there could be difficulty and additional cost in placing the cover slab.

Where it is necessary to close off any fissures or crevices in rock or coral in the pit, the pit dimensions must be sufficient for someone to be lowered down to do the work. Great care must be exercised in lowering anyone. A safety rope must be used and at the first sign of any cave in or other problem others on top must promptly pull the person from out of the pit. If the fissures are large concrete to a mix of one part cement, two-part clean sand and four parts gravel/coral/stones must be used to close them. If not use cement mortar with 1 part cement and 2 parts sand. The concrete or mortar must be to a stiff mix.

.2 FOUNDATION

The foundation provides a sealed support for the cover slab and raises it above the surrounding ground. The foundation may be cast and concrete or be made up of concrete block masonry or durable timber. The ground around the pit must be levelled and preferably raised with a layer of gravel/coral or earth before pouring/erecting the foundation.

.3 COVER SLAB

A cover slab is a pedestal type on which the user can sit.

The cover slab must be placed over the foundation so that it is fully supported without any gaps. Cement mortar may be used to firmly seal the slab over the foundation. The finished surface of the slab must be at least 150 mm above the immediate surrounds.

The water seal pedestal must fit in the cover slab and can be purchased from private suppliers. It could also be locally precast.

Figure 4.3.1 Concrete Cover Slab - plan

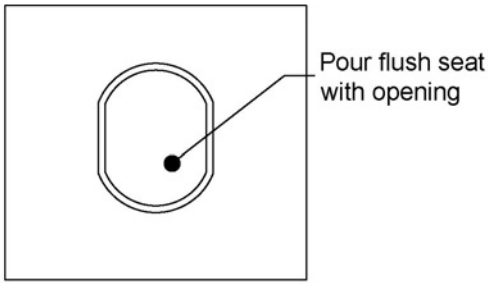


Figure 4.3.2 Pour Flush Water Seal Seat

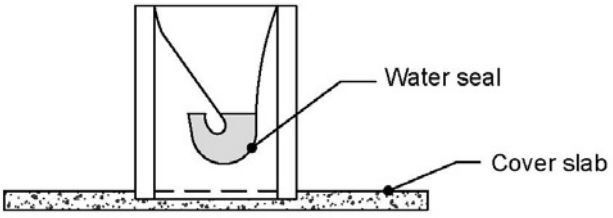
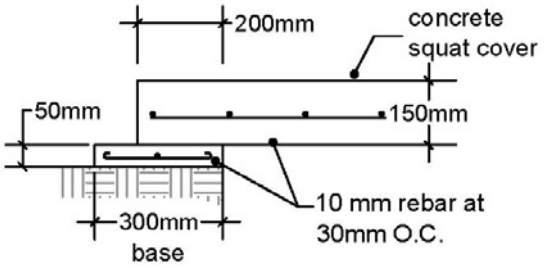


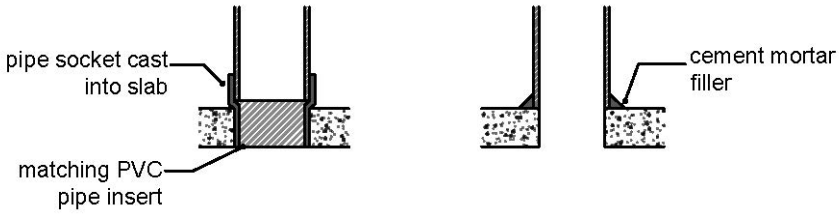
Figure 4.3.3 Squat Cover Section



.4 VENT PIPE

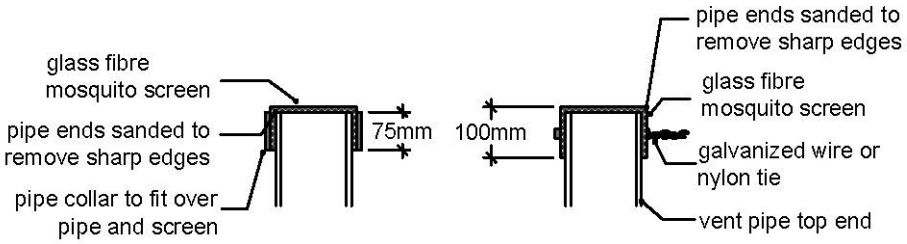
A 100 mm PVC vent pipe may be erected over the pit to remove foul gases generated by the decomposition of the waste matter. The water seal pedestal inserted slab has a matching PVC insert shown in Figures A1.4 and A1.5 on which the vent pipe can be erected. The vent pipe must be supported to the frame of the shed over the pit. One way of strapping the pipe is also shown in Figure A1.4.

Figure 4.4.1 Vent Pipe Fixing



The vent pipe must be at least 2.5 m high and 500 mm above the roof at the point of penetration or the nearest point. The open end of the vent must be covered with durable fly screen to prevent flies and mosquitos from entering (Figure A1.5).

Figure 4.4.2 Vent with Insect Screen



.5 THE SHED

A typical shed is shown in Figure A1.6. Although it could be built of any locally available material, it should be durable and firmly held down, otherwise it could be blown away during cyclones and act as a wind-borne missile.

The shed must afford privacy and have good ventilation. The shed must be shaded from too much light as flies are attracted to light.

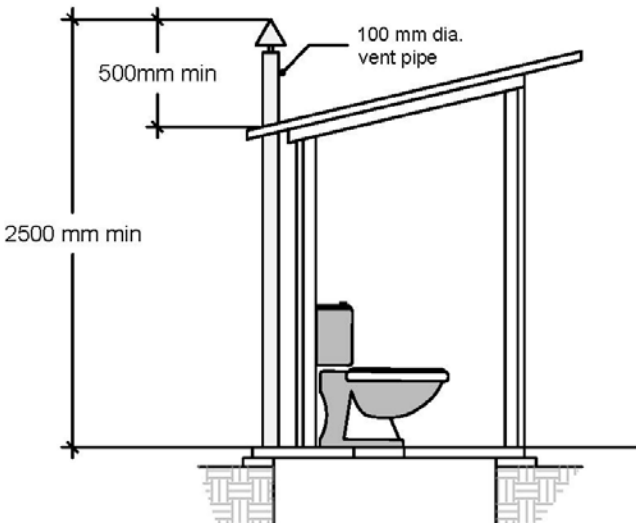


Figure 4.5.1 Typical Shed

The pour flush toilet must be kept clean at all times. However, do not use strong disinfectants in large quantities. It is best to use a wet mop or wet rag soaked in diluted disinfectant or cleaning agent to clean the cover slab and seat. If chemicals and cleaning agents were allowed inside the pit, they would drastically affect the bacterial degradation of the waste matter and there could be problems with foul smells and the pit could be filled sooner.

Any erosion of the fill around the foundation must be noted and repaired. The fly screen cover over the vent pipe must also be checked periodically and replaced promptly if damaged. The pour flush toilet superstructure must be in good repair.

5. POUR FLUSH TOILET SLUDGE CHAMBER CLOSURE

When the pour flush toilet sludge chamber is full to within about 0.5 m of the water seal pedestal it must not be used any more. Another chamber must be located at least 3 m away (the deeper the chamber, the greater the separation distance). The water seal pedestal, vent pipe, and shed can be re-used over the new chamber. The remaining space in the old chamber must be filled with earth. It is good to over-fill and form a mound so that enough surplus earth is available when the material subsides with decomposition.

ANNEXURE 2

SEPTIC TANKS FOR DOMESTIC USE

1. FUNCTION OF A SEPTIC TANK

The basic function of a household septic tank is to receive normal liquid household wastes and to condition them for such a time, and in such a manner, that the clarified effluent may be percolated efficiently into the subsoil, where it is absorbed and evaporated. In order to perform this basic function, all septic tanks must fulfill the following requirements:

a) Remove solids – a septic tank must have a primary or liquefying chamber of such shape and size that the rate of flow of all sewage is so reduced that at least the larger solids sink to the bottom and are retained, and the clarified effluent is discharged. The inlet and outlet pipes of this primary chamber must be so shaped and located that the scum which forms on the surface of the sewage is not disturbed. The capacity of the tank is usually kept equal to the inflow during 24 hours to allow a day's retention.

b) Promote bacterial action – to ensure that the solids and liquids in the tank will decompose it is necessary that the tank be designed so that there is a variety of bacteria that is either:

(i) Anaerobic bacteria which thrive in the absence of free oxygen are present, or

(ii) Aerobic bacteria which thrive with access to air is also present

A tank that is designed to achieve the purpose defined in (i) is a single-treatment septic tank, and a tank that is designed to achieve the purpose defined in (ii) is a double-treatment septic tank. A double-treatment tank is generally more expensive. Therefore, details of only single-treatment tanks with or without aerobic filters will be included in this Specification.

c) Store sludge – a fine silt-like sludge accumulates at the base of the primary tank. It follows that the primary tank must be of sufficient size to store sludge for a considerable period, otherwise if the tank is not cleaned out at the frequent intervals, the sludge will eventually be scoured from the tank and clog the outlet drain, the absorption trench or soil and an aerobic filter where provided.

2. LOCATION

Septic tanks and other connected works such as absorption trenches and soak pits must be located at a sufficient distance to prevent contamination of potable water sources and nuisance. Figure A2.1 shows typical layouts with the minimum separation distances marked on them.

Another important consideration in the siting of a septic tank is that an adequately absorbent area must be available for discharging the effluent through absorption trenches or soak pits.

Careful thought must be given to choosing a suitable site for a septic tank. Septic tanks are normally completely or partially buried in the ground.

Preferred location for a septic tank is:

- Close to toilet and wastewater drains coming from the house to reduce the cost of drains and trenches
- Not closer than 1.5 m to any building foundation

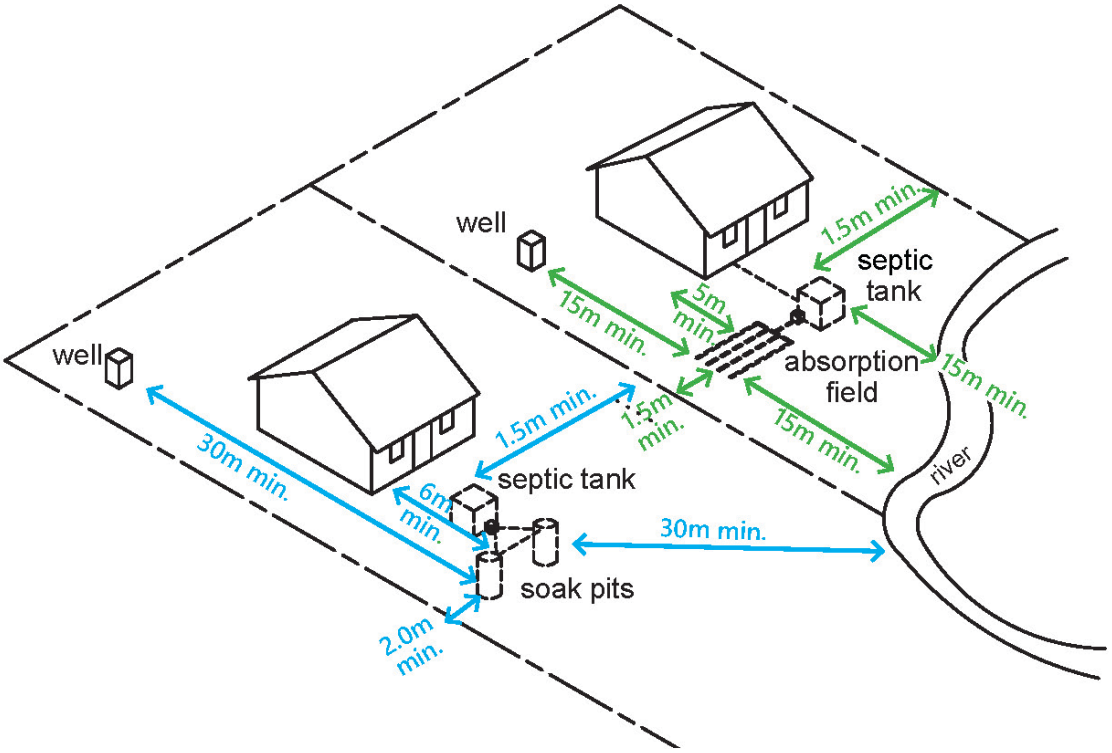
- At least 3 m from any window opening or tree
- At least 3 m from any allotment boundary
- At least 3m from a building where there are sandy soils that could collapse during construction and undermine building foundations
- In a location with good access for periodic sludge removal

The septic tank is to be located to provide the required minimum fall (slope) for the drain or drains leading into the tank. The reason for a minimum fall is to avoid deposition of waste solids in the pipe, risking clogging. Typically, the minimum fall for a 100 mm drain is 1:80 (125 mm drop for each 1 m length of pipe).

Places where a septic tank should **NOT** be located:

- Do not locate in flood prone areas
- Do not locate where the groundwater is less than 1 m below the bottom of the septic tank
- Avoid areas where water storage tanks could overflow
- Avoid areas that could receive stormwater discharge from a roof
- Do not locate where vehicles (cars, trucks) travel or park as they may damage the septic tank

Figure A2.1 Septic Tank Setbacks



3. CONSTRUCTION

.1 MATERIAL

Septic tanks may be of reinforced concrete or of reinforced block masonry walls over a reinforced concrete base. Tanks of precast concrete construction may be made from rectangular slabs which are assembled on the site, or be of cylindrical construction, either as a single cylinder open at the top, or a stack of short, open-ended cylinders. There are also prefabricated septic tanks made of fibre glass or plastic tanks and one such design is a Rotamould technique.

.2 FORM

Whatever form of construction or materials are used for the sides and bottoms of septic tanks, the resulting work must be impervious to water. For tanks of rectangular section, it is important that all internal angles be well rounded, so as to minimize shrinkage cracking. Leakage at the corners of tanks of precast concrete construction made from rectangular slabs, or at the joints of precast tanks made from a number of open-ended cylinders, must be detected and corrected in advance.

.3 COVERAGE AND OPENINGS

Every septic tank of block masonry or concrete construction must be covered with reinforced concrete slabs and removable manhole covers fitted over every compartment. Manholes are used when it is necessary to pump out or otherwise clean the tanks. Inspection openings are also required over the inlet and outlet square junctions. The aerobic filter, where provided, must be filled with hard, impervious and durable stone, coral or gravel. These must be graded from 60 mm to 75 mm.

.4 DESIGN DETAILS

The design of the type of septic tank system to be installed will be governed by the results of the investigations of the site and locality, taken in conjunction with results of the percolation test. Where the soil is of a suitable type and is sufficiently large to dispose of the final effluent, a single treatment septic tank will be suitable. If there is any doubt about the porosity of the site and that the effluent might seep on to adjoining premises or public places, then an aerobic filter must be installed with a septic tank.

A surface area of one square metre of filtering materials must be provided in aerobic filters for up to every 0.9 m^3 of flow of sewage per day. This works out to about 1 m^3 of filter for 50 m^3 of daily flow of sewage.

For soils with poor absorption, the designer may design a septic tank to a larger factor so that the retention time is more than 24 hours. In this case, the absorption trench should be used for septic tank effluent. It is preferred that when the population is more than 50 people, use a three-chamber system where the first chamber is 50% volume, and the other two chambers are 25% volume respectively.

Two-Chamber System

A two-chamber system is appropriate for a population size of 50 persons or less.

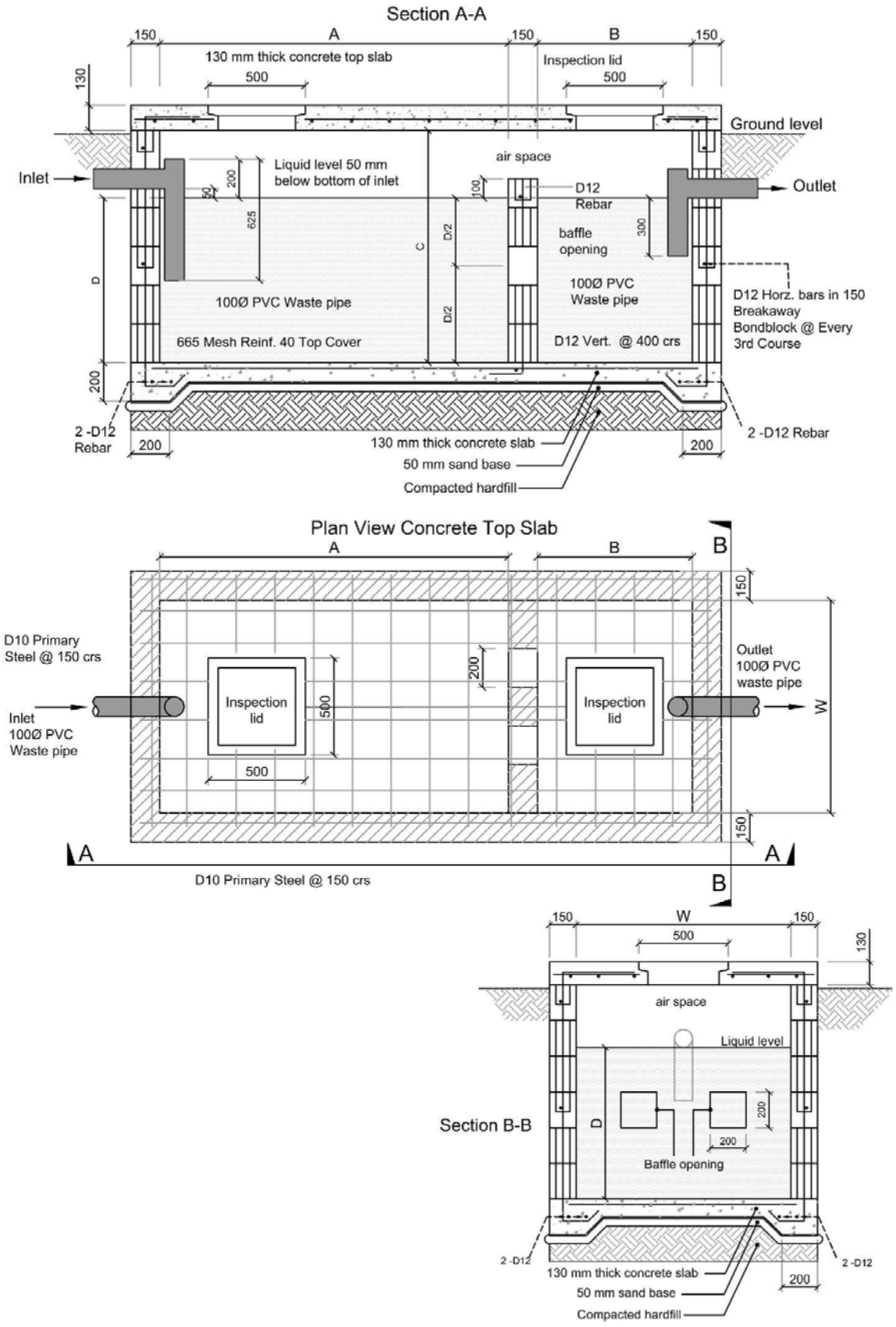
Table A2.1 Two Chamber System – Only Soil Waste (Black Water)

No. of Persons	ONLY SOIL WASTE (BLACK WATER) – TWO CHAMBER SYSTEM					
	A (mm) Chamber Length 1	B (mm) Chamber Length 2	C (mm) Height	D (mm) Depth	W (mm) Width	Volume of Septic Tank (m^3)
8	1127	555	1000	850	1000	1.43
10	1142	710	1000	850	1000	1.57
12	1434	717	1000	850	1000	1.82
15	1489	743	1050	900	1000	2.00
25	2010	990	1200	1000	1050	3.15
50	1950	961	1400	1100	1400	4.48
A sanitary system for a population greater than 50 must be a 3-chamber system						

Table A2.2 Two Chamber System - All Domestic Waste

No. of Persons	ALL DOMESTIC WASTE – TWO CHAMBER SYSTEM					
	A (mm) Chamber Length 1	B (mm) Chamber Length 2	C (mm) Height	D (mm) Depth	W (mm) Width	Volume of Septic Tank (m^3)
8	1812	900	1150	850	1000	2.30
10	1850	911	1350	1050	1000	2.90
12	2169	1068	1350	1050	1000	3.40
15	2180	1072	1350	1050	1200	4.10
25	2680	1320	1550	1250	1400	7.00
50	4014	1927	1750	1450	1600	13.80
A sanitary system for a population greater than 50 must be a 3-chamber system						

Figure A2.2 Two Chamber Septic Tank



Three Chamber Septic Tank

A three chambered septic tank system has more advantages than a double chambered system as it exhibits more hydraulic and process stability. For a population more than 50 for blackwater or all wastewater, a three chambered system is recommended.

Table A2.3 Three Chamber System – Only Waste (Black Water)

No. of Persons	ONLY SOIL WASTE (Black Water) – THREE CHAMBER SYSTEM									
	Width (mm)	Depth (mm)	Height (mm)	L1 (mm)	V1 (m^3)	L2 (mm)	V2 (m^3)	L3 (mm)	V3 (mm)	Total Volume (m^3)
50	1400	1100	1400	1457	2.24	728	1.12	728	1.12	4.48
100	1400	1200	1400	2109	4.04	1054	2.02	1054	2.02	8.10
150	1400	1300	1600	2342	6.08	1171	3.04	1171	3.04	12.17
200	1400	1400	1600	2857	8.00	1428	4.00	1428	4.00	16.00
300	1400	1600	1800	3618	11.57	1809	5.79	1809	5.79	23.15
400	1400	1680	1800	3805	15.34	1902	7.67	1902	7.67	30.68
500	1400	1700	1800	3992	19.00	1996	9.50	1996	9.50	38.00
600	1400	1800	2000	4192	22.63	2096	11.31	2096	11.31	45.28

L1 – Chamber Length 1 V1 – Volume of Chamber 1 | L2 – Chamber Length 2 V2 – Volume of Chamber 2 | L3 – Chamber Length 3 V3 – Volume of Chamber3

Notes:

1. *Volumes are liquid capacity and the real depth will fluctuate to get a 50 mm fall at least for liquid to move.*
2. *Height is the total height of the constructed tank including enough free board from TWL to the ceiling.*
3. *Alternate sanitation technologies could be an option such as improved septic tanks or package sewage plants if the population is very high and such construction may not be feasible for the space for trenches / soak pits is very small, or the soil type rehabilitation for trenches will be very costly.*

Table A2.4 Three Chamber System of All Domestic Waste

No. of Persons	ALL DOMESTIC WASTE – THREE CHAMBER SYSTEM									
	Width (m)	Depth (m)	Height (m)	L1 (m)	V1 (m^3)	L2 (m)	V2 (m^3)	L3 (m)	V3 (m^3)	Total Volume (m^3)
50	2.0	1.45	1.75	2.38	6.90	1.18	3.45	1.18	3.45	13.80
100	3.0	1.65	1.95	2.38	11.75	1.18	5.87	1.18	5.87	23.50
150	3.0	1.85	2.0	3.70	20.54	1.85	10.27	1.85	10.27	41.08
200	3.5	1.85	2.1	4.29	27.75	2.14	13.87	2.14	13.87	55.50
300	4.0	1.85	2.15	5.61	41.50	2.80	20.75	2.80	20.75	83.00
400	4.5	1.85	2.15	6.67	55.50	3.33	27.75	3.33	27.75	111.00
500	5.5	1.85	2.15	7.01	71.37	3.51	35.68	3.51	35.68	142.73
600	6.0	1.85	2.15	7.48	83.00	3.74	41.50	3.74	41.50	166.00

L1 – Chamber Length 1 V1 – Volume of Chamber 1 | L2 – Chamber Length 2 V2 – Volume of Chamber 2 | L3 – Chamber Length 3 V3 – Volume of Chamber3

Notes:

1. *Volumes are liquid capacity and the real depth will fluctuate to get a 50 mm fall at least for liquid to move.*
2. *Height is the total height of the constructed tank including enough free board from TWL to the ceiling.*
3. *Alternate sanitation technologies could be an option such as improved septic tanks or package sewage plants if the population is very high and such construction may not be feasible for the space for trenches / soak pits is very small, or the soil type rehabilitation for trenches will be very costly.*

Figure A2.3 Three Chamber Septic Tank

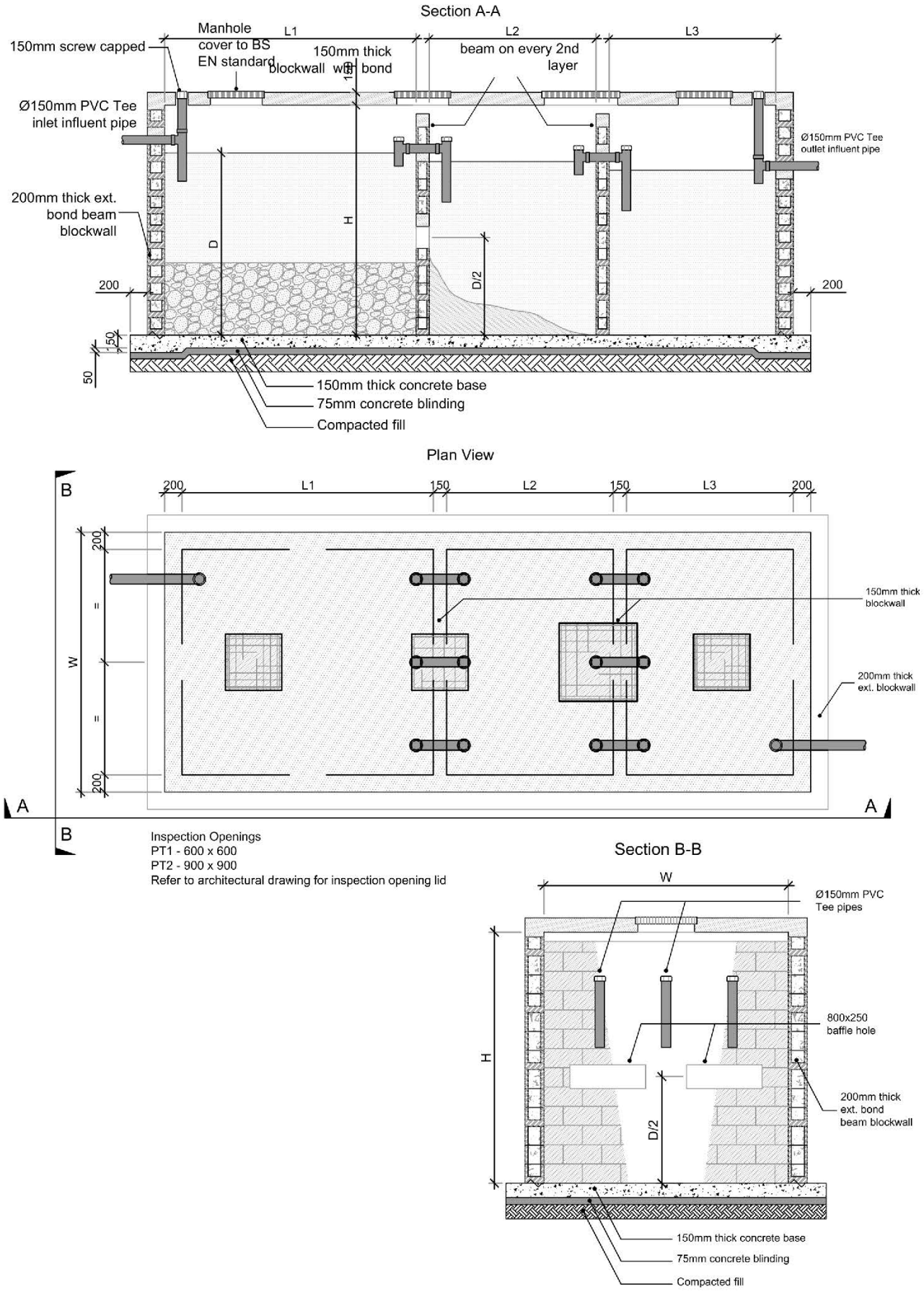


Table A2.5 Reinforcement for Masonry Septic Tanks

Block wall thickness	Height of Tank (m)	Vertical bars	Horizontal bars
150	1.0	D10 @ 600	D12 @ 600
	1.2	D12 @ 600	D12 @ 600
	1.4	D12 @ 400	D12 @ 600
200	1.6	D12 @ 400	D12 @ 600
	1.8	D16 @ 600	D12 @ 600
	2.0	D12 @ 400 fill all cells	D16 @ 800

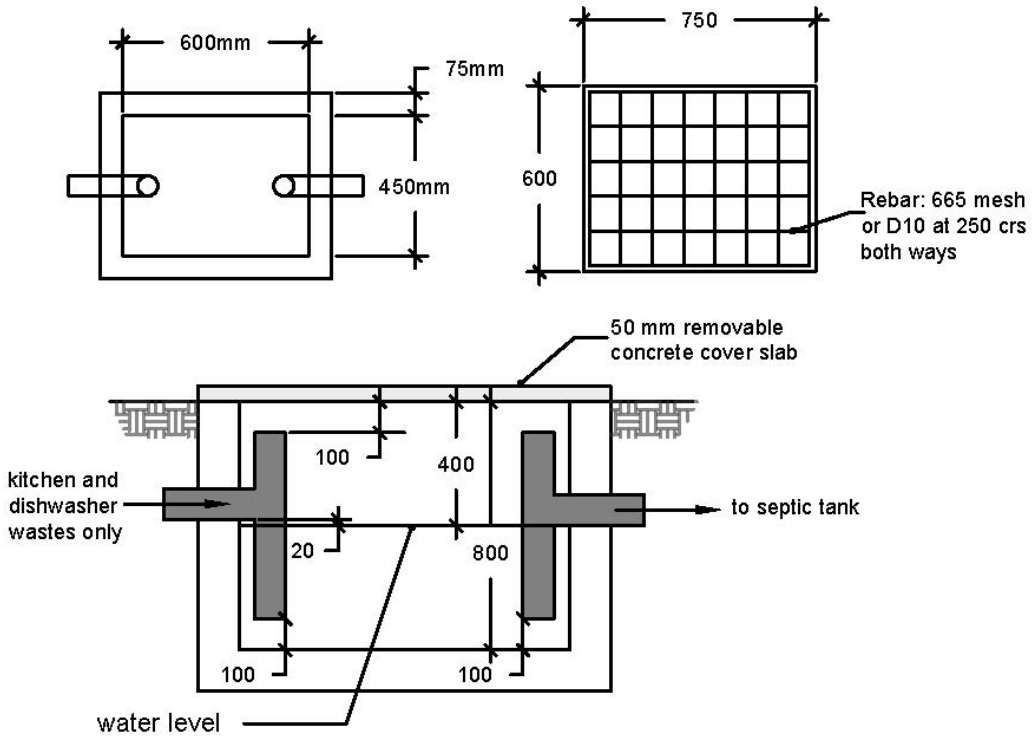
4. GREASE TRAPS

The satisfactory disposal of the discharge from kitchen waste fixtures is frequently difficult because it is charged with grease which cannot be satisfactorily dealt with in a septic tank. This difficulty may be overcome by a grease trap located near the kitchen through which all discharge from the kitchen must pass before entering the drain to the septic tank. For satisfactory working of the trap, it is necessary that both laundry and roof waters, and liquid and powder detergents, be excluded from it. A grease trap constructed as shown in Fig. A2.3 and A2.4 has been found effective in arresting grease. Alternatively, a smaller precast concrete or other type of grease trap may be installed.

The capacity of the grease trap below the level of the invert of the outlet must be not less than the total capacity of the sinks and dishwashers served. The cover over the trap should be removable to facilitate the cleaning of the trap.

If grease traps are not regularly cleared of the accumulated grease, it would give rise to the blocking of drains, unsightly overflow through the sides of the cover slab of the trap, and unpleasant odour.

Figure A2.4 Grease Trap



5. EFFLUENT ABSORPTION AREA

.1 SUITABLE SOIL

An important factor when considering the installation of a septic tank is to determine whether the soil is suitable to absorb the effluent and whether the soil is of adequate depth and area. Generally, it can be said that the most suitable soil for an absorption area is a sandy or silty foam, and the most unsuitable soil is hard impervious clay, or rock. Where an impervious stratum such as rock or clay is present, it may not be possible to provide an absorption trench. If the slope of the ground allows the provision of imported absorbent fill of sufficient thickness, it will still be possible to have a trench or soak pit.

.2 PERCOLATION TEST

The absorption rate of the soil may be ascertained by carrying out the following percolation test:

At a number of representative spots within the area to be used for installation of the absorption drains, dig holes 300 mm square to the depth of the absorption drain. Pour water into the holes to a depth of 150 mm or more and allow the water to soak away. Again, pour water into the holes to a depth of 150 mm and record the times taken for the surface of the water to fall 25 mm.

.3 RECOMMENDED DOSAGE

The recommended dosage of effluent in litres per metre of absorption trench per day, according to the time taken for the water surface to fall 25 mm in the test is given in Table A2.4, and the minimum length of the absorption trench in metres may be determined from the formula at the base of the Table.

Table A2.6 Length of Absorption Trench for Different Absorption Rates

Time for water level in test to fall by 25 mm (minutes)	Dosage of effluent in litres per metre of trench per day (E)
1	75
2	60
5	45
10	30
20	18
30	15
60	11

Notes:

(a) *Length of absorption trench in metres = 1000 V/E, Where V is the volume given in cubic meters in Table A2.1 and A2.2, and E is the dosage of effluent in litres per metre of trench per day*

(b) *If the time taken for a fall in level of 25 mm is more than 60 minutes the soil is not suited for absorption trench method of disposal.*

6. ABSORPTION TRENCHES

.1 LAYOUT

Typical dimensions for an absorption trench are approximately 450 mm width and minimum depth of 400 mm. The trenches are packed with 75 mm size hard stone, gravel and coral to a height of 150 mm, over which a line of perforated pipes is laid along the centre of the trench commencing about 300 mm from the beginning of the trench and thereafter running the full length of the trench. The drain pipe conveying the effluent to the trench extends into the trench and butts against the first perforated pipe.

.2 PIPE COVERAGE

The joints between the pipes in the trench must not be sealed. The pipes should be surrounded and covered with 75 mm broken hard stone or hard coral to within a few millimetres from the top of the trench, over which should be placed a protective covering of old iron, bag, bark or the like, before covering the trench with soil or turf.

.3 CONCRETE SLAB ALTERNATIVE

The absorption trench may also be constructed of concrete slabs laid in such a manner that there are many vertical joints left open so as to allow the effluent to escape. Concrete slabs are used to cover the top of the trench, and these may be themselves be covered by soil or turf.

.4 LOCATION

The absorption trench should be constructed along the general contour of the ground. It must be so positioned that the prepared ground level at the trench is lower than the invert of the outlet pipe from the septic tank so as to prevent the effluent from back-flooding into the septic tank. Typical absorption trenches are shown in Figure A2.10 and A2.11 and their general layout in Figure A2.12.

.5 LANDSCAPE

Moisture seeking shrubs or other vegetation planted in the vicinity of the trench will assist in the absorption of the effluent, but care should be taken in selecting the shrubs so that their roots are not likely to interfere with the efficiency of the trench. Roof water and as far as possible surface and ground water must be excluded from absorption trenches, so as to maintain their efficiency.

Figure A2.5 Example of an Absorption Trench

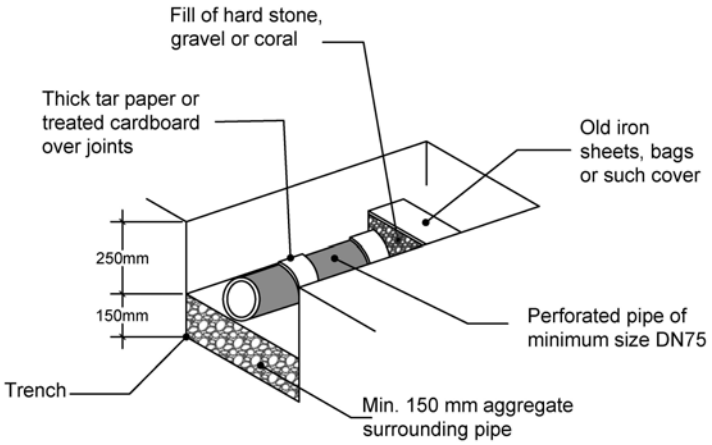
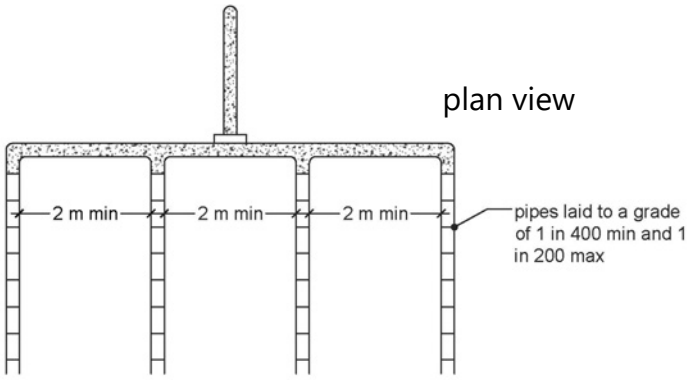


Figure A2.6 General Layout of Absorption Trench



7. SOAK PITS

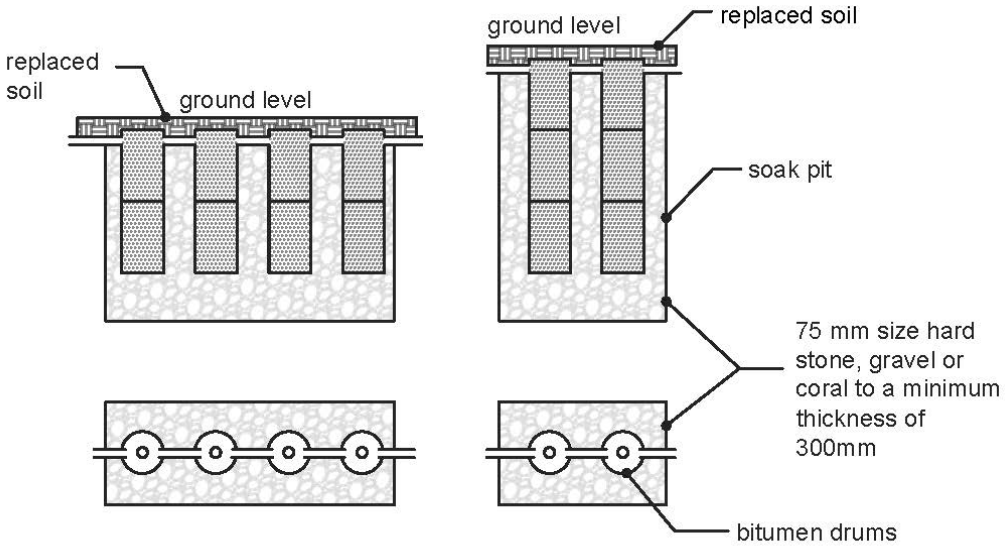
Where sufficient area for absorption trenches is not available, but there is sufficient depth of absorbent material, soak pits may be used. A typical arrangement is shown in Figure A2.11 with the following characteristics:

- Old bitumen drums with the ends removed are shown arranged in tiers
- The drums are pierced at about 200 mm centres with a pick or so
- Drums are surrounded by 75 mm hard stone, gravel or coral
- The effluent is drained into the drums
- The minimum thickness of stone surrounding the drums must be 300 mm minimum
- The actual dimensions of the soak pit will depend on the nature of the soil and the volume of the effluent

In general, a soak pit is not as effective or desirable a means of disposal as absorption trenches.

8. SPECIAL CIRCUMSTANCES

Figure A2.7 Two Arrangements of Drums Used in Soak Pits



9. SITE CONDITIONS

Site conditions can necessitate the adoption of special measures, such as:

a) Importation of suitable soil and its retention to act as an absorption area

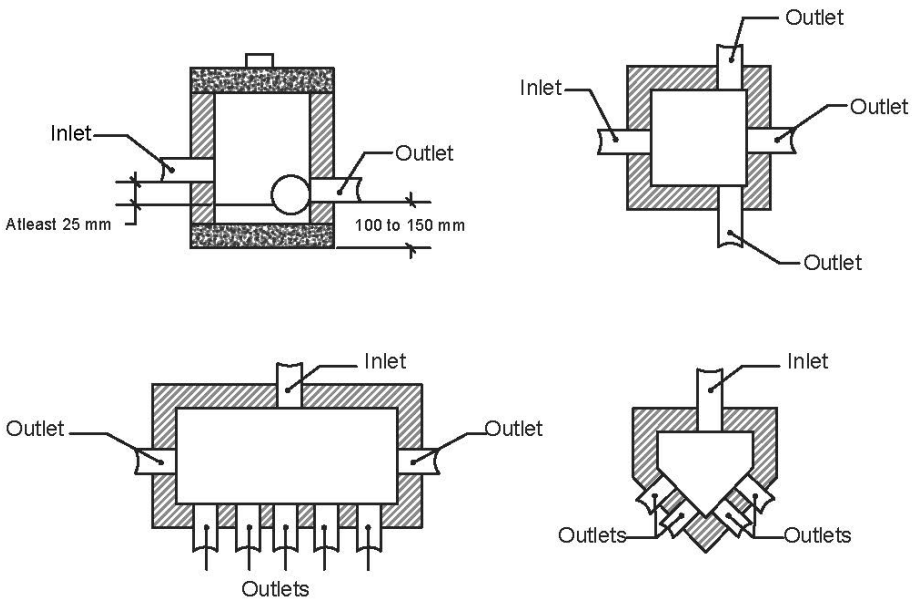
b) Alternatively, it may be necessary for wastes from the kitchen, laundry and bathroom to by-pass the septic tank and be absorbed in an area away from that used to absorb the effluent from the septic tank

c) It may be necessary to construct a number of trenches as a grid, to distribute the effluent over as wide an area as possible. A distributor may be incorporated in the effluent-drain system to direct the effluent to any desired trench. Typical examples of distribution boxes are shown in Figure A2.12.

d) On some sites it may be necessary to locate the absorption area uphill from the septic tank and to install an electric pump. The pump is operated by a float switch and automatically pumps the effluent up to the absorption trench when the effluent in the tank reaches a nominated level. The cost of installing and maintaining such a pump should be considered.

e) In some areas where there are many septic tanks, a drainage system can be made available to take the effluent away from each septic tank, either by gravity or by pumping, to an absorption area, public sewerage or treatment pond.

Figure A2.8 Examples of Distribtion Boxes



10. VENTS

A vent is required in order to allow ventilation through the septic tank and drainage system. Vents are usually of PVC capable of withstanding ultraviolet radiation and are normally taken off at the head of the house drain farthest away from the septic tank. At various stages in the operation of a septic tank, offensive odours may be given off. The height and location of the vent outlet must be a minimum of 150 mm above its point of penetration through any roof covering and 600 mm above the top of any opening situated within a radius of 3 m from the vent.

ANNEXURE 3

PREFABRICATED SEPTIC TANK

1. COMPLIANCE

Prefabricated septic tanks are typically rectangular or cylindrical in shape and can be installed to service a single residential occupancy building or up to 6 units in a Class 1 building. Only a septic tank that is suitably sized for the occupancy will be permitted.

The design of prefabricated septic tanks must be based on established engineering principles and take into account the anticipated wastewater content, volume and load. It must be capable of treating expected hydraulic and organic loadings from the residence and disposing of sewage to a leach field or other acceptable means.

Fabrication and installation of a prefabricated septic tank must comply with:

AS/NZS 1546.1 On-site Wastewater Treatment Units, Part 1: Septic Tanks

If high fat, oil or grease levels are expected due to the use of the building or allotment, a grease trap should be installed to pre-treat wastewater before it enters the septic tank.

2. MATERIAL AND FABRICATION

A prefabricated septic tank should be constructed of durable and watertight materials such as reinforced concrete, fiberglass, or high-density polyethylene (HDPE), and should be resistant to the impact of ultraviolet light, corrosion, decay and chemical degradation, and subject to acceptable loads from earth pressure and earth movement. The material should be impervious to the waste contained in the tank and to water entering the tank from its surroundings except through the inlet and outlet ports.

3. SIZE

The size of the septic tank should be determined based on the number of users and daily wastewater flow. The tank should have sufficient capacity to accommodate the expected usage based on the number of bedrooms in the building that it serves.

4. DURABILITY

The minimum durability rating for a prefabricated septic tank is 15 years.

5. INSTALLATION

A prefabricated septic tank should be installed according to manufacturer's instructions. A licensed plumber should be used for pipe fittings and connections.

Location

Select a suitable location for the prefabricated septic tank considering such factors as soil conditions, setback requirements and providing accessibility to inlets, outlets and venting for maintenance. A

prefabricated water tank should be installed in a location that is clear of obstructions such as trees, utilities lines, and structures that could interfere with the operation of the septic tank or cause health and safety issues. Where possible, it should be installed in a shaded location to avoid flies and the accumulation of other insects attracted to heat.

The minimum setbacks for a prefabricated septic tank are:

- At least 1.5m from the building
- At least 3.0 m from the allotment boundary
- At least 15 m from a rainwater harvesting system
- At least 30 m from a well supplying drinking water
- At least 5 m horizontal from a low voltage utility line … consult EFL to determine setbacks for high voltage lines

The above setbacks do not apply in situations where site conditions and characteristics warrant an increase in the setback distances for health and safety reasons.

Excavation

A hole of appropriate dimensions relative to the size of the prefabricated septic tank should be excavated and with respect to the setback distances listed above and in AS 1546.1. The hole should be deep enough to allow positive drainage from the building/grease trap to the inlet of the septic tank and from the septic tank to the drainfield or other mechanism in the one-site sewage disposal system such as an aerobic water treatment system (AWTS). The base of the excavated pit must be level and compacted to provide a stable base for the tank.

A minimum 300 mm layer of suitable bedding material, such as sand, aggregate or coral, should be placed at the base of the excavated hole, compacted and levelled. After the tank is placed on the level base, the sides of the septic tank should be backfilled with the same bedding material up to the finished grade of the surrounding ground.

Inlet and Outlet Connections

All connections must be made by a certified plumber. Connect the inlet and outlet pipes and extensions, if used, to the openings in the prefabricated septic tank. All connections must be secure and leak-free. All connections shall be sealed with watertight gaskets and tested for water tightness after installation, and prior to backfilling.

Grading

The top surface of a prefabricated septic tank should be installed at or just above the surrounding ground surface level. If installed below ground, a waterproof vertical extension must be installed for the access and inspection openings. The height and placement of the tank and vertical extensions shall not impede the use of the access covers that seal the opening.

The tank should be installed so that flotation will not occur.

A positive slope away from the septic tank on all sides must be achieved.

Access Covers

Access covers provided by the manufacturer should be installed over all access openings and allow access for inspection, maintenance, and pumping. Access covers must be airtight and secure to prevent unauthorized entry and to maintain the integrity of the tank.

Ventilation

Proper ventilation of a septic tank is essential to prevent the buildup of harmful gases such as methane. Vent pipes with appropriate height and diameter should be installed to allow for the escape of gases according to manufacturer's instructions. All connections must be secure, airtight and leak-free.

Testing and Certification

As part of the building permit application, the name of the manufacturer of the prefabricated septic tank, model number, size, materials, configuration of openings and warranty must be submitted for review by the local authority.

After installation and connection of piping, the installer / other authorized agent should undertake testing to ensure the prefabricated septic tank meets the requirements for functionality, watertightness and structural integrity. The installer / authorized agent must then submit a certificate of compliance with the FNBC to the local authority. Alternatively, the local authority or its agent will inspect the prefabricated septic tank installation and authorize it as safe for use before it is permitted to be used by occupants.

SPECIFICATION F2.9

Accessible Adult Change Facility

1. SCOPE

This Specification contains the requirements for an accessible adult change facility that provides a private space for a person to assist a person with a disability with personal care needs.

2. GENERAL REQUIREMENTS

.1 Each accessible adult change facility must be constructed so that all required equipment and fixtures are contained within the same room.

.2 In each accessible adult change facility, the following must be provided:

a) A change table

b) A hoist to transfer a person in a wheelchair or other mobility device to a change table

c) A toilet pan, seat, backrest and grabrails

d) A washbasin and tap

e) Fixtures and fittings as specified in Clause 6

f) Changing rails

g) An automated sliding entrance door

h) Signage

i) Operating instructions for the hoist and change table

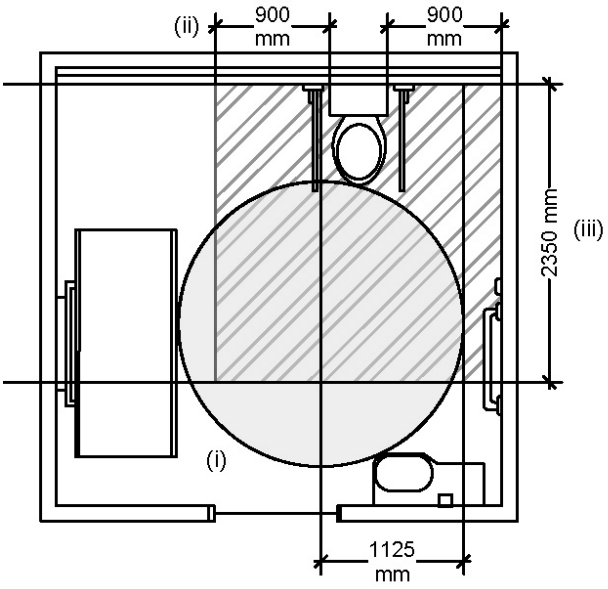
j) Adequate circulation space to accommodate a person in a wheelchair or other assisted mobility device, and for an individual assisting the person with a disability

.3 The floor surface must be slip resistant and safely accommodate the intended use with respect to potential wetting of the floor.

.4 Minimum areas, setbacks, sizing and positioning of accessible and safety features must comply with the diagrams and text in Figure 2.

Figure 1 Required Circulation Spaces and Clearance Widths

Diagram A. Turning space, each side of the pan and in front of the pan



Required clearances

Applies to Diagram A, B and C:

i. A full-circle minimum 1125 mm turning space required

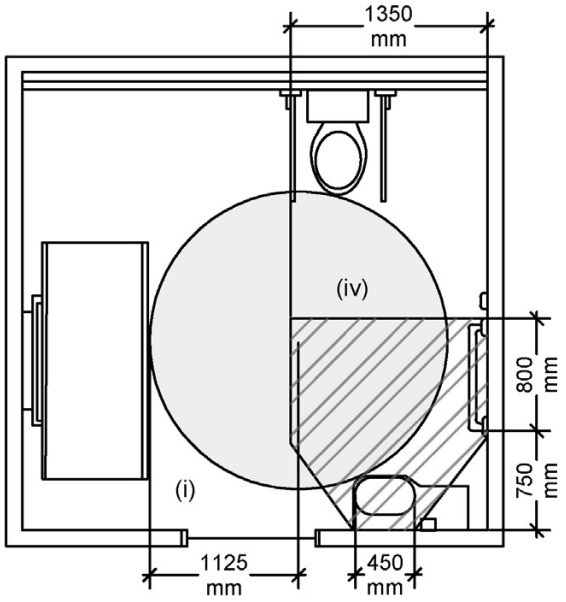
ii. Each side of the pan must have a 900mm clear space

iii. A clear space of 2350mm in front of the toilet pan, measured from the wall behind the pan

iv. All required turning spaces must have a clear height above the floor of a minimum 2000 mm

v. Required circulation spaces may be overlapped

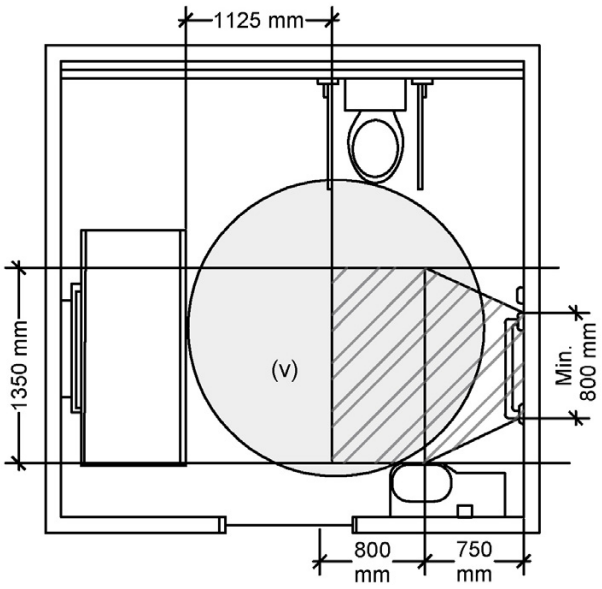
Diagram B. Required clearance width for wash basin



b)

vi. For a washbasin (see Diagram B): the required clearance must extend from the width of the wash basin and increase to a minimum width of 1350 mm measured at a distance of 750 mm from the wall behind the washbasin, then continue at that width for a total of 1550 mm from the wall behind the wash basin

Diagram C. Required clearance width for changing rails



For changing rails (see Diagram C): the required clearance width must extend from the width of the rails and increase to a width of 1350 mm at a distance of 750 mm out from the wall to which the rails are fixed, then continue at that width for a total of 1550 mm out from the wall to which the rails are attached

3. HOIST

.1 The hoist must:

a) Provide a constant charge in-line room coverage hoist system (also known as an "XY" system or gantry) including 2 parallel fixed rails and a moving traverse rail

b) Provide coverage over the entire room

c) Have a maximum safe working load of not less than 180 kg

d) Be capable of sustaining a static load of not less than 1.5 times the rated load

e) Have a minimum lifting height of 2100 mm.

4. TOILET PAN, SEAT, BACKREST AND GRABRAILS

.1 The toilet pan must be of the centrally located ("peninsula-type") design.

.2 The toilet pan must be installed so that:

a) The front edge of the pan is 800 mm (±10 mm) from the rear wall

b) The top of the seat is between 460 mm and 480 mm above finished floor level

c) There is a minimum clearance of 900 mm, measured horizontally, between each side of the pan and any adjacent wall or privacy screen

.3 The toilet seat must:

a) Be of the full-round type (not open-fronted) with minimal contours to the top surface

b) Be securely fixed in position when in use

c) Have seat fixings that provide lateral stability to the seat when the seat is in use

d) Be load-rated to 150 kg

e) Have a minimum luminance contrast of 30% against the pan, wall or floor

f) Remain in the fully upright position when raised.

.4 Hand-operated flushing controls must:

a) Be located on the centreline of the toilet, at a height of:

i. Not less than 600 mm

ii. Not more than 1100 mm

iii. Above finished floor level

b) Not be located within the area required for any grabrails or backrest

c) Have the button mounted so that it is proud of the wall surface, and activates the flushing operation before the button becomes level with the surrounding surface

.5 The backrest must:

a) Be capable of withstanding a force, in any direction, of not less than 1100 N

b) Have a minimum height, between the lower edge of the backrest and the top of the seat, of between 120 mm and 150 mm

c) Have a vertical height, between the upper and lower edges of the backrest, of between 150 mm and 200 mm

d) Have a width of between 350 mm and 400 mm

e) Be positioned such that the face of the backrest achieves an angle of between 95°and 100° back from the seat, when the seat is in use.

.6 Grabrails must be installed adjacent to each side of the pan and must be:

a) Of the drop-down type

b) Located such that:

i. The top of each rail is between 800 mm and 810 mm above finished floor level

ii. The rails are between 750 mm and 770 mm apart, measured centre-to-centre, and equidistant to the centreline of the pan

c) At least 850 mm long

d) With a diameter of between 30 mm and 40 mm

e) Securely fixed to withstand a force, in any direction, of not less than 1100 n

f) Provided with a toilet paper dispenser on one side

g) Capable of being lifted up or swung away when not in use, so as to allow unimpeded access to the toilet pan

5. WASHBASIN AND TAP

.1 The washbasin must be installed so that the rim of the basin is between 800 mm and 830 mm above finished floor level.

.2 Exposed heated water supply pipes must be insulated or located so as not to pose a hazard.

.3 Water supply or sanitary drainage pipes must not encroach on the space under the basin.

.4 The washbasin must have an integrated shelf not less than 300 mm long.

.5 Water taps must have a single lever flick-mixer handle or a sensor plate or the like.

.6 Where lever handles are provided, they must be installed with a clear space of not less than 50 mm between the tap and any adjacent surface.

.7 Heated water must be provided and temperature controlled so as not to harm occupants.

6. FIXTURES AND FITTINGS

Mirror:

.1 A vertical mirror must be provided at the washbasin, with a reflective surface that:

a) is not less than 600 mm wide

b) has its bottom edge not more than 900 mm above finished floor level

c) has its top edge not less than 1850 mm above finished floor level.

.2 If a second vertical mirror is provided in the facility, it must have a reflective surface that:

a) is not less than 600 mm wide

b) has its bottom edge not less than 600 mm above finished floor level

c) has its top edge not less than 1850 mm above finished floor level.

.3 Towel dispensers, hand dryers and the like:

.4 Towel dispensers, hand dryers, soap dispensers and the like must be operable using one hand, and must be installed with their output or operative components:

a) between 900 mm and 1100 mm above finished floor level

b) not less than 500 mm from any internal corner.

Soap dispenser:

.5 A soap dispenser must be installed above the integrated shelf required by Clause 5(d).

Clothing hook:

.6 A clothing hook must be installed so that it is located:

a) at a height of between 1200 mm and 1350 mm above finished floor level

b) adjacent to the washbasin

c) not less than 500 mm from any internal corner

Sling hook:

.7 A sling hook, used to store a sling when it is not in use, with a minimum projection of 50 mm from the wall must be installed beside the change table at a height of 1500 mm above finished floor level.

Disposal bins:

.8 A sanitary disposal bin must be provided in the corner adjacent to the toilet pan.

.9 An incontinence pad disposal bin must be provided in the corner adjacent to the change table.

7. CHANGE TABLE

.1 The change table must be:

a) Permanently installed, with one of the long edges up against a wall and with a retractable safety rail on the opposite side

b) Motorised for the purposes of height adjustment

c) Height adjustabe between 450 mm and 900 mm above finished floor level

d) Not less than 700 mm wide

e) Not less than 1800 mm long.

.2 The change table must have a maximum safe working load of not less than 180 kg, including when raising or lowering the table.

.3 The change table must not encroach on any required circulation space.

.4 A dispenser for sanitary wipes must be provided.

.5 A shelf not less than 400 mm long and 150 mm wide must be provided.

8. CHANGING RAILS

.1 Changing rails must be installed as two horizontal and parallel rails fixed to a wall, not less than 800 mm long, each with a diameter between 30 and 40 mm.

.2 The lower rail must be installed between 800 mm and 810 mm above finished floor level.

.3 The upper rail must be installed between 1000 mm and 1010 mm above finished floor level.

.4 The rails must be able to withstand a force of not less than 1100 N in any direction.

9. DOOR AND DOOR CONTROLS

.1 The entrance door and associated door controls must be automated and must comply with the following:

a) The threshold must incorporate a smooth transition without a step or lip.

b) The minimum clear opening width must be:

i. 1100 mm in locations where beach wheelchairs are likely to be used, or

ii. 950 mm in all other locations.

.2 The doorway must achieve a luminance contrast of at least 30% between:

a) Door leaf and door jamb, or

b) Door leaf and adjacent wall, or

c) Architraves (where used) and adjacent wall, or

d) Door leaf and architrave (where used), or

e) Door jamb and adjacent wall

.3 The operation of the door must be calibrated such that:

a) It has a gentle opening and closing movement

b) There is sufficient dwell time for a user to safely travel through the doorway

.4 The door must be fitted with a fail-safe opening mechanism that opens the door if an obstruction is detected during its closing movement.

.5 Door controls must be located internally and externally:

a) Between 900 mm and 1200 mm above finished floor level

b) Not less than 500 mm from any internal corner

.6 Door control buttons must:

a) Have a minimum diameter of 25 mm

b) Be proud of the surrounding surface

c) Activate the door operation before the button becomes level with the surrounding surface

d) Be of a contrasting colour to the surrounding plate

.7 The surrounding plates of both internal and external door controls must include the words "Push to Open".

.8 The following indicator lights must be provided:

a) "Occupied" and "Vacant" on the external plate

b) "Locked" and "Unlocked" on the internal plate

.9 Braille and tactile signage complying with Specification D3.6 must identify the door controls.

10. SIGNAGE

.1 External signage must incorporate:

a) The symbol shown in Figure 10

b) The words "Accessible Adult Change Facility"

.2 The symbol required above must have a blue (B21, ultramarine) background with the hoist and table elements shown in white.

.3 Signage must be braille and tactile signage complying with Specification D3.6.

Figure 2 Symbol for an Accessible Adult Change Facility

11. OPERATING INSTRUCTIONS

.1 Signage provided within the facility must include the following information for the hoist and change table:

a) Operating instructions

b) Safe working load limits

SPECIFICATION F5.2

Sound insulation for building elements

1. SCOPE

.1 This Specification lists the weighted sound reduction index Rw for some common forms of construction.

.2 Wall systems listed in Table 2 having a minimum 20 mm cavity between 2 separate leaves, with:

a) For masonry, where wall ties are required to connect leaves, the ties are of the resilient type

b) For other than masonry, there is no mechanical linkage between leaves except at the periphery,

are deemed to be discontinuous construction.

2. CONSTRUCTION DEEMED-TO-SATISFY

.1 The forms of construction listed in Table 2 for wall construction and Table 3 for floor construction, are considered to have the Rw , Rw + Ctr and Lnw stated in that Table. The forms of construction must be installed as follows:

Masonry: Units must be laid with all joints filled solid, including those between the masonry and any adjoining construction.

Concrete slabs: Joints between concrete slabs or panels and any adjoining construction must be filled solid.

Sheeting materials: If one layer is required on both sides of a wall, it must be fastened to the studs with joints staggered on opposite sides.

If two layers are required, the second layer must be fastened over the first layer so that the joints do not coincide with those of the first layer.

Joints between sheets or between sheets and any adjoining construction must be taped and filled solid.

Timber or steel-framed construction: perimeter framing members must be securely fixed to the adjoining structure, and:

a) Bedded in resilient compound, or

b) The joints must be caulked so that there are no voids between the framing members and the adjoining structure

Services:

.2 Services must not be chased into concrete or masonry elements.

.3 A door or panel required to have a certain Rw + Ctr that provides access to a duct, pipe or other service must:

a) Not open into any habitable room (other than a kitchen)

b) Be firmly fixed so as to overlap the frame or rebate of the frame by not less than 10 mm, be fitted with a sealing gasket along all edges and be constructed of:

i. Wood, particleboard or blockboard not less than 33 mm thick, or

ii. Compressed fibre-reinforced cement sheeting not less than 9 mm thick, or

iii. Other suitable material with a mass per unit area not less than 24.4 kg/m^2

.4 A water supply pipe must:

a) Only be installed in the cavity of discontinuous construction

b) In the case of a pipe that serves only one sole-occupancy unit, not be fixed to the wall leaf on the side adjoining any other sole-occupancy unit and have a clearance not less than 10 mm to the other wall leaf

.5 Electrical outlets must be offset from each other:

a) in masonry walling, not less than 100 mm

b) in timber or steel-framed walling, not less than 300 mm

SPECIFICATION F5.5

Impact sound — Test of equivalence

1. SCOPE

This Specification describes a method of test to determine the comparative resistance of walls to the transmission of impact sound.

2. CONSTRUCTION TO BE TESTED

a) The test is conducted on a specimen of prototype wall construction and on a specimen of one or other of the constructions specified in Table 2 of Specification F5.2

b) The testing of a construction specified in Table 2 of Specification F5.2 need not be repeated for subsequent comparisons provided complete records of the results, the test equipment and the technique of testing are kept so that identical equipment can be employed and an identical technique can be adopted in the testing of specimens of prototype wall construction.

3. METHOD

a) The wall constructions to be compared must be tested in accordance with **AS 1191 Acoustics – Method for Laboratory Measurement of Airborne Sound Insulation of Building Elements**.

b) A horizontal steel platform 510 mm x 460 mm x 10 mm thick must be placed with one long edge in continuous and direct contact with the wall to be tested on the side of the wall on which the impact sound is to be generated.

c) A tapping machine complying with **ISO 140/6 — 1998 (E) Acoustics — Measurement of Sound Insulation in Buildings and of Building Elements — Part 6: Laboratory Measurements of Impact Sound Insulation of Floors** must be mounted centrally on the steel platform.

d) The sound transmission through the wall must be determined in accordance with **AS 1191 Acoustics – Method for Laboratory Measurement of Airborne Sound Insulation of Building Elements** except that the tapping machine as mounted on the steel platform must be used as the source of sound.

e) The impact sound pressure levels measured in the receiving room must be converted into normalised levels using a reference equivalent absorption area of $10m^2$.

SPECIFICATION F5.5A
Rainwater storage

1. INTRODUCTION

.1 Rainwater collection from the roof depends on a number of factors. Unless these are suitably matched the supply would not be satisfactory. The factors are:

a) The average annual rainfall and its variability through the year

b) The roofing material and the available area of the roof

c) The daily rate of consumption of water

d) The storage volume and the material of the tank

e) The desired reliability of the supply

2. RELATIONSHIP OF RAINFALL, ITS VARIABILITY, ROOF AREA AND STORAGE VOLUME

The higher the average annual rainfall, the smaller the collection area of roof required for a given rate of consumption. To allow for variation in actual rainfall from the monthly averages, it is advisable to have the available roof area to be twice the theoretical area.

If the pattern of rainfall is fairly uniform through the year, the size of storage tank for a given rate of consumption would be relatively smaller. The tank size could be as small as to hold 50 days consumption where rainfall is quite uniform through the year.

Where most (such as 75%) of the annual rainfall occurs in 3 or 4 months, it will be necessary to size the tank to hold 100 to 120 days of consumption. This assumes that the available roof collection area is twice the theoretical area. Where the available roof area is less than about 1.4 times the theoretical area, the required storage volume tends to increase very steeply. The size of the tank determined from these considerations should normally give an average reliability of supply with a failure rate of about once every 5 years. If an average chance of failure of supply of once a year is acceptable, the calculated tank size can be reduced by about 30% in areas of high rainfall and by 40% in areas of lower rainfall.

3. DESIGN

The theoretical relationship outlined in Section 0.2 above can be expressed as:

$A = 365 \times C/R$ where:

A is the roof area acting as the catchment in square metres

C is the daily average consumption of water by the household in litres

R is the average annual rainfall in millimetres

However, for the reasons stated earlier, the practical value of the roof catchment is:

$A = 2 \times 365 \times C/R \approx 730\ C/R$

To assess the size of the storage tanks, Fiji has been divided into 2 categories - areas with a more uniform spread of rainfall and those with rainfall concentrated over 3 or 4 months of the year. In the case of the areas with a more uniform rainfall, it is estimated that a storage capacity of 80 days consumption would be adequate to provide a reasonably reliable supply with the risk of failure of only once in 5 years. For a similar level of reliability in areas with an uneven spread rainfall, the estimated storage is equal to 100 days consumption.

Taking a family size of 5 members, each consuming no more than 30 litres per day of the stored water, the minimum roof area and storage capacity required in representative regions in Fiji have been calculated for the average rainfall in those regions. These are shown in Table 1. If the family size and daily consumption are different, the required roof area and tank size can easily be calculated from the Table.

Table 1 Minimum Roof Area and Tank Capacity for Rainwater Collection

Total tank capacity of 15 kilolitres (3400 gallons)		**Total tank capacity of 12 kilolitres (2700 gallons)**	
Minimum roof catchment to drain into storage (m^2)			
64	**50**	**40**	**30**
Sigatoka / Nadi	**Ba**	**Suva / Nausori**	**Navua**
Lautoka	**Vanua Levu**	**Rakiraki**	**Monasavu**
Lau Group	**Kadavu**	**Taveuni**	**Rotuma**
Yasawa group			

Example: if the family size considered in say, Rotuma is 7 and the daily consumption per head is 20 litres, the required roof catchment = 30 x 20 x 7 / (30 x 5) = 28 m^2
Tank size = 12 x 20 x 7 / (30 x 5) = 11.2 kilolitres (2500 gallons)

Note: *if risk of failure of supply once a year is acceptable, the tank size can be reduced by 30%*

4. EFFECT OF ROOFING MATERIAL AND THE ENVIRONMENT

Rainwater in general is very pure and hence many metals dissolve in it much faster than in land-based water. For instance, if any lead is used in the roof for flashing or in the form of lead-based paint, the rainwater would leach the lead into the storage tank. If this happened, the water would not be potable. The nature of the materials used in the roof must be ascertained and their safety confirmed before a decision is taken to use the run-off from the roof. In general, galvanised iron sheets, zinc-aluminium coated sheets and a number of other products are safe.

As far as possible, leaves and twigs must not be allowed to fall on the roof. The leached extracts from some leaves would make the water unfit for consumption. In addition, the organic matter from leaves and twigs would encourage the growth of microorganisms in the tank, thereby polluting the water. Accumulation of any dust on the roof, such as from industrial activity nearby, would also make the water unfit.

5. TANK MATERIAL

Tanks are generally made of plastic by the Rotamould technique and these have replaced many galvanised or zinc-aluminium coated steel plates and fiberglass. Whereas suitable fiberglass would be inert and therefore not affected by the rainwater, galvanised steel could. The greater the purity of the stored water, the greater the risk of the galvanising getting leached out very fast. If the roofing sheets are of galvanised steel, the stored water would already contain some of the zinc from the roofing material and hence the tank

would last longer. This is not the case where the roofing is of zinc-aluminium coated or painted steel or of some other fabricated material.

In order to prevent the corrosive effects of pure rainwater on the tank coating, suitably formulated metaphosphates are commercially available. These produce a protective film inside the tank and thus extend the life of metal coated tanks. Such methods must be used from the very first filling of the tank. There are also plastic protective coatings compatible with potability which are applied to metal tanks.

The inside of the tank must not be painted with any ordinary paint.

In no case must lead be used in any form such as in sheets for flashing or as paint, etc. on roofs from which water is collected.

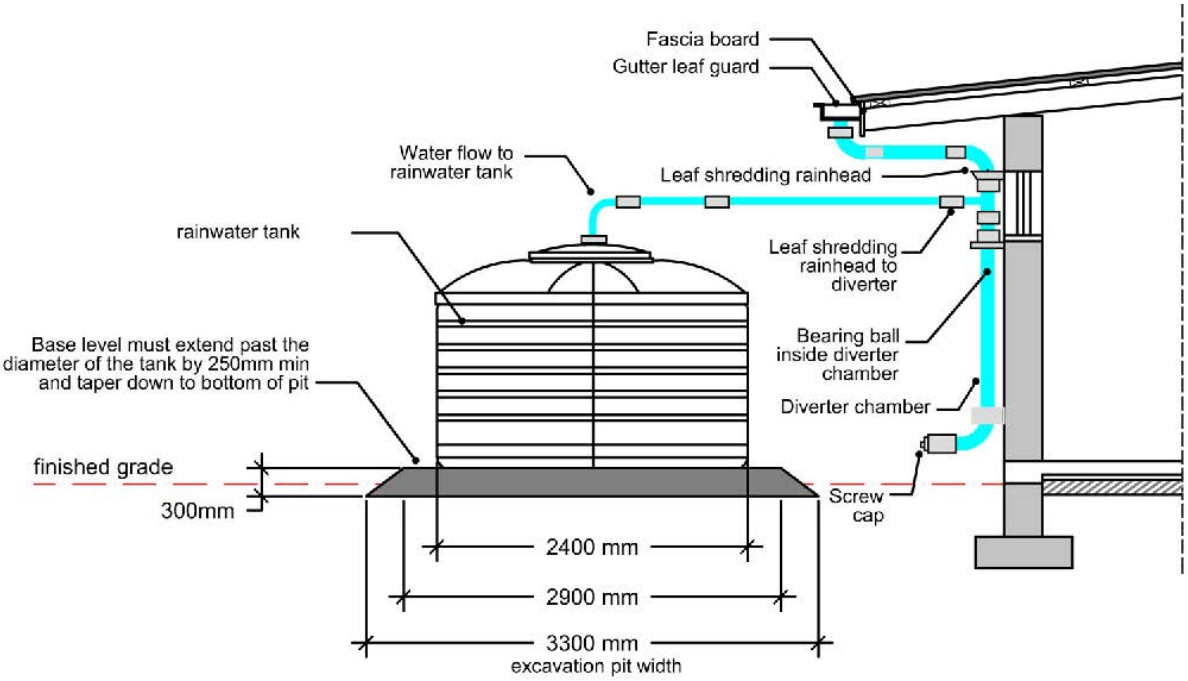
6. INSTALLING RAINWATER TANKS

In recent years, plastic tanks of the Rotamould technique are quite robust regarding structural integrity and are very popular for water storage. These tanks should have an appropriate first flush device so that water collected is of good quality. Installing a rainwater tank in a shady area protects the tank from extra heat and the water remains cool. Under all circumstances, stored water has to be used periodically to prevent water from becoming stale and compromise its aesthetic quality.

The overflow pipes fitted to tanks for the disposal of excess inflow of rainwater must be adequate to prevent uncontrolled overflow. Such pipes must not terminate very close to stormwater drains and soak pits to prevent unpleasant gases from entering the tank. The pipe end and all openings to the tank must be fitted with strong, durable mesh to prevent birds, mosquitos and other insects from gaining entry into the tank.

No copper pipe should be used with any metal water tank. The inlet pipe must discharge the water through a durable strainer fitted well above the high-water level. The inlet must not be close to the tank wall. Where tanks are interconnected, each tank must receive at least some of the water directly from the roof. No tank must get its supply entirely from other tanks. It is convenient to have individual domestic tanks of no greater capacity than 4 or 5 kilolitres (1000 gallons).

Figure 1 Rainwater Tank Installation



SPECIFICATION F7.2

Sizing of gutters and downpipes

1. DESIGN CRITERIA

The design of a roof-drainage system is based on the following factors:

- Rainfall intensity and risk of flooding
- Catchment area of roof
- Gutter efficiency
- Spacing of downpipes

.1 RAINFALL INTENSITY

In rainstorms, long periods of steady rainfall are interspersed with peak intensities for short periods. The roof-drainage system must be capable of handling the peak intensities without flooding or overflow. Peak intensities for a 5 minute duration for Fiji are as follows:

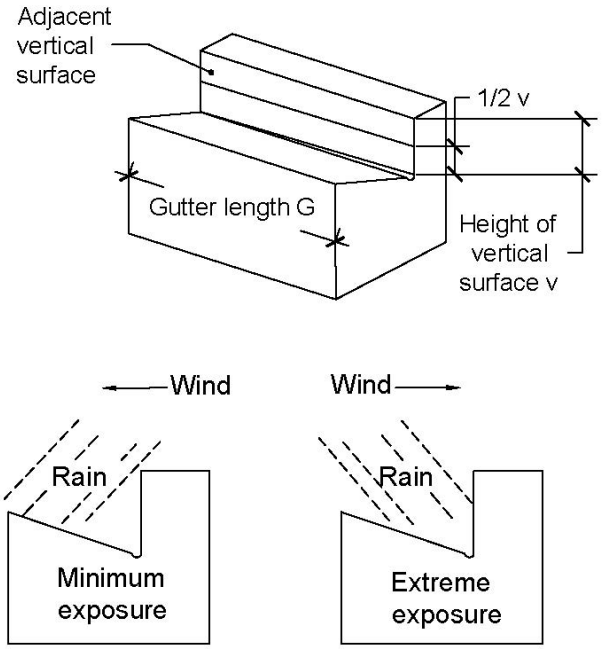
5-year return period	340 mm/hr
20-year return period	385 mm/hr
100-year return period	515 mm/hr

Any known local variations should be taken into account. The 5-year return intensity is used in the design of temporary structures of short life. The design of eaves gutters of permanent buildings must be based on the 20-year return intensity and of internal box gutters and valley gutters on the 100-year return intensity. A freeboard of 25 mm for eaves gutters and of 35 mm for internal box gutters and valley gutters are required to provide against overflow into buildings.

2. CATCHMENT

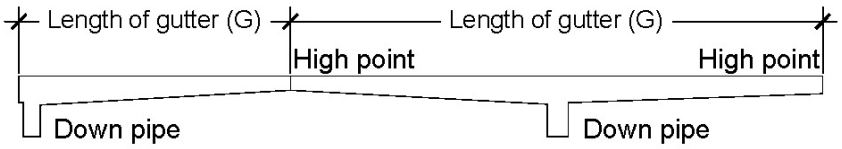
A roof drainage system is best analysed by dividing it into lengths of gutter each sloping down from a high point to an outlet with a downpipe. A long length of roof usually drains into several lengths of gutter separated by expansion joints that are also high points. The catchment area for a length of gutter Is determined by multiplying the rafter length by the length of gutter (G) and adding a proportion of any vertical surface against which rain can be driven. A reasonable procedure is to add half the area of a very exposed vertical surface and smaller proportions for less extreme conditions (see Figure 2.1).

Figure 2.1 Effect of Vertical Surface on Catchment



The length G of a gutter is measured as the distance from a high point in the gutter to the downpipe when the downpipe is at the end of the gutter and between high points when the downpipe is not at the end (see Figure 2.2).

Figure 2.2 Measuring Gutter Length



3. EAVES GUTTER

The procedure for the design of an eaves gutter is as follows:

.1 SIZE

Space the downpipes suitably and calculate the catchment area per downpipe. For eaves gutters of permanent buildings, determine the gutter discharge area by matching the catchment area against the 115 mm/hr intensity line in Table 3.1. If the gutter discharge area obtained is more than what is available from a standard gutter after allowing for a 25 mm freeboard, either reduce the spacing of the down pipes and recalculate or proceed to specify a specially fabricated gutter. With rectangular fabricated gutters, an additional allowance of 10 percent of area must be made in addition to the freeboard allowance.

The net cross-sectional area of each vertical downpipe including the nozzle must be not less than 50 per cent of the gutter discharge area.

.2 SLOPE

The fall of an eaves gutter must never be less than 1 in 500 but in areas where dust or debris is likely to build up between rain periods the slope must be as steep as 1 in 50.

.3 LEAF GUARDS AND OVERFLOWS

Leaf guards must be fitted to prevent the nozzle to the downpipe from becoming blocked wherever leaves or other debris are likely to collect in the gutter. If the eaves gutter has a fascia front higher than the rear lip, an overflow must be fitted at a level below that of the lowest point in the rear lip.

.4 PROPORTION

The proportions of a rectangular eaves gutter are ideal when its width is twice the maximum depth of water flowing in it. Although a narrow deep gutter will provide a greater head of water over the outlet with a consequent improvement in the discharge capacity of the outlet, a shallower gutter is usually easier to maintain.

Table 3.1 Gutter Sizes for Various Rainfall Intensities and Roof Catchment Areas per Downpipe

Roof Catchment Area	10 m^2	20 m^2	50 m^2	100 m^2	200 m^2
Rainfall Intensity (mm/hr)	Cross-Sectional Area of Gutter (mm^2) required to drain above roof catchment area into one downpipe				
80	1300	2200	4600	8000	14000
90	1420	2400	5100	8750	15220
100	1540	2600	5500	3450	16430
110	1630	2800	5890	10150	17630
120	1740	2990	6280	10850	18820
130	1850	3180	6670	11530	20000
140	1950	3370	7050	12210	21170
150	2050	3560	7430	12890	22330
160	2150	3750	7810	13570	23490
175	2300	4030	8370	14570	25210
200	2550	4480	9290	16220	28060
225	2800	4920	10200	17820	30860
275	3300	5760	12000	20920	36400
325	3780	6560	13750	23920	41700
425	4650	8060	16800	29250	51000

Note: *For internal box gutters add 25 mm of freeboard depth to cross sectional areas given in Table 3.1*

4. BOX GUTTERS

The procedure for the design of box gutters is as follows:

Ideally, box gutters must be straight, at least 300 mm wide, capable of supporting a workman, fired at a slope of not less than 1 in 200, and provided with an overflow and adequate downpipe outlets not more than 18 m apart. The gutters must have sufficient slope to clear dust and debris, and they might need leaf guards.

.1 SIZE OF GUTTER

Space the downpipes suitably and calculate the catchment area per downpipe. From Figure 4.1.1 using the calculated catchment area and 150 mm/hr rain intensity, determine the design flow for the gutter and the downpipe. Select a width of not less than 300 mm for the box gutter. The required depth can then be read from Figure 4.1.2 by using the selected width and the design flow. The depth allows for a freeboard of 35 mm which will be necessary during cyclonic winds along with normal turbulence and ripples. The depth thus determined assumes that the gutter is laid to zero slope. To adjust for the slope, use the depth determined from Figure 4.1.2, and read off the depth adjusted for slope against the appropriate slope line Figure 4.1.3. The minimum depth must be 80 mm.

Table 4.1 Cross Section of a Downpipe for Each Gutter Type

Gutter Type	Downpipe size for each square metre roof area
Eaves Gutter	65 mm^2
Internal Box Gutter	95 mm^2

Note:
The minimum cross section of any downpipe should be at least half that of the gutter from which it drains.
It is good practice to provide drainage sumps at downpipe connections to gutters or at least have funnels at the head of each downpipe, particularly for internal box gutters.
Where possible downpipes should be spaced at no more than 18 m centres.

.2 OVERFLOW

A box gutter discharging directly into a downpipe must have an overflow outlet to allow for blockage and to provide for rainfall intensities greater than those used for design. To cope only with peaks in rainfall it is sufficient for the overflow outlet to have a cross sectional area equal to 15 percent of the total cross-sectional area of the gutter, that is an overflow area of 0.15 dw (see Figure 4.3.1).

Figure 4.2.1 Overflow Outlet

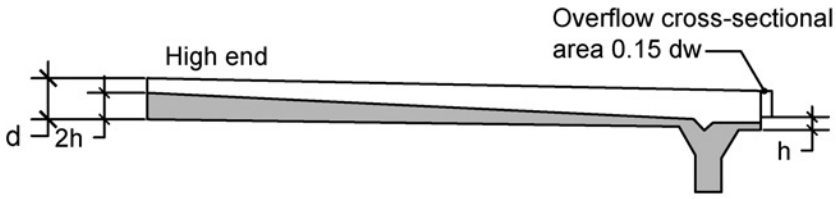
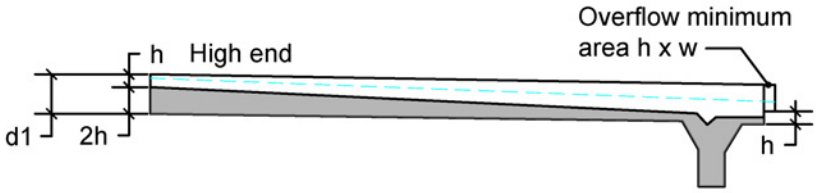


Figure 4.2.2 Overflow with Blocked Downpipe



But if the overflow is intended to cope with the effect of a total blockage of the downpipe during a peak period, then the cross-sectional area of the overflow outlet must equal the cross-sectional area of the water flow at the outlet of the gutter (h x w for minimum fall). The overflow should be slightly above level h in order to accommodate the flow of water in a crisis (see Figure 4.3.2). The slope factor must not be taken into account when determining the new depth for the gutter. The amount of freeboard added to the increased gutter depth will depend on the risk the designer wishes to take regarding the possibilities of failure of the roof-drainage system during a peak period. Other methods of preventing overflow due to blocked downpipes are the provision of rainheads and sumps.

5. RAINHEADS AND SUMPS

.1 RAINHEADS

The rainhead is a device used to increase the capacity of a downpipe at the end of a box gutter and to allow for overflow in case of a blocked downpipe. The discharge capacity of an outlet increases with the depth of water (head) over the outlet. The rainhead is located at the far end of the box gutter and consists of a sump and overflow arrangements. The sump increases the flow through the downpipe by providing an additional head of water. The overflow provides safety against water spilling into the building if the downpipe is blocked. The detailed design of rainheads is given in AS 2180 Metal Rainwater Goods - Selection and Installation.

.2 SUMPS

Where a sump is fitter to the sole of the gutter it provides a local reservoir and the additional head increases the flow through the downpipe. The detailed design of sumps is given in AS 2180 Metal Rainwater Goods – Selection and Installation.

6. DOWNPIPES

.1 LOCATION

Downpipes must be located externally, but where it is necessary to locate a downpipe internally the pipe must be accessible so that any blockage can be cleared. Access for cleaning must be provided at the base of all downpipes that are connected directly to a storm water drain. Downpipes are most efficient when located at the centre of a length of gutter.

.2 SWIRL

The performance of an outlet with the head of water more then 1/3 of its diameter will be reduced of swirl occurs at the outlet. This would generally happen only where rainheads or sumps are included in the system. Swirl can be eliminated if the centreline of the downpipe is kept no more than a distance equal to its diameter or the average of its cross-sectional dimensions away from the nearest vertical side of the rainhead of the sump.

.3 GRATINGS

Where a grating or strainer is fitter to a rainwater outlet, the total area of the perforations in the grating must be at least 1.5 times the cross-sectional area of the outlet. Strainer gratings must project above the calculated level of flow at the outlet and must be cleared of accumulated debris regularly.

7. INCOMPATIBLE MATERIALS

Dissimilar metals must be separated by a non-conducting gasket or similar device to prevent electro-chemical corrosion. Water draining from copper components must not discharge onto non-copper components for the same reason. However, water can be safely drained from non-copper onto copper components. (The prevention of electro-chemical corrosion between metals will not necessarily prevent atmospheric corrosion of the individual metals).

8. EXPANSION JOINTS FOR GUTTERS

Metal gutters must be provided with expansion joints to prevent distortion and resulting damage and reduced flow. The maximum length between expansion joints is given in Table 8.

Table 8 Maximum Distance between Gutter Expansion Joints

Material	Estimated exposed temperature range (°C)	Distance between 20 mm expansion joints (m)
Aluminium	45	18
Copper	55	21
Stainless steel	40	30
Steel	50	33
Zinc	50	15

9. STORMWATER

.1 GENERAL

Where a downpipe discharges into a stormwater gully it must terminate below the gully grating. Where the connection is made directly to a stormwater pipe underground, the internal diameter of the underground pipe must be greater than that of the downpipe. Underground stormwater pipes draining roof and paved catchments must be laid in straight lines at uniform gradients between sumps or collection pits. Large paved areas and roadways must slope towards drainage points with a minimum cross-fall of 1 in 60 for bitumen or concrete surfaces and 1 in 20 for concrete kerb channels.

.2 PIPE SIZES

Table 9.1 to 9.3 indicate the maximum total catchment area of roof and paving that can be drained by underground pipes laid at different gradients, of various diameters and running half full. Areas shown above the heavy line will have a flow velocity insufficient to flush out debris.

The tables are for rainfall intensity of 115, 228 and 340 mm/hr. For other rainfall intensities, the horizontal area to be drained must be proportionally adjusted by multiplying the area by 115 and dividing by the required rainfall intensity. The proportionally adjusted area can be used in the Table to determine the pipe size.

Table 9.1 Stormwater Drain Size for Downpipes – Rainfall Intensity of 115 mm/h

Pipe Diameter (mm)	Maximum horizontal projected area (m) that can be drained			
	1 in 50	1 in 100	1 in 150	1 in 200
100	220	150	130	110
150	600	430	350	260
200	1300	950	780	650
250	2350	1650	1300	1130
300	3700	2600	2170	1910
375	6700	4700	3820	3130
450	8800	6950	5650	4600

Based on 5-minute duration

Table 9.2 Stormwater Drain Size for Downpipes – Rainfall Intensity of 228 mm/hr

Pipe Diameter (mm)	Maximum horizontal projected area (m) that can be drained			
	1 in 50	1 in 100	1 in 150	1 in 200
100	160	120	100	85
150	540	370	290	240
200	1100	800	640	540
250	2000	1400	1100	950
300	3350	2300	1800	1600
375	6000	4150	3300	2900
450	8800	6750	5300	4400

Based on 5-minute duration

Table 9.3 Stormwater Drain Size for Downpipes – Rainfall Intensity of 340 mm/hr

Pipe Diameter (mm)	Maximum horizontal projected area (m) that can be drained			
	1 in 50	1 in 100	1 in 150	1 in 200
100	160	120	100	85
150	540	370	290	240
200	1100	800	640	540
250	2000	1400	1100	950
300	3350	2300	1800	1600
375	6000	4150	3300	2900
450	8800	6750	5300	4400

Based on 5-minute duration

Table 9.4 Maximum Roof Run (in metres) for Roof Pitch and Rainfall Intensities

Sheet Profile	Rainfall Intensity mm/hr	Roof Slope					
		1 in 50 (1°)	1 in 30 (2°)	1 in 20 (3°)	1 in 12 (5°)	1 in 7.5 (7.5°)	1 in 6 (10°)
CUSTOM ORB and BLUE CUSTOM ORB	100				45	54	58
	150				30	35	38
	200				22	26	28
	250				18	21	23
	300				14	17	19
	400				11	13	14
SPANDEK HI-TEN 700	150		42	48	56	65	70
	200		31	36	42	49	52
	250		25	28	33	39	42
	300		20	23	27	32	35
	400		15	17	20	24	26
TRIMDEK HI-TEN	200		58	68	83	98	
	250		46	54	66	78	86
	300		39	45	55	65	71
	400		29	34	41	49	53
KLIP-LOK HI-TEN	250	64	80	94			
	300	53	66	78	95		
	400	40	50	58	70	83	91
	500	32	40	46	56	66	73
BROWNBUILT 406 & 305	250	100					
	300	85	100				
	400	63	80	94			
	500	51	64	75	90	100	

The drainage or run-off capacity of roof sheeting is another limitation on the total length of a sheet run that must be considered in roof design and construction.

As a guide, Table 9.4 lists the maximum recommended length of roof run for various LBI sheet profiles at the roof slopes and rainfall intensities shown. These are based on CSIRO research and LBI calculation of the behaviour of roofing profiles under peak rainfall conditions.

The roof run is the total length of roof sheeting draining rainwater in one direction including any end laps, expansion joints or steps that may be present in the roof.

Section G

Energy Efficiency

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SPECIFICATION

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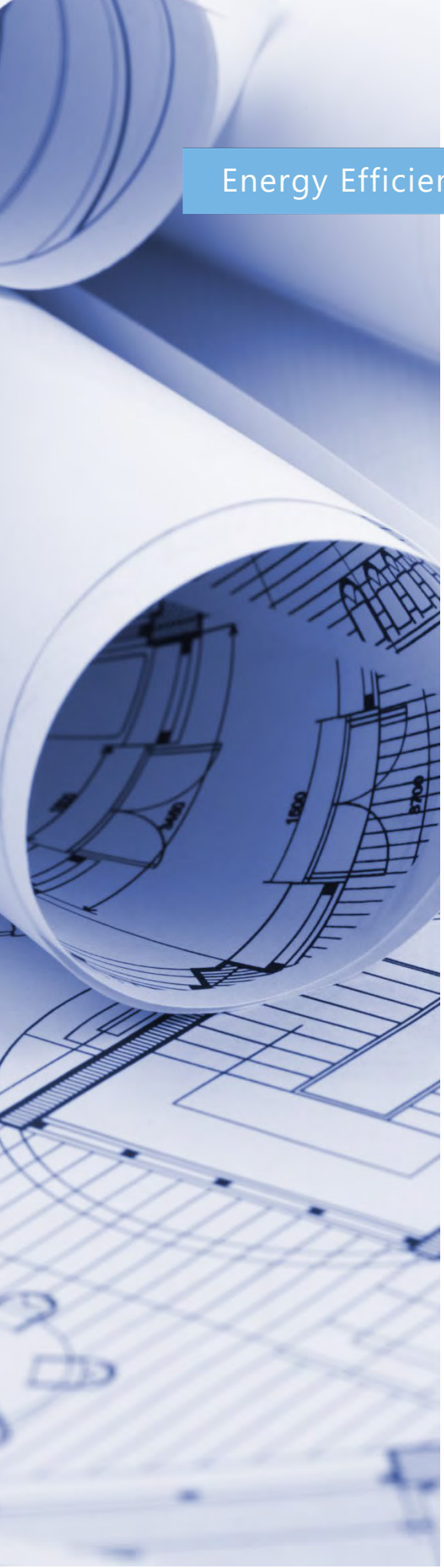


Energy Efficiency

OBJECTIVES

(1) A building, including its services, must have features that facilitate the efficient use of energy appropriate to:

a) The function and use of the building

b) The level of human comfort required for the building use

c) Health, safety and security

d) Climate change objectives approved by the Government of Fiji

(2) All buildings designed for energy efficiency must:

a) Resist solar heat gain

b) Promote natural ventilation and circulation of air

c) Promote natural illumination

d) Reduce greenhouse gas emissions

(3) Exceptions to the above objectives include:

a) Domestic indigenous buildings with thatched roofs and woven walls that are not constructed for commercial or special use

b) Non-habitable essential buildings such as a greenhouse or other structure used for industry or agriculture that require a high degree of water, energy or heat to operate

VERIFICATION METHODS

1. A building or structure shall be deemed to comply with energy efficiency performance standards in Section G1 to G6 by demonstrating adequate completion and successful execution of any of the following verification methods (no certification required):

a) Achievement of 30% energy reduction using EDGE app green building software by the IFC International Finance Corporation, a division of World Bank Group, or

b) Achievement of a successful rating score using the Government of Fiji Green Building Scorecard, or

c) Achievement of a minimum of Green Star 3 using the Green Star rating system by the Green Building Council of Australia, or

d) Achievement of LEED Bronze using the green building rating system developed by the US Green Building Council, or

e) Achievement of an acceptable level of energy saving techniques using an approved and certified green building rating system acceptable to the Government of Fiji not listed above, or

f) Compliance with Performance Requirements in Section G

Note: Compliance with standards relating to construction methods, materials, fabrications and installation must be demonstrated in building permit applications in addition to the above verification methods for energy efficiency.

2. Energy modelling calculations must consider the following:

(a) Geographical location (elevation above sea level, adjacent land uses, tree cover)

(b) Building orientation

(c) Building Form

(d) Roof geometry

(e) WWR

(f) Number of storeys

(g) Energy supply (reticulated, renewable, - generated on-site)

(h) Lighting (natural, LED)

(i) Ventilation (natural, mechanical)

(j) Cooling (natural, mechanical)

(k) Occupancy and Equipment Used (appliances, water heating, lifts, travelators, escalators, industrial)

(l) Water supply

(m) Timing Devices

(n) Number of degree days

.3 The Base Case for energy modelling must use, as a minimum, the following parameters:

Table G.1 Base Case Parameters for Energy Modelling

	Roof	Wall	Floor	Glazing	Domestic Hot water
All Building Types	Pitched or flat Metal sheets on framing or concrete Clay tile on framing	Reinforced concrete Reinforced concrete block Metal sheets on framing Tile on framing Wood on framing	Reinforced concrete slab Reinforced concrete on corrugated sheet and framing Wood or metal on framing	Single pane glass with U-value of 6.22	Supplied by grid

G1 ENERGY REDUCTION

Performance Requirements

(1) New buildings and additions shall be designed and constructed to achieve a 30% energy reduction as required in the National Development Plan of Fiji, enacted through the Climate Change Act, 2021

(2) The energy reduction target may be achieved by any of the following techniques:

a) Passive solar cooling
b) Natural ventilation
c) Heat gain avoidance and deflection
d) Efficiency in lighting
e) Efficiency in heating and cooling systems
f) Efficiency in windows
g) Use of building materials with low embodied carbon
h) Renewable energy generation and use

(3) No provision of this section shall apply to a building or structure that is part of a designated World Heritage Site or similar heritage or cultural landscape /feature that the Government of Fiji is committed to preserving

(4) The degree to which energy saving techniques are used for any one building will respond to:

a) Site characteristics
b) Overall energy saving target
c) Building form
d) Building Function
e) Availability of building material

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Performance requirements of G1 are satisfied if:

- **All of the following** Deemed-to-Satisfy provisions are successfully demonstrated
- **Section G2 to G8** are complied with

D1 REQUIRED ENERGY REDUCTION TECHNIQUES

All Buildings

.1 All building designs must include at least one of the following energy saving techniques to achieve the 30% reduction target:

a) Window shading as specified in Section G1
b) Low energy appliances and energy monitoring devices as specified in Section G1
c) Cool roof, walls and floors as specified in Section G2
d) Natural ventilation as specified in Section G3
e) Daylighting and reduced lighting loads as specified in Section G4
f) Use of lower carbon building materials as specified in Section G5
g) Efficient water use as specified in Section G7
h) Renewable energy as specified in Section G8

Class 2 – 9 Buildings

.2 Building designs must incorporate the following energy saving techniques, where applicable, to achieve the 30% reduction target:

a) Renewable energy supply for hot water for domestic use
b) Air-tight construction methods for buildings that will be air-conditioned, as specified in Section F
c) Efficient appliances, heating and cooling equipment as specified in Section G2

D2 PASSIVE SOLAR COOLING

.1 Buildings that achieve passive solar cooling standards will include a majority (at least 3) of the following energy-saving techniques:

a) Orientation of a building on the site where the longer sides of buildings face east-west and shorter sides face a north-south direction

b) Placement of less-occupied spaces such as laundry rooms, stairwells, storage areas adjacent to the north facade to protect occupied spaces from solar gain

c) Achieve a window-to-wall ratio of 10% - 40% maximum

d) Avoid the use of curtain walls and window walls unless in a limited capacity, and if used:

(i) Locate them primarily on the south façade

(ii) Shade them for the majority of the day

(iii) Use reflective glazing

e) Plant vegetation close to the building such that at maturity it will shade the walls for the majority of the day

Figure G1.1 Window-to-Wall Ratio

$$\text{WWR (\%)} = \frac{\text{Total area of all windows}}{\text{Total area of facade}} \times 100$$

Precaution: ensure trees planted for shading are low-growing species and planted a sufficient distance away from the building so they are not hazardous to people or property during a cyclone or tropical storm.

D3 WINDOW SHADING

.1 Buildings that comply with window shading standards will contain a majority of the following features:

a) Placement of the majority of windows on south-facing facades to reduce solar heat gain

b) Shading provided by an external permanent projection such as a verandah, balcony, fixed canopy, eaves, shading hood or carport, which extends horizontally on both sides of the glazing for a distance greater than or equal to the projection

c) Shading provided by an external shading device such as a shutter, blind, vertical or horizontal building screen with blades, battens or slats which:

(i) Is capable of restricting at least 80% of the summer solar radiation

(ii) If adjustable, is readily operated either manually, mechanically or electronically by the building occupants

.2 Window shading devices, other than eaves or overhangs, that project more than 0.45 m from the external wall of the building must:

a) Be integrated into the architecture of the building, or

b) Be attached with cyclone-grade fasteners, and

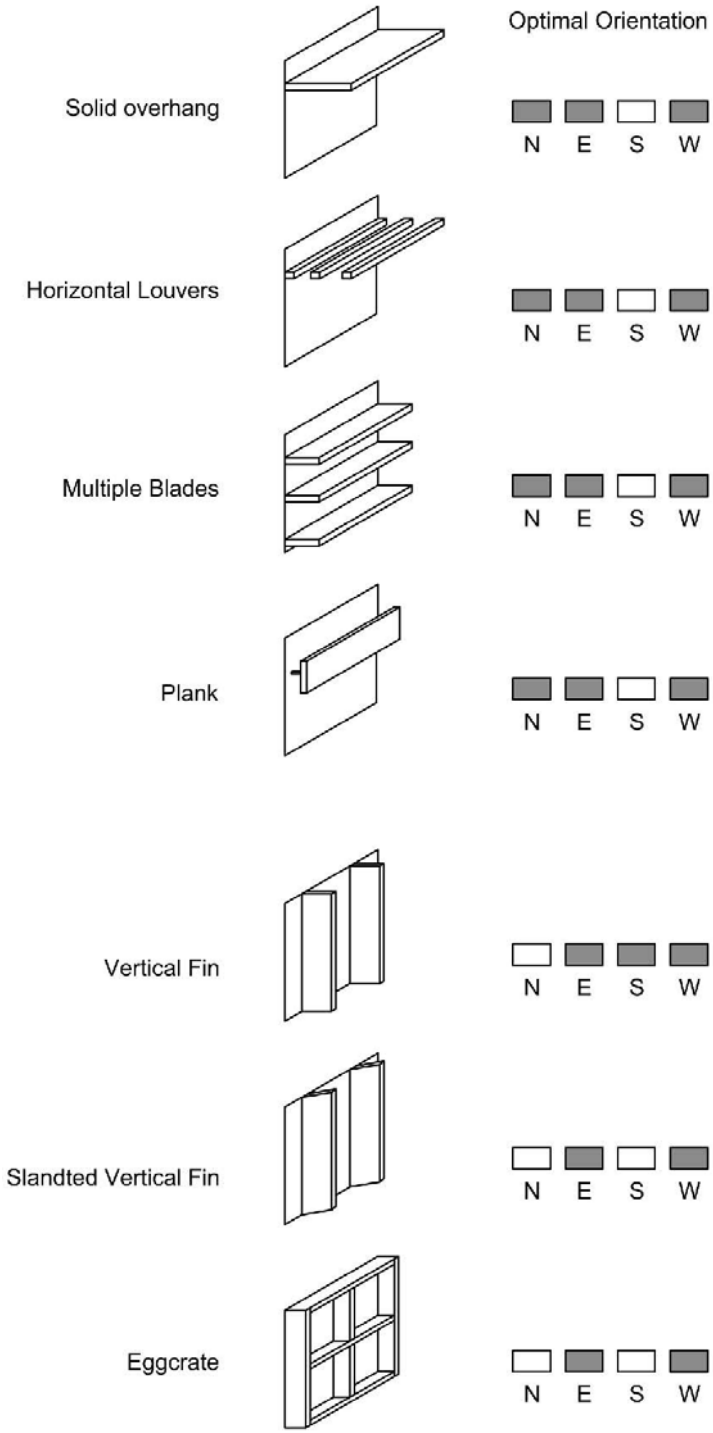
c) Must comply with wind load standards in Section B2

.3 Windows on north-facing facades must be protected by horizontally oriented shading, and windows on east and west facades must be protected by vertically oriented shading placed on the north side of the window.

Class 2, 3, 5, 7, 8 and 9 buildings

.4 A combination of window shading and energy efficient glazing should achieve a U-value less than 3.99 and SHGC of 0.25.

Figure G1.2 Examples of Window Shading Options



D4 LOW ENERGY USE APPLIANCES AND EQUIPMENT

Residential (Class 1 to 5 buildings)

.1 To comply with this standard, domestic and/or commercial/industrial appliances and equipment must demonstrate an acceptable degree of energy efficiency satisfactory to the Government of Fiji.

D5 ENERGY MONITORING

Timers

Class 2 to 9 buildings

.1 All occupancy units with an enclosed interior must be equipped with the following energy monitoring equipment for lighting, fans and air-conditioning, where appropriate to the use of the room:

a) Individual controls to increase and decrease energy use per occupancy unit and per room for lighting, fans and air-conditioning

b) Usage controls such as timers, dimmers and occupancy sensors in common areas

.2 A lighting timer must:

a) Be located within 2 m of an entry door to a room or outdoor space

b) Have an indicator light that is illuminated when the artificial lighting is off

c) Not control more than:

(i) An area of 100 m^2 with a single push button timer

(ii) 95% of the lights in rooms or outdoor spaces of area more than 25 m^2

d) Be capable of maintaining the artificial lighting:

(i) For not less than 5 minutes

(ii) For not more than 12 hours if the timer is reset

e) Be capable of being overridden by:

(i) A manual switch, remote control or an occupant sensing device that on sensing a person's presence, overrides the time switch for a period of up to 2 hours for interior rooms and 8 hours for outdoor spaces, after which if there is no further presence detected, the time switch must resume control, or

(ii) An occupant sensing device that overrides the time switch upon a person's entry and returns control to the time switch upon the person's exiting, such as a security card reader or remote control

f) Not be used to illuminate an evacuation route or fire-isolated passageway

.3 A timer switch for external lighting must be capable of being configured to operate between 30 minutes before sunset and 30 minutes after sunrise and/or any time period between these limits.

.4 An energy timer switch for indoor lighting must be:

a) Capable of being switched on and off at variable pre-programmed times and on variable pre-programmed days

b) Configured so that the lights are switched off at any time the space is designated to be unoccupied

c) Equipped with a manual "off" switch

.5 A timer switch for boiling water or chilled water storage units must be capable of being overridden by a manual switch or a security access system that senses a person's presence, and overrides for a period of up to 2 hours, after which if there is no further presence detected, the time switch must resume control.

Motion detectors

Class 2 to 9 buildings

.6 In a Class 2, 3 or 9c residential care building other than within a sole-occupancy unit, a motion detector must:

a) Be capable of sensing movement such as infra-red, ultrasonic or microwave detection, or a combination of these means

b) Be capable of detecting a person before they are 1 m into the space

c) Other than within a sole-occupancy unit of a Class 3 building, not control more than:

(i) An area of 100 m^2

(ii) 95% of the lights in spaces of area more than 25 m^2

d) Be configured so that the lights are turned off when the space is unoccupied for more than 15 minutes

e) Be capable of being overridden by a manual switch only enabling the lights to be turned off

.7 In a Class 5, 6, 7, 8, 9a or 9b building, a motion detector must:

a) Be capable of sensing movement such as infra-red, ultrasonic or microwave detection or a combination of these means

b) Be capable of detecting:

(i) A person before they have entered 1 m into the space

(ii) Movement of 500 mm within the useable part of the space

c) Not control more than:

(i) In other than a carpark, an area of 500 m^2 with a single sensor or group of parallel sensor

(ii) 75% of the lights in spaces using high intensity discharge

d) Be configured so that the lights are turned off when the space is unoccupied for more than 15 minutes

e) Be capable of being overridden by a manual switch that only enables the lights to be turned off

.8 When outside a building, a motion detector must:

a) Be capable of sensing movement such as y pressure, infra-red, ultrasonic or microwave detection, or a combination of these means

b) Be capable of detecting a person within a distance from the light equal to:

(i) Twice the mounting height, or

(ii) 80% of the ground area covered by the light's beam

c) Not control more than five lights

d) Be operated in series with a photoelectric cell or astronomical time switch so that the light will not operate in daylight hours

e) Be configured so that the lights are turned off when the area is unoccupied for more than 15 minutes

f) Have a manual override switch which is reset after a maximum period of 4 hours

.9 When installed in a fire-isolated stairway, fire-isolated passageway or fire-isolated ramp, a motion detector must:

a) Be capable of sensing movement such as infra-red, ultrasonic or microwave detection or a combination of these means

b) Be capable of detecting:

(i) Movement of 500 mm within the useable part of the space

(ii) A person before they have entered 1 m into the space

c) Be configured so that the lights dim to a 30% peak power or less when the space is unoccupied for more than 15 minutes

.10 A daylight sensor and dynamic control device for artificial lighting must:

a) For switching on and off:

(i) Be capable of having the switching level set point adjusted between 50 and 1000 lux

(ii) Have:

A. A delay of more than 2 minutes

B. A differential of more than 100 lux for a sensor controlling high pressure discharge lighting, and 50 lux for a sensor controlling other than high pressure discharge lighting

b) For dimmed or stepped switching, be capable of reducing the power consumed by the controlled lighting in proportion to the incident daylight on the working plane either:

(i) Continuously down to a power consumption that is less than 50% of full power, or

(ii) In no less than 4 steps down to a power consumption that is less than 50% of full power.

.11 Where a daylight sensor and dynamic control device have a manual override switch, the manual override switch must not be able to switch the lights permanently on or bypass the lighting controls.

Energy Meter

Class 5, 7, 8 and 9 buildings

.12 All occupancy units and common areas with an enclosed interior must be equipped with:

a) An energy meter configured to record the time-of-use consumption of grid-supplied energy for:

(i) Air-conditioning (heating and/or cooling)

(ii) Artificial lighting

(iii) Appliance power

(iv) Central hot water supply

(v) Internal transport devices including lifts, escalators and moving walkways

(vi) Other energy-consumption equipment

b) A communication system that collates the time-of-use energy consumption data to a single interface monitoring system where it can be stored, analysed and reviewed.

G2 COOLING SYSTEMS

Performance Requirements

(1) The cooling and ventilation systems of a building or structure must have features that facilitate the efficient use of energy appropriate to:

a) The function and use of the building

b) The level of comfort required for the building use

c) Climate change objectives in the National Development Plan and Climate Change Act, 2021 and subsequent updates

(2) A conditioned room or space must be based on the most efficient energy reduction strategy as possible, appropriate to the building size, massing, geography, occupancy and building materials

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Performance requirements of Section G2 are satisfied if:

- **All of the following** Deemed-to-Satisfy provisions are successfully demonstrated for the energy saving technique used
- **Section C5** Smoke Management System is complied with
- **Specification E2.4 and G3.8** are complied with

D1 FANS

.1 Ceiling fans used to cool building interiors or outdoor spaces must:

a) Be permanently installed

b) Be energy efficient and have a speed controller

c) Serve the whole room with an appropriate fan blade size, as shown in Table G2.1

d) Be accompanied by a natural ventilation system (see Section G3 Ventilation)

Table G2.1 Energy Star Suggested Fan Size per Room Size

Room Dimensions	Fan Blade Size (inches)	Fan Blade Size (cm)
Up to 7.0	29 – 36	74 – 91
7.0 to 13.5	36 – 42	91 – 107
> 13.5 to 20.9	42 – 50	107 – 127
> 20.9 to 37	50 – 54	127 - 137

Class 2, 3, 5, 7, 8 and 9 buildings

.2 Ceiling fan outlets shall be provided in each bedroom and a minimum of one ceiling fan outlet shall be provided for each additional 35 m^2 of floor area.

.3 When more than one outlet is required within a space, the outlets shall be uniformly distributed throughout the room.

.4 An exhaust fan must be fitted with a sealing device such as a self-closing damper, filter or the like when serving:

a) A conditioned space, or

b) A habitable room

D2 AIR HANDLING SYSTEM

.1 If an air-handling system is installed in a building, it must operate in accordance with:

a) Specification NE2.4 of the National Construction Code of Australia

b) For testing package air-conditioning equipment not less than 65 kWr, **AS/NZS 3823.1.2 Performance of Electrical Appliances - Air Conditioners and Heat Pumps, Part 1.2: Ducted Air Conditioners and Air-to-Air Heat Pumps - Testing and Rating for Performance**

c) For testing a refrigeration chiller, **AHRI 551/591 Performance Rating of Water-Chilling and Heat Pump Water-Heating Packages Using the Vapor Compression Cycle**

D3 AIR-CONDITIONING

.1 Air-conditioning must for 98% of the annual hours of operation, achieve temperatures between:

a) 18°C to 25°C for conditioned spaces with transitory occupancy

b) 21°CDB (dry bulb temperature) to 24°CDB in all other conditioned spaces

.2 If the proposed building has no mechanically provided cooling or has mixed mode cooling, the same method of control and control set points for non-mechanical cooling should be used for the whole building..

.3 The infiltration rate in each zone must be:

a) 0.7 air changes per hour throughout all zones when there is no mechanically supplied outdoor air

b) 0.35 air changes per hour at all other times

c) For testing air-conditioning equipment not less than 65 kWr, **AS/NZS 3823.1.2 Performance of Electrical Appliances - Air Conditioners and Heat Pumps, Part 1.2: Ducted Air Conditioners and Air-to-Air Heat Pumps - Testing and Rating for Performance**

d) For testing a refrigeration chiller, **AHRI 551/591 Performance Rating of Water-Chilling and Heat Pump Water-Heating Packages Using the Vapor Compression Cycle**

Air-conditioning system control

.4 An air-conditioning system:

a) Must be capable of being deactivated when the sole-occupancy unit, building or part of the building being served is not occupied

b) Must be capable of being set back to temporarily operate the system to maintain zone temperatures up to 30°C when serving the sole-occupancy unit of a Class 3 building

c) When serving a sole-occupancy unit of a Class 3 building, air-conditioning systems must not operate when any external door, including a door opening to a balcony, patio, courtyard, or the like, is open for more than one (1) minute

.5 Air-conditioning systems that serve more than one air-conditioning zone or areas with different cooling needs must have the capability to:

a) Thermostatically control the temperature of each zone or area

b) Other than where a packaged air-conditioning unit is used, have a variable speed fan when its supply air quantity is varied

c) Comply with:

(i) For testing package air-conditioning equipment not less than 65 kwr, **AS/NZS 3823.1.2 Performance of Electrical Appliances - Air Conditioners and Heat Pumps, Part 1.2: Ducted Air Conditioners and Air-to-Air Heat Pumps - Testing and Rating for Performance**

(ii) For testing a refrigeration chiller, **AHRI 551/591 Performance Rating of Water-Chilling and Heat Pump Water-Heating Packages Using the Vapor Compression Cycle**

d) Which contains more than one water heater, chiller or coil, must be capable of stopping the flow of water to those not operating

e) With an airflow of more than 1000 L/s, must have a variable speed fan when its supply air quantity is capable of being varied

f) Must have the ability to use direct signals from the control components responsible for the delivery of comfort conditions in the building to regulate the operation of central plant

g) Must have a control dead band of not less than 2°C, except where a smaller range is required for specialised applications

h) Must be provided with balancing dampers and balancing valves that ensure the maximum design air or fluid flow is achieved but not exceeded by more than 15% above design at each:

(i) Component, or

(ii) Group of components operating under a common control in a system containing multiple components

(iii) As required to meet the needs of the system at its maximum operating condition

i) Must ensure that each independently operating space of more than 1000 m^2 and every separate floor of the building has provision to terminate airflow independently of the remainder of the system sufficient to allow for different operating times

j) Must have automatic variable temperature operation of heated water and chilled water circuits

k) When deactivated, must close any motorised outdoor air or return air damper that is not otherwise being actively controlled

.6 When two or more air-conditioning systems serve the same space they must use control sequences that prevent the systems from operating in opposing heating and cooling modes.

.7 Thermostats must have automatic time clock or programmable controls that are capable of starting and stopping the system for seven different daily schedules per week and retaining their programming and time setting during a loss of power for at least 10 hours.

.8 Thermostats must have a manual override that allows temporary operation of the system for up to 2 hours, a manually operated timer capable of being adjusted to operate the system for up to 2 hours, or an occupancy sensor.

a) Exceptions:

(i) Zones that will be operated continuously

(ii) Zones with a full HVAC load demand not exceeding 2 kWr and having a readily accessible manual shutoff switch except for sole occupancy unit of Class 3 buildings

.9 All air-conditioning equipment installed in the building shall meet the minimum efficiency requirements in Table G2.2.

Time Switch

.10 A time switch must be provided to control:

a) An air-conditioning system of more than 2 kWr

b) A heater of more than 1 kW heating used for air-conditioning

.11 The time switch must be capable of switching electric power on and off at variable pre-programmed times and on variable pre-programmed days.

.12 The requirements of D2.10 above do not apply to:

a) An air-conditioning system that serves:

(i) Only one sole-occupancy unit in a Class 1, 2, 3 or 9c building, or

(ii) A Class 4 part of a building, or

b) A conditioned space where air-conditioning is needed for 24 hour continuous use

Table G2.2 Minimum Equipment Efficiency Requirements for Cooling

Equipment Type	Size Category	Minimum Efficiency	Test Procedure
Air-conditioner – cooling	<65 kWr	*Reference Australian MEPS*	
	65 kWr to 95 kWr	2.70 EER	**AS/NZS 3823.1.2**
	>95 kWr	2.80 EER	
Data center			
Refrigerant Chillers , water cooled	≤ 350 kWr	4.2 EER 5.2 IEER	**AHRI 550/590**
Refrigerant Chillers, air or evaporative cooled	≤ 350 kWr	2.5 EER 3.4 IEER	
Refrigerant Chillers, air or evaporative cooled	>350 kWr	Reference MEPS	
Cooling towers – propeller or axial fan		310 W of fan power/Ls of cooling water	
Cooling towers – centrifugal fan		590 W of fan power/Ls of cooling water	
Closed circuit cooler – propeller or axial fan		500 W of fan power/Ls of cooling water	

MEPS *(Minimum Energy Performance Standard) – a standard issued by the Government of Australia that indicates the air conditioning equipment has attained an acceptable degree of energy efficiency*

EER *(Energy Efficiency Ratio) -a measure of the instantaneous energy efficiency of air conditioning equipment at a specific outdoor temperature to establish minimum efficiency target. A higher EER value indicates greater energy efficiency.*

IEER *(Integrated Energy Efficiency Ratio) – a measure of energy efficiency of air conditioning equipment or heat pump system over an entire cooling season, and considers full-load operation, part-load operation and off-conditions. A higher IEER value indicates greater energy efficient and lower operating costs over time*

Fans

.13 Each air-conditioning system having a total fan system motor nameplate horsepower exceeding 3.7 kW shall be designed so that the total fan motor power of the air-conditioning supply air and return air fans in the building divided by the floor area served by those fans is in accordance with Table G2.3

Table G2.3 Maximum Fan Power

Air-conditioning sensible heat load (W/m^2 of the floor area of the conditioned space)	Maximum fan motor power (W/m^2 of the floor area of the conditioned space)	
	System serving ≤ 500 m^2	System serving > 500 m^2
≤ 100	5.3	8.3
101- 150	9.5	13.5
151-200	13.7	18.3
201-300	22.2	28.0
301-400	30.7	37.0
401-500	0.09 W fan motor power for each Watt of air-conditioning sensible load	
>500	0.12 W fan motor power for each Watt of air-conditioning sensible load	

.14 The following need not comply with the above requirement:

a) Fans in un-ducted air-conditioning units with a supply air capacity of less than 1,000 L/s

b) The power for a fan in an energy reclaiming system that preconditions outdoor air

c) The power for process related components such as high efficiency particulate air filters

Chiller and coil isolation

.15 Systems with more than one chiller must be capable of automatically stopping the flow of water through the chiller when the chiller is shut down.

.16 Systems that have more than one coil must have controls that automatically bypass the coil when the air-condition zone is not calling for cooling.

Pumps

.17 Where water is circulated by plumbing at greater than 2 L/s, pumps shall be designed so that the maximum pump power is in accordance with Table G2.4. A pump that is rated at more than 3kW of pump power must also be capable of varying speed in response to varying loads except where the pump is needed to run at full speed for safe and efficient operation.

Table G2.4 Air-Conditioning Maximum Pump Power

Cooling Load (W/m^2 of the floor area of the air-conditioned space)	Maximum pump power (W/m^2 or air-conditioned floor area)	
	Chilled water	Condensed water
≤ 100	1.3	0.9
101-150	1.9	1.2
151-200	2.2	2.2
201-300	4.3	3.0
301-400	5.0	3.6
>400	5.6	5.6

Duct and Plenum

.18 All supply and return air ductwork and plenums shall be insulated with a minimum of R-2 insulation when located in unconditioned spaces and with a minimum of R-3 insulation when located outside the building. Ductwork located in conditioned space shall be insulated to an R-1.2.

.19 Insulation on ductwork must be protected:

a) By a continuous vapor barrier on the outside of the insulation.

b) Against the effects of weather and sunlight if located outside the building

c) Does not apply to ductwork and plenums located within equipment

.20 All ductwork, air handlers and filter boxes must be sealed against air loss by sealing openings in the surface, joints and seams with adhesives, mastics, sealants or gaskets. All sealants shall be rated for use specifically for the ductwork where it will be applied. Duct tape is not acceptable as a sealant for any ductwork.

.21 Insulation for refrigerant and cooling water piping must:

a) Meet the piping insulation requirements in Table G2.5 and G2.6

b) Be protected by aluminium sheet metal, painted canvas, or plastic cover if exposed to weather

c) Protected as above or painted with water retardant pain if it is cellular foam insulation

Table G2.5 Minimum R-value of Cooling Water Piping

Cooling Water Piping	Minimum R-value	
	Conditioned space	Unconditioned space
≤ 65 kW	1.0	1.2
>65 kW ≤ 250kW	1.7	1.9
>250 kW	2.0	2.2

Table G2.6 Minimum R-value of Refrigerant Piping

Temperature Range	15 mm to 40 mm	50 mm to 80 mm	100 mm to 125 mm	150 mm	200 mm
Refrigerant ≤ 2°C	1.3	1.7	2.0	2.0	2.7
Refrigerant > 2°C ≤ 20°C	Same as for cooling water in Table G2.4				

.22 Vessels, heat exchangers or tanks containing chilled fluid, other than those with insulation levels covered in Table G2.5 and G2.6 above, must be insulated in accordance with Table G2.7.

Table G2.7 Minimum R-value of Vessel, Heat Exchanger and Tank

Refrigerant Type and Temperature	R-value
Refrigerant, low temperature brine or glycol ≤ 2°C	2.7
Refrigerant cooling water >2°C ≤ 20°C	1.8

D4 AIR-TIGHT CONSTRUCTION FOR AIR-CONDITIONED SPACES

All Buildings

.1 The following standards apply to buildings that will be cooled with air-conditioning.

.2 The building thermal envelope shall be well-sealed to limit uncontrolled air infiltration.

.3 The following areas shall be caulked, gasketed, weather-stripped or otherwise sealed with an air barrier material, suitable film or solid material:

a) All joints, seams and penetrations

b) Openings between window and door assemblies and their corresponding jambs and frames

c) Utility penetrations

d) Dropped ceilings or chases adjacent to the thermal envelope

e) Knee wall – walls between an air-conditioned space and attic

f) Walls and ceilings separating a garage or other unconditioned space from a conditioned space

g) Behind tubs and showers on exterior walls (applicable only to framed walls)

h) Common walls between dwelling units

i) Other sources of infiltration

.4 Sealing methods between dissimilar materials shall allow for differential expansion and contraction.

Class 1 Buildings

.5 An external door, internal door or openable window between a Class 1 building and an unconditioned Class 10a building must be:

a) Sealed when serving a conditioned space

b) Protected with a seal to restrict air infiltration:

(i) With a draft protection device at the bottom edge of a door

(ii) With a foam or rubber compressible strip, fibrous seal or the like for any edge other than the bottom edge of the door

c) A window complying with the maximum air infiltration rates specified in **AS 2047 Windows and External Glazed Doors in Buildings - Selection and Installation** need not comply with (a) or (b) above.

Class 2 to 9 buildings

.6 To support an air-conditioned room, air-tight construction must be used for all building components (roof, wall, floor, ceiling, and openings) serving the space, except:

a) Where an opening is needed for smoke hazard management or other fire safety measure

b) Where an opening is needed for exhaust fans and other air flows associated with safe execution of industrial processes, manufacturing and the like

.7 Air-tight construction must be:

a) Enclosed by internal lining systems that are close-fitting at ceiling, wall and floor junctions, or

b) Sealed at junctions and penetrations with:

(i) Close-fitting architrave, skirting or cornice, or

(ii) Expanding foam, rubber compressible strip, caulking or the like

.8 An entrance to a building, if leading to a conditioned space, must have an airlock, self-closing door, rapid roller door, revolving door or the like, except:

a) Where the conditioned space has a floor area of not more than 50 m^2 (> 275 m^2), or

b) Where a café, restaurant, open front shop or the like has:

(i) 3 m deep un-conditioned zone between the main entrance, including an open front, and the conditioned space

(ii) Has self-closing doors at all other entrances

c) Where a building has a permanent building opening that is necessary for the safe operation of a gas appliance

d) Where the mechanical ventilation provides sufficient pressurization to prevent air infiltration at the building entrance

e) Doors not intended for use by the public (e.g. mechanical or equipment rooms) or designated for employee use only

.9 A loading dock entrance, if leading to a conditioned space, must be fitted with a rapid roller door or the like.

.10 An exhaust fan must be fitted with a sealing device such as a self-closing damper or the like when serving:

a) A conditioned space, or

b) A habitable room

.11 A roof light serving a conditioned space must be capable of being sealed, and any opening must be operable either manually, mechanically or electronically by the occupant.

G3 VENTILATION

Performance Requirements

(1) A habitable space in a building must have adequate flow-through air from outside to safeguard people from health risks

(2) A mechanical ventilation system in a building must provide for acceptable air quality, air exchanges and air temperature appropriate to the occupancy

(3) Natural ventilation must be configured to cool the building interior, increase occupant comfort and reduce the need for air conditioning

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Performance requirements of G3 are satisfied if:

- **All of the following** Deemed-to-Satisfy provisions are successfully demonstrated
- **Section C5** Smoke Management System is complied with
- **Specification E2.4 and G3.8** are complied with

D1 AIR MOVEMENT

.1 All buildings must provide an acceptable air exchange rate through the use of:

a) Natural ventilation, and/or

b) Mechanical ventilation or air conditioning system

.2 Mechanical ventilation systems must have air movement provided to habitable rooms that complies with:

a) AS 1668.1 The Use of Air Conditioning and Ventilation in Buildings Part 1: Fire and Smoke Control in Buildings

b) AS/NZS 3666.1 Air-Handling and Water Systems of Buildings, Part 1: Microbial Control Design, Installation and Commissioning

.3 Natural ventilation from an opening in an adjoining room is permitted if:

All Buildings

a) The adjoining room is not a sanitary compartment

b) Both rooms are within the same occupancy unit

c) Both rooms have an opening to a shared enclosed verandah

d) The opening has a ventilating area of not less than 5% of the floor area of the room to be ventilated

e) The adjoining room has an opening or other device with a ventilating area of not less than 5% of the combined floor areas of both rooms

Class 5 to 9 (except electricity network substation)

f) The opening has a ventilating area of not less than 1.0% of the floor area of the room to be ventilated, measured not more than 3.6 m above the floor

g) The adjoining room has an opening with a ventilating area of not more than 10% of the combined floor area

Ventilation Openings

.4 A breeze path must:

a) Pass through not more than two openings in the internal walls with each opening having an area of not less than 1.5 m^2

b) Have a distance along the breeze path between ventilation openings of not more than 20 m

.5 An exhaust fan or other mechanical ventilation system must be used to ventilate a sanitary compartment, laundry, kitchen or bathroom if an opening of sufficient size is not provided.

Air Exchange Rate

.6 An adequate air exchange rate must be established in accordance with Clause G3 D1.2 above and must:

a) Be calculated based on use of the space, room size, layout of rooms and openings, and number of occupants

b) For residential and accommodation buildings, be at least:

(i) 0.5 ACH for bedrooms

(ii) 0.35 ACH for living rooms and other habitable rooms

(iii) 0.25 litres per second for bathrooms and toilets

c) Comply with the following standards:

(i) **AS/NZS 1668 The Use of Ventilation and Air Conditioning in Buildings**

(ii) **AS/NZS 3666 Air-handling and Water Systems of Buildings**

D2 NATURAL VENTILATION

.1 Buildings that comply with natural ventilation requirements of this code shall comply with all standards in this section and shall not have mechanical cooling installed (except potentially ceiling fans).

.2 Natural ventilation must be provided by openable windows, doors, vents, ventilation shafts and ducts, wind catchers, solar chimneys or other devices that:

a) Have an aggregate opening or openable size not less than 10% of the floor area of the room required to be ventilated

b) Open to:

(i) A court, or space open to the sky, or

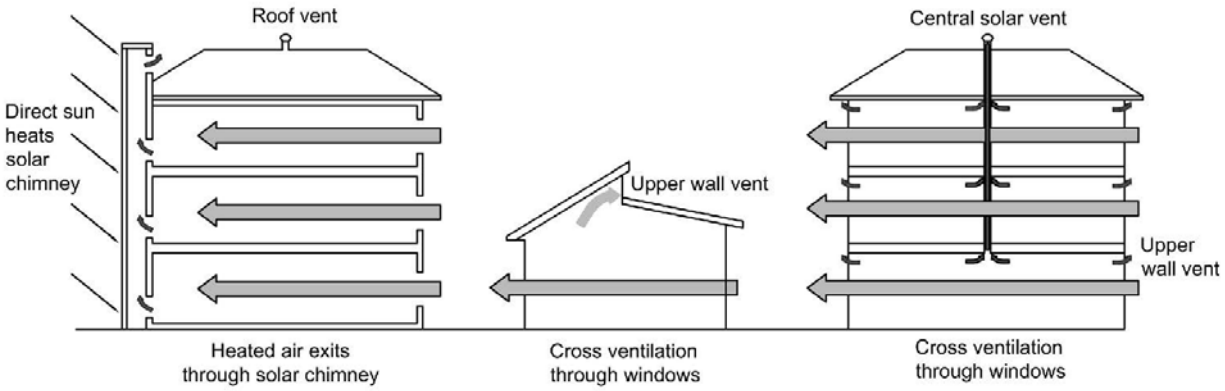
(ii) An open verandah, open carport, or the like

.3 Naturally ventilated buildings must have cross-ventilation with large window openings, louvres and/or wall vents allowing air movement from exterior wall to exterior wall.

.4 Upward air movement inside a room must be facilitated by vents in the ceiling or upper portion of a wall, or fire-protected stacked vent and the like that open directly to the outside air.

.5 Rooms that are naturally ventilated must have a minimum height from the floor to the ceiling of 3.2m to allow hot air to rise above the living space, and be accompanied by ceiling or upper wall vents that direct the heated air to the exterior of the building or other suitable outlet.

Figure G3.1 Natural Ventilation Examples



.6 A minimum of two windows, vents, sliding doors, louvres, entry screen doors, or other opening to the outside must be provided on opposite or adjacent walls for each space.

.7 The minimum total operable area for ventilation in each space shall be equal to 40% of the floor area.

.8 No more than 70% of the total free area for ventilation may be placed on one wall.

.9 For spaces employing a wing wall, no more than 70% of the total free area of ventilation may be placed on one side of the wing wall.

.10 Ceiling fans shall be provided in each bedroom.

D3 VENTILATION BORROWED FROM ADJOINING ROOM

.1 Natural ventilation to a room may come through a window, opening, ventilating door or other device from an adjoining room (including an enclosed verandah) if both rooms are within the same sole-occupancy unit or the enclosed verandah is common property:

.2 Ventilation from room to room is permitted if:

a) The room to be ventilated is not a sanitary compartment

b) Ventilation is not borrowed from one bedroom to another or between a bedroom and the kitchen

c) The window, opening, door or other device has a ventilating area of not less than 10%of the floor area of the room to be ventilated

d) The adjoining room has a window, opening, door or other device with a ventilating area of not less than 10% of the combined floor areas of both rooms

Class 5, 6, 7, 8 or 9 building

.3 Ventilation from room to room is permitted if:

a) The window, opening, door or other device has a ventilating area of not less than 10% of the floor area of the room to be ventilated, measured not more than 3.6 m above the floor

b) The adjoining room has a window, opening, door or other device with a ventilating area of not less than 10% of the combined floor areas of both rooms

c) The ventilating areas specified in (a) and (b) may be reduced as appropriate if direct natural ventilation is provided from another source

D4 AIRLOCKS

.1 If a room containing a closet pan or urinal is prohibited from opening directly in another room:

a) In a sole-occupancy unit in a Class 2 or 3 building or in a Class 4 part:

(i) Access must be by an airlock, hallway or other room, or

(ii) The room containing the closet pan or urinal must be provided with an exhaust fan

b) In a Class 5, 6, 7, 8, or 9 building (which is not an early childhood centre, primary school or open spectator stand):

(i) Access must be by an airlock, hallway or other room with a floor area of not less than 1.1 m^2 and fitted with self-closing doors at all access doorways, or

(ii) The room containing the closet pan or urinal must be provided with mechanical exhaust ventilation and the doorway to the room adequately screened from view

D5 ROOF, CEILING AND WALL VENTILATION

.1 All roofs shall be ventilated by one or a combination of:

a) Ridge vent – installed at the peak of a sloped roof

b) Soffit vent – permits air intake in the eaves to create airflow in baffles or an attic

c) Gable vent – placed on the tallest supporting walls near the tope of the gable to release hot air from the interior to the atmosphere

d) Turbine vent – rotating vent placed near the top of a roof

e) Power vent – a powered fan installed in an attic with an opening for hot air to be released

f) Saddle vent - installed on a hip roof where two roof planes intersect

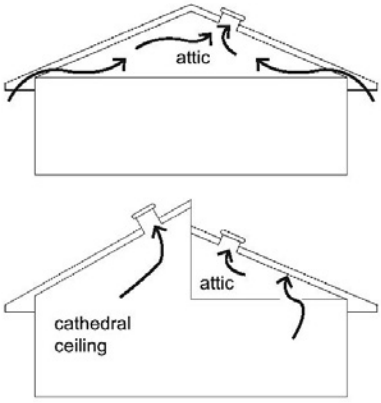
g) Rafter vent – installed between rafters to allow airflow through the roof

h) Drip edge vent – metal strips with small vent openings installed along the eaves

i) Dormer vent – installed into a dormer structure or window

j) Solar vent – a rotating vent powered by energy from solar panels

Figure G3.2 Roof Vent Air Flow



.2 A roof is permitted to be unventilated if it contains cooling techniques, such as reflective roof material and insulation, that are sufficient to cool the internal room temperature on the storey below the roof to a comfortable degree without the need for air-conditioning.

.3 All roof and wall vents must be configured and installed to be:

a) Weather-tight such that moisture will not enter the vent or any nearby opening

b) Evenly distributed to allow an unobstructed flow of air

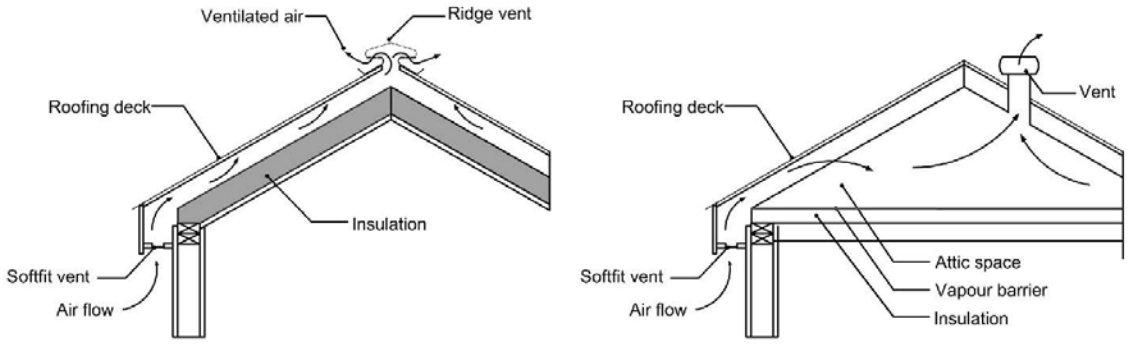
c) Located to ensure, where practicable, there are no dead airspaces

d) Located in an aggregate fixed open area of not less than 1% of the ceiling area, or

e) Have no less than two wind driven roof ventilators with an aggregate opening area of not less than 0.14 m^2 in conjunction with gable vents, ridge vents, eave vents, roof vents or the like having an aggregate fixed open area of not less than 0.2% of the ceiling areas

.3 A ceiling vent cannot open directly into an enclosed attic space but must have a vent that directs air to the outside of the building.

Figure G3.3 Roof and Ceiling Ventilation Examples



D6 FOUNDATION AND SUBFLOOR VENTILATION

Suspended Floor

.1 Where a building has a timber floor on posts, a 300 mm clear space must be maintained between the underside of the lowest timber in the subfloor and the ground.

.2 Where a building has a suspended concrete floor on posts, a clear space of 150mm minimum must be maintained between the underside of the floor and the ground and it must be ventilated.

.3 Maximum vent spacing in a subfloor is 2.0 m apart, with a vent placed not more than 500 mm in from the corner of a sub-floor.

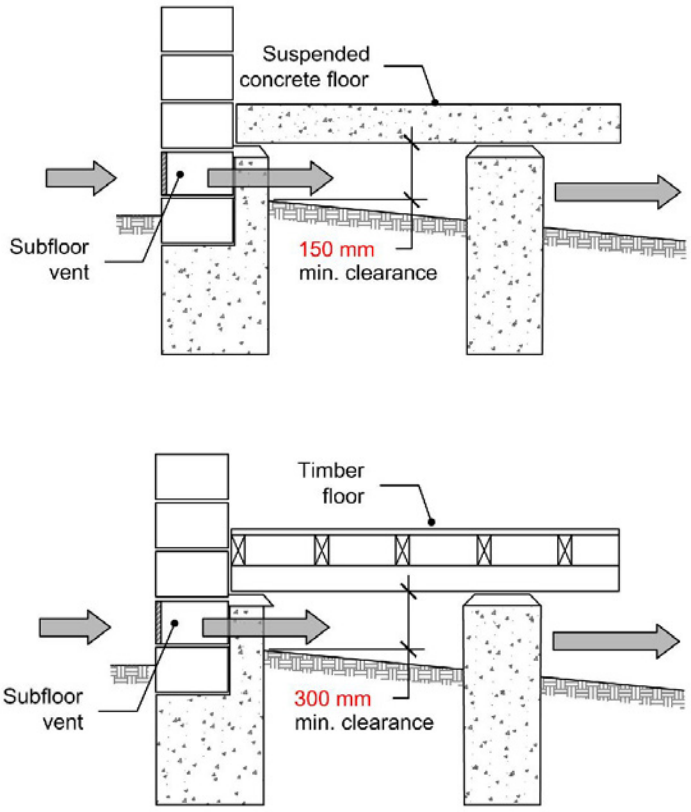
.4 Ventilation openings must be of a size that is not less than 3% of the peripheral vertical area between the ground and the boundary of the floor.

.5 Subfloor space must be free from all building debris and vegetation.

.6 Vents must not be blocked by obstacles that could prevent airflow.

.7 If adequate natural ventilation cannot be provided to a sub-floor, a mechanical ventilation system must be installed to replace the air on a regular basis and prevent the formation of dead air spaces.

Figure G3.4 Suspended Floor Ventilation and Insulation

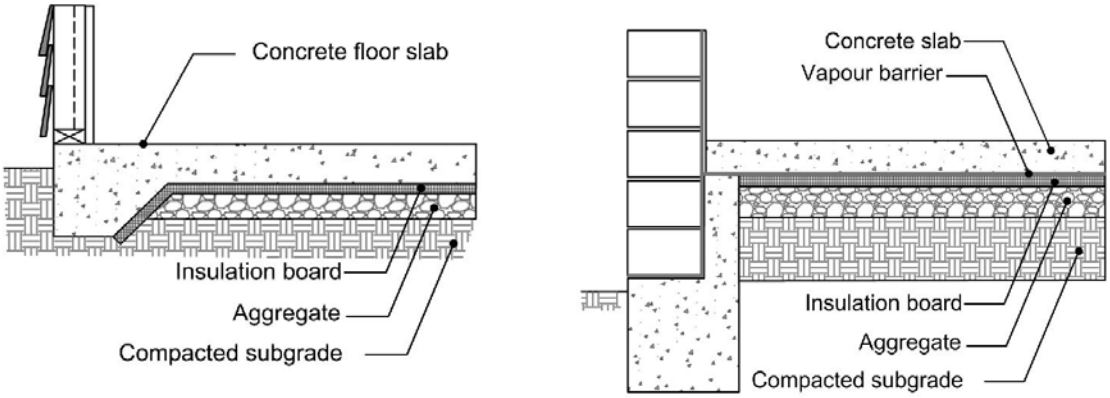


Concrete Slab Foundation

.8 Floor insulation to block heat exchange from the earth to the building interior can be installed above or below the concrete slab.

.9 A vapour barrier must be installed to ensure moisture from the ground does not seep into the concrete slab foundation.

Figure G3.5 Insulation on Underside of Concrete Slab Foundation



D7 PUBLIC CARPARK VENTILATION

.1 Every storey of a public carpark must have:

a) A mechanical ventilation or air-conditioning system complying with AS 1668.2 The Use of Air Conditioning and Ventilation in Buildings Part 2: Mechanical Ventilation in Buildings, or

b) A suitable system of permanent natural ventilation

c) Occupancy sensor, or the like, that will energise the ventilation system when triggered

G4 LIGHTING AND WINDOWS

Performance Requirements

(1) The positioning and size of rooms, windows and light fixtures must permit a sufficient amount of illumination for the occupancy and use of the room

(2) Energy-efficient lighting fixtures, controls and systems must protect the health and safety of occupants

(3) Thermal performance of windows and glazed doors must provide energy efficiency through:

a) Type of glass

b) Framing material

c) Weatherproof construction

(4) Glazing used in buildings of high risk where there is likely to be human impact and/or that serves as a fall protection device must be fabricated and installed to protect the health and safety of occupants

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Performance requirements of Section G4 are satisfied if:

- **All of the following** Deemed-to-Satisfy provisions are successfully demonstrated
- **Section G1 Energy Reduction and G3 Ventilation** are complied with
- **Appendix B** is complied with

D1 NATURAL LIGHTING

.1 Window placement, configuration and room size must provide natural daylighting for the daytime use of the room, except :

a) Buildings and rooms where daylighting is not desirable or safe

b) Medium-to-large scale atrium for institutional / retail use, or warehousing/manufacturing space

.2 An exception to G4.D1.1 above can be made if the room is sufficiently illuminated by energy-efficient bulbs, fixtures, timers and controls.

.3 Natural lighting must be provided in:

a) Class 1 and 2 buildings and Class 4 parts - to all habitable rooms

b) Class 3 buildings - to all bedrooms and dormitories

c) Class 9a buildings - to all room used for sleeping purposes

d) Class 9b buildings - to general purpose classrooms in primary or secondary schools and playrooms for the use of children in an early childhood centre

.4 Natural lighting to a room may come through a glazed panel or opening from an adjoining room (including an enclosed verandah) if:

a) The glazed panel or opening has an area of not less than 10% of the floor area of the room to which it provides light

b) The adjoining room has windows with an aggregate light transmitting area of not less than 10% of the combined floor areas of both rooms

c) In a Class 2 or 3 building or Class 4 part, both rooms are within the same sole-occupancy unit, or the enclosed verandah is on common property

And the areas may be reduced as appropriate if direct natural light is provided from another source

.5 A Class 4 part of a building must have access to a space open to the sky of 20 m^2 minimum area, and at least 5 m^2 must be at the same level as the Class 4 part and the rest may be at either 3 m above or 3 m below.

.6 Direct natural lighting must be provided by windows that:

a) Are not less than a horizontal distance from any adjoining allotment, or wall of the same building or another building on the allotment that they face, that is greater of:

(i) In a Class 2, 3 or 9 building or a Class 4 part - 1 m

(ii) In a ward area or other room used for sleeping purposes in a Class 9a building - 3 m

(iii) 50% of the square root of the height of the wall in which the window is located, measured in meters from its sill

The areas specified above may be reduced as appropriate if direct natural light is provided from another source.

b) For mezzanines, windows must be placed near the top exterior walls in addition to any lower windows at ground level, and such windows must be protected by shading devices and be openable to promote natural ventilation.

D2 ARTIFICIAL LIGHTING

Class 2 to 9 buildings

.1 Artificial lighting must be provided:

a) In required stairways and ramps by means of separate electrical wiring circuits from the main switchboard for the exclusive use of the stairway or ramp

b) If natural lighting is not available and the periods of occupation or use of the room or space will create undue hazard to occupants seeking egress in an emergency for the following building types:

(i) Class 1 buildings - to sanitary compartments, bathrooms, kitchens, stairways

(ii) Class 4 parts - to sanitary compartments, bathrooms, shower rooms, airlocks, stairways and laundries

(iii) Class 2 building - to compartments, bathrooms, shower rooms, stairways airlocks, laundries, common stairways and other spaces used in common by the occupants of the building, and all parts of an evacuation routes

(iv) Class 3, 5, 6. 7, 8 and 9 buildings - to all rooms that are frequently occupied and all corridors, lobbies, internal stairways and ramps, other circulation spaces and paths of egress, and all parts of an evacuation route

.2 Artificial lighting must comply with **AS/NZS 1680 Interior and Workplace Lighting** for:

a) Illumination levels according to building type and room function

b) Uniformity in lighting distribution to avoid excessive contract and shadows

c) Glare control to ensure visual comfort

d) Colour rendering, colour appearance and colour temperature

e) All other provisions

.3 A minimum of 75% of lamps in permanently installed lighting fixtures must have a minimum efficacy of 40 lumens per watt.

.4 The lamp power density or illumination power density of artificial lighting, excluding heaters that emit light, must not exceed the allowance of, depending on room type:

a) 5 W/m^2 in a Class 1 building

b) 4 W/m^2 on a verandah, balcony or the like attached to a Class 1 building

c) 3 W/m^2 in a Class 10a building associated with a Class 1 building

.5 The illumination power density allowance in D2.3 above may be increased by dividing it by the relevant illumination power density adjustment factor for a control device as applicable.

.6 When designing the lamp power density or illumination power density, the power of the proposed installation must be used rather than nominal allowances for exposed batten holders or luminaires.

.7 If halogen lamps are installed, they must be separately switched from fluorescent lamps.

.8 Artificial lighting around the perimeter of a building must:

a) Be controlled by a daylight sensor, or

b) Have an average light source efficacy of not less than 40 lumens/w

.9 Common areas in buildings with multiple occupancy must be equipped with automatic or manual lighting controls such as dimmers, timers, and occupancy sensors.

.10 Individual occupancy units, guest rooms or patient rooms in Class 2, 3, and 5 to 9 buildings must be equipped with lighting controls to minimize illumination when the room is not in use.

D3 GLAZING EFFICIENCY

All Buildings

.1 Windows must have a minimum energy efficiency demonstrated by:

a) Australian Fenestration Rating Council (AFRC) or National Fenestration Rating Council (NFRC) rating a Five Star cooling rating, per the Window Energy Rating Scheme (WERS)

b) A maximum U-value of 3.99 and maximum SHGC (solar heat gain coefficient) of 0.25

c) Tinted

d) A combination of energy efficient glazing and shading of the window that results in a maximum SHGC of 0.25

.2 All windows on exterior walls must allow natural ventilation through the use of openable panes, louvres, and the like, unless part of a structural curtain wall where an opening would not be safe or desirable.

Class 2 – 9 Buildings

.1 The solar heat gain coefficient (SHGC) of glazed fenestration products (windows, glazed doors and skylights) shall be determined in accordance with AFRC 200 by an accredited, independent laboratory, and labeled and certified by the manufacturer.

.2 Window film shall be rated in accordance with AFRC 200. Products lacking such a labeled SHGC as described above must be tinted per Table G4.1

Table G4.1 Window SHGC and Tinting Requirements

Natural Shading	Projection Factor of overhang from base of average windowsill	AFRC Rated SHGC	Non-Rated Tint Selection
Un-shaded	<.20	.30	Tinted Glass
Partially Shaded	.20-.45	.40	Tinted Glass
Well Shaded	0.45 max.	N/A	Clear

Natural Shading due to vegetation or other significant landscape features. Partially shaded windows are those that are protected from direct sun for much of the time (at least 40%). Well shaded windows are those that are normally protected from direct sun (e.g. significant tree canopy).

D4 ROOF LIGHTS

Class 2 – 9 Buildings

.1 Roof light area is limited to a maximum of 5% of the gross roof area and must have a maximum SHGC (Solar Heat Gain Coefficient) of 0.35.

.2 Roof lights (including any associated shaft and diffuser) serving a habitable room or an interconnecting space such as a corridor, hallway, stairway or the like must:

a) Comply with Table G4.2

b) Have an aggregate area of not more than 3% of the total floor area of the storey served, or:

c) Be protected with transparent and translucent elements with:

i) Total System SHGC of not more than 0.29
ii) Total system U-value of not more than 2.9

.3 For the purposes of Table G4.2, the following applies:

a) The roof light shaft index is determined by measuring the distance from the centre of the shaft at the roof to the centre of the shaft at the ceiling level and dividing it by the average internal dimension of the shaft opening at the ceiling level (or the diameter for a circular shaft) in the same units of measurement

b) The roof light area index is the total area of roof lights serving the room or space as a percentage of the floor area of the room or space

c) The total area of roof lights is the combined area for all roof lights serving the room or space

d) The area of a roof light is the area of the roof opening that allows light to enter the building

e) The thermal performance of an imperforate ceiling diffuser may be included in:

(i) The total system U-Value of the roof light

(ii) The total area of roof lights serving the room or space as a percentage of the floor area of the room or space must not be more than 5%

Table G4.2 Roof lights – Thermal Performance of Transparent and Translucent Elements

Roof light shaft index	Roof light area index ≤ 2%	Roof light area index ≤ 3%	Roof light area index > 3% to ≤ 4%	Roof light area index > 4% to ≤ 5%
<0.5	Total System SHGC ≤ 0.83 Total System U-Value ≤ 8.5	Total System SHGC ≤ 0.57 Total System U-value ≤ 5.7	Total System SHGC ≤ 0.43 Total System U-value ≤ 4.3	Total System SHGC ≤ 0.34 Total System U-value ≤ 3.4
≥ 0.5 to < 10	Total System SHGC ≤ 0.83 Total System U-Value ≤ 8.5	Total System SHGC ≤ 0.72 Total System U-value ≤ 5.7	Total System SHGC ≤ 0.54 Total System U-value ≤ 4.3	Total System SHGC ≤ 0.43 Total System U-value ≤ 3.4
≥ 1.0 to < 2.5	Total System SHGC ≤ 0.83 Total System U-Value ≤ 8.5	Total System SHGC ≤ 0.83 Total System U-value ≤ 5.7	Total System SHGC ≤ 0.69 Total System U-value ≤ 4.3	Total System SHGC ≤ 0.55 Total System U-value ≤ 3.4
≥ 2.5	Total System SHGC ≤ 0.83 Total System U-Value ≤ 8.5	Total System SHGC ≤ 0.83 Total System U-value ≤ 5.7	Total System SHGC ≤ 0.83 Total System U-value ≤ 4.3	Total System SHGC ≤ 0.83 Total System U-value ≤ 3.4

.4 A roof light must be equipped with automatic or manual shading devices.

.5 A roof light must be sealed, or capable of being sealed, when serving:

a) A conditioned space, or

b) A habitable room

AND

c) Sealed with an imperforate ceiling diffuser or the like installed at the ceiling or internal lining level, or

d) A weatherproof seal, or

e) A shutter system readily operated either manually, mechanically or electronically by the occupant

D5 SAFETY GLASS

.1 Glazing required to resist breakage includes that found in areas most likely to be in contact with humans and are not protected from human impact by railings, screens, or the like, including:

a) Doors, and door side panels

b) Low level glazing - any part of which is located within:

(i) 800 mm from the finished floor in an early childhood centre

(ii) 1,000 mm from the finished floor in all other habitable buildings and structures

c) Within 2,000 mm horizontal or vertical distance of stairs, ramp and balcony, and if used as a fall barrier on stairs, ramp or balcony

d) In and around wet areas, including shower doors, vanity doors, mirrors, other partitions, etc. In bathrooms, ensuites and spas located in the 2,000 mm safety zone

e) Protecting a fall of 1,000 mm or more

f) In areas used for high-risk activities

(i) Gymnasiums, sports courts, or marked fields - all glazing wholly or partly within 2,000 mm vertically and 5,000 mm horizontally of the sealed surface of sports courts / fields

(ii) Swimming pools - all glazing wholly or partly within 2,000 mm vertically or horizontally of the walking surface alongside swimming pools and space

(iii) Schools - all glazing in the safety zone (within 2,000 mm above the finished floor)

(iv) Early childhood centres - all low-level glazing (within 800 mm above the finished floor)

(v) Other areas deemed suitable by the Government of Fiji

g) In public halls and rooms where glazing or windows are less than 2,000 mm from the finished floor

h) Internal partitions

i) Mirror and glass wall cladding within 2,000 mm above the finished floor unless fully backed and completely adhered to a solid material

j) Shopfronts

k) Window seats

l) Sashless windows (will be subject to special design)

m) Louvres

.2 Exemptions from G4.D5.1 above include:

a) Glazing in lift cars and lift wells

b) Furniture and cabinet glass, vanities, glass basins, refrigeration units, internal glass fitments, glass wall linings, framed internal wall mirrors, and mirrors

c) Buildings and structures with no public access intended for non-habitable, horticultural and/or agricultural use

d) Restoration or repair of existing decorated glass

e) Glazing that might fail due to stresses other than tensile stresses, such as glass floors

f) Plastic glazing materials

g) Glass blocks, pavers, slumped, formed or cast glass

h) Point-fixed or point-supported systems used for glazing, cladding, signage

.3 To protect humans from potential injury, all glazing must meet the standards of the New Zealand Safety Glass Association (NZSGA) regarding:

a) Type of glass

b) Maximum area

c) Minimum nominal thickness

d) Maximum number of vertical butt joints per opening

e) Maximum number of panels per opening

f) Maximum individual panel width

.4 Safety glass must bear permanent identification markings indicating that the pane has been cut from safety glass material in accordance with requirements in **NZS 4223.3 Glazing in Buildings Part 3: Human Impact Safety Requirements.**

.5 Manifestation of glazing (making it visually apparent when it could be mistaken for a doorway or unimpeded path of travel), must be part of the installation for the following:

a) Doors and door side panels

b) Low level glazing, if any part of glazing is located:

(i) 800 mm from the finished floor in an early childhood centre

(ii) 1,000 mm from the finished floor in all other habitable buildings and structures

c) Shower doors and bath enclosures

d) Shopfronts

e) Internal partitions

f) Glazing located within 2,000 mm of a stairway or ramp

.6 Where there is likely to be human impact on both sides, both panes shall comply with **NZS 4223.3 Glazing in Buildings Part 3: Human Impact Safety Requirements.**

.7 Where glazing safeguards a fall of 1,000 mm or more, an external pane must be designed for wind load and comply with Section B2.

.8 Selection of appropriate glazing to provide adequate protection from human impact must comply with Table G4.3 and the Tables in Appendix B of the FNBC.

Table G4.3 Safety Glass Requirements

Glass Type	Required Safety Glass
Buildings in High-Risk Areas	
Early Childhood Centre	Toughened or Laminated safety glass to NZS 4223.3 Table 1, Table 4 and Table 5, manifestation height 0 – 800 mm
Primary School Secondary School Spa and Swimming Pools Sports Courts Other High Risk Buildings	Toughened or Laminated safety glass to NZS 4223.3 Table 1, Table 4 and Table 5; manifestation height 0 – 2000 mm
Doors	
Full-framed doors and side panels	< 0.5 m^2 – Toughened or Laminated safety glass to NZS 4223.3 Table 1 or 5 mm float minimum >0.5 m^2 – Toughened or Laminated safety glass to NZS 4223.3 Table 1
Unframed - internal	Minimum 8 mm toughened safety glass subject to height
Unframed - external	Use toughened safety glass minimum subject to height and wind load
Bathroom door - framed	Toughened or Laminated safety glass to NZS 4223.3 Table 1
Bathroom door – partly framed 1 or 2 opposite edges unframed	5 mm toughened minimum, refer to NZS 4223.3 Appendix D for thickness
Bathroom door – partly framed >2 adjacent edges unframed	6 mm toughened minimum, refer to NZS 4223.3 Appendix D for thickness
Bathroom Door unframed	6 mm toughened minimum, refer to NZS 4223.3 Appendix D for thickness
Wardrobe and Closet Doors	Toughened or Laminated safety glass to NZS 4223.3 Table 1, except that 4 mm organic backed safety mirror may be used for fully framed door up to 2 m^2 maximum
Roller, tilting and sectional doors	Toughened or Laminated safety glass to NZS 4223.3 Table 1
Fire Rated Doors	Approved fire protection safety glass. Grade B wired safety glass may be used to maximum area in NZS 4223.3 Table 1 provided it meets fire performance
Side Panels - partly framed, internal, unframed side edges	Toughened or Laminated safety glass to NZS 4223.3 Table 4
Side Panels - partly framed, external, unframed side edges	Toughened or Laminated safety glass to NZS 4223.3 Table 5
Side panels – unframed, internal, side edges + exposed edges	Toughened or Laminated safety glass to NZS 4223.3 Table 4 with 8 mm minimum thickness
Side panels – unframed, external, side edges + exposed edges	Toughened or Laminated safety glass to NZS 4223.3 Table 5 with 10 mm minimum thickness
Fall is < 1000mm - Low Level Glazing within 800 mm of Finished Floor Level (FFL)	
Fully framed Pane is <1000mm high or < 500 mm wide or has compliant manifestation, and is not capable of being mistaken for an unimpeded path of travel	Toughened or Laminated safety glass to NZS 4223.3 Table 1, or float glass to Table 2 with 5 mm minimum
Fully framed Pane is >1000mm high and 500 mm wide and without compliant manifestation, and is capable of being mistaken for an unimpeded path of travel	Toughened or Laminated safety glass to NZS 4223.3 Table 1
Partly framed -Internal May or may not have compliant manifestation or be capable of being mistaken for an unimpeded path of travel	Toughened or Laminated safety glass to NZS 4223.3 Table 4

Glass Type	Required Safety Glass
Partly framed -External May or may not have compliant manifestation or be capable of being mistaken for an unimpeded path of travel	Toughened or Laminated safety glass to NZS 4223.3 Table 5
Fall is < 1000 mm – Glazing within 800 mm of a window seat >200 mm wide	
Fully framed	Toughened or Laminated safety glass to NZS 4223.3 Table 1
Partly framed	Toughened or Laminated safety glass to NZS 4223.3 Table 4 or 5
Fall is < 1000 mm – Glazing greater than 800 mm from finished floor level	
Fully framed – housing (glazing 800 mm to 1000 mm) and all other buildings 800 mm to 1100 mm	Float glass to NZS 4223.3 Table 3
Partly framed - housing (glazing 800 mm to 1000 mm) and all other buildings 800 mm to 1100 mm	Toughened, laminated or float glass to NZS 4223.3 Table 4 or 5
Fall is > 1000 mm from window seat – Glazing within 800 mm of a window seat >200 mm wide	
Fully framed	Toughened or Laminated safety glass to NZS 4223.3 Table 7
Partly framed	Toughened or Laminated safety glass to NZS 4223.3 Table 8
Fall is > 1000 mm – Glazing greater than 800 mm from finished floor level	
Fully framed - housing (glazing 800 mm to 1000 mm) and all other buildings 800 mm to 1100 mm	Toughened or Laminated safety glass to NZS 4223.3 Table 7
Partly framed - housing (glazing 800 mm to 1000 mm) and all other buildings 800 mm to 1100 mm	Toughened or Laminated safety glass to NZS 4223.3 Table 8
Glazing between 1000 mm and 2000 mm from FFL for housing and all other buildings between 1100 mm and 2000 mm from FFL	Float glass to NZS 4223.3 Table 3
Bathrooms, ensuite and spa rooms	
Fully framed	Toughened or Laminated safety glass up to 2000 mm of FFL – refer to NZS 4223.3 Table 1
Partly framed – 1 or 2 opposite edges unframed	5 mm toughened minimum. Refer to NZA 4223.1 Appendix D for thickness
Partly framed – 2 or more adjacent edges unframed	6 mm toughened minimum. Refer to NZS 4223.1 Appendix D for thickness
Unframed	6 mm toughened safety glass minimum. Refer to NZS 4223.1 Appendix D for thickness
Shopfronts and internal partitions	
Fully framed	Toughened or Laminated safety glass to NZS 4223.3 Table 1, or float to Table 2 with 5 mm minimum thickness
Partly framed	Toughened, laminated or float glass to NZS 4223.3 Table 4 or 5
Safeguards a fall of 1000 mm or more – fully framed	Toughened or Laminated safety glass to NZS 4223.3 Table 7
Safeguards a fall of 1000 mm or more – partly framed	Toughened or Laminated safety glass to NZS 4223.3 Table 8
Stairways, ramps and landings – Fall is < 1000 mm	
Glazing adjacent and within 1000 mm horizontal or walking surface	Toughened or Laminated safety glass to NZS 4223.3 Table 1 up to 2000 mm high
Glazing within 2000 mm horizontally and at right angles to bottom riser	

Glass Type	Required Safety Glass
Protected by compliant barrier and within 1000 mm horizontally of barrier	
Stairways, ramps and landings – Fall is > 1000 mm	
Glazing adjacent and within 1000 mm horizontal or walking surface – fully framed	Toughened or Laminated safety glass to NZS 4223.3 Table 7 up to 2000 mm high
Glazing within 2000 mm horizontally and at right angles to bottom riser – fully framed	
Glazing adjacent and within 1000 mm horizontal or walking surface – partly framed	Toughened or Laminated safety glass to NZS 4223.3 Table 8 up to 2000 mm high
Glazing within 2000 mm horizontally and at right angles to bottom riser - Partly framed	
Leadlights and decorative glass	
All	3 mm annealed – 0.1 m^2 4mm annealed – 0.3 m^2 5 mm annealed and thicker – 0.5 m^2
Fire-resistant glazing	
All	As required by NZS 4223.3. Grade B safety glass, such as wired glass, to maximum area in Table 1 provided it meets fire performance requirements
Curved Glass	
All	Acceptable if a flat panel of same type and thickness complies with NZS 4223.3
Louvres – Fall is< 1000 mm	
Fall is < 1000 mm	Toughened or Laminated safety glass to NZS 4223.3, minimum 5 mm thick Table 6
Fall is > 1000 mm Within 1000 mm of FFL for housing or 1100 mm for all other buildings	Specific design
Faceted glazing	
All	Refer to NZS 4223.3 Parts 1 and 4
Mirror and glass cladding	
Fully backed and completed adhered to solid material	Float glass
Not fully backed or adhered	Toughened or Laminated safety glass to NZS 4223.3 Table 1
Operable Windows	
All	Comply with NZS 4223.3 in all possible operable positions
Sashless Windows	
All	Two or more edges supported; tough of lam safety glass to specific design
Other glazing	
Fully framed	Toughened, laminated or safety glass or float glass to NZS 4223.3 Table 1 or Table 3 and to wind load
Partly framed with unframed side edges	Toughened, laminated or safety glass or float safety glass to NZS 4223.3 Table 4, 5 or 8 and to wind load

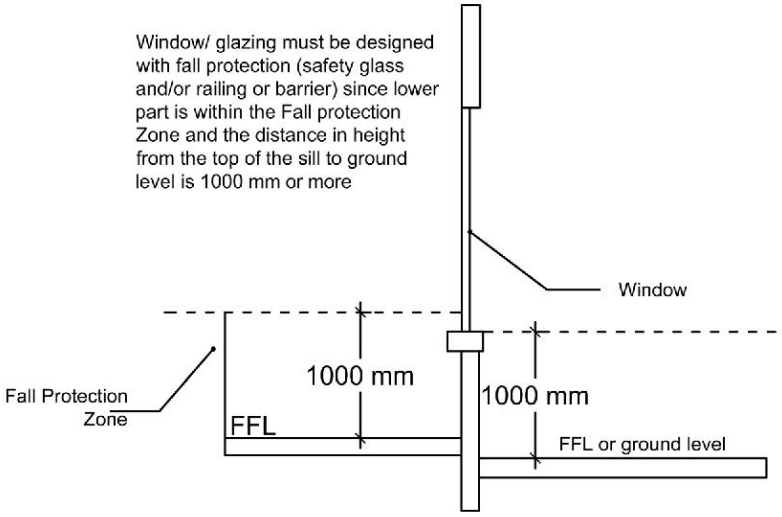
D6 GLAZING FOR FALL PROTECTION

.1 Glazing must be designed to safeguard against a fall where the glazing is:

a) Located within the Fall Protection Zone (1,000 mm from the finished floor level)

b) Protects a difference in grade of 1,000 mm or more

Figure G4.1 Fall Protection Distances



.2 Glazing with fall protection must consist of the following glass types:

a) Fully framed - safety glass that complies with Table 7, Appendix B of the FNBC

b) Partly framed, full height - safety glass that complies with Table 8, Appendix B of the FNBC

c) Other - subject to a specific design

.3 Glass barriers (balusters, fences, or screens) that safeguard occupants from falling 1,000 mm or more are subject to all provisions for fall protection in the FNBC, in addition to wind load provisions in Section B Structure.

.4 Glass screens over 1,500 mm in height and full-length glass screens acting as a glass barrier must have the following glass types and size requirements:

a) Fully framed must comply with Table 7 in Appendix B of the FNBC

b) Partly framed, full height glass barriers must comply with Table 8 in Appendix B of the FNBC

c) For fall protection, glass infill barriers must comply with Tables 9 through 17 in NZS 4223 Glazing in Buildings, regarding design load, wind pressure, and maximum glass span

D7 WINDOW WEATHERPROOFING

.1 Windows must be weathertight with a continuous barrier installed around it, and comply with **AS 2047 Windows and External Glazed Doors in Buildings - Selection and Installation** requirements for resistance to water penetration for the following:

a) Windows in external walls

b) Sliding and swinging glazed doors with a frame, including French and bi-fold doors with a frame

c) Adjustable louvres

d) Shopfronts except for open-air markets

e) Curtain walls with one piece framing

f) Roof lights

Exceptions:

g) Revolving doors

h) Fixed louvres

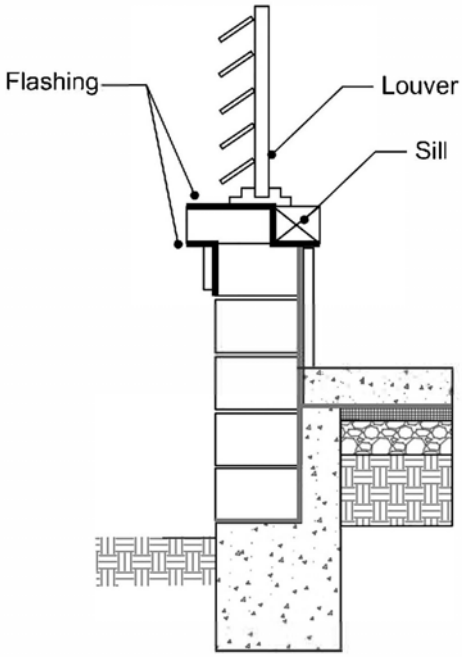
i) Heritage windows

.2 Where windows are fitted onto an external roof or wall, weather protection must be provided by:

a) A sub-sill flashing as part of the membrane system

b) Extension of the external finish must extend beyond the termination of the membrane, with vertical upward termination heights as specified in Table A1 of **AS 4654.2 Waterproofing Membranes for External Above-Ground Use, Part 2: Design and Installation**

Figure G4.2 Window Flashing



G5 LOW CARBON BUILDING MATERIALS

Performance Requirements

(1) Buildings and additions must be constructed of an appropriate proportion of low carbon building materials to achieve sustainability objectives of the Government of Fiji.

(2) Use of building materials with low embodied carbon must be appropriate to:

a) Function and use of building, facility and/or site

b) Human comfort, health and safety in the interior environment

c) Safe operation of storage, handling and fabrication of products and/or hazardous substances

d) Geographic location, topography, hydrology and natural features

e) Buildings, facilities, site works and site servicing on adjacent property

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Performance requirements of Section G5 are satisfied if**:**

- **All of the following** Deemed-to-Satisfy provisions are successfully demonstrated
- **Section B8 and G1** are complied with
- **Specification C1.1 and Schedule 5** Fire Resistance are complied with

D1 BUILDING MATERIAL SOURCE

.1 Buildings which are constructed with the following low carbon building materials will satisfy performance requirements:

a) Locally sourced (90% minimum) building material including:

(i) Natural or engineered timber

(ii) Bamboo

(iii) Stone and aggregate, and/or

b) Concrete containing low carbon cementitious material additives that reduce GHG emissions, and/or

c) Re-used or re-cycled building materials (minimum 75%), and/or

d) Complies with Table G5.1

.2 Building materials must not contain the following hazardous substances to an unacceptable degree:

a) Asbestos

b) Lead

.3 Volatile organic compounds in paints, varnishes and finishes must be avoided, where possible.

Table G5.1 Low Carbon Building Materials

Building Material	Thermal Conductivity (W/m.K)	Locally Sourced, Extracted, Manufactured	Satisfies Low Carbon Criteria	R-Value (minimum thickness)
1. FRAMING				
(a) Bamboo	0.19	Yes	Yes	0.52 (100 mm)
(b) Steel	47.8	No	Yes (if reflective)	0.94
(c) Timber	0.16	Yes	Yes	0.04 to 0.08/ cm
2. ROOF CLADDING				
(a) Asphalt shingle	0.79	No	Yes	0.44
(b) Bitumen roof membrane	0.02	Yes	Yes (if reflective)	0.15
(c) Clay Tile	0.81	No	Yes	2.95
(d) Membrane with aggregate	?	No	Yes (if reflective)	0.33
(e) Membrane EPDM	0.47	No	Yes	0.24
(f) Metal (steel) sheet	47.5	No	Yes (if reflective)	0.0
(g) Wood shingle or panel	0.10	Yes	Yes	0.94
3. WALL CLADDING				
(a) Asphalt shingle	0.79	No	Yes	0.44
(b) Bamboo	0.19	Yes	Yes (if insulated)	0.18 (35 mm)
(c) Cement render	0.53	Yes	Yes (if insulated)	0.25 (25 mm)
(d) Concrete block	0.85	Yes	Yes (if insulated)	0.16 (140 mm)
(e) Solid Concrete	1.44	Yes	Yes (if insulated)	0.034 (50 mm)
(f) Clay tile	0.81	No	Yes	2.95
(g) Metal (steel) sheets/ panels	47.5	No	Yes (if insulated)	0.00
(h) Stone Veneer	0.03	Yes	Yes	0.83 (25 mm)
(i) Wood shingle	0.10	Yes	Yes	0.94
4. INTERIOR WALL FINISH				
(a) Bamboo	0.19	Yes	Yes	0.18 (35 mm)
(b) Fibre-cement board	0.25	No	Yes	0.08 (20 mm)
(c) Gypsum plasterboard	0.17	No	Yes	0.08 (15 mm)
(d) Pine weatherboard	0.10	Yes	Yes	0.15 (15 mm)
(e) Plywood	0.14	Yes	Yes	0.11 (15 mm)
5. FLOOR FINISH				
(a) Bamboo	0.19	Yes	Yes (if insulated)	0.18 (35 mm)
(b) Carpet	0.04	No	Yes	0.62 (25 mm)
(c) Concrete Planks	0.80	Yes	Yes	0.62 (50 mm)
(d) Particleboard	0.12	No	Yes (if insulated)	0.13 (15 mm)
(e) Plywood	0.14	Yes	Yes (if insulated)	0.16 (15 mm)
(f) Solid Concrete	1.44	Yes	Yes (if insulated)	0.034 (50 mm)
(g) Timber	0.16	Yes	Yes (if insulated)	0.22 (35 mm)
(h) Vinyl floor tiles	0.79	No	Yes (if insulated)	0.00 (5 mm)
6. INSULATION				
(a) Bamboo	0.19	Yes	Yes	0.26 (50 mm)
(b) Cellulose	0.04	Yes	Yes	1.8 (75 mm)
(c) Fiberglass Batt	0.04	No	Yes	1.25 (50 mm)
(d) Mineral Wool Batt	0.04	No	Yes	1.25 (50 mm)
(e) Phenolic foam board	0.03	No	Yes	1.5 (50 mm)
(f) Sprayed Polyurethane Foam	0.02	No	Yes	2.27 (50 mm)

G6 HEAT GAIN REDUCTION

Performance Requirements

(1) Building roof, wall and floor assemblies must be designed and constructed to provide opportunities to reduce solar heat gain and promote cooling of the interior appropriate to:

a) Function and use of building, facility and/or site

b) Human comfort, health and safety in the interior environment

c) Safe operation of storage, handling and fabrication of products and/or hazardous substances

d) Geographic location, topography, hydrology and natural features

e) Buildings, facilities, site works and site servicing on adjacent property

Key Energy Performance Terms

Solar absorption – *degree of solar energy absorbed by a material - lower number preferred (decimal between 0-1)*

Reflectance – *a material's ability to reflect sunlight and reduce solar energy gain – higher number preferred (decimal between 0-1)*

SRI (Solar Reflectance Index) – *solar reflectance combined with the ability to radiate heat back into the atmosphere, higher number preferred (0-100)*

Thermal emittance – *ability to release absorbed heat energy, higher number preferred indicating a material gains and releases heat at the same rate (decimal between 0-1)*

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Performance requirements of Section G6 are satisfied if:

- **All of the following** Deemed-to-Satisfy provisions are successfully demonstrated.
- **Section G1 and G5** are complied with

D1 ROOF ENERGY PERFORMANCE

.1 Roofs for habitable buildings must contain at least one of the following passive solar design mechanisms:

a) Solar panels to collect heat and generate power for appliances, mechanical systems, and the like

b) Green roof

c) Bulk insulation in an attic space or within a roof panel to protect interior rooms

d) Air vents in open or attic roof spaces to release heated air to the atmosphere

e) Solar reflectance (SRI) of 90 or greater, see Table G6.1

.2 Energy performance of roof cladding (cladding material and/or a reflective coating applied to the cladding) must achieve the following targets as indicated in Table G6.1:

a) A solar absorption of at most 0.45, which can be achieved by selecting materials with a Load-bearing absorptance rate or

b) A labeled reflectance greater than 0.45, or

c) Aged reflectance of at least 0.55 and a minimum thermal emittance of 0.75, or

d) A Solar Reflective Index (SRI) of at least 64

.3 A roof must have a Total R-Value (ability of a material to resist heat flow) greater than R-3.7 which can be achieved by:

a) Bulk insulation such as foamboard, cellulose, mineral wool, batt, but not solely reflective foil, or

b) Solar panels or solar shingles with extensive coverage (95%) or

c) Thatch – minimum 100mm thickness, or

d) A combination of roof cladding, reflective coating and insulation that achieves R-3.7 as outlined in Table G6.2

Table G6.1 Energy ratings of roofing material and Insulation

Roof Colour	Reflectance	Solar Absorption	Solar Relectance Index (SRI)	Thermal Emittance
Black	Low (0.05 – 0.15)	High (0.85 – 0.95)	0-10	0.05 – 0.15
Grey	Medium (0.2 – 0.5)	Medium-high (0.5 – 0.8)	40-80	0.5 – 0.7
Brown	Medium (0.1 – 0.3)	High (0.7 – 0.9)	20-40	0.4 - 0.6
Red/Blue/Green	Medium (0.2 – 0.4)	Medium-high (0.5 – 0.8)	40-80	0.5 - 0.7
White	High (0.7 – 0.9)	Low (0.1 – 0.3)	90-110	0.85 – 0.9
Silver	Very High (0.9 +)	Very Low (0.05 - 0.15)	80+	0.85 +

Note The energy efficiency ratings on the Product Sheet / label from the manufacturer of a roof cladding or coating may differ from the above and it shall override the values in the table.

Table G6.2 Approximate R-Value of roofing material

Asphalt Shingles	0.81 - 1.0
Clay Tiles	0.44 – 1.25
Concrete Tiles	0.2 – 0.33
Metal Roofing	0.94 – 1.25
Slate Tiles	0.8 – 1.3
Wood Shingles	0.87 – 1.25
Cellulose insulation (100 mm)	3.1 – 3.7
Fiberglass batt insulation (100 mm	3.1 – 4.3
Foam Board insulation (50 mm)	4.5 – 5.0
Polyurethane spray foam insulation (50 mm)	6.0 – 7.0
Double-sarking reflective insulation	1.5 - 2.5

Note: The R-value on the Product Sheet / label from the manufacturer of a roofing material may differ from the above and it shall override the values in the table. Values in the table apply to the thicknesses shown only.

Any combination of R-values that add up to R-3.7 or greater is needed to comply with G6.D1.3. Proof of R-value for each product must be submitted for review.

.4 Roof lights must have:

a) A total area of not more than 5% of the floor area of the room or space served

b) Transparent and translucent elements, including any imperforate ceiling diffuser, with a combined performance of

(i) SHGC of a maximum of 0.25

(ii) U-value of a maximum 3.9

D2 ROOF INSULATION

.1 Concrete and other mass roof assemblies with insulation must comply with AS/NZS 4859.1 Materials for the Thermal Insulation of Buildings, Part 1: General criteria and technical provisions and be installed so that it:

a) Abuts or overlaps adjoining insulation other than at supporting members such as studs, noggings, joists, furring channels and the like where the insulation must be against the member

b) Forms a continuous barrier with ceilings, walls, bulkheads, floors or the like that inherently contribute to the thermal barrier

c) Does not affect the safe or effective operation of a service or fitting

d) Has a sufficient air gap between the insulation and a building lining or cladding to achieve the required R-Value.

..2 Bulk insulation may be attached:

a) Directly to the roof cladding, and if so, a vapour barrier must also be installed

b) Under the purlins, in which case there is an air gap between the insulation and the roof cladding

c) On top of a ceiling for an attic roof assembly

.3 Bulk insulation must be installed so that it:

a) Maintains its position and thickness, other than where it is compressed between cladding and supporting members, water pipes, electrical cabling or the like

b) Overlaps the wall by not less than 50 mm where there is no bulk insulation or reflective insulation in the wall beneath

c) Creates a continuous layer without any air gaps

.4 Where permitted, reflective insulation must be installed with:

a) The necessary airspace to achieve the required R-value between a reflective side of the reflective insulation and a building lining or cladding

b) The reflective insulation closely fitted against any penetration, door or window opening

c) The reflective insulation adequately supported by framing members

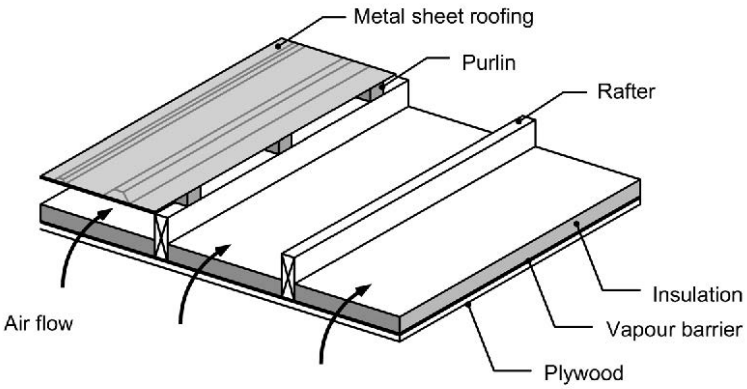
d) Each adjoining sheet or roll of membrane must be overlapped by at least 150 mm and taped together with manufacturer's specified tape.

.5 Where a roof will have gaps in the insulation because of recessed downlights, skylights, or other roof opening, the loss of insulation must be compensated for by increasing the R-value of insulation in the remainder of the roof in accordance with Table G6.3.

Table G6.3 Adjustment of Minimum R-Value for Loss of Ceiling Insulation

Percentage of ceiling area uninsulated	For R-value of 3.5	For R-Value of 4.0
	Required R-Value Increase	
0.5% to less than 1.0%	4.0	4.7
1% to less than 1.5%	4.4	5.2
1.5% to less than 2.0%	4.8	5.8
2.0% to less than 2.5%	5.3	6.5
2.5% to less than 3.0%	5.9	X

Figure G6.1 Roof Insulation Example



Notes to Figure G6.1

The Total R-Value of the roof and ceiling construction is based on there being an air gap which increases energy efficiency. If the air gap is filled and the roof is unvented, the R-Value for the air gap (typically R 0.95) needs to be subtracted from the Total R-Value of the roof and ceiling materials.

D3 GREEN ROOF

.1 A green roof constructed for cooling the interior or for aesthetics must, at a minimum, consist of:

a) A drainage layer to convey excess water to roof drains

b) A root barrier and filter sheet

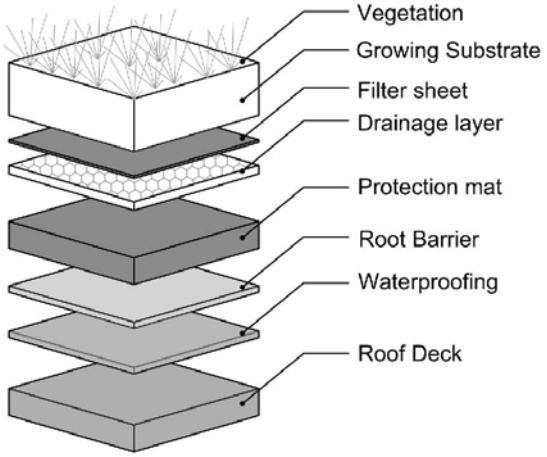
c) A growing substrate

d) Vegetation

e) Insulation

and be installed on a waterproof membrane attached to a sufficiently stable roof structure (reinforced concrete or plywood/sheet metal with sufficient framing support) designed to carry the full weight of the green roof

Figure G6.2 Layers of a Typical Green Roof



.2 Safety measures must be incorporated into the green roof design including:

a) Appropriate roof edge construction, weather-proofing and venting

b) Roof materials and fastening appropriate to earthquake loads and weight of green roof components

c) Choice of vegetation appropriate to wind loads

d) Roof construction that can support live and dead loads of the green roof when fully saturated with water

e) Ability to effectively and safely convey stormwater in extreme storm events

f) Access for maintenance

g) Fire spread reduction

h) Weathertight construction so that water in the green roof does not penetrate the roof structure below

.3 Green roofs must assist in stormwater management by using a porous growing substrate that collects and absorbs stormwater during the first five minutes of a weather event.

.4 In addition to structural requirements for roofs contained in Section B Structure, green roof gravity loads must be calculated:

a) According to ASTM standard: **ASTM E2397.05 — Standard Practice for Determination of Dead Loads and Live Loads Associated with Green Roof Systems**

b) With the assumption that the design hydraulic load of the green roof system is fully saturated prior to the maximum fifteen-minute rainfall

.5 The density of the growing substrate must be determined:

a) In accordance with **ASTM E2399.05 — Standard Test Method for Maximum Media Density for Dead Load Analysis of Green Roof Systems**, or

b) Using an unfactored, saturated density of the growing substrate of 2,000 kg/m3

.6 All green roofs with slopes in excess of 10º (17%) must incorporate anti-shear measures.

.7 Parapets protected by flashing and scuppers must be part of a flat green roof design, where required, to allow controlled release of excess stormwater in the event of obstructed or overloaded roof drains in extreme weather events and to protect the roof edge from wind.

.8 Where roof penetrations, intersecting walls, parapets, upturns or mechanical equipment are clad with combustible materials, a 0.5 m wide vegetation-free border zone must abut such features.

.9 Immediately prior to installation of the green roof, the roof must be tested to ensure it is weathertight and a report prepared by a professional consultant must be submitted and approved by the Government of Fiji that contains the following:

a) Flood test

b) Electric field vector mapping

c) Impedance test

d) Infrared (IR) thermal imaging

e) Low voltage testing

f) High voltage testing

g) Moisture sensors

.10 The drainage layer must be appropriately sized for effective stormwater retention during extreme weather events according to **ASTM E2398.05 Standard Test Method for Water Capture and Media Retention of Geo-Composite Drain Layers for Green Roof Systems,** or an equivalent acceptable to the Government of Fiji.

.11 Adequate drainage on a green roof must be provided by:

a) Installation of a drainage layer (designed specifically for green roofs) under the growing substrate with sufficient height and carrying capacity to convey water at an acceptable rate during extreme weather events

b) One or more roof drains that convey excess water to the buildings or facility's gutter, downspout and building drainage system

c) A positive slope (1% minimum) to roof drains

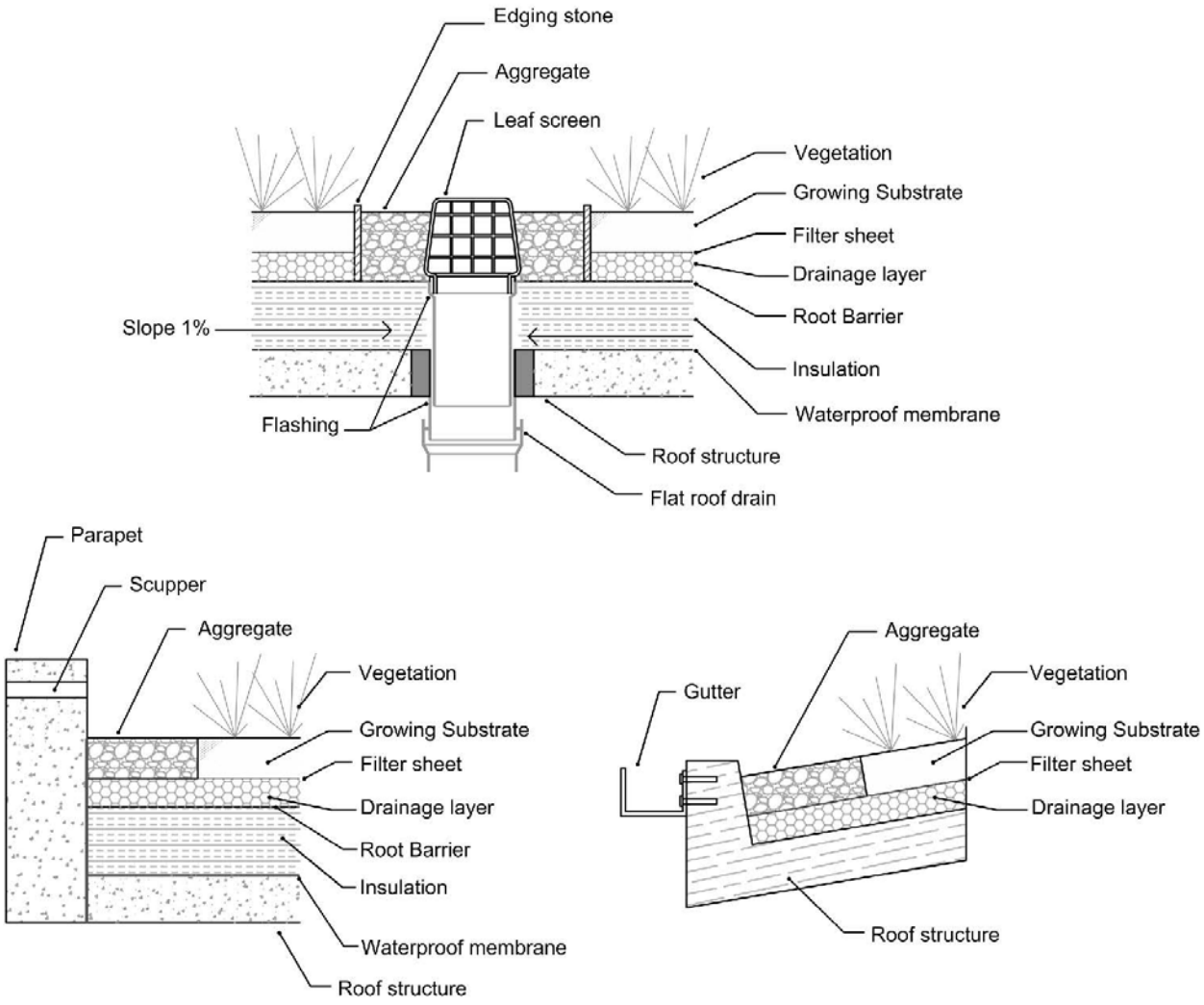
d) Minimum 300 mm diameter vegetation-free zone around all roof drains

e) Root penetration barrier beneath the growing substrate to permit percolation of water to the drainage layer while not permitting roots or soil to pass through

f) Provision of scuppers where a parapet is provided to convey excess stormwater

g) Growing substrate of sufficient composition and density to allow infiltration of stormwater

Figure G6.3 Roof Drain on a Green Roof



D4 EXTERNAL WALL ENERGY PERFORMANCE

.1 The energy performance of the sum of all parts of an external wall must:

a) Achieve a minimum total R-value of 2.8, or

b) Achieve a minimum total R-value of 2.4 and be shaded by a verandah, balcony, eaves, carport, vegetation, or by an awning, overhang or other shading device that projects at a minimum angle to fully shade windows at midday in the month of June, see Figure G6.4

Table G6.4 Approximate R-Value of Wall Material

Bamboo (engineered)	0.12- 0.14
Concrete Block, filled	0.2 – 0.5
Concrete Poured (150 mm)	0.08 – 0.1
Metal (steel or aluminum)	0.01 – 0.05
Plywood or wood	1.25
Air Gap (25 - 100 mm)	0.18 – 0.34
Cellulose insulation (100 mm)	3.1 – 3.7
Double-sarking reflective foil insulation	**1.5 - 2.5**
Fiberglass batt insulation (75 mm)	3.0 – 4.3
Foamboard insulation (35 mm)	4.5 - 5.0
Polyurethane spray foam insulation (50 mm)	**6.0 - 7.0**
Gypsum board (15 mm)	0.45

Note: The R-value on the Product Sheet / label from the manufacturer of a wall material may differ from the above and it shall override the values in the table. Values in the table apply to the thicknesses shown only and are to be used as a guide.

Any combination of R-values that add up to R-2.8 or greater is needed to comply with G6.D4.1. Proof of R-value for each product must be submitted for review.

Figure G6.4 Window Shading Devices

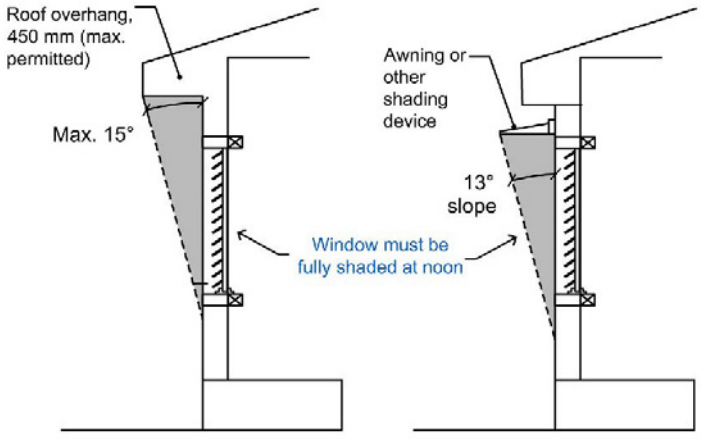
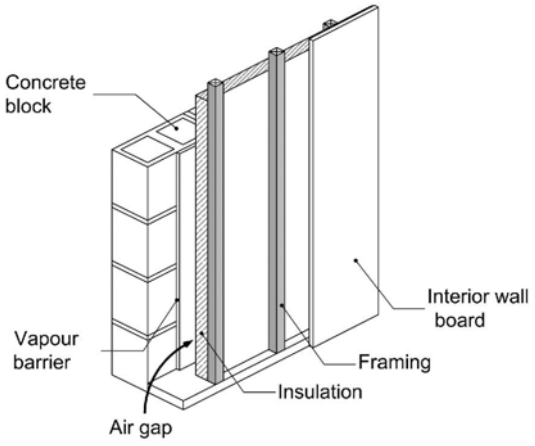


Figure G6.5 External Wall Insulation Example



.2 An air gap within a wall assembly must be :

a) A minimum of 50mm in width

b) Fully surrounded by fire-resistant building materials, or

c) Be vented to the exterior at the top of each external wall, and

d) Have fire-blocking to prevent the spread of flames to upper stories

.3 A building with metal wall cladding must have an air gap between the cladding and the interior wall material.

D5 FLOOR ENERGY PERFORMANCE

.1 The energy performance of the sum of all parts of a floor must:

a) Achieve a minimum total R-value of 2.0 for a suspended floor, or a floor between two habitable storeys as per Table G6.5, or

b) Achieve a minimum total R-value of 1.5 for a ground slab floor as per Table G6.5

Table G6.5 Approximate R-Value of Floor Material

Bamboo (engineered)	0.12- 0.14
Ceramic Tile	0.13 – 0.38
Concrete Slab (150 mm)	0.08 – 0.1
Hardwood Floor	0.71 – 1.25
Laminate Flooring	0.12 - 0.25
Metal rafters (steel or aluminium)	0.01 – 0.05
Plywood / OSB subfloor	0.63
Cellulose insulation (100 mm)	3.1 – 3.7
Double-sarking reflective foil insulation	**1.5 - 2.5**
Fiberglass batt insulation (75 mm)	3.0 – 4.3
Foam board insulation (25 mm)	4.5 - 5.0
Polyurethane spray foam insulation (50 mm)	**6.0 - 7.0**
Vinyl flooring	0.06 - 0.2

Note: The R-value on the Product Sheet / label from the manufacturer of a floor material may differ from the above and it shall override the values in the table. Values in the table apply to the thicknesses shown only and are to be used as a guide.

Any combination of R-values that add up to R-2.0 or greater for a suspended floor or R-1.5 or greater for a ground slab is needed to comply with G6.D5.1. Proof of R-value for each product must be submitted for review.

.2 Any floor with metal components must reduce the potential for thermal bridging (transfer of heat energy) by:

a) Ensuring framing design does not expose metal parts to the floor above or the floor below unless suitably covered and insulated

b) Ensuring insulation is continuous in the subfloor so that heat cannot be transmitted to another floor

c) Ensuring protection from thermal bridging extends from the floor to the walls where metal framing extends from floor to ceiling

.3 Insulation must be protected with a vapour barrier that can prevent moisture build-up and be water-resistant.

Attached Class 10a buildings

.4 A Class 10a building attached to a Class 1 building must

a) Have an external fabric that achieves the required level of thermal performance for a Class 1 building, or

b) Be separated from the Class 1 building with construction having the required level of thermal performance for the Class 1 building

G7 EFFICIENT WATER USE

Performance Requirements

(1) A heated water system must be safe, reliable, energy efficient and user-friendly

(2) Heated water must not cause harm to people, property or the natural environment

(3) A heated water system must be designed and fabricated to prevent corrosion and scaling and maintain a healthy degree of water quality

(4) A heated water supply system must be designed and installed in accordance with Part B2 of NCC Volume Three Plumbing Code of Australia

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Performance requirements of Section G7 are satisfied if:

- **All of the following** Deemed-to-Satisfy provisions are successfully demonstrated
- **Section F4 Water Plumbing** is complied with
- **Section F7 Sustainable Water Use** is complied with
- **Specification G2.2** Installation of Boilers and Pressure Vessels is complied with

D1 EFFICIENT WATER HEATING

.1 A system for the heating, storage or distribution of hot water must obtain its energy from:

a) A grid-supplied energy system, and/or

b) An on-site renewable energy source, and/or

c) Another process as reclaimed energy

.2 A heated water service must obtain water supply from:

a) Reticulated water supply, and/or

b) On-site rainwater harvesting system

.3 All piping for solar water heating must be copper or other suitable metal as per manufacturer's instructions.

.4 Heated water supply must be suitably protected to prevent the possibility of bacteria as per standards in Section F.

.5 A water heater under normal use must be sufficient to heat and supply water between 60°C to 75°C.

Class 1 buildings

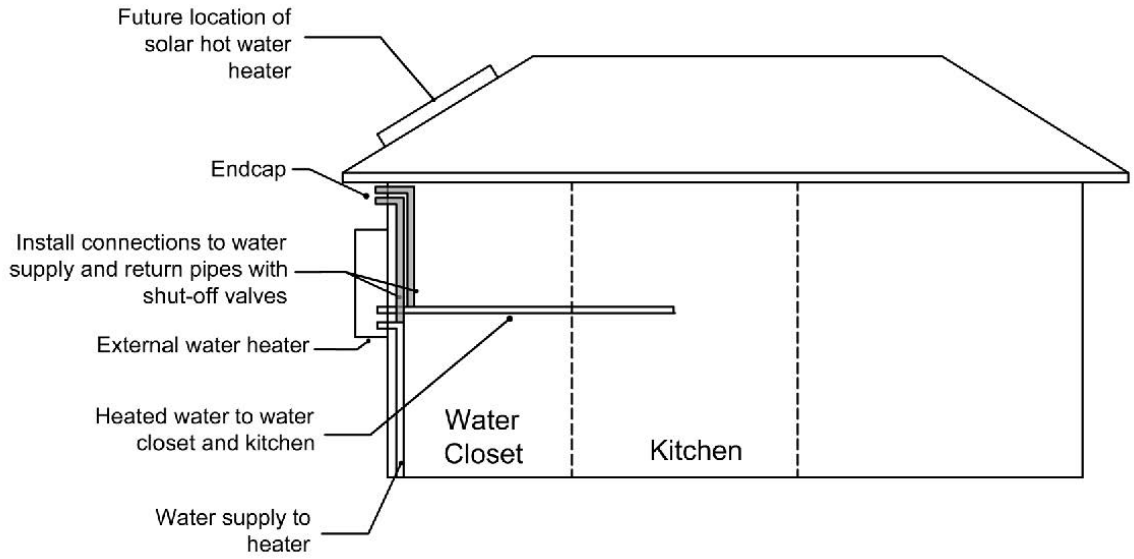
.6 All Class 1 buildings must pre-plumb for solar water heating or install a solar water heating system if hot will be supplied to the building unless site characteristics render the installation and use of a solar hot water heater to be ineffective, unsafe, or uneconomical to install and/or use.

Class 2 to 9 buildings

.7 A portion of the heated water supply must be from a solar water heating system to a degree acceptable to the Government of Fiji relative to the occupancy, size and scale of the building and expected hot water usage. Exceptions include restaurants and food service facilities, hospitals and health care services, laboratories, and other uses that demonstrate health-related needs for electronic or propane heated water with storage capacity.

.8 Piping associated with electric or propane water storage heaters must be insulated with R-0.3, and valves insulated with R-0.2 insulation. Insulation exposed to weather shall be protected by aluminum sheet metal, painted canvas, plastic cover, or cell foam insulation that is painted with water retardant paint

Figure G7.1 Example of Pre-Plumbing for Future Solar Hot Water Supply in a Class 1 Building



D2 INSULATION OF SERVICES

.1 Thermal insulation for central heating water piping and heating and cooling ductwork must:

a) Be protected against the effects of weather and sunlight

b) Be able to withstand the temperatures within the piping or ductwork

c) Use thermal insulation material in accordance with AS/NZS 4859.1 Thermal Insulation Materials for Buildings, Part 1: General Criteria and Technical Provisions

.2 Any electrical components and works associated with renewable energy generation must comply with Section # Electrical and the energy provider requirements, where applicable.

D3 CENTRAL HEATING WATER PIPING

.1 Central heating water piping that is not within a conditioned space must be thermally insulated to achieve a minimum material R-value of 1.5 and/or in accordance with Table G6.4 for the following:

a) Internal piping including:

(i) Flow and return piping that is:

A. Within an unventilated wall space, or

B. Within an internal floor between storeys, or

C. Between ceiling insulation and a ceiling

(ii) Heated water piping encased within a concrete floor slab (except that which is part of a floor heating system)

b) Piping located within a ventilated wall space, an enclosed building subfloor or a roof space, including:

(i) Flow and return piping

(ii) Cold water supply piping within 500 mm of the connection to the central water heating system

(iii) Relief valve piping within 500 mm of the connection to the central water heating system

c) Piping located outside the building or in an unenclosed building subfloor or roof space, including:

(i) Flow and return piping

(ii) Cold water supply piping within 500 mm of the connection to the central water heating system

(iii) Relief valve piping within 500 mm of the connection to the central water heating system

Table G7.1 R-Value of Insulation Used for Smaller Diameter Piping

Insulation	R-Value
9 mm of closed cell polymer	0.4
13 mm of closed cell polymer	0.6
19 mm of closed cell polymer	0.9
25 mm of closed cell polymer	1.3
25 mm of glass wool	1.3

D4 HEATING AND COOLING DUCTWORK

.1 Heating and cooling ductwork and fittings must be sealed against air loss by closing all openings in the surface, joints and seams of ductwork with adhesives, mastics, sealants or gaskets in accordance with AS 4254.1 Ductwork for Air-Handling Systems in Buildings, Part 1: Flexible Duct and AS 4254.2 Ductwork for Air-Handling Systems in Buildings, Part 2: Rigid Duct for a Class C seal.

.2 Duct insulation must:

a) Abut adjoining duct insulation to form a continuous barrier

b) Be installed so that it maintains its position and thickness, other than at flanges and supports

c) Where located outside the building, under a suspended floor, in an attached Class 10a building or in a roof space:

(i) Be protected by an outer sleeve of protective sheeting to prevent the insulation becoming damp

(ii) Have the outer protective sleeve sealed with adhesive tape not less than 48 mm wide creating an airtight and waterproof seal

.3 The requirements of D4.2 above do not apply to heating and cooling ductwork and fittings located within an insulated building envelope including a service riser within the conditioned space, internal floors between storeys and the like.

.4 The material R-value of duct insulation that must be achieved is R-1.5.

D5 ELECTRIC RESISTANCE SPACE HEATING

.1 An electric resistance space heating system that serves more than one room must have:

a) Separate isolating switches for each room

b) A separate temperature controller and time switch for each group of rooms with common heating needs

c) Power loads of not more than 110 W/m^2 for living areas, and 150 W/m^2 for bathrooms

D6 WATER HEATER

.1 A water heater in a heated water supply system must be designed and installed in accordance with:

a) Specification G2.2 Installation of Boilers and Pressure Vessels

b) Part B2 of NCC Volume Three Plumbing Code of Australia

D7 SWIMMING POOL HEATING AND PUMPING

.1 Heating for a swimming pool must be by:

a) Solar heater not boosted by electric resistance heating, or

b) Heater using reclaimed energy, or

c) Gas heater, or

d) Heat pump, or

e) Combination of (i) to (iv)

.2 Where some or all of the heating is by a gas heater or a heat pump, the swimming pool must have:

a) A cover unless located in a conditioned space

b) A time switch to control the operation of the heater

.3 A time switch must be provided to control the operation of a circulation pump for a swimming pool.

.4 For the purposes the above, a swimming pool does not include a spa pool.

D8 SPA POOL HEATING AND PUMPING

.1 Heating for a spa pool that shares a water recirculation system with a swimming pool must be by:

a) Solar heater, or

b) Heater using reclaimed energy, or

c) Gas heater, or

d) Heat pump, or

e) Combination of (i) to (iv)

.2 Where some or all of the heating is by a gas heater or a heat pump, the spa pool must have:

a) A cover

b) Push button and a time switch to control the operation of the heater

c) A time switch to control the operation of the circulation pump for a spa pool with a capacity of 680 L or more

G8 RENEWABLE ENERGY

Performance Requirements

(1) New buildings and additions must be designed and constructed to provide opportunities for use of renewable energy as a source of power for cooling, water heating, and energy supply for appliances, lighting and other such uses requiring electrical power.

(2) Renewable energy systems must be appropriate to:

- a) Function and use of building, facility and/or site
- b) Human comfort, health and safety in the interior environment
- c) Safe operation of storage, handling and fabrication of products and/or hazardous substances
- d) Geographic location, topography, hydrology and natural features
- e) Buildings, facilities, site works and site servicing on adjacent property

(3) At a minimum, new buildings and additions must have renewable energy (energy generated from solar, wind, geothermal, bio-energy, hydroelectric, tides/waves, fuel cells, or other sources acceptable to the Government of Fiji) as a source of power for:

- a) Class 1 buildings, where applicable:
  - (i) Domestic hot water supply
  - (ii) Swimming pool pump, heater and other equipment
  - (iii) Exterior lighting (except at required exits, evacuation routes and fire doors)
- b) Class 2 – 9 buildings - electricity supplied by:
  - (i) Connection to a grid electricity supply that provides energy from a renewable source, where available, or
  - (ii) An on-site renewable energy source providing at least 30% of energy needs, or
  - (iii) Potential to connect to a renewable grid electricity supply or other renewable energy supply by 2031

(4) New buildings and additions in Class 1 to 9 that cannot meet performance requirement (3) above due to financial hardship or site conditions are required to be renewable-ready by providing:

- a) Adequate stability to support a future renewable energy system on the roof
- b) Infrastructure and openings to allow easy installation of future renewable energy systems

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Performance requirements of Section G8 are satisfied if:

- **All of the following** Deemed-to-Satisfy provisions are successfully demonstrated
- **Section G1 Energy Reduction and Section E Electrical** are complied with

D1 RENEWABLE ENERGY INSTALLATION

.1 Design and construction of renewable energy systems must achieve the following standards:

a) Use building materials that are energy efficient, structurally sound, and durable

b) Acceptable wind resistance according to Section B Structure

c) Acceptable fire protection according to Section C Fire Protection

d) Acceptable electrical installation according to Section E Electrical

e) Acceptable mechanical and plumbing equipment and installation according to Section F Health and Amenity

f) Be sited to avoid conflicts with stormwater, natural features (trees, water bodies, etc.) and natural disasters

g) Be attached to building elements (walls, roofs), where appropriate, that can structurally support the additional weight of the renewable energy system

h) Use energy storage mechanisms such as batteries, when applicable, that are sited appropriately and sized sufficiently to meet energy needs of the renewable energy system

i) Use power inverters appropriate to the voltage system in Fiji that are certified for health and safety by a recognised approval agency

.2 All renewable energy systems that connect to Fiji's power supply grid must receive approval from the relevant energy provider prior to issuance of a building permit.

.3 Ground and rooftop mounted renewable energy systems must comply with stability and wind load standards in Section B and be fastened appropriately with one or a combination of:

a) Rammed-posts extending sufficiently deep into an appropriate soil structure

b) Concrete foundation with reinforcement

c) Post-mounted attached to a base with sufficient stability and durability

d) Rafter and clamps with a weathertight seal for rooftop installations according to manufacturer instructions

e) Other supports and fastenings supplied by the manufacturer that are compliant with Section B

Class 3, 5, 7, 8 and 9 buildings

.4 A building and/or site must provide infrastructure for renewable energy vehicles (electric and/or fuel cell cars, scooters, bicycles, and other modes of travel acceptable by the Government of Fiji), including:

a) A designated area for sufficient and convenient installation and storage of the energy source

b) Parking spaces adjacent to the power source

c) Facilities to conveniently re-charge a renewable energy vehicle

.5 A building that cannot meet D1.4 above is required to be renewable-ready by providing:

a) Adequate stability to support a future renewable energy system

b) A designated area for future installation of the energy source that is:

(i) Convenient to the use of the building or site

(ii) Appropriate for easy installation and operation of the future renewable energy source including space for future parking of renewable energy vehicles

c) Infrastructure to allow easy installation of future renewable energy systems

D2 SOLAR AND WIND ENERGY

.1 Buildings and sites may use one or a combination of the following systems of solar and wind power to achieve a required energy reduction target:

a) Roof-mounted solar panels

b) Stand-alone solar panels

c) Solar shingles

d) Thin film solar sheets direct application

e) Solar water heating

f) Solar powered appliances

g) Exterior solar lighting for illumination, signs, traffic signals

h) Solar walkways, roads and road markings

i) Solar heating for pools and spas

j) Solar bench, paving, shade shelters and other site furniture

k) Wind turbines

l) Other solar or wind energy systems and products acceptable to the Government of Fiji

.2 Solar roof-mounted systems must:

a) Be constructed of stainless steel, galvanised steel, aluminium or other sufficient, durable material providing corrosion protection

b) Preferably be sited facing north and at an angle between 18 - 25 degrees from the earth's surface

c) Not protrude higher than:

(i) Residential buildings - 100 mm above the surface of the roof

(ii) All other buildings and facilities:

A. Sloping roof - 200 mm above the surface of the roof

B. Flat roof - 1.0 m above the surface of the roof unless visually screened by building materials and methods acceptable to the Government of Fiji

(iii) A height thatwould render it not to comply with wind load standards in Section B

d) Be installed a minimum of 200 mm from the edge of the plane of the roof

.3 Solar shingles or solar wall cladding installed instead of shingles or cladding must be weathertight.

.4 Batteries that store energy derived from solar and wind collectors must be accessible for easy maintenance but visually screened from view.

.5 Design and construction of wind turbines must incorporate the following safety measures:

a) Have a minimum separation distance of 5.0 m between the ground level and the lowest part of any wind turbine blade

b) Be located a minimum of 5.0 m from any property boundary

c) Be sized appropriate to the building size and occupancy

d) Be protected from high winds and extreme weather conditions through either of the following:

(i) Able to be easily demounted prior to extreme weather events, and/or

(ii) Able to be restrained prior to extreme weather events

e) Use non-reflective materials on blades

f) Be constructed to withstand seismic impacts according to Section B Structure

g) Be able to be removed as soon as reasonably practicable when no longer used for power supply

Class 1 Buildings

.6 Building-mounted wind turbines must:

a) Not protrude more than 3.0 m above the highest part of the roof (excluding the chimney) or exceed an overall height (including building, hub and blade) of 15 m, whichever is the lesser, for any part (including blades)

b) Be located so there is no possibility of harm to people or adjacent property

c) Be located to enhance the architectural quality of the building, facility or site, and/or be located, designed and constructed to reduce its visual impact

D3 GEOTHERMAL ENERGY

.1 Buildings, facilities, and sites using geothermal energy as a power source require approval from appropriate ministries of the Government of Fiji prior to being considered for a building permit.

.2 All buildings and facilities that use a small-scale, closed loop geothermal energy system to generate electricity for heating or cooling must:

a) Be equipped with a thermal pump and appropriate piping, heat exchanger and ductwork

b) Have a ground loop system (horizontal or vertical) filled with a water solution

c) Have appropriate connections to heating and cooling equipment and piping inside the structure

.3 Large-scale geothermal energy systems for office/commercial/industrial/accommodation/institutional and mixed-use structures are to be required to undergo an environmental impact assessment.

.4 Any deep geothermal energy system greater than 200 m in depth must have an environmental impact assessment approved by the Government of Fiji before issuance of a building permit.

D4 BIO ENERGY

.1 Construction and installation of bio-energy as an energy source for heating / cooling a building or facility must comply with the following standards in the FNBC:

a) Section B Structure - for underground, partially-submerged, or above-ground storage tanks

b) Section C Fire Protection - for buildings, minor structures, electrical system

c) Section D Access and Egress – provide for maintenance and monitoring access safety

d) Section E Electrical - electrical safety

e) Section F Health and Amenity - indoor air quality to mitigate rancid odours, sewage and water supply piping

f) Section G Energy Efficiency - thermal performance for structures

g) Section H Hazardous Substances - appropriate storage of bio-energy so that it does not become volatile, and appropriate treatment of waste products from bio-energy production

.2 Storage areas for organic matter (prior to combustion) must:

a) Be weathertight but also have sufficient ventilation to prevent condensation build-up and mould

b) Provide for easy inspection of level of fuel (e.g. hatch, window, webcam)

c) Have the interior be free from electrical sockets, switches, and exposed electrical fittings

d) Be physically separated from the bio-energy generator by:

(i) Minimum 5.0 separation distance, or

(ii) Physical separation such as a solid wall constructed to prevent leakage from spreading between the storage area and the generator

.3 Tanks used for combustion and generation of bio-energy must be:

a) Fabricated and/or constructed of durable, weathertight material

b) Appropriately sealed at all openings

c) Include precautionary measures to ensure gas generated from combustion does not mix with air in dangerous proportions

d) Constructed to reduce potential for negative pressure inside the tank

.4 Tanks that are positioned partially-submerged in the ground or underground must be constructed:

a) On a portion of the site not impacted by a high groundwater level

b) On a portion of the site not prone to flooding unless stormwater management techniques can effectively manage impacts from the 500-year storm, and any openings to digester tanks are sited above the 100-year storm

c) On a compacted subgrade

d) With suitable drainage under the tank consisting of a layer of 25 mm dia. aggregate or the like, and a perforated PVC pipe to convey water to a suitable discharge area

e) With a suitable root barrier to protect the tank from intrusion of roots from nearby vegetation

f) With appropriate structural reinforcement to withstand vibration and movement from seismic activity

g) With both of the following waterproofing agents attached to the entirety of the tank exterior where the tank is made of concrete or other porous material:

(i) Asphalt-based coating, or the like, sprayed onto tank exterior

(ii) Waterproof membrane - bitumen, plastic, metal, PVC or other suitable material

.5 Electrical equipment, including connections from the bio-energy generating system to the reticulated electrical supply must comply with all aspects of Section E Electrical.

.6 Waste from the bio-energy generation process must be treated in an appropriate storage area so that it achieves the proper nutrient balance and chemical composition prior to being applied as fertiliser, transported, or for any other approved use.

.7 Reducing the potential for offensive odour emanating from any part of the bio-energy generation system must be incorporated into the design of buildings, facilities and equipment, including:

a) Appropriate siting of odour-generating equipment relative to prevailing winds and neighbouring occupancies

b) Effective ventilation

c) Use of weathertight openings, where appropriate

d) Ducting to direct offensive odours to specified target areas, where deemed appropriate

.8 Bio-energy pipes must have a flame arrester safety device placed in an appropriate placement (e.g. immediately after the gate valve at the digester) to prevent any flame from traveling down the gas pipe into the gas storage tank or digester and cause an explosion.

.9 Engine room floors must be at or above ground level to avoid the buildup of heavier-than-air gases and be vented at its highest point to allow lighter-than-air gases to escape.

.10 The engine exhaust pipe must extend to release potentially dangerous exhaust gases to outside the structure.

D5 FUEL CELL ENERGY

.1 All fuel cells and energy storage mechanisms such as batteries used to supply energy to buildings, facilities and sites must have certification verifying safety requirements by an accredited agency.

.2 A fuel cell connected to the local utility grid must meet interconnection requirements of an energy supply company as appropriate.

.3 Fuel Cell installation must comply with:

a) **IEEE 1547 Standard for Interconnected Distributed Resources with Electric Power Systems**

b) **IEEE 1547.1 Standard Conformance Test Procedures for Equipment Interconnecting Distributed Resources with Electric Power Systems**

.4 Separation distance for hydrogen storage systems must meet separation distances specified in **NFPA 2 Hydrogen Technologies Code 2011 Edition (13.75 m).**

.5 Fuel cells and energy storage mechanisms such as batteries must be installed in a well-ventilated enclosure that:

a) Allows air-intake at the bottom of the enclosure and air out-take at the highest point

b) Is constructed of fire-resistant materials

c) Uses fans, where additional ventilation is needed

d) Has a concrete base, or equivalent supporting structure

e) Has a mounted stand so that batteries and fuel cells do not sit directly on the base

f) Has access / safety signs for warnings and emergencies according to Section H hazardous Substances

g) Has a disconnection switch or quick-disconnect fuse near the fuel cell and/or batteries so they can be electrically isolated from the rest of the system

D6 WATER BASED AND OTHER ENERGY

.1 Any scale of hydroelectric wave or tidal power system must have an approved Environmental Impact Assessment prior to issuance of a building permit.

.2 Renewable energy sources not listed in the FNBC must be submitted as an alternative solution.

SPECIFICATIONS

G

Energy Efficiency

G2.2 Installation of Boilers and Pressure Vessels

SPECIFICATION G2.2
Installation of boilers and pressure vessels

1. SCOPE

This Specification sets out the requirements for the installation of boilers and pressure vessels in buildings.

2. BOILERS AND PRESSURE VESSELS

.1 Explosion relief

The distance between the vent of any explosion relief device and any adjacent wall, roof, ceiling or other solid construction shall be calculated in accordance with Table 2.1.

Table 2.1 Minimum Clearances for Explosion Relief

Clearance From:	Minimum Clearance (metres)
Adjacent wall or ceiling/roof	0.4(V/3)1/3 or 0.4 m, whichever is the greater
Two walls at right angles; or one wall and a ceiling/roof	0.6(V/3)1/3 or 0.6 m, whichever is the greater
Note to Table 2.1: V is the internal volume of the boiler or pressure vessel being vented up to the connection of the flue.	

.2 Floors and drainage

a) Floor surfaces beneath boilers and pressure vessels shall be water resistant and formed to drain away from supports and structural building elements

b) Where a safe tray is provided to trap liquids, it must be manufactured from a material resistant to corrosion from the contents of the boiler or pressure vessel

.3 Protection from heat

.1 Building elements surrounding a boiler must be protected from any surface heat by refractory material or effective air spaces so that:

a) Steel elements do not exceed a temperature of more than 300°C

b) Concrete elements do not exceed a temperature of more than 200°C

c) Timber elements do not exceed a temperature of more than 150°C.

Section H

Hazardous Substances

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SPECIFICATIONS

No specifications in this section

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OBJECTIVES

(1) Buildings or sites that will be constructed with building materials, equipment or assemblies containing hazardous substances must be constructed to:

a) Safeguard people from injury related to the storage, dispensing, use and handling of hazardous substances and processes

b) Minimise the risk of unwanted releases, fires or explosions of hazardous substances during normal operations and in the event of a catastrophe

(2) Buildings where hazardous substances are stored and hazardous processes undertaken shall be constructed to provide adequate protection for people, property and the environment

The performance requirements and deemed to satisfy provisions in Section H apply to buildings, related equipment and assemblies that contain hazardous substances that may cause harm or damage to humans, property and the environment during and after the construction of a building or site. Procedures for storage, handling, manufacture, disposal and use of hazardous substances post-construction are contained in the Health and Safety at Work (Control of Hazardous Substances) Regulations.

H1 BUILDING SAFETY MEASURES

Performance Requirements

(1) Buildings or sites that will be constructed with building materials, equipment or assemblies containing hazardous substances must be constructed to:

a) Safeguard people and property from the consequences of:

(i) Exposure to the hazardous substance

(ii) Damage resulting from a fire, explosion or the like

b) Protect the natural environment from harmful discharge of the hazardous substance

(2) Buildings where hazardous substances will be used, stored, transported or disposed of must provide safety measures for:

a) Safe storage of hazardous substances

b) Safe operation and maintenance

c) Safe removal of hazardous substances, if applicable

d) Securing the site against unauthorized entry

(3) Equipment and operations involving hazardous substances must be designed, installed, and maintained to ensure they operate as intended.

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Performance requirements of Section H1 are satisfied if:

- **All of the following** Deemed-to-Satisfy provisions are successfully demonstrated appropriate to the energy-saving technique used
- **Section H2** is complied with
- **Part E4** Visibility in an Emergency, Exit Signs and Warnings Systems is complied with

D1 IDENTIFICATION AND CLASSIFICATION

.1 A substance is considered to be hazardous if it is:

a) Defined as hazardous by the Government of Fiji

b) Defined as potentially hazardous by the Government of Fiji based on research and data published by international agencies such as the New Zealand Environmental Protection Agency

.2 A substance that is part of a raw building material that is listed on the Fiji Chemical Inventory or New Zealand Inventory of Chemicals shall be deemed to be non-hazardous as per standards in the Government of Fiji Health and Safety at Work (Control of Hazardous Substances) Regulations.

.3 An acceptable methodology to determine whether a building material, equipment or assembly is considered hazardous and could cause serious harm to humans, property or the environment must include, at a minimum, all of the following:

a) Detailed description of each known harm and potential harm for use of the building material, equipment or assembly

b) Analysis of the likelihood of an injury or harm occurring

c) Estimate how many people are likely to be exposed to the hazard and for how long

d) Risk assessment (low / moderate / high / extreme)

e) Projection of residual risk that could occur once control measures are in place

D2 NOTIFICATION

.1 Landowners and builders who supply building materials and engage in construction must notify the Local Authority prior to application for a building permit if:

a) The building is proposed to be constructed with building material, equipment or assemblies containing a known or potentially hazardous substance

b) Building occupancy will involve the storage, use, fabrication, transportation or disposal of a known or potentially hazardous substance

.2 Procedures for notification shall follow the regulations in the Health and Safety at Work (Control of Hazardous Substances) Regulations administered by the Ministry of Employment, Productivity and Industrial Relations.

.3 The Ministry of Employment, Productivity and Industrial Relations must be satisfied that the proposed building and site development does not pose an undue level of risk from the use of hazardous substances prior to a building permit being issued.

D3 GENERAL BUILDING SAFETY REQUIREMENTS

.1 Buildings or sites that will be constructed with building materials, equipment or assemblies with known hazardous materials, or that are planned for an occupancy involving the storage, handling, manufacture, or disposal of hazardous substances must describe the following protection measures in the building permit application:

a) Methods for notification of the location of hazardous substances

b) A compliant sprinkler system (see Section C - Fire Protection) or other appropriate suppression system

c) Fire-resistant construction for rooms in which the hazardous substances will be used

d) Suitable exhaust systems to dispel potentially harmful air-borne contaminants

e) Methods for storage

f) Methods for spill management

g) Accessible alarm and warning system

h) Methods for safe evacuation

i) Emergency equipment

.2 Where a spill is determined to be a plausible event that would endanger people, environment or property, spill containment systems or means to render a spill harmless to people or property must be part of the design, construction and operation of the building and/or site.

.3 Safeguards must be provided to minimise the risk of exposing combustible hazardous substances to unintended sources of ignition and to limit damage from a fire or explosion.

.4 Safeguards must be provided to minimise the risk of exposing hazardous substances to physical damage that could endanger people or property.

.5 Where a release of a hazardous substance could cause immediate harm to persons or property, means of mitigating the dangerous effects of a release must be incorporated into the building design and installation, such as showers, eye baths, accessible escape routes, etc., appropriate to the nature of the hazardous substance.

D4 HAZARDOUS SUBSTANCE STORAGE

.1 Buildings and sites must provide appropriate storage for hazardous substances, including separating substances with a high potential for danger into separate structures, and fire compartments (in accordance with Section C - Fire Protection).

.2 Appropriate fire-resisting construction (see Schedule 5 Fire Resistance) must be used for storage of hazardous substances as well as provisions for fire prevention, fire spread reduction, protection of openings, fire safety system, smoke control system, and emergency responder operations as per Section C.

.3 Storage building interiors must be treated, coated and constructed of building materials that are non-reactive with any hazardous substance being stored.

.4 Storage rooms or permanent containers for hazardous substances within a building, facility or site must be designed and constructed so that harmful fumes are not released to other parts of the structure by including one, or a combination of, the following techniques:

a) Airtight construction

b) Ventilation with an airtight exhaust system that releases to an approved location

c) Ventilation in a closed system

.5 Storage areas for liquid or solid hazardous substances must provide spill control and secondary containment.

.6 Storage of hazardous substances that are shock-sensitive must be sufficiently padded, suspended or otherwise protected against accidental dislodgement during seismic activity or other disasters.

.7 Adequate separation of incompatible hazardous substances must be accomplished through one or a combination of the following:

a) Segregation of incompatible material by a minimum of 6.0 m (or a longer separation distance where justified by the risk), where such separation will not create a dangerous or harmful situation, and the material does not have a high potential for danger or ignition

b) Isolating incompatible material by a non-combustible partition extending a minimum of 450 mm above and to the side of the stored material

c) Storing liquid and solid materials in hazardous substances storage cabinets designed for that purpose

d) Storing compressed gases in gas cabinets or enclosures, and separating incompatible materials into different cabinets or enclosures with separate exhaust systems

.8 Outdoor storage of hazardous substances must be kept free from vegetation exceeding 1.0 m in height, debris and combustible material for a minimum distance of 4.5 m surrounding the storage area.

.9 Shelving used to store hazardous substances must be structurally adequate to carry the load.

.10 Materials that must be stored at temperatures other than normal ambient temperatures to prevent a hazardous reaction must be provided with an approved means to maintain the temperature in a safe range, and any such safety measure must continue operating upon failure of the primary temperature control system.

.11 Stationary tanks and equipment containing hazardous substances stored in a pressurised state must have some form of construction or other approved means to relieve excessive internal pressure to an approved location.

D5 SPILL CONTROL

.1 Provision for appropriate emergency procedures and prevention of potential disasters must be incorporated into the design of buildings, facilities and sites that meet the requirements of the Disaster Management Office, National Fire Authority, Energy Fiji Limited or other energy provider, and other Government of Fiji stakeholders.

.2 Floors in indoor locations and hard surface material in outdoor locations (where liquid or solid hazardous substances are dispensed or used) must be constructed to contain a spill and/or convey it to a suitable location where it will not cause harm to people, property or the environment by using any, some, or all of following methods appropriate to the properties of the hazardous substances:

a) Liquid-tight, non-combustible, recessed or sloped floors (minimum 1% slope)

b) Provision of liquid-tight, non-combustible raised or recessed sills, dikes or floor drains

c) Sumps and collection systems

d) Other approved engineered systems that are non-combustible with a liquid-tight seal compatible with the stored material

.3 Secondary containment in a storage area for hazardous substances must consist of a drainage system leading to an approved location or other approved engineered system and must separate incompatible materials.

.4 Floor drains in secondary containment systems must be sized to carry the volume of water that would be released from a compliant sprinkler system in case of an emergency or the volume of a 100-year storm event in outdoor storage areas.

D6 USE, DISPENSING, HANDLING AND SAFETY

.1 Buildings that dispense and use hazardous substances in open containers must:

a) Have a mechanical exhaust ventilation system sufficient to capture harmful gases, fumes, mists or vapours at the point of generation

b) Use explosion control measures where an explosion could occur due to the characteristics and usage of the hazardous substances

c) Be located in a fire compartment of appropriate fire-resistance

d) Have a fire safety system appropriate for the use and potential danger

.2 Closed systems that are designed to be opened as part of normal operations must be provided with adequate ventilation that prevents hazardous substances from contaminating the building or outside air.

.3 Outdoor dispensing and use areas for hazardous substances must be located and designed to not endanger contamination of groundwater and surface water and will not have other adverse effects on the natural environment.

.4 All equipment involved in the use, dispensing and handling of hazardous substances, and the detection, alarm and emergency equipment associated with them, must be maintained in a safe and operable condition during the life cycle of the hazardous substance.

D7 HAZARD PREVENTION DURING CONSTRUCTION AND DEMOLITION

.1 Building Permit applications must demonstrate the following best practices during construction and demolition for a building or site that stores, uses or produces a hazardous substance:

a) Protect authorised personnel from injury resulting from falling objects, fire, blasts, tripping, falling or any other risk posed by the construction or demolition operation

b) Prevent the entry of unauthorized personnel on the construction or demolition site

c) Protect property off-site from damage resulting from any activity during construction or demolition

d) Protect the reticulated system (stormwater, water supply, wastewater, electricity) from contamination due to the release of hazardous substances into a drainage ditch, creek, stream, river, pond, lake, ocean, or on the ground, sidewalk, street, highway or into the atmosphere unless:

(i) The release or emission of hazardous substances is allowed in compliance with other laws, regulations or policies of the Government of Fiji

(ii) The use of hazardous substances is permitted and appropriate precautions have been incorporated into the building architecture

.2 Safety procedures during construction or demolition must limit the accumulation of combustible materials on site and safeguard equipment and operations from ignition sources.

.3 The structure and site under construction must be protected from damage due to wind, rain or other natural disasters likely to occur during construction.

.4 Exposure to hazardous substances that are known as health hazards must be limited to levels acceptable to the Government of Fiji.

.5 Recommendations from an Environmental Assessment administered by the Ministry of the Environment must be incorporated into the building permit drawings.

D8 FUEL SUPPLY, TANKS AND CYLINDERS

.1 All fuel supply systems, appliances, and related accessories must comply with the International Fuel Gas Code 2012, as amended.

.2 Fuel supply, tanks and cylinders must be constructed, operated, maintained and disposed of to prevent harm to people and the environment by:

a) Being placed in a location on site not prone to natural disasters, flooding, or near a source of fire

b) Being equipped with devices that prevent spills and overfills, and graded so that if a spill occurs it will be properly contained and not become a hazard to the site, people or the environment

.3 Use and handling of fuel gas cylinders and fuel storage tanks must comply with:

a) Guidelines for Gas Cylinder Safety AU435_82369, as amended

b) Contamination control guidelines published by the Ministry of the Environment

.4 Fuel gas cylinders must bear certification markings acceptable to the Government of Fiji verifying safety and quality.

.5 Fuel storage tanks and fuel gas cylinders must be placed so that they cannot become part of an electrical circuit, earthing system or equipotential bonding system in a building or facility.

Residential Buildings in Class 1, 2 and 3

.6 Storage of fuel gas cylinders on a residential site, or within a unit of a residential building, or within a building deemed appropriate by the Government of Fiji, must:

a) Be within a well-ventilated interior room with fire-resisting construction or exterior space

b) Be sufficiently removed from sources of ignition, except where the fuel gas cylinder is part of an appliance in a domestic kitchen

c) Be in a waterproof location

d) Be located at least 5 m away from stairways, elevators, ramps and any part of an evacuation route

Class 2 – 9 Buildings

.7 Fuel supply (source and piping) must have the following safety measures:

a) Be airtight

b) Be constructed to operate at a safe pressure appropriate to the use

c) Have isolation devices that separate the end-use and piping systems from the source

d) Be equipped with access for maintenance, texting, leak detection and repair

e) Have safety controls that prevent the operation of the fuel source in the event of failure of ventilation and natural draft systems, except for the following:

(i) Portable fuel gas cylinders not connected to a fixed fuel supply system

(ii) Farm appliances and equipment such as brooders, dehydrators, dryers and irrigation equipment

(iii) Industrial gas applications using acetylene and acetylenic compounds, hydrogen, ammonia, carbon monoxide, oxygen and nitrogen

(iv) LP-gas equipment for vaporization, gas mixing and gas manufacturing

(v) Temporary LP-gas piping for buildings under construction or renovation that is not to become part of the permanent piping system

(vi) Installation of hydrogen gas, LP-gas and compressed natural gas (CNG) systems on vehicles

(vii) Portable fuel cell appliances that do not connect to a fixed piping system nor to a power grid

.8 When a naked flame is in the vicinity of an exposed gas pipe, a minimum separation distance of 600 mm must be maintained from the gas pipe to the flame, or a suitable distance appropriate to the hazardous substance.

.9 Storage of fuel gas cylinders on a non-residential site must:

a) Be inside a secure enclosure located outside the building

b) Comply with the ventilation requirements of **AS/NZS 1596 The Storage and Handling of LP Gas**

c) Comply with structural standards in Section B of this document to support the use

.10 An enclosure for fuel gas cylinders must:

a) Be located 3 m or more from any window, door, vent or other openings in a building

b) Have a concrete base and surrounding land that provides positive drainage (2% slope) away from the enclosure so that water does not accumulate

c) Be constructed from heavy-gauge chain-wire mesh or other suitable non-combustible material

d) Be at least 1.8 m high

e) Be sufficiently ventilated according to **AS/NZS 1596 The Storage and Handling of LP Gas**

f) Have a hinged, heavy-gauge chain-wire door that is secure against unauthorised entry and is non-combustible

g) Have its roof at least 600 mm above the uppermost fitting on any fuel gas cylinder

h) Ensure fuel gas cylinders are contained in a compartment separated by fire-resisting construction from other pressurised cylinders such as oxygen tanks

i) Comply with Section B1 Siteworks of this document regarding stability, stormwater management and slope stability

.11 An incinerator installed in a building must have an opening providing access to a charging chute that is:

a) Non-combustible

b) Airtight when closed

c) Designed to return to the closed position after use

d) Not attached to a chute that connects directly to a flute unless the hopper is located in the open air

e) Not located in an evacuation route or required exit

.12 A room containing an incinerator must be separated from other rooms in the building in a fire compartment and constructed with fire-resistant walls, ceilings and floors.

H2 DISASTER WARNING SYSTEM

Performance Requirements

(1) Buildings or sites that will be constructed with building materials, equipment or assemblies containing hazardous substances must contain:

a) A suitable emergency plan and warning system to warn people of all abilities of a disaster resulting from the use, fabrication, storage or transport of hazardous substances

b) Provide for safe evacuation of the building and/or site

(2) Procedures in the Health and Safety at Work (Control of Hazardous Substances) Regulation administered by the Ministry of Health must be followed for all buildings or sites that are intended to use, store, fabricate, transport or dispose of hazardous substances with regard to:

a) Hazard identification and risk assessment

b) Preparation of a Material Safety Data Sheet

c) Hazard Communication System

d) Registration and notification of hazardous substances

e) Any other required procedure

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Performance requirements of Section H2 are satisfied if:

- **All of the following** Deemed-to-Satisfy provisions are successfully demonstrated appropriate to the energy-saving technique used
- **Section H1** is complied with
- **Part E4** is complied with
- **Specification D3.6 and E4.8** are complied with

D1 WARNING SYSTEM

.1 A warning system must consist of a combination of visual, auditory and sensory components to accommodate:

a) Employees, business owners and other regular occupants

b) Visitors

c) People with disabilities

.2 A warning system must be planned, installed, maintained, tested and operated for the lifecycle of the building and use of the site appropriate to the nature of the hazardous substances and their use.

.3 A warning system for hazardous substances must be coordinated, designed, installed and operated along with the fire safety system, smoke control system, and emergency responder operations in Section C Fire Protection where it is advantageous to do so and in the best interest of safety for people and property.

D2 INFORMATION SIGNS AND MESSAGING

.1 Signs must be provided in and about buildings to identify:

a) Accessible evacuation routes leading to an accessible place of safety

b) Location of emergency-related safety equipment and features

.2 Potential hazard signs must be placed and messaging systems installed so that people encounter the signs / messaging before encountering the potential hazard.

.3 Information and warning signs for hazardous substances must be accessible to people of all abilities with regard to:

a) Being easy to read and understood from a minimum distance of 10 m

b) Having lettering large enough to be easily read from a distance of 3.5 m

c) Having wording in Fijian and English, or suitable pictograms

d) Providing auditory and sensory messaging

e) Comply with Section D - Access

.4 Warning signs must be appropriately sized and configured based on the usage, occupancy and layout of the building and/or site.

.5 The number, location, size, colour and content of signs and labels on hazardous substances, fire suppression or emergency equipment must be to the satisfaction of the National Fire Authority, Disaster Management Office and Ministry of Health, but in general will be placed at suitable entrances to the building and/or site, and at the access to rooms or outdoor areas containing hazardous substances.

.6 Physical and health-hazard properties of hazardous substances, dangers, volatility, safety and accident prevention procedures must be made known to occupants, employees, surrounding neighbours and emergency responders.

Section I

Auxillary Buildings

Overview

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SPECIFICATIONS

No specifications in this section

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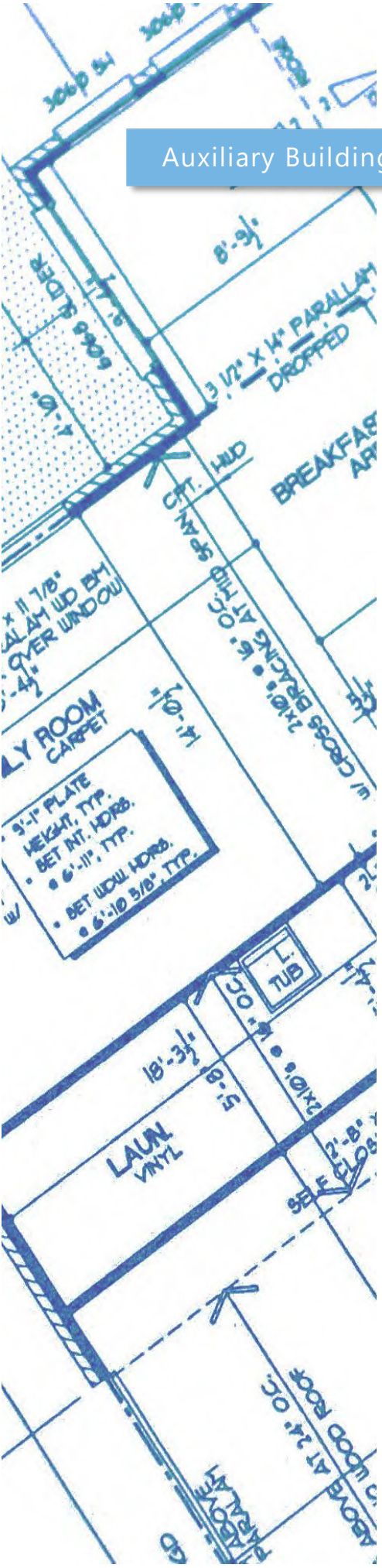

Auxiliary Buildings

OBJECTIVES

(1) Built form that is ancillary to a building or site (Class 10) must:

a) Safeguard people from injury related to access, use, operations and maintenance

b) Minimise the risk of harm to the property and the natural environment

(2) Built form that is ancillary to a building or site (Class 10) must be suitable to the occupancy, capacity and usage

I-1 MINOR STRUCTURES AND COMPONENTS

Performance Requirements

(1) Safety measures must be incorporated into the design of minor structures and components (Class 10) regarding:

a) Structural integrity (see Section B)

b) Fire protection (see Section C)

c) Safe access for people of all abilities (see Section D)

d) Electrical (see Section E)

e) Health and Amenity (see Section F)

f) Energy Efficiency (see Section G)

g) Hazardous substances (see Section H)

(2) Minor Structures and components must be designed and constructed to protect people, property and the environment with regard to:

a) Swimming pools and outdoor place spaces in early childhood centres – provide for safe access and restrictions to unsolicited use, and prevent injury to a person

b) Cool rooms and Vaults – safe access, adequate lighting and warning system

c) Animal houses – health and enjoyment of property must be protected for the occupant and adjacent neighbours

d) Projections that safeguard occupants

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Performance requirements of Section I-1 are satisfied if:

- **All of the following** Deemed-to-Satisfy provisions are successfully demonstrated
- **Specification D3.10** is complied with

D1 SWIMMING POOLS

All Buildings

.1 Swimming pools must be designed to:

a) Safeguard people from drowning or injury resulting from unsupervised access to a swimming pool

b) Safeguard people from injury due to suction by a swimming pool water recirculation system

c) Safeguard people from illness or injury caused by fire and/or overheating from a swimming pool heater

.2 A swimming pool with a depth of water more than 300 mm must have suitable barriers or safety fencing in accordance with AS 2818 Guide to Swimming Pool Safety and AS 1926 Swimming Pool Safety to restrict unsupervised access.

.3 A barrier or fence must be provided:

a) To the allotment or the immediate pool surrounds if there is only one Class 1 building on the allotment

b) To the immediate pool surrounds if the swimming pool is associated with buildings other than Class 10 buildings on the same allotment

.4 A swimming pool must have suitable means of drainage.

Class 2 – 9 Buildings

.5 Swimming pools must have means for the disposal of waste and drainage.

.6 Heating for a swimming pool, where provided, must be by way of:

a) A solar heater, or

b) A heater using reclaimed heat from another process such as reject heat from a refrigeration plant, or

c) A bio or geothermal heater, or

d) A gas heater that:

(i) If rated to consume 500 MJ/hour or less, achieves a minimum gross thermal efficiency of 86%, or

(ii) If rated to consume more than 500 MJ/hour, achieves a minimum gross thermal efficiency of 90%, or

e) A heat pump, or

f) A combination of the above

.7 Where some or all of the heating required for a swimming pool is by a gas heater, solar heating or a heat pump, the swimming pool must have:

a) A removable cover with a minimum R-Value of 0.05

b) A time switch to control the operation of the heater

.8 Where required, a time switch must be capable of switching electric power on and off at variable pre-programmed times and on variable pre-programmed days to reduce energy consumption.

.9 Pipework carrying heated or chilled water for a swimming pool must comply with the insulation requirements of Section G.

D2 SPA POOL

.1 Heating for a spa pool that shares a water recirculation system with a swimming pool must be by way of:

a) A solar heater, or

b) A heater using reclaimed heat from another process such as reject heat from a refrigeration plant, or

c) A bio or geothermal heater, or

d) A gas heater that:

(i) If rated to consume 500 MJ/hour or less, achieves a minimum gross thermal efficiency of 86%, or

(ii) If rated to consume more than 500 MJ/hour, achieves a minimum gross thermal efficiency of 90%, or

e) A heat pump, or

f) A combination of the above

.2 Where some or all of the heating required by a spa pool is by a gas heater, solar heater or a heat pump, the spa pool must have:

a) A cover with a minimum R-Value of 0.05

b) A push button and a time switch to control the operation of the heater

.3 A time switch must be provided to control the operation of a circulation pump for a spa pool having a capacity of 680 L or more.

.4 Where required, a time switch must be capable of switching electric power on and off at variable pre-programmed times and on variable pre-programmed days.

.5 Pipework carrying heated or chilled water for a spa pool must comply with the insulation requirements of Section G.

D3 COOL ROOMS AND VAULTS

.1 A refrigerator or cooling chamber or vault which is of sufficient size for a person to enter must have:

a) A door which is capable of being opened by hand from inside without a key

b) Internal lighting controlled by a switch which is located adjacent to the entrance doorway inside the chamber, strongroom or vault

c) An indicator lamp positioned outside the chamber or vault which is illuminated when the interior lights are switched on

d) An alarm that is:

(i) Located outside but controllable only from within the chamber or vault

(ii) Able to achieve a sound pressure level outside the chamber or vault of 90 dB(A) when measured 3 m from the sounding device

.2 A door in a refrigerated or cooling chamber must have a doorway with a clear width of not less than 600 mm and a clear height of not less than 1.5 m. If deemed to be an accessible door, it must have a minimum width of 965 mm.

.3 A strong room or vault in a building must have:

a) Internal lighting controllable only from within the room

b) A pilot light located outside the room but controllable only by the switch for the internal lighting

c) A suitable alarm device located outside but controllable from within the chamber or vault

D4 OUTDOOR PLAY SPACES

.1 Any outdoor play space in a Class 9b early childhood centre must be enclosed on all sides with a barrier that complies with **AS 1926.1 Swimming Pool Safety, Part 1: Safety Barriers for Swimming Pools**.

.2 if there is a swimming pool located adjacent to the outdoor play space, the barrier must restrict children from exiting the outdoor place space and entering the swimming pool without supervision.

.3 The requirements of D4.1 above do not apply to a wall, including doors and windows, which form part of the Class 9b early childhood centre.

D5 PROJECTIONS

.1 To the degree necessary to avoid creating hazardous conditions that may cause injury to people passing below or driving past, an attachment to a building must incorporate features that will:

a) Protect it against corrosion

b) Collect and discharge water run-off safely

c) Prevent its projection from affecting adjacent road safety conditions or pedestrian traffic

d) Provide resistance to the spread of fire if it overhangs a street boundary

.2 Where a flat roof or other elevated place has regular access by humans, a parapet or balustrade of not less than 1.0 m height above the surface of the roof or elevated place must be provided and

comply with fall protection provisions of Section D. The width of any opening in the parapet or balustrade must not exceed 100 mm.

.3 Buildings must not project beyond the allotment boundary.

.4 Architectural features such as eaves, cornices, clocks, lamps, ventilating equipment, trade signs, hoardings, flag poles, bay or oriel windows and the like, as well as platform or balcony to provide additional means of egress from an existing building, may, however, project over public footpaths or roads with the following minimum clearances:

a) 3300 mm above the existing or intended finished level of footpaths

b) Outer extremity of the feature must be setback 300 mm from an existing or intended path

.5 Any drainage from such architectural features (including drainage from air conditioning and other ventilating equipment) must be suitably discharged to a drain with a downpipe that satisfies the required clearances in the above section.

D6 MOVABLE AWNINGS AND FENCES

.1 Any movable awnings or sunshades must be firmly fixed so that they do not create a dangerous obstruction or inconvenience to pedestrians.

.2 Movable awnings or sunshades must be installed with the following minimum clearances if they project over public places:

a) 2300 mm above the finished levels of the footpath

b) Their outer extremity must be set back 200 mm from the kerb or footpath

.3 Any fencing or free-standing wall must be suited to the occupancy of the building within.

.4 Fencing or a free-standing wall must not detract from the general appearance of the surroundings.

.5 If any barbed wire or other such fencing is used, it must be at a height of not less than 2.0 m above the finished level of any existing path of travel.

D7 ANIMAL HOUSES

.1 A building used for keeping domestic birds or animals must not be located less than:

a) 12 m from any Class 1 building

b) 10 m from any boundary

c) 20 m from the boundary adjoining an allotment containing or intended to contain any building other than a Class 1 building

.2 The floor of the building must be constructed of suitable material for safety, health and occupancy.

.3 Size and arrangements in the building must be conducive to the welfare of poultry or animals.

D8 OUTDOOR KITCHEN

.1 An outdoor kitchen must have a non-slip surface.

.2 An outdoor kitchen that could potentially be exposed to rainwater must have electrical sockets and switches protected according to standards in Section E2 D8 Wet Areas and Swimming Pools.

.3 An outdoor kitchen must be well-ventilated such that smoke is directed away from the interior by ductwork.

.4 Fire safety provisions in Section C Fire Protection must be followed.

I-2 ATRIUM CONSTRUCTION

Performance Requirements

(1) Safety measures must be incorporated into the design of an atrium regarding:

a) Structural integrity (see Section B)

b) Fire protection (see Section C)

c) Safe access for people of all abilities (see Section D)

d) Electrical (see Section E)

e) Health and Amenity (see Section F)

f) Energy Efficiency (see Section G)

g) Hazardous substances (see Section H)

(2) Health, comfort level, and sustainability in an atrium must be achieved by:

a) Ensuring the design aligns with its intended purpose

b) Appropriate ventilation to promote air flow and passive cooling

c) Appropriate lighting that fosters energy efficiency

(3) An atrium must be accessible to people with disabilities where appropriate to the occupancy

(4) Atriums must be designed to safeguard:

a) Occupants from overheating

b) Conserve energy as much as possible

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Performance requirements of Section I-2 are satisfied if:

- **All of the following** Deemed-to-Satisfy provisions are successfully demonstrated
- **Specification G3.8** is complied with

D1 ATRIUMS

.1 This Part (Section D1) does not apply to an atrium which:

a) Connects only 2 storeys, or

b) Connects only 3 storeys if:

(i) Each storey is provided with a sprinkler system (other than an FPAA101D Automatic Fire Sprinkler System Design and Installation - Drinking Water System or an FPAA101H Automatic Fire Sprinkler System Design and Installation – Hydrant Water Supply System)

(ii) One of those storeys is situated at a level at which there is direct egress to a road or open space

.2 An atrium well must have a width throughout the well that is able to contain a cylinder having a horizontal diameter of not less than 6 m.

.3 An atrium must be separated from the remainder of the building at each storey by bounding walls set back not more than 3.5 m from the perimeter of the atrium well except in the case of the walls at no more than 3 consecutive storeys if:

a) One of those storeys is at a level at which direct egress to a road or open space is provided

b) The sum of the floor areas of those storeys that are contained within the atrium is not more than the maximum area that is permitted in the maximum size of fire compartments in Section C.

.4 Bounding walls must:

a) Have an FRL of not less than 60/60/60

b) Extend from the floor of the storey to the underside of the floor next above or to the underside of the roof

c) Have any door openings protected with self-closing or automatic –/60/30 fire doors, or

d) Be constructed of fixed toughened safety glass, or wired safety glass in non-combustible frames, with:

(i) Any door openings fitted with a self-closing smoke door

(ii) The walls and doors protected with wall-wetting systems in accordance

(iii) A fire barrier with an FRL of not less than –/60/30 installed in any ceiling spaces above the wall

.5 If a bounding wall separating an atrium from the remainder of the building is set back from the perimeter of the atrium well, a barrier that is imperforate and non-combustible, and not less than 1 m high must be provided.

.6 In an atrium:

a) The roof must have the FRL prescribed in Table 3 of Specification C1.1, or

b) The roof structure and membrane must be protected by a sprinkler system (other than an **FPAA101D Automatic Fire Sprinkler System Design and Installation - Drinking Water System** or an **FPAA101H Automatic Fire Sprinkler System Design and Installation. – Hydrant Water Supply System**) complying with Specification E1.5 Fire Sprinkler Systems

.7 All areas within an atrium must have access to at least 2 exits.

.8 Sprinkler systems, smoke control, fire detection and alarm systems, and emergency warning and intercom systems must be installed in compliance with Specification G3.8 Fire and Smoke Control Systems in Buildings Containing Atriums.

Section J

Specialty Buildings

OVERVIEW

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SPECIFICATIONS

No specifications in this section

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OBJECTIVES

(1) All buildings subject to Section J must:

a) Safeguard people from injury related to access, use, operations, and maintenance

b) Minimise the risk of harm to the property and the natural environment

J1 THEATRES, STAGES, AND PUBLIC HALLS

Performance Requirements

(1) Safety measures must be incorporated into the design of specialty buildings subject to Section J regarding:

a) Structural integrity (see Section B)

b) Fire protection (see Section C)

c) Safe access for people of all abilities (see Section D)

d) Electrical (see Section E)

e) Health and Amenity (see Section F)

f) Energy Efficiency (see Section G)

g) Hazardous substances (see Section H)

(2) Fire safety, access, health and sustainability of theatres, stages, public halls, farm buildings, and any other building subject to Section J must be appropriate to the use of the building and occupancy.

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Performance requirements of Section J1 are satisfied if:

- **All of the following** Deemed-to-Satisfy provisions are successfully demonstrated
- **Section B to H** are complied with
- **Specification C1.1, C1.8, C1.10, C1.11, C1.13, C1.13a, C3.4, C3.15, D1.12, D3.6, E1.5, E2.2a, E2.2b, E2.4, E3.1, E4.8, F2.9, F5.2, F5.5 and G3.8** are complied with
- **Schedule 5** Fire Resistance must be complied with
- **Part 3.10.6 and Part E4** are complied with

D1 SEPARATION AND SMOKE CONTROL

.1 The design of smoke control systems for theatres and public halls must fulfil up-to-date fire engineering principles and practices.

.2 A theatre, public hall or the like must:

a) Have a smoke control system in accordance with AS 1668.1 The Use of Ventilation and Air Conditioning in Buildings, Part 1: Fire and Smoke Control in Buildings where relevant, or

b) Have the stage, backstage area and accessible under-stage area, separated from audiences by a proscenium wall and have a mechanical exhaust system

D2 SAFETY MEASURES

.1 In a seating area in a Class 9b building or part of a building:

a) The slope of the floor surface must not exceed 1:8, or the floor must be stepped so that:

(i) The pitch does not exceed 300 mm

(ii) It has a riser height of not more than 300 mm

(iii) The height of any other opening in the rise is not more than 100 mm

.2 If an aisle divides the stepped floor, and the difference in level between any 2 consecutive steps:

a) Exceeds 230 mm but not 400 mm – an intermediate step must be provided in the aisle

b) Exceeds 400 mm – 2 mm equally spaced steps must be provided in the aisle

.3 The going of intermediate steps must be not less than 270 mm to provide as nearly as practicable squall treads throughout the length of the aisle.

.4 The clearance between rows of fixed seats used for viewing performing arts, sports or recreational activities must be not less than:

a) 300 mm if the distance to an aisle is not more than 3.5 m, or

b) 500 mm if the distance to an aisle is more than 3.5 m

.5 The path of travel to an exit from a stage or performing area must not pass through a proscenium wall if the stage area is separated from the audience area with a proscenium wall.

.6 Required exits from backstage and under-stage areas must be independent of those provided for the audience area.

.7 A stairway that provides access to a service platform, rigging lot, or the like, must comply with **AS 1657 Fixed Platforms, Walkways, Stairways and Ladders - Design, Construction and Installation**.

J2 FARM BUILDINGS AND FARM SHEDS

Performance Requirements

(1) Farm buildings and farm sheds must be constructed to safeguard people, property, livestock and the environment from harm.

(3) Safety measures must be incorporated into the design of specialty buildings subject to Section J regarding:

a) Structural integrity (see Section B)

b) Fire protection (see Section C)

c) Safe access for people of all abilities (see Section D)

d) Electrical (see Section E)

e) Health and Amenity (see Section F)

f) Energy Efficiency (see Section G)

g) Hazardous substances (see Section H)

DTS (DEEMED-TO-SATISFY PROVISIONS) VERIFICATION

Performance requirements of Section J2 are satisfied if:

- **All of the following** Deemed-to-Satisfy provisions are successfully demonstrated
- **Section B to H** are complied with
- **Specification C1.1, C1.10, C1.8, C1.11, C1.13, C1.13a, C3.15, D1.12, E1.5, E2.2a, E2.2b, E2.4, F5.5A and F7.2** are complied with

Schedule 5 Fire Resistance is complied with

D1 SITING

.1 An open space adjacent to a farm building or a farm shed need not be directly connected with a public road.

D2 ENTRANCES AND EXITS

.1 The threshold of a doorway that serves an area not required to be accessible in a farm building need not comply with Section D where the door sill is not more than 700 mm above the finished surface of the ground or floor or the like, to which the doorway opens.

.2 A swinging door in a required exit or forming part of a required exit need not swing in the direction of egress if it serves a farm building.

D3 STAIRWAYS, LADDERS AND RAMPS

.1 A fixed platform, stairway, ladder and any going and riser, landing, handrail or barrier may comply with AS 1657 Fixed Platforms, Walkways, Stairways and Ladders - Design, Construction and Installation in lieu of standards in Section D Access where it serves a farm building or a farm shed.

D4 FIRE FIGHTING EQUIPMENT

.1 A farm building with a total floor area greater than 500 m^2 located where a fire brigade station is not more than 50 km from the building as measured along roads and equipped with equipment capable of utilising a fire hydrant, must be:

a) Provided with a fire hydrant system stalled in accordance with **AS 2419.1 Fire Hydrant Installations, Part 1: System Design, Installation and Commissioning,** except a reference to '4 hours' water supply in clause 4.2 is replaced with '2 hours', or

b) Located on the same allotment as an access point to a water supply which:

(i) Has a minimum total capacity of 144,000 litres

(ii) Is situated so as to enable emergency services vehicles access to within 4 m

(iii) Is located within 60 m of the building and not more than 90 m from any part of the building

.2 Water supply for a farm building must consist of one or a combination of the following:

a) A water storage tank

b) A dam

c) A reservoir

d) A river

e) A lake

f) A bore

g) A sea

.3 If the whole or part of the water supply is contained in a water storage tank, it must be:

a) Located not less than 10 m from the building

b) Fitted with at least one small-bore suction connection and one large-bore suction connection where:

(i) Each suction connection is located in a position so as to enable emergency service vehicles access to within 4 m

(ii) The suction connections are located not less than 10 m from the building

(iii) Small bore suction connection' and 'large bore suction connection' have the meanings contained in **AS 2419.1 Fire Hydrant Installations, Part 1: System Design, Installation and Commissioning**

.4 A fire hose reel system need not be provided to serve a farm building where portable fire extinguishers are installed in accordance with Section C Fire Protection.

.5 A farm building not provided with a fire hose reel system must be provided with:

a) One portable fire extinguisher rated at not less than 5ABE in each room containing flammable materials or electrical equipment

b) One portable fire extinguisher rated at not less than 4A60BE adjacent to every required exit door

c) Location signs complying with clauses 3.3 to 3.9 of **AS 2444 Portable Fire Extinguishers and Fire Blankets - Selection and Location** above each required portable fire extinguisher

a) A farm shed must be provided with not less than one portable fire extinguisher for every 500 m^2 of floor area or part thereof, distributed as evenly as practicable throughout the building

.6 A portable fire extinguisher must be:

a) Of ABE type

b) Not less than 4.5 kg in size

c) Installed in accordance with Section 3 of **AS 2444 Portable Fire Extinguishers and Fire Blankets - Selection and Location**

D5 EMERGENCY AND ARTIFICIAL LIGHTING

.1 An emergency lighting system need not be installed in a farm building:

a) With no artificial lighting, or

b) With artificial lighting where, if that lighting fails due to an emergency, an automatic power supply to the building is provided by a fuel-driven generator

.2 An emergency lighting system need not be installed in a farm shed.

.3 An artificial lighting system need not be provided in a farm building where:

a) Occupants are provided with visibility sufficient for safe movement through suitable alternative means

a) The use of artificial lighting could adversely affect the function of the building including, but not limited to:

(i) The behaviour or welfare of animals being kept in the building, or

(ii) The cultivating or propagating of plants or fungi

D6 EXITS

.1 In a farm building or a farm shed, if an exit is not readily apparent to persons occupying or visiting the building, exit signs must be installed in appropriate positions in corridors, hallways, lobbies, and the like, indicating the direction to a required exit and place of safety.

.2 An exit serving a farm shed need not be provided with an exit sign where the exit is a permanent opening not less than 2 m wide and at minimum of 2.2 m in height.

.3 In a farm building, each required exit sign need not comply with D5.1 above if:

a) The use of illuminated exit signs may adversely impact the behaviour or welfare of animals being kept in the building

b) Non-illuminated exit signs are installed in accordance with the requirements of Appendix D of **AS/NZS 2293.1 Emergency Lighting and Exit Signs for Buildings System Design, Installation and Operation** for an externally illuminated exit sign, and clauses 5.6 and 5.8 of **AS/NZS 2293.1 Emergency Lighting and Exit Signs for Buildings System Design, Installation and Operation**

.4 In a farm shed, each required exit sign provided need not comply with D5.1 if:

a) Non-illuminated exit signs are installed in accordance with the requirements of Appendix D of **AS/NZS 2293.1 Emergency Lighting and Exit Signs for Buildings System Design, Installation and Operation** for an externally illuminated exit sign, and clauses 5.6 and 5.8 of **AS/NZS 2293.1 Emergency Lighting and Exit Signs for Buildings System Design, Installation and Operation**

b) The maximum viewing distance in Clause 5.6 of **AS/NZS 2293.1 Emergency Lighting and Exit Signs for Buildings System Design, Installation and Operation** is not more than 24 m

D7 HEIGHT OF ROOMS AND OTHER SPACES

.1 Section F3 Room Dimensions does not apply to a farm shed which has a ceiling height not less than:

a) 2.1 m in a room, corridor, passageway or the like

b) In a room or space with a sloping ceiling or projections — a height of not less than 2.1 m for at least two-thirds of the floor area of the room or space, and when calculating the floor area of the room or space, any part that has a ceiling height of less than 1.5 m is not included

c) In a stairway, ramp, landing or the like — 2.0 m measured vertically above the nosing line of stairway treads or the floor surface of the ramp, landing or the like

APPENDIX A

Standards Referenced in the FNBC

Appendix A – Standards Referenced

FIJI STANDARDS

FS 1170.1 Structural Design Actions, Part 1: Wind Load as Fijian Standards
FS 1170.2 Structural Design Actions, Part 2: Wind Actions as Fijian Standards
FS 4055 Wind Loads on Housing

INTERNATIONAL STANDARDS

Air-Conditioning, Heating, and Refrigeration Institute

AHRI 551/591 Performance Rating of Water-Chilling and Heat Pump Water-Heating Packages Using the Vapor Compression Cycle

NCC Australian Building Code Standards

AS 1170 Structural Design Actions
- AS 1170.1 Part 1: Permanent, Imposed and Other Actions
- AS 1170.2 Part 2: Wind Actions
- AS 1170.4 Part 4: Earthquake Actions in Australia

AS 1191 Acoustics –Method for Laboratory Measurement of Airborne Sound Insulation of Building Elements.
AS 1273 Unplasticised PVC (uPVC) Down Pipe and Fittings for Rainwater
AS 1288 Glass in Buildings: Selection and Installation
AS 1349 Bourdon Tube Pressure and Vacuum Gauges
AS 1428 Design for Access and Mobility
- AS 1428.1 Part 1: General Requirements for Access - New Building Work
- AS 1428.4 Part 4: Tactile Ground Surface Indicators

AS 1530.1 Methods for fire tests on building materials, components and structures, Part 1: Combustibility Tests for Materials
AS 1530.2 Methods for fire tests on building materials, components and structures, Part 2: Test for Flammability of Materials
AS 1530.3 Methods for Fire Tests on Building Materials, Components and Structures, Part 3: Simultaneous Determination of Ignitability, Flame Propagation, Heat Release and Smoke Release
AS 1530.4 Methods for Fire Tests on Building Materials, Components and Structures. Part: 4 Fire Resistance Tests for Elements of Construction
AS 1562 Design and Installation of Sheet Roof and Wall Cladding
- AS 1562.1 Part 1: Metal

AS 1627.1 Metal finishing — Preparation and Pretreatment of Surfaces, Part 1: Removal of Oil, Grease and Related Contamination
AS 1627.4 Metal finishing — Preparation and Pretreatment of Surfaces, Part 4: Abrasive Blast Cleaning of Steel
AS 1627.5 Metal Finishing - Preparation and Pretreatment of Surfaces, Part 5: Pickling
AS 1657 Fixed Platforms, Walkways, Stairways and Ladders - Design, Construction and Installation
AS 1668 The Use of Air Conditioning and Ventilation in Buildings
- AS 1668.1 Part 1: Fire and Smoke Control in Buildings
- AS 1668.2 Part 2: Mechanical ventilation in buildings

AS 1669 Transmission Belting - Frictioned Surface
AS 1670 Automatic Fire Detection and Alarm Systems
- AS 1670.1 Part 1: Fire Detection, Warning, Control and Intercom Systems - System Design, Installation and Commissioning Fire
- AS 1670.3 Part 3: Fire Detection, Warning, Control and Intercom Systems - System design, installation and Commissioning Fire Alarm Monitoring
- AS 1670.4 Fire Detection, Warning, Control and Intercom Systems – System Design, Installation and Commissioning Emergency Warning and Intercom Systems

AS 1684 Residential Timber-Framed Construction
- AS 1684.1 Part 1: Design criteria
- AS 1684.2 Part 2 : Non-cyclonic Areas
- AS 1684.3 Part 3: Tongued, Grooved, Plywood and Particleboard Flooring
- AS 1684.4 Part 4: Simplified — Non-Cyclonic Areas

AS 1720.1 Timber Structures Design Methods
AS 1720.4 Timber Structures Fire Resistance of Timber Elements
AS 1735 Lifts, Escalators, and Moving Walks (the SAA Lift Code)
- AS 1735.11, Part 11: Fire-Rated Landing Doors
- AS 1735.12, Part 12: Facilities for Persons with Disabilities

AS 1768 Lightning Protection
AS 1905.1 Components for the Protection of Openings in Fire-Resistant Walls, Part 1: Fire-Resistant Doorsets
AS 1905.2 Components for the Protection of Openings in Fire-Resistant Walls, Part 2: Fire-Resistant Roller Shutters
AS 1926 Swimming Pool Safety
- AS 1926.1 Part 1: Safety Barriers for Swimming Pools

AS 2047 Windows and External Glazed Doors in Buildings - Selection and Installation
AS 2049 Roof Tiles
AS 2052 Metallic Conduits and Fittings
AS 2118 Automatic Fire Sprinkling Systems
- AS 2118.1 Part 1: General Systems
- AS 2118.4 Part 4: Sprinkler Protection for Accommodation Buildings Not Exceeding Four Storeys in Height
- AS 2118.6 Part 6: Combined Sprinkler and Hydrant Systems in Multistorey Buildings

AS 2159 Rules for the Design and Installation of Piling (Known as the SAA Piling Code)
AS 2179 Specifications for Rainwater Goods, Accessories and Fasteners
- AS 2179.1 Part 1: Metal Shape or Sheet Rainwater Goods, and Metal Accessories and Fasteners

AS 2180.1 Metal Rainwater Goods – Selection and Installation
AS 2419.1 Fire Hydrant Installations, Part 1: System Design, Installation and Commissioning
AS 2441 Installation of Fire Hose Reels
AS 2444 Portable Fire Extinguishers and Fire Blankets - Selection and Location
AS 2601 The Demolition of Structures
AS 2665 Smoke / Heat Venting Systems - Design, Installation and Commissioning
AS 2685 Confined Spaces
AS 2818 Guide to Swimming Pool Safety
AS 2870 Residential Slabs and Footings
- AS 2870.1 Part 1- Construction

AS 2904 Damp-Proof Courses and Flashings
AS 2890.6 Off-street Parking for People with Disabilities

AS 3007 Electrical Installations – Surface Mining
AS 3194 Approval and Test Specification – Electrical Shaver Supply Units
AS 3500 Plumbing and Drainage
- AS 3500.1 Part 1: Water services
- AS 3500.4 Part 4: Heated water services

AS 3600 Concrete Structure, Steel and Tendons
AS 3660 Termite Management
- AS 3660.1 Part 1: New Building Work

AS 3700 Masonry Structures
AS 3786 Smoke Alarms
AS 4040.3 Methods of Testing Sheet Roof and Wall Cladding Resistance to Wind Pressures for Cyclone Regions

AS 4072.1 Components for the Protection of Openings in Fire-Resistant Separating Elements, Part 1: Service Penetrations and Control Joints
AS 4100 Steel Structures
AS 4154 General Access Floors (Elevated Floors)
AS 4254 Ductwork for Air-Handling Systems in Buildings
    AS 4254.1 Part 1: Flexible Duct
    AS 4254.2 Part 2: Rigid Duct
AS 4586 Slip Resistance Classification of New Pedestrian Surface Materials
AS 4654 Waterproofing Membranes for External Above-Ground Use
    AS 4654.1 Part 1: Materials
    AS 4654.2 Part 2: Design and Installation
AS 4678 Earth-Retaining Structures
AS 4702 Polymeric Cable Protection Covers
AS 4799 Installation of Underground Services

AS 5601 Gas Installations
AS 5604 Natural Durability Ratings – Timber
AS 5637.1 Determination of Fire Hazard Properties, Part 1: Wall and Ceiling Linings.

AS 60083 Section E-4 / IEC TR 60083 Plugs and Socket-Outlets for Domestic and Similar General Use Standardized in Member Countries of IEC

Communications Australia
AS/CA S009 Installation Requirements for Customer Cabling (Wiring Rules)

Australia and New Zealand Building Code Standards
AS/NZS 1170 Structural Design Actions
    AS/NZS 1170.1 Part 1: Permanent, Imposed and Other Actions
    AS/NZS 1170.2 Part 2: Wind actions
AS/NZS 1200 Boilers and Pressure Equipment
AS/NZS 1214 Hot-Dip Galvanized Coatings on Threaded Fasteners
AS/NZS 1428 Design for Access and Mobility
    AS/NZS 1428.4.1 Part 4: Means to Assist the Orientation of People with Vision Impairment - Tactile Ground Surface Indicators
AS/NZS 1546.1 On-site Wastewater Treatment Units, Part 1: Septic Tanks
AS/NZS 1562.1 Design and Installation of Sheet Roof and Wall Cladding, Part 1: Metal
AS/NZS 1596 The Storage and Handling of LP Gas
AS/NZS 1604 Specification for Preservative Treatment
AS/NZS 1664.1 Aluminium Structures, Part 1: Limit State Design
AS/NZS 1680 Interior and Workplace Lighting
AS/NZS 1735 Lifts, Escalators and Moving Walks – General Requirements
    AS/NZS 1735.11 Part 11: Fire-rated Landing Doors
AS/NZS 1860.1 Particleboard Flooring Part 1: Specifications
AS/NZS 1860.2 Particleboard Flooring Part 2: Installation

AS/NZS 2008 Electrical Installations – Selection of Cables
AS/NZS 2179.1 Specifications for Rainwater Goods, Accessories and Fasteners, Part 1: Metal Shape or Sheet Rainwater Goods, and Metal Accessories and Fasteners
AS/NZS 2208 Safety Glazing Materials in Buildings
AS/NZS 2293 Emergency Lighting and Exit Signs for Buildings

AS/NZS 2293.1 Part 1: System Design, Installation and Operation

AS/NZS 2312 Guide to the Protection of Structural Steel Against Atmospheric Corrosion by the Use of Protective Coatings

AS/NZS 2312.1 Part 1: Paint Coatings

AS/NZS 2312.2 Part 2: Hot Dip Galvanizing

AS/NZS 2327 Composite Steel-Concrete Construction in Buildings

AS/NZS 2381 Electrical Equipment for Explosive Atmospheres - Selection, Installation and Maintenance

AS/NZS 2890 Parking Facilities

AS/NZS 2890.6, Part 6: Off-street Parking for People with Disabilities

AS/NZS 2904 Damp Proof Courses and Flashing

AS/NZS 2918 Domestic Solid Fuel Burning Appliances – Installation

AS/NZS 3000 Electrical Installations - Buildings, Structures and Premises (Known as the AS/NZS Wiring Rules)

AS/NZS 3001 Electrical Installations – Transportable Structures and Vehicles including their Site Supplies

AS/NZS 3002 Electrical Installations – Shows and Carnival Events

AS/NZS 3003 Electrical Installations – Patient Areas

AS/NZS 3004 Electrical Installations – Marinas and Pleasure Craft at Low Voltage

AS/NZS 3012 Constructions Electrical Installations

AS/NZS 3013 Electrical Systems: Classification of Fire and Mechanical Performance of Wiring Systems

AS/NZS 3015 Electrical Installations – Extra-Low Voltage D.C. Power Supplies and Service Earthing Within Public Telecommunications Network

AS/NZS 3112 Approval and Test Specification – Plugs and Socket-Outlets.

AS/NZS 3194 Approval and Test Specification - Electric shaver supply units

AS/NZS 3439.1 Low-Voltage Switchgear and Control Gear Assemblies, Part 1: Type-Tested and Partially Type-Tested Assemblies

AS/NZS 3500 Plumbing and Drainage

AS/NZS 3500.1 Part 1: Water Services

AS/NZS 3500.2 Part 2: Sanitary Plumbing and Drainage

AS/NZS 3500.4 Plumbing and Drainage Part 4: Heated Water Services

AS/NZS 3661 Slip Resistance of Pedestrian Surfaces

AS/NZS 3661.1 Part 1: Requirements

AS/NZS 3666 Air-handling and Water Systems of Buildings

AS/NZS 3666.1 Part 1: Microbial Control Design, Installation, and Commissioning

AS/NZS 3823 Performance of Electrical Appliances - Air Conditioners and Heat Pumps

AS/NZS 3823.1.2 Part 1.2: Ducted Air Conditioners and Air-to-Air Heat Pumps - Testing and Rating for Performance

AS/NZS 4200 Pliable Building Membranes and Underlays: Materials

AS/NZS 4200.1 Installation

AS/NZS 4249 Electrical Installations and Safety Practices – Film, Video, and Television Sites

AS/NZS 4269 Complaints Handling

AS/NZS 4296 Cable Trunking Systems

AS/NZS 4600 Cold-formed Steel Structures

AS/NZS 4663 Slip Resistance of Existing Pedestrian Surfaces

AS/NZS 4671 Steel Reinforcing Concrete

AS/NZS 4680 Hot-Dip Galvanised (Zinc) Coating on Fabricated Ferrous Articles

AS/NZS 4859 Thermal Insulation Materials for Buildings

AS/NZS 4859.1 Part 1: General criteria and technical provisions

AS/NZS 5000 Electric Cables – Polymeric Insulated for Working Voltages Up to and including 0.6/1 (1.2) Kv
AS/NZS 5033 Installations and Safety Requirements for Photovoltaic (PV) Arrays
AS/NZS 5131 Structural Steelwork – Fabrication and Erection
AS/NZS 6124 Electrical Apparatus for Use in the Presence of Combustible Dust
AS/NZS 61439 Low-Voltage Switchgear and Control gear Assemblies
AS/NZS 61439.1 Part 1: General Rules
AS/NZS 61535 Installation Couplers Intended for Permanent Connection in Fixed Installations

American Section of International Association for Testing Materials
ASTM E72-15 Standard Test Methods of Conducting Strength Tests of Panels for Building Construction
ASTM E 136 Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750^0C
ASTM E695-03 Standard Method for Measuring Relative Resistance of Wall, Floor, and Roof Construction to Impact Loading
ASTM E2073-10 Standard Test Method for Photopic Luminance of Photoluminescent Markings
ASTM E2397.05 Standard Practice for Determination of Dead Loads and Live Loads Associated with Green Roof Systems
ASTM E2398.05 Standard Test Method for Water Capture and Media Retention of Geo-Composite Drain Layers for Green Roof Systems
ASTM E2399.05 Standard Test Method for Maximum Media Density for Dead Load Analysis of Green Roof Systems

BOC Australia
AU 435_82369 Guidelines for Gas Cylinder Safety

Fire Protection Association Australia
FPAA101D Automatic Fire Sprinkler System Design and Installation – Drinking Water Supply
FPAA101H Automatic Fire Sprinkler System Design and Installation – Hydrant Water Supply

Institute of Electrical and Electronics Engineers Standards Association (IEEE SA)
IEEE 1547 Standard for interconnected Distributed Resources with Electric Power Systems
IEEE 1547.1 Standard Conformance Test Procedures for Equipment interconnecting Distributed Resources with Electric Power Systems

Institute of Refrigeration Heating & Air Conditioning Engineers of New Zealand
IRHACE Code of Practice, 2007

ISO International Organization for Standardization
ISO 140/6 — 1998 (E) Acoustics — Measurement of Sound Insulation in Buildings and of Building Elements — Part 6: Laboratory Measurements of Impact Sound Insulation of Floors
ISO 540 Hard Coal and Coke – Determination of Ash Fusibility

National Fire Protection Association
NFPA 2 Hydrogen Technologies Code 2011 Edition (13.75 M)

New Zealand Building Code Standards
NZS 1170.5 Structural Design Actions, Part 5: Earthquakes Actions

NZS 3101 Concrete Structures Standard
NZS 3101.1 Part 1: The Design of Concrete Structures
NZS 3101.2 Part 2: Commentary
NZS 3104 Specifications for Concrete Production

NZS 3109 Concrete Construction
NZS 3114 Specification for Concrete Surface Finishes
NZS 3124 Specification for Concrete Construction for Minor Works:
NZS 3403.2 Wind Loads for Petrochemical and Other industrial Facilities
NZS 3404 Steel Structures Standard
    NZS 3404.1 Part 1: Materials, Fabrication, and Construction
    NZS 3404.2 Part 2: Commentary to the Steel Structures Standard
NZS 3603 Timber Structures Standard

NZS 4121 Design for Access and Mobility: Buildings and Associated Facilities
NZS 4122 Guide to Approachability, Accessibility and Usability of Buildings
NZS 4210 Code of Practice for Masonry Buildings, Materials and Workmanship:
NZS 4223 Glazing in Buildings
    NZS 4223.1 Part 1: Glass Selection and Glazing
    NZS 4223.3 Part 3: Human Impact Safety Requirements
NZS 4229 Code of Practice for Masonry Buildings Not Requiring Specific Design
NZS 4230 Design of Reinforced Concrete Masonry Structures
NZS 4232 Fire Doors and Windows
NZS 4503 Hand Operated Fire-Fighting Equipment
NZS 4504 Specification for Fire Hose Reels
NZS 4509 Stand-alone Power Systems
NZS 4510 Fire Hydrant Systems
NZS 4512 Fire Detection and Alarm Systems in Buildings
NZS 4541 Automatic Fire Sprinkler Systems

APPENDIX B

Safety Glass Glazing Table Summary Charts

SOURCE:

NZS 4223-32016 Glazing in Buildings, Part 3: Human Impact Safety Requirements

Table 1a

Type of safety glass	Nominal thickness mm	Fully framed glazing	
		Maximum area single glazing m²	Maximum area IGU m²
Toughened	3	1	1.5
	4	2	3.0
	5	3	4.5
	6	4	6.0
	8	6	9.0
	10	8	12(2)
	12	10	15(2)
	15	13(2)	SD
	19	17(2)	SD
Laminated (3)	5	2	3.0
	6	3	4.5
	8	5	7.5
	10	7	10.5(2)
	12	9	13.5(2)
	14	11	SD
	16	13(2)	SD
	18	15(2)	SD
	20	17(2)	SD
Organic-backed safety glass and organic-backed safety mirror(3)	≥6	2	3.0

Note:

1) The IGU area is based on the same thickness for both panes, using a factor of 1.5. For non-symmetrical units use the thinner of the two panes to determine the maximum area
2) This area might not be readily available
3) Based on glass thickness only – interlayer and film thickness to be added. For wardrobe and closet doors see 4.4. for toughened and heat-strengthened laminated glass, see 2.6 and use nearest greater nominal thickness.
4) For an Alternative Solution see 1.4
5) NA = Not Applicable
6) SD = Specific design required

Table 4

Max height of glass (span) mm	Type of glass	Unlimited number of vertical sealed joints, glass panes, and pane width Minimum glass thickness mm	Three-edge support with one vertical sealed joint, maximum pane width of 1200 mm Minimum glass thickness mm
1600	Annealed	8	6
	Toughened	6	6
	Laminated	8	6
2400	Annealed	10	8
	Toughened	10	8
	Laminated	10	8
2600	Annealed	12	10
	Toughened	10	10
	Laminated	12	10
3000	Annealed	12	10
	Toughened	12	10
	Laminated	12	10
3200	Annealed	NA	NA
	Toughened	12	10
	Laminated	16	10
3600	Annealed	NA	NA
	Toughened	15	12
	Laminated	16	12
4000	Annealed	NA	NA
	Toughened	15	12
	Laminated	20	12

NOTE

1) Use specific design for heights above 4000 mm
2) Adequate edge cover is required to retain the glass under load (refer to section 4 of NZS 4223.1)
3) Glass design is based on ULS and SLS internal design wind pressures of 0.5 kPa and 0.36 kPa respectively
4) Maximum deflection at SLS pressure is restricted to span / 60 , and 30mm for three-edged support
5) For design loads exceeding those in note 3, Table 5 may be used up to its limits
6) Joints between glass panes are to be sealed with silicone
7) For toughened laminated glass use the toughest glass limits
8) NA = Not Applicable

Table 5

Max height of glass (span) mm	Type of Glass	Unlimited number of vertical sealed joints, glass panes, and pane width Minimum Thickness mm				Three-edge support with one vertical sealed joint, maximum pane width of 1500 mm Minimum thickness mm			
		Wind Zone (ULS)				Wind Zone (ULS)			
		Low	Medium	High	Very High	Low	Medium	High	Very High
		0.72 kPa	0.96 kPa	1.36 kPa	1.76 kPa	0.72 kPa	0.96 kPa	1.36 kPa	1.76 kPa
2000	Annealed	10	12	15	19	8	10	12	15
	Toughened	10	10	12	12	8	8	10	10
	Laminated	10	12	16	16	8	10	12	16
2400	Annealed	12	15	19	NA	10	10	12	15
	Toughened	12	12	15	15	10	10	12	12
	Laminated	12	16	20	20	10	10	12	16
2800	Annealed	15	19	NA	NA	12	12	15	15
	Toughened	12	15	15	19	12	12	15	15
	Laminated	18	20	20	24	12	12	16	16
3000	Annealed	15	19	NA	NA	12	12	15	15
	Toughened	15	15	19	19	12	12	15	15
	Laminated	16	20	24	30	12	12	16	16
3200	Annealed	NA	NA	NA	NA	NA	NA	NA	NA
	Toughened	15	15	19	19	12	15	15	15
	Laminated	16	20	24	30	12	16	16	16
3600	Annealed	NA	NA	NA	NA	NA	NA	NA	NA
	Toughened	19	19	25	25	15	15	19	19
	Laminated	20	24	30	NA	16	16	20	20
4000	Annealed	NA	NA	NA	NA	NA	NA	NA	NA
	Toughened	19	19	25	NA	15	15	19	19
	Laminated	24	24	30	NA	16	16	20	20

NOTE

1) Use specific design for heights above 4000 mm
2) Adequate edge cover is required to retain the glass under load (refer to section 4 of NZS 4223.1)
3) Glass design is based on ULS design and pressure
4) Maximum deflection at SLS pressure is restricted to span / 60 , and 30mm for three-edged support
5) Use specific design for design loads exceeding those in notes 2 and 3
6) Joints between glass panes are to be sealed with silicone
7) For toughened laminated glass use the toughest glass limits
8) NA = Not Applicable

Table 8

Occupancy Type (AS/NZS 1170.1)	SLS design load (multiply by 1.5 for ULS)			Maximum glass height (mm)							
				Toughened Safety Glass				Toughened Laminated Safety Glass			
	Line kN/m	Concent-rated Kn	Uniform kPa	10	12	26	19	10	12	16	20
A	NA	NA	0.5	2400	2750	3250	3850	2400	2750	3400	4050
A(other) & C3	NA	NA	1.0	1950	2300	2900	3600	1950	2300	3050	3900
B, E	NA	NA	1.0	1950	2300	2900	3600	1950	2300	3050	3900
C1/C2, D & C5	NA	NA	1.5	1700	2000	2500	3200	1700	2000	2600	3400

NOTE

1) The top and bottom edges of the glass panes are supported by continuous frames
2) The side edges are unframed and silicone butt joined, and glass panels are at least 1000 mm wide. Side edges of end panes are framed
3) The joints are at least 6 mm wide and sealed with structural silicone
4) Do not use this table for glass supported by point fixings (stand off spider fittings and so on)
5) For design, short term infill live loads are supplied as follows – 100% of the uniform infill load is applied up to 1200 mm above the bottom edge of glass, and infill load applied from 1200 mm to 2000 mm
6) Glass deflections are restricted to span/60 to a maximum of 33 mm. the span is the glass height
7) Glass thicknesses are nominal and for toughened glass they exclude the interlayer
8) Wind pressure on the glazing must also be considered as this may be the critical load for design

Table 8a

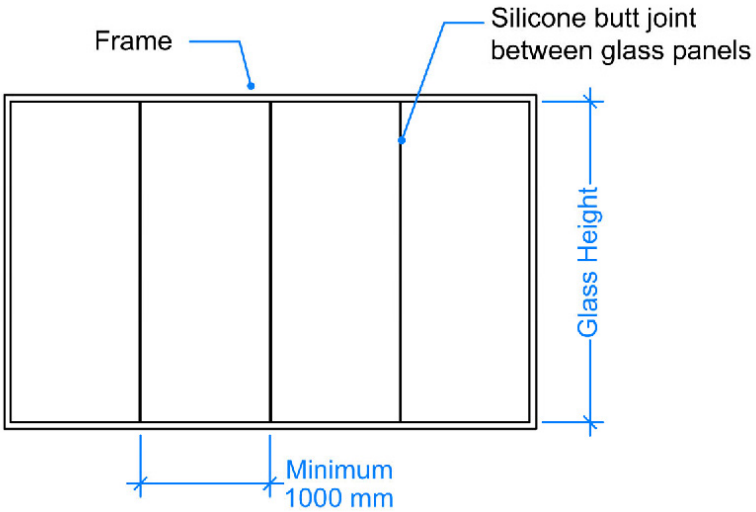


Table 6			
Type and thickness (mm)	**Maximum blade length mm**		
	Less than 100 wide	**100 to 155 wide**	**155 to 225 wide**
Annealed			
4	500	600	NA
5	600	750	750
6	750	900	900
Toughened			
4	600	700	800
5	800	900	1000
6	1000	1100	1200
Laminated			
6	700	800	900

NOTE

1) For low and medium wind zones only.
2) For wind zones above medium check the louvres for strength and deflection in accordance With NZS 4223.4.
3) Louvres safeguarding a fall of 1 m or more may require specific design.
4) NA = Not applicable.

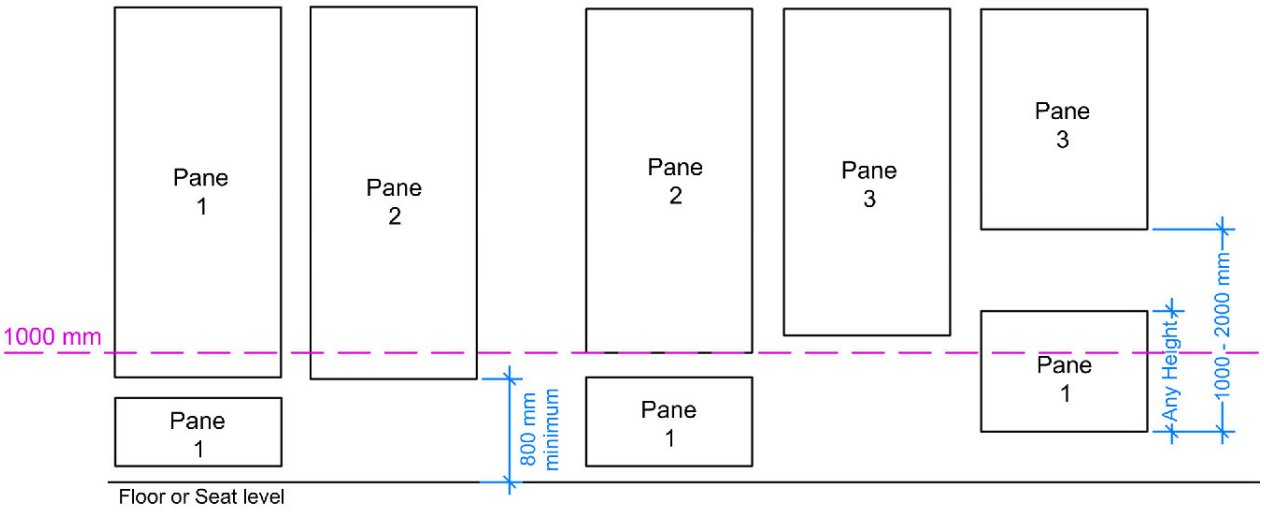
Table 7

Glass Selection Table			
Occupancy type (AS/NZS 1170.1)	**Pane 1**	**Pane 2**	**Pane 3**
	Designed to uniform infill load and human impact	**Designed to uniform infill load and human impact**	**Designed to uniform infill load and human impact**
A (within private dwelling)	Safety glass to Table 1. Minimum 4 mm toughened or 6 mm laminated	Safety glass to Table 1 or annealed glass to Table 2 (5 mm minimum)	Safety glass to Table 1 annealed glass to Table 2. Check ULS wind pressure of 1.36 kPa
A (other),C3, B&E	Safety glass to Table 1 Minimum 4 mm toughened or 6 mm laminated	Safety glass to Table 1 or annealed glass to Table 2 (6 mm minimum)	Safety glass to Table 1 or annealed glass to Table 2.
C1/C2, D & C5	Safety glass to Table 1 Minimum 4 mm toughened or 8 mm laminated	Safety glass to Table 1. Minimum 4 mm toughened or 6 mm laminated	Safety glass to Table 1

NOTE

1) This figure applies to all glass widths and spans
2) For single glazing the panes shall be also checked for wind pressures to NZS 4223.4
3) For laminated glass the thickness excludes the interlayer
4) For an IGU the inner pane shall be treated as single glazing and the type and thickness shall comply with the relevant table and column for single glazing
5) For an IGU the outer pane shall e designed for the load share of wind pressure from NZS 4223.1 and for wind pressures to NZS 4223.4
6) Uniform infill loads from Table 3.3 of AS/NZS 1170.1 are applied as per B1/VM1
7) Top edge line and concentrated design loads are not applied to the glass pane, and specific design is required for these loads
8) Pane 1 has been checked for an infill concentrated load of 0.35 kN SLS (0.53 kN ULS) which is considered suitable for this type of glazing. Specific design is required for higher loads.

Table 7a



APPENDIX C

Hazard Classification

AS/NZS 1170 Probability of Exceedance Table

AS/NZS 1170 Deflection Table

Table 1 Hazard Classification

Hazard class	Exposure	Specific service conditions	Biological hazard	Examples of typical uses
H1	Inside, above ground	Completely protected from the weather and well ventilated, and protected from termites	Lyctid borers	Susceptible framing, flooring, furniture, interior joinery
H2	Inside, above ground	Protected from wetting. Nil leaching	Borers and termites	Framing, flooring, and similar, used in dry situations
H3	Outside, above ground	Subject to periodic moderate wetting and leaching	Moderate decay, borers and termites	Weatherboard, fascia, pergolas (above ground), window joinery, framing and decking
H4	Outside, in-ground	Subject to severe wetting and leaching	Severe decay, borers and termites	Fence posts, garden wall less than 1 m high, greenhouses, pergolas (in ground) and landscaping timbers
H5	Outside, in-ground contact with or in fresh water	Subject to extreme wetting and leaching and/or where the critical use requires a higher degree of protection	Very severe decay, borers and termites	Retaining walls, piling, house stumps, building poles, cooling tower fill
H6	Marine waters	Subject to prolonged immersion in sea water	Marine wood borers and decay	Boat hulls, marine piles, jetty cross-bracing, landing steps, and similar

Table 2 Probability of Exceedance (adapted from AS/NZS 1170.0)

Design working life	Importance level	Annual probability of exceedance for ultimate limit states		Annual probability of exceedance for serviceability limit states	
		Wind	Earthquake	SLS1	SLS2 Importance level 4 only
Construction equipment, e.g., props, scaffolding, braces and similar	2	1/100	1/100	1/25	
Less than 6 months	1 2 3 4	1/25 1/100 1/250 1/1000	1/25 1/100 1/250 1/1000	- 1/25 1/25 1/25	
5 years	1 2 3 4	1/25 1/250 1/500 1/1000	1/25 1/250 1/500 1/1000	- 1/25 1/25 1/25	- - - 1/250
25 years	1 2 3 4	1/50 1/250 1/500 1/1000	1/50 1/250 1/500 1/1000	- 1/25 1/25 1/25	- - - 1/250
50 years	1 2 3 4	1/100 1/500 1/1000 1/2500	1/100 1/500 1/1000 1/2500	- 1/25 1/25 1/25	- - - 1/500
100 years or more	1 2 3 4	1/250 1/1000 1/2500 *	1/250 1/1000 1/2500 *	- 1/25 1/25 1/25	- - - *

Table 3 Deflection Limit (adapted from AS/NZS 1170.0)

Element	Phenomenon Controlled	Serviceability Parameter	Applied Action	Element response
Roof Cladding				
Metal	Indentation	Residual Deformation	Q= 1kN	Span/600 but <0.5mm
	Decoupling	Mid-span deflection	G and Ψ_3Q	Span/120
Concrete or ceramic	Cracking	Mid-span deflection	G and Ψ_3Q	Span/400
Roof Supporting Elements				
Members (trusses, rafters, etc.)	Sag	Mid-span deflection	G and Ψ_3Q	Span/300
Roof elements supporting brittle claddings	Cracking	Mid-span deflection	G and Ψ_3Q or W_3	Span/400
Ceiling and ceiling supports				
Matt or gloss paint finish	Ripple	Mid-span deflection	G	Span/500 (see Note 3)
Textured finish	Ripple	Mid-span deflection	G	Span/300
Suspended	Ripple	Mid-span deflection	G	Span/360
Support framing	Sag	Mid-span deflection	G	Span/360
Plaster Finish	Cracking	Mid-span deflection	G and Ψ_3Q or W_3	Span/200
Wall elements				
Columns	Side sway	Deflection at top	W_3	Height/500
Portal frames (frame racking action)	Roof damage	Deflection at top	W_3, or E	Spacing/200
Lintel beam (vertical sag)	Doors / window jamb	Mid-span deflection	W_3	Span/240 but <12 mm
Face loaded	Discerned movement	Mid-height deflection	W_3	Height/150
Face loaded	Soft body impact (neighbours notice)	Mid-height deflection	Q = 0.7 kN	Height/200 but <12 mm
Face loaded	Supported elements rattle	Mid-height deflection	W_3	Height/1000
Specific claddings (see Note 7)	Cracking	Mid-height deflection	W_3	Height/500
Brittle cladding (ceramic) face loaded	Noticeable cracking	Deflection at top	W_3, or E	Height/600
Masonry (in plane)	Noticeable cracking	Deflection at top	W_3, or E,	Height/400
Masonry (face loaded)	Lining damage	Mid-height deflection	W_3,	Height/300
Plaster/gypsum (in plane or face loaded)	Lining damage	Mid-height deflection	W_3, or E	Height/200
Moveable partition	Soft body impact system damage	Deflection at top	Q = 0.7 kN	Height/160
Glazing	Bowing	Mid-span deflection	W_3	Span/400
Windows, facades, curtain walls	Facade damage	Mid-span deflection	W_3 or E_3	Span/250
Fixed glazing systems	Glass damage	Deflection	W_3 or E	2 x glass clearance
Floors and floor supports				

Element	Phenomenon Controlled	Serviceability Parameter	Applied Action	Element response
Beams where line-of-sight is along invert	Sag	Mid-span deflection	G and $\Psi_3 Q$	Span/500
Beams where line-of-sight is across soffit	Sag	Mid-span deflection	G and $\Psi_3 Q$	Span/250
Flooring	Ripple	Mid-span deflection	G and $\Psi_3 Q$	Span/300
Joists and beams	Sag	Mid-span deflection	G and $\Psi_3 Q$	Span/300
Floors	Vibration	Static mid-span deflection	Q = 1.0 kN	Less than 1 to 2 mm
Normal floor system	Noticeable sag	Mid-span deflection	G and $\Psi_3 Q$	Span/400
Specialist floor system	Noticeable sag	Mid-span deflection	G and $\Psi_3 Q$	Span/600
Side-sway (acceleration)	Sway	Acceleration at floor	W_3	<0.01 g
Supporting masonry walls	Wall Cracking	Mid-span deflection	G and $\Psi_3 Q$	Span/500
Supporting plaster lined walls	Cracks in lining	Mid-span deflection	G and $\Psi_3 Q$	Span/300

APPENDIX D

Results of Energy Efficiency Modeling of 12 Building Types in Fiji using EDGE Energy Modelling Software

Table 1: Modelled Energy Savings from Lowest to Highest (all building types)

Energy Saving Techniques	% Total Energy Savings
Efficiency of glass (double pane)	1.54%
Efficiency of glass (louver)	1.61%
Ceiling fans	1.94%
External shading devices	2.14%
Efficient lighting for internal areas	3.40%
Reflective roof	3.60%
Smart meters for energy	3.61%
Lighting controls (occupancy sensors)	3.64%
Efficient refrigerator and washing machines	3.95%
Lighting controls (continuous dimming)	4.02%
Lighting controls (timer)	4.08%
Green roof	4.94%
Power factor corrections	5.51%
Insulation of roof	6.28%
Fresh air pre-conditioning system	6.30%
Reflective exterior walls	6.40%
Insulation of ground floor slab	7.45%
Cooling system efficiency	9.35%
Natural ventilation	12.30%
Other energy saving measures	14.44%
Solar hot water system	27.09%
Insulation of ground floor slab	28.50%
Onsite renewable energy (85%)	59.97%

APPENDIX E

Expected Sea Level Rise in Fiji

SOURCE:

PRIF (2021) Guidance for Managing Sea Level Rise Infrastructure Risk in the Pacific Island Countries, Published: December 2021

Table 3.7 Projection of Sea Level Rise in Meters for Fiji

Year	Low SSP1-2.6	Intermediate SSP2-4.5	High SSP3-7.0	Very High SSP5-8.5	Very High – Low SSP5-8.5 H+
1995-2014	0.00	0.00	0.00	0.00	0.00
2020	0.07 (0.04–0.10)	0.07 (0.03–0.11)	0.07 (0.04–0.09)	0.07 (0.04–0.10)	0.07 (0.04–0.11)
2030	0.13(0.09–0.17)	0.13 (0.08–0.17)	0.12 (0.09–0.16)	0.13 (0.10–0.17)	0.14 (0.10–0.20)
2040	0.18 (0.13–0.24)	0.18 (0.13–0.25)	0.19 (0.14–0.25)	0.20 (0.15–0.27)	0.21 (0.15–0.33)
2050	0.25 (0.18–0.33)	0.26 (0.20–0.34)	0.27 (0.20–0.36)	0.29 (0.22–0.38)	0.30 (0.22–0.49)
2060	0.31 (0.23–0.41)	0.33 (0.26–0.44)	0.35 (0.28–0.46)	0.38 (0.30–0.50)	0.40 (0.30–0.68)
2070	0.38 (0.29–0.50)	0.42 (0.32–0.56)	0.46 (0.36–0.59)	0.49 (0.39–0.65)	0.53 (0.39–0.93)
2080	0.44 (0.34–0.59)	0.51 (0.39–0.68)	0.56 (0.44–0.74)	0.62 (0.48–0.82)	0.67 (0.48–1.21)
2090	0.50 (0.38–0.69)	0.60 (0.45–0.81)	0.68 (0.54–0.91)	0.76 (0.60–1.02)	0.85 (0.60–1.54)
2100	0.57 (0.41–0.79)	0.69 (0.50–0.96)	0.82 (0.62–1.11)	0.93 (0.72–1.25)	1.07 (0.72–1.89)
2110	0.65 (0.45–0.92)	0.78 (0.54–1.11)	0.92 (0.65–1.28)	1.05 (0.75–1.46)	1.27 (0.75–2.23)
2120	0.71 (0.49–1.02)	0.88 (0.60–1.24)	1.05 (0.73–1.46)	1.19 (0.85–1.67)	1.50 (0.85–2.56)
2130	0.78 (0.53–1.11)	0.97 (0.66–1.38)	1.18 (0.82–1.65)	1.33 (0.95–1.87)	1.76 (0.95–3.34)
2140	0.83 (0.56–1.20)	1.05 (0.72–1.51)	1.31 (0.91–1.83)	1.46 (1.04–2.07)	2.04 (1.04–4.42)
2150	0.89 (0.60–1.30)	1.14 (0.77–1.64)	1.43 (0.99–2.01)	1.59 (1.13–2.26)	2.34 (1.13–5.60)

Notes:
1. Shared Socioeconomic Pathway (SSP); H+ represents low confidence high consequence scenario.
2. Projections based on IPCC (2021), sourced from AR6 and interpolated to nearest decade and adjusted for the upper bound of the most likely vertical land movement as defined by Fox-Kemper et al. (2021).
3. Projections are given for the 50%ile of the CMIP6 model ensemble and likely range shown in brackets.

Source: PRIF (2021): Guidance for Managing Sea Level Rise Infrastructure Risk in Pacific Island Countries, Published December, 2021

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