National Building Code of Tuvalu

2021

PREFACE

I am honoured and pleased to present the National Building Code 2021 for Tuvalu. The Building Code is the outcome of many attempts since the late 1980's to introduce suitable building control measures to meet public safety, health, and environmental challenges that confront Tuvalu. The initial work on drafting the Building Code began in 1990 with the first draft developed. Several revisions were introduced thereafter to ensure the Code's provisions were deemed within the economic and technical means of the country.

In 2018, another draft was developed from the 1990 version through collaboration between the Government Task Force for the NBC, national stakeholders, and consultants with assistance from the Asian Development Bank (ADB). The formulation of the Building Code was developed from existing documents. Similar Codes from other Pacific countries, Australia and New Zealand were studied and adapted to be relevant to the context of Tuvalu. Many of these closely followed the draft 1990 Tuvalu National Building Code.

In early 2021, the work on the Building Code started by the Asian Development Bank was continued by the World Bank through consultations with island communities in Tuvalu, non-government organisations, national consultants, and the international consulting firm Arup (Australia), which resulted in the completion of the current document.

The Tuvalu National Building Code 2021 is a performance-based minimum standard that provides the objectives and descriptions of how buildings and their sites should be designed and built to achieve an acceptable structure that is sustainable and can be adopted by the people of Tuvalu, now and in the future.

Special attention has been applied to consider the vulnerability of Tuvalu to disasters and the impacts of climate change, and focusing on a standardised construction for different classes of buildings that are safe and environmentally sustainable.

The actual use of the Building Code will reveal over time the need for some modifications. Periodic examination and suitable revision will keep it up to date and relevant.

I would like to sincerely thank all the people and organisations who have contributed to producing the National Building Code during its initial phases to its current stage. Together we will achieve in fulfilling the implementation of this important document.

Hon. Ampelosa Tehulu

Minister of Public Works, Infrastructure, Environment, Labour, Meteorology & Disaster

ACKNOWLEDGEMENTS

The success and final outcome of the National Building Code 2021 (NBC) required a lot of guidance and assistance from many people and organizations in and outside of Tuvalu. The NBC could not have been completed without their cooperation, insight, and experience.

The Government of Tuvalu and the Ministry of Public Works, Infrastructure, Environment, Labour, Meteorology and Disaster acknowledge with gratitude the dedicated effort of island communities in Tuvalu, non-government organizations, government departments and our development partners in this endeavour, the World Bank and the Asian Development Bank, for their invaluable inputs and work on the new building regulatory framework which culminated in supporting the legal instrument to implement the Tuvalu Building Act of 2019; the Building Regulations 2021 and the Tuvalu National Building Code 2021.

MAP OF TUVALU

Map of Tuvalu

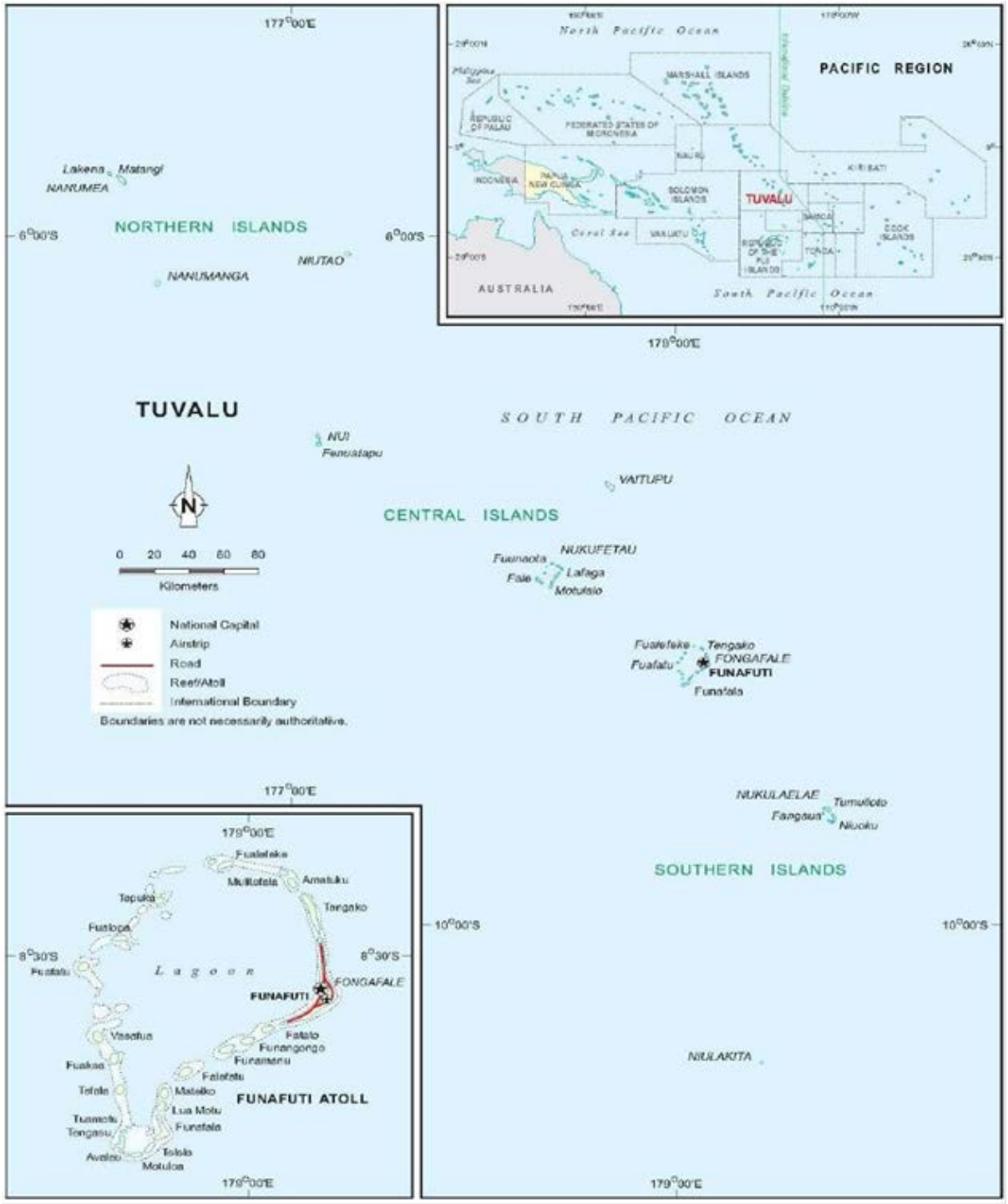


Figure 1: Map of Tuvalu. Source: Infrastructure Strategy and Investment Plan, 2011

INTRODUCTION

About this Code

The basic objective of the Code is to ensure that the acceptable standards of structural sufficiency, fire safety, health and amenity, are maintained for the benefit of the Tuvalu community now and in the future.

The requirements included in this Code are intended to extend no further than is necessary in the Public interest, to be cost effective, not needlessly onerous in their application, and easily understood.

Compliance with the code will reduce disaster risk and help adapt to the impact of climate change.

What is in the Code

The code sets down the Performance Requirements and the corresponding Deemed-to-Satisfy Provisions which apply to the construction of buildings for all classes of occupancy.

It must be recognised that a Building Code cannot cover every issue concerned with the design and construction of buildings. In the case of innovative, complex or unusually hazardous building proposals, or other building work beyond the scope of the Code, legislation may be provided for other suitable action.

Where appropriate the Code allows for variations in climate and geological conditions.

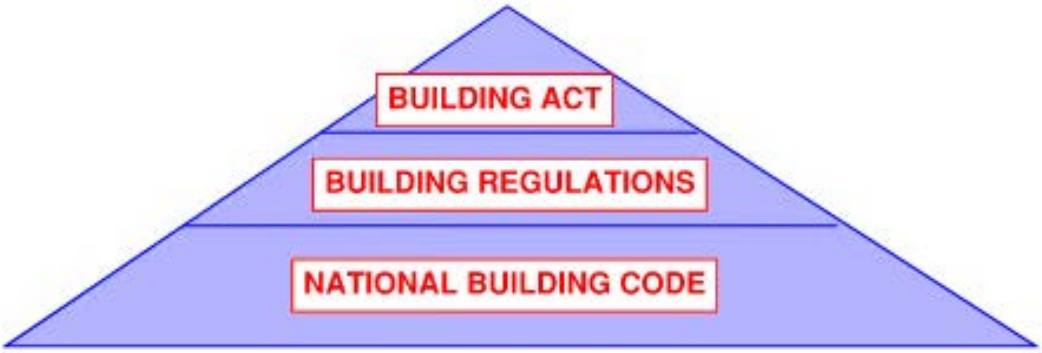
The Code covers those aspects of buildings which are controlled by Approval Authorities such as structure, fire resistance, access and egress, firefighting equipment, and certain aspects of health and amenity.

Layout of the Code

The numbering of Sections and Parts has been made on an alpha-numbering system for ease of reference. It provides flexibility to accommodate future additions or deletions and the future consolidation of building regulations presently contained in other legislation, without undue disruption to the layout.

Other than for common provisions contains in Section A and B, the code is divided into two areas; one which covers Class 1 and 10 building, and the other which covers all other Classes of buildings.

Building Control Framework



Administrative Arrangements

This Code is brought into effect by enabling building control legislation which prescribes the requirements which have to be satisfied in order to gain approval for a new building or major changes to an existing building, including change of use.

The enabling legislation consists of an Act of Parliament (the Building Act 2019) and Building Regulations. It empowers the Administration to regulate certain aspects of the building process and contains the necessary administrative provisions for the work of the Building Authority. The legislation also imposes responsibilities on the authorities or other persons or bodies and describes particular administrative procedures.

The following administrative matters are covered in the enabling or subordinate legislation-

- Building Permit Application submission and approval procedures.
- Issue of Building Permits
- Inspection during, on completion and after construction.
- Provision of evidentiary certificates.
- Issue of Certificates of Occupancy and Compliance.
- Accreditation or approval of materials or components.
- Review and enforcement of standards.
- Fees and charges.

Enabling Legislation / Building Act

The National Building Code (Code) is brought into effect by the Building Act 2019 (as amended), which empowers the Minister responsible for Infrastructure to regulate certain aspects of the building process including the creation and administration of a Building Regulations and a Code.

The legislation also outlines procedures for, among other things, appeals, obtaining a Building Permit, exemptions from Building Permits, exemptions from specific provisions of the Code, inspections, demolition, sanitation, permanent and temporary stop work notices, corrective notices, offences, penalties, and for the periodic review of the Code and Building Regulations.

Authority of the Code

According to the Building Act 2019 (as amended) provisions in the Code apply to all proposed development projects that are under consideration for a building permit from the date that the Code is enacted. Requirements in the Code will extend throughout the lifespan of the building, for specified systems, maintenance, alteration and demolition.

The Code may be used as a guideline or reference document by other government ministries and agencies for Government of Tuvalu approvals, but the provisions in the Code are only enforceable for the building permit approval process, maintenance, alterations and demolition via the Building Act 2019, as amended. The ability of a proposed development to meet the requirements in the Code does not override any decision on other approvals of the Government of Tuvalu.

Building Regulations

The Building Act 2019 (as amended) provides for the creation and administration of building regulations which are administered by the Building Authority, the Public Works Department.

They set out procedures for the building permit approval process, including:

- Building Permit Application submission and approval procedures.
- Issue of Building Permits
- Inspection during, on completion and after construction.
- Provision of evidentiary certificates.
- Issue of Certificates of Occupancy and Compliance.
- Accreditation or approval of materials or components.
- Review and enforcement of standards.
- Fees and charges.

Compliance Paths

All applications for a Building Permit must have plans and specifications demonstrating that performance requirements of the Code have been achieved to the satisfaction of Approval Authorities in Tuvalu.

For Building Permit approval, compliance with Performance Requirements can 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 Tuvalu 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-comply provisions

Where Deemed-to-Satisfy provisions are used to show acceptable solutions are compliant with different components of a Performance Requirement, each one must be specifically notated.

Performance Requirements

These are described in terms which would allow considerable scope for innovation and the development of new materials and methods of construction. The Performance Requirements are in some cases separated into Objectives and the Required Performance.

Objectives are broad statements of intent and are included at the beginning of each Section to identify the objectives that the provisions of the Section are intended to achieve. They are the basic concepts which apply generally to all buildings and structures.

Required Performance gives the fundamental requirements which will satisfy the objectives and are expressed in performance terms.

Accreditation certificates, test reports, detailed calculations or other documentary evidence may be used as evidence that a particular material, design or construction method meets the performance requirements of this code.

Deemed-to-satisfy Provisions

The Deemed-to-satisfy Provisions have been drafted in sufficiently general terms to allow some flexibility without increasing the need to use administrative discretion. In the absence of National Standards for design, construction and materials, the Standards produced by the standards Association of Australia and New Zealand have been called up. Detailed specifications have been given where necessary.

Professional Certification

This Code allows for certificates from professional consultants to be used as evidence of compliance with particular requirements or standards.

The enabling legislation will determine the extent of the use of professional certification and the procedures for the submission of certificates, reports or other documentation to the Approval Authorities as evidence of compliance.

Alterations to Non-Conforming Existing Buildings

Buildings, Facilities, Siteworks, Site Servicing and Sites that exist prior to the enactment of the Code that do not comply with the provisions in the Code are not required to comply with the Code. However, if an application is made to alter, renovate, add-on, change or demolish the structure or site in any way, the proposed changes will be subject to all applicable Sections in the Code as set out in the Building Regulations. Additional works outside of the proposed scope of work may also be required if deemed necessary to bring the proposed development to an acceptable health and safety standard, as determined by the Government of Tuvalu.

Alternative Solutions

The Deemed-To-Satisfy Provisions and Acceptable Solutions listed in the Code illustrate means of satisfying the Performance Requirements, but Performance Requirements can also be met by an Alternative Solution. When an Alternative Solution is used, it must satisfy the objectives and performance that would have been achieved had the Deemed-To-Satisfy Provisions and Acceptable Solutions been followed.

Administrative Discretion

The Code is drafted with the objective of reducing the need for the Approval Authority to make discretionary decisions.

However, in many cases it is not possible to draft a provision in purely technical terms and informed judgement is required on the standard which would be suitable in particular circumstances.

Accordingly, in the number of clauses, the Code requires a particular material or construction method to be “suitable”, meaning fit in all relevant respects for its intended purpose and use.

The Approval Authority responsible for the enforcement of building controls retains the right to question “suitability” and differences of opinion are open to appeal.

SECTION A - GENERAL PROVISIONS

THIS SECTION APPLIES TO ALL BUILDINGS

A1 INTERPRETATION

A1.1 Definitions

Some of the words and phrases used in the Code have specific defined meanings. Wherever such meaning is intended the words and phrases are printed in italics. The defined meanings are:

Accessible, having features to enable use by people with a disability.

Accessway, a continuous accessible path of travel to, into or within a building.

Aged care building, a Class 9c building for residential accommodation of aged persons who, due to varying degrees of incapacity associated with the ageing process, are provided with personal care services and 24 hour staff assistance to evacuate the building during an emergency.

Alteration, any structural alteration to an existing building other than by demolition , includes an addition or extension to a building.

Amenity, an attribute which contributes to the health, physical independence, comfort and well-being of people.

Approval Authority, as defined by the Building Act,(Public Works Department)

Assembly building, a building where people may assemble for:

(a) civic, theatrical, social, political, or religious purposes;
(b) educational purposes in a school, early childhood centre, preschool, or the like;
(c) entertainment, recreational or sporting purposes; or
(d) transit purposes.

Atria/Atrium, space within a building that connects 2 or more storey and:

(a) is wholly or substantially enclosed at the top by a floor or roof (including a glazed roof structure), and
(b) includes any adjacent part of the building not separated by bounding construction; but
(c) does not include a stairwell, rampwell or the space within a shaft; and
(d) for the purpose of (a) a space is considered enclosed if the area of the enclosing floor or roof is greater than 50% of the area of the space, measured in plan, of any of the storeys connected by the space.

Average recurrence interval, applied to rainfall, means the expected or average interval between exceedances for a 5-minute duration rainfall intensity.

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

Backpressure, means a reversal of water flow caused by the downstream pressure becoming greater than the supply pressure.

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

Baluster, a vertical support for a handrail.

Building, any temporary or permanent, moveable or immovable, structure - including any structure intended for occupation by people, animals, machinery or chattels.

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

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

Building Regulations, a set of standards and procedures issued by the Government of Tuvalu outlining requirements for the development process including plan submission and regulations for building permit application.

Certificate of Accreditation, a certificate acceptable to the Approval Authority stating that the properties and performance of a building material or method of construction or design fulfil specific requirements of this code.

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

Clad frame, timber or metal frame construction with exterior timber or sheet wall cladding that is not sensitive to minor movement and includes substructure masonry walls up to 1.5 m high.

Combustible:

(a) applied to a material - means combustible under AS 1530.1
(b) applied to construction or part of a building - means constructed wholly or in part of combustible materials.

(See definition of *non-combustible*).

Common Wall, a wall that is common to adjoining buildings.

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, the weight assigned to the building elements of a building, storey excluding people or goods.

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.

Deemed-to-Satisfy Provision, a provision that is deemed to satisfy the Performance Requirements.

Deemed-to-Satisfy Solution, a method of satisfying the Deemed-to-Satisfy Provisions.

Design fire, the quantitative description of a representation of a fire within the design scenario.

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 and/or the Government of Tuvalu.

Design scenario, the specific scenario of which the sequence of events is quantified, and a fire safety engineering analysis is conducted against.

Design wind speed, the design gust wind speed for the area where the building is located, calculated in accordance with AS/NZS 1170.2.

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

Detention centre, a building in which persons are securely detained by means of the built structure including a prison, remand centre, juvenile *detention centre*, holding cells or psychiatric *detention centre*.

Drainage Ditch, an open channel lower in elevation than the surrounding land intended to collect and convey stormwater on private or public property.

Drain, a line of pipes to carry sewage or *trade waste* or stormwater, located within the property boundary, laid above or below ground, and includes all fittings and equipment such as inspection openings, traps and gullies.

A drain is a *branch drain* if it is intended to receive the discharge from fixture discharge pipes. Branch drains join a *main drain*.

The *main drain* collects the *wastewater* from *branch drains* and/or from fixture discharge pipes and conveys them to the disposal system.

Durability, the safe performance of a building, facility 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.

Early Childhood Centre, a preschool, kindergarten or child-minding centre.

Effective height, the height 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) from the floor of the highest storey providing egress to a road or open space. The road or open space must be capable of providing unobstructed access to emergency vehicles.

The effective height of a stepped or terraced building is the maximum effective height of any segment of the building.

Exit:

(a) Any, or any combination of the following if they provide egress to a road or open space:
(i) An internal or external stairway.
(ii) A ramp complying with Section ND.
(iii) A fire-isolated passageway.
(iv) A doorway opening to a road or open space.
(b) A horizontal exit or a fire-isolated passageway leading to a horizonal exit.

Expert Judgement, the judgement of an expert who has the qualifications and experience to determine whether a Performance Solution or Deemed-to-Satisfy Solution complies with the Performance Requirements.

Extensions, mean building works that alter an existing building or storey by increasing the floor area.

External Wall, an outer wall of a building which is not a *common wall* or a *separating wall*.

Fabric, the basic building structural elements and components of a building including the roof, ceilings, walls, glazing and floors.

Farm building, a Class 7 or 8 building located on land primarily used for farming:

(a) that is:
(i) used in connection with farming; or
(ii) used primarily to store one or more *farm vehicles*; or
(iii) a combination of (i) and (ii); and
(b) in which the total number of persons accommodated at any time does not exceed one person per 200 m^2 of *floor area* or part thereof, up to a maximum of 8 persons; and
(c) with a total floor area of not more than 3500 m^2.

Farm shed, a single storey Class 7 or 8 building located on land primarily used for farming:

(a) that is:
(i) used in connection with farming; or
(ii) used primarily to store one or more *farm vehicles*; or
(iii) a combination of (i) and (ii); and
(b) occupied neither frequently nor for extended periods by people; and
(c) in which the total number of persons accommodated at any time does not exceed 2; and
(d) with a total floor area of more than 500 m^2 but not more than 2000 m^2.

Farm vehicle, a vehicle used in connection with farming.

Fascia, a material covering the end of roof supports extending past the external walls.

Fire Brigade, The Police Fire Service, a statutory authority having as one of its functions, the protection of life and property from fire and other emergencies.

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

Fire Compartment, a part of a building which is separated from the remainder in accordance with this Code to resist the spread of fire and smoke.

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-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 road or open space.

Fire-isolated Ramp, a ramp within a fire-resisting enclosure which provides egress from a storey.

Fire-isolated Stairway, a stairway within a fire-resisting shaft and includes the floor and roof or top enclosing structure.

Fire Main, a water supply service pipe located outside a building to supply water at adequate pressures and rates of flow for fire-fighting purposes. The fire main must be:

(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 applied in such a manner that it protects other materials or building elements from the damaging effects of fire. Acceptable materials are:

(a) 13 mm fire-protective grade plasterboard;
(b) 12 mm cellulose fibre reinforced sheeting;
(c) 12 mm mesh-reinforced fibrous piaster in which the mesh is 13 mm x 13 mm x 0.7 mm welded wire located not more than 6 mm from the exposed face; or
(d) other material not less fire-protective than 13 mm fire-protective grade plasterboard,
(e) fixed in accordance with the normal trade practice for a fire- protective covering.

Fire-resistance Level (FRL), the grading periods in minutes determined in accordance with Specification AS2.3, for:

(a) structural adequacy;
(b) integrity, and
(c) insulation,

and expressed in that order.

Fire-resisting Construction, one of the Types of construction referred to in Section GC1.

Fire-separated Section, a part of a building which is separated from the remainder by fire walls in accordance with Section GC2 and thereby regarded as a separate building.

Fire-source feature:

(a) the far boundary of a road, or the like adjoining the allotment; or
(b) a side or rear boundary of the allotment; or
(c) an *external wall* of another building on the allotment which is not a Class 10 building.

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

Fire Wall, a wall that divides a storey or building to resist the spread of fire and smoke and has the FRL required under Specification GCS1.1.

Fixture Unit, a unit of measure based on the rate of discharge, time of operation and frequency and use of a sanitary fixture, that expresses the hydraulic load imposed by that fixture to the sanitary plumbing system.

Flammability index, the index number determined under AS 1530.2. The lower the Flammability Index value, the less flammable the material being measured.

Flight, the part of a stair that has a continuous series of risers not interrupted by a landing or floor.

Flood, an inundation of water on the ground surface above normal levels.

Flood hazard area, the site (whether or not mapped) encompassing land lower than the flood hazard level which has been determined by the approval authority.

Flooding, a rise or overflow of water onto lands not normally submerged typically resulting from a result of heavy rainfall, storm surge, raised groundwater levels, overflow of river channels, increases in runoff from land or blocked drainage systems, among others.

Floodplain, areas adjacent to rivers and coasts which flood during periods of heavy rain from storm surge.

Floor Area:

(a) in relation to a building: the total area of all storeys; and
(b) in relation to a *storey*: the area of all floors of that *storey* measured over the enclosing walls (if any) and that part of any *common wall* located within the allotment; and

(c) in relation to a *room*: the area of the *room* measured within the finished surfaces of the walls, and includes the area occupied by any cupboard or other built-in furniture, fixture or fitting.

Floor Drain, a plumbing fixture installed on the floor of a building that accepts and conveys water piping connected to a suitable discharge area.

Foundation, the ground which supports the building.

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

Fuel Supply, pipes and associated fittings that contain pressurized flammable mixtures of hydrocarbon gases to supply energy for heating and cooling in a building facility, including Liquefied Petroleum Gas (propane) and natural gas (methane).

Glazing, a transparent or translucent element and its supporting frame located in the envelope and includes a window other than a roof light.

Going, the horizontal dimension from the front to the back of a tread less any overhang from the next tread or landing above.

Greywater, household wastewater from sinks, baths, washing machines, dishwashers and other kitchen appliances that do not contain toxic substances or faecal matter.

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

Growing Substrate, substance through which plant roots grow and extract water and nutrients on a green roof, which may include peat, humus, wood chips, sand, lava, or expanded clay.

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

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

Hazard, anything with an unreasonable risk of bodily injury or deterioration of health or causes a disaster.

Habitable Room, a room used for normal domestic activities, and:

(a) includes a bedroom, living room, lounge room, music room, television room, kitchen, dining room, sewing room, study, playroom, family room and sunroom; but
(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.

Health-care Building, a building whose occupants or patients undergoing medical treatment generally need physical assistance to evacuate the building during an emergency and includes:

(a) a public or private hospital; or
(b) a nursing home or similar facility for sick or disabled persons needing full-time care; or
(c) a clinic, day surgery or procedure unit where the effects of the predominant treatment administered involve patients becoming non-ambulatory and requiring supervised medical care on the premises for some time after the treatment.

Horizontal Exit, a *required* doorway through a required fire wall separating two portions of a building with approximately the same floor level so as to establish an area of refuge affording safety from fire and/or smoke in the portion from which the escape is made.

Hydrant, a fire service outlet fitting installed in a riser main or a fire main which provides a valve outlet to permit a controlled supply of water to be taken from the main for firefighting.

Hydrants installed in a riser main system within a building are referred to as *internal hydrants* and those installed in a fire main outside a building, as *external hydrants*.

Insulation, in relation to a Fire Resistance Level, FRL, means the ability to maintain a temperature on the surface not exposed to the furnace below the limits specified in AS 1530.4.

Integrity, in relation to a Fire Resistance Level, FRL, means the ability to resist the passage of flames and hot gases specified in AS 1530.4.

Internal Wall, excludes a common wall or a party wall.

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

A square junction connects the main pipe at right angles and has an airtight removable cap to facilitate inspection and cleaning.

An inspection branch is a junction with an airtight removable cap to facilitate inspection and cleaning.

Landing, an area at the top or bottom of a *flight* or between two *flights*.

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

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

Loadbearing, intended to resist forces and moments additional to those due to its own weight.

Luminance contrast, the light reflected from one surface or component, compared to the light reflected from another surface or component.

Mezzanine, an intermediate floor within a room which is not more than 1/3 of the floor area of the room or 200 m², whichever is the lesser.

Mixed construction, a building consisting of more than one form of construction, particularly in double-storey buildings.

Non-combustible:

(a) applied to a material: not deemed *combustible* as determined by AS 1530.1; and
(b) applied to construction or part of a building: constructed wholly of materials that are not deemed combustible.

Occupiable outdoor area, a space on a roof, balcony or similar part of a building:

(a) that is open to the sky; and
(b) to which access is provided, other than access only for maintenance; and
(c) that is not open space or directly connected with open space.

On-site sanitation system, a sanitation system that is not connected to the public sewer system.

Open Garage, a carport or garage with 2 or more sides substantially open.

Open Space, a space on an allotment, or a roof or similar part of a building complying with Section ND2.12, open to the sky and connected directly with a public road.

Open Spectator Stand, a tiered stand substantially open at the front.

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

Performance Requirement, a requirement which states the level of performance which a Performance Solution or Deemed-to-Satisfy Solution must meet.

Performance Solution, a method of complying with the Performance Requirements other than by a Deemed-to-Satisfy Solution.

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

Pitch, the maximum angle to the horizontal of a line connecting the nosing of stair treads in a single straight flight of a stairway.

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

Private Garage, is either:

(a) any garage associated with a Class 1 building;
(b) a single storey of a building containing not more than 3 vehicle spaces (limited to only one storey within a building); or

(c) any separate single storey garage associated with another building that contains no more than 3 vehicles.

Professional Consultant, a person with appropriate experience in the relevant field, being

(a) legislation so requires - a registered professional consultant in the relevant discipline; or
(b) a Corporate Member of a recognized professional institution.

Public Corridor, an enclosed corridor, hallway or the like which:

(a) serves as a means of egress from 2 or more sole-occupancy units to a required exit from the storey concerned; or
(b) is required to be provided as a means of egress from any portion of a storey to a required exit.

Public Carpark, a building that is 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.

Quality Assurance, an inspection by an approval authority or a peer review of the construction of a building facility to verify general conformance with the construction documents, applicable performance code and approved regulations and standards.

Registered Testing Authority:

(a) National Building Technology Centre
PO Box 30
CHATSWOOD NSW 2067
AUSTRALIA;
(b) Commonwealth Scientific and industrial Research Organisation; Division of Building Research
PO Box 56
HIGHETT VIC 3190
AUSTRALIA;
(c) An organisation registered by the National Association of Testing Authorities (NATA) to test in the relevant field;
(d) Building Research Association of New Zealand
Private Bag,
PORIRUA
NEW ZEALAND;
(e) Testing laboratories registered by the Testing Laboratory Registration Council (TELARC of New Zealand to test in the relevant field;
(f) An organisation recognized by NATA or TELARC through a mutual recognition agreement;
(g) Fire Insurers Research and Testing Organisation Melrose Avenue
BOREHAM WOOD
LONDON (UK);

(h) National Institute of Standards and Technology
GAITHERSBURG, MD 20899
USA;
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NORTHBROOK, IL 60062
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75 Boul De Mortagne Boucherville
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CANADA

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

Required, required by this Code.

Residential care building, a Class 3, 9a or 9c building which is a place of residence where 10% or more of persons who reside there need physical assistance in conducting their daily activities and to evacuate the building during an emergency (including any *aged care building* or *residential aged care building*) but does not include a hospital.

Resistance to the incipient spread of Fire, in relation to a ceiling membrane, means the ability of a ceiling membrane to insulate the space between the ceiling and roof, or ceiling and floor above, to limit the temperature rise of combustibles in this space during the Standard Fire Test to 180°C.

Rise, in storeys, means the greatest number of storeys calculated in accordance with GC1.2 at any part of the external walls of the building -

(a) above the finished ground next to that part; or
(b) part of the external wall is on the boundary of the allotment, above the natural ground level at the relevant part of the boundary.

Riser, the height between consecutive treads and between each *landing* and continuous tread.

Runoff, amount of rainfall that does not percolate into soil and becomes perched on the ground-surface.

Safety Glass, toughened or laminated glass 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 Tuvalu, 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, or 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, and accessories such as towel racks, automatic hand dryers, soap dispensers etc.

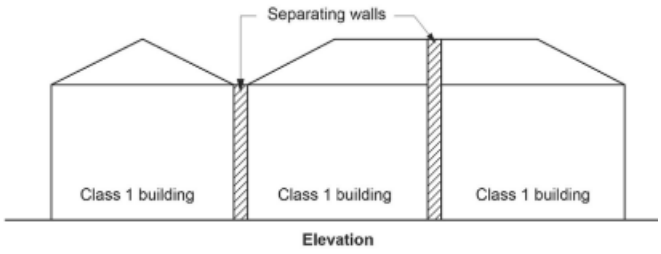
Sarking-type Material, a material such as a reflective foil or other flexible membrane of a type normally used for a purpose such as water-proofing, vapour proofing or thermal reflectance.

School, includes a primary or secondary school, college, university or similar educational establishment.

Self-closing, applied to a door or window means equipped with a device which returns the door or window to the fully closed and latched position immediately after each manual opening.

Separating element, a barrier that exhibits fire integrity, structural adequacy, insulation, or a combination of these for a period of time under specified conditions (often in accordance with AS 1530.4).

Separating wall, a wall that is common to adjoining Class 1 building.



Service, a mechanical or electrical system that uses energy to provide air-conditioning, mechanical ventilation, heated water supply, artificial lighting, vertical transport and the like within a building, but which does not include -

(a) systems used solely for emergency purposes; and
(b) cooking facilities; and
(c) portable appliances.

Service Station, a garage which is not a private garage and is for the servicing of vehicles, other than only washing, cleaning or polishing.

Sewage, waterborne human waste from domestic and commercial premises including faeces and urine, and waste from kitchens, showers, baths, domestic laundries etc.

Sewer, a conduit vested in a public authority and located outside the property boundary. It is used for the conveyance of waste water.

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.

Site, the part of the allotment of land on which a building stands or is to be erected.

Sitework, work on or around a site, including earthworks, preparatory to or associated with the construction, alteration, demolition or removal of a building.

Sludge, semi-liquid solids settled from wastewater.

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-Developed Index, the index number for smoke developed under AS/NZS 1530.3.

Soak pit, an area constructed of course aggregate, stones, or similar, below ground level to collect stormwater and runoff.

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.

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 and includes:

(a) a dwelling; or
(b) a room or suite of rooms in a Class 3 building which includes sleeping facilities; or
(c) a room or suite of associated rooms in a Class 5, 6, 7, 8 or 9 building; or
(d) a room or suite of associated rooms in a Class 9c building, which includes sleeping facilities and any area for the exclusive use of a resident.

Spread-of-Flame Index, the index number for spread of flame under AS/NZS 1530.3.

Sprinkler System, a system of automatic fire sprinklers complying with NE1.5.

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

Stage, a floor or platform in Class 9b building on which performances are presented before an audience.

Standard Fire Test, the Fire-resistance Test of Structures under AS 1530.4.

Storey, a space within a building which is situated between one floor level and the floor level next above, or if there is no floor above, the ceiling or roof above, but not –

(a) a stairway or meter room;
(b) a bathroom, shower room, water closet, or other sanitary compartment, or
(c) a combination of the above.

Storm Surge, a rise in sea level over and above the predicted astronomical tide generated by a storm or tsunami.

Structural Adequacy, in relation to a Fire Resistance Level, FRL means the ability to maintain stability and adequate load bearing capacity under AS1530.4.

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

Stud, an upright support in the wall of a building facility to which sheathing, drywall, etc. are attached

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

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

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

Upgrades, alterations made to an existing building to improve building performance requirements. An upgraded building is not required to meet all provisions of the National Building Code unless required to do so by other legislation.

Ward Area, that portion of a storey of a Class 9a building for residing patients and includes areas for sleeping, recreation and sanitary facilities, and nurses' stations.

Waste Fixture, a sanitary fixture other than a soil fixture. Examples are: basins, bidets, kitchen sink, laundry trough etc.

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.

Waterproof, the complete and total resistance of a building element or material to the ingress 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 (excludes kitchens, bar 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 main.

Winders, treads within a straight flight that are used to change direction of the stair.

Window, includes a roof light, glass panel, glass brick, glass louver, 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.

A1.2 Adoption of Standards and other references

The adoption of a Standard, rule, specification or provision included in any document issued by the Standards Association of Australia, Standards Association of New Zealand or other body, does not include a provision:

(a) specifying the respective rights, responsibilities or obligations between that body and any manufacturer, supplier or purchaser;
(b) specifying the responsibilities of any tradesman or other building operative, architect, engineer, authority, or other person or body;
(c) requiring the submission for approval of any material, building component, form or method of construction, to any person, authority or other body;
(d) specifying that a material, building component, form or method of construction, must be submitted to the Standards Association of Australia, Standards Association of New Zealand or other body or a committee of either Association for expression of opinion; or
(e) permitting a departure from the Standard, rule, specification or provision at the sole discretion of the manufacturer or purchaser, or by arrangement or agreement between the manufacturer and purchaser.

A1.3 Referenced Standards

A reference to a document under Section A1.2 refers to the latest edition or issue, together with any amendment, listed in A7.0.

A1.4 Differences between referenced documents and this Code

This Code overrules in any difference arising between it and any Standard, rule, specification or provision in a document listed in A7.0. Further, references in this Code to any Standard or Code of Practice issued by the Standards Association of Australia or of New Zealand or such other body, exclude the need for:

(a) compliance with NZS 1900 wherever it is quoted in any standard;
(b) compliance with any laws and regulations that are not of this country; and
(c) recognition of the meaning of “Engineer”.

Also, references to “FRR” in Standards issued by the Standards Association of New Zealand mean “Fire resistance level” as defined in this Code.

A1.5 Mandatory provisions

(a) The following provisions of the Code are mandatory:
  (i) all provisions of Section A; and
  (ii) the Performance Requirements stated at the beginning of all the other Sections.
(b) The Deemed-to-Satisfy Provisions of the Code are one means of satisfying the Performance Requirements. The Performance Requirements can also be met by any other means, Performance Solutions. When this latter approach is taken, it must meet the final objectives and performance that would have been achieved had the Deemed-to-Satisfy Provisions been followed.

A2 ACCEPTANCE OF DESIGN AND CONSTRUCTION

A2.0 Suitability of materials

Every part of a building must be constructed in a manner which will achieve the required level of performance, using materials and methods that are not faulty or unsuitable for the purpose for which they are intended.

Evidence of suitability (as defined in Section A2.1) shall be provided for all materials imported from overseas and shall be provided to the Building Controller on request.

A2.1 Evidence of suitability

Evidence to support the use of a material, method, form of construction or design may be –

(a) a report issued by a Registered Testing Authority, showing that the material of form of construction has been submitted to the tests listed in the report, and setting out the results of those tests and any other relevant information that demonstrates its suitability for use in the building;
(b) a current Certificate of Accreditation;
(c) a certificate from an appropriately qualified professional consultant which –
  (i) certifies that a material, design or form of construction complies with the requirements of this Code; and
  (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; or
(d) a Standards Mark Certificate issued by the Standards Associations of Australia or the Standards Association of New Zealand; or
(e) any other form of documentary evidence that correctly describes the properties and the performance of the material or form of construction and adequately demonstrates its suitability for use in the building,

and any copy of documentary evidence submitted under this Code, must be a complete copy of the original report or document.

A2.2 Fire Resistance of building elements

The *fire resistance level*, FRL of structural member or other building element must be determined in accordance with A.A7.1. Any relevant testing or certification must be by an appropriately qualified professional consultant or Registered Testing Authority.

A2.3 Early Fire Hazard indices

The Early Fire Hazard Indices of a component or assembly must be determined in accordance with A.A7.3

A2.4 Material durability

Building materials, components and construction methods shall be sufficiently durable to ensure that the building, without reconstruction or major renovation, satisfies the functional requirements of this Code throughout its design life. Refer to

Section B1.3 for minimum durability requirements of common materials used in construction.

A2.5 Use of native timber

The use of native timber is prohibited in the construction of buildings, except when:

(a) used solely for architectural and cultural decoration;
(b) permission has been granted by the Building Controller;
(c) used for the construction of Traditional Buildings as described in the Building Act and Regulations.

In this context, “native timber” means logs and sawn pieces of dressed and undressed timber of trees indigenous to Tuvalu.

A3 CLASSIFICATION OF BUILDINGS AND STRUCTURES

Classification is a process for understanding risk in a building or part of a building according to its use.

A3.0 Principles of classification

(a) The classification of a building or part of a building is determined by the purposes for which it is designed, constructed or adapted to be used.
(b) Each part of a building must be classified according to its purpose and comply with all the appropriate requirements for its classification.
(c) A room that contains a mechanical, thermal or electrical facility or the like that serves the building must have the same classification as the major part or principal use of the building or *fire compartment* in which it is situated
(d) Unless another classification is more suitable an *occupiable outdoor area* must have the same classification as the part of the building to which it is associated.
(e) Where it is unclear which classification should apply, the approval authority has the discretion to decide.

A3.1 Classifications

Buildings are classified as follows:

Class 1: are houses. Class 1 buildings are typically standalone single dwellings of a domestic or residential nature.

They can also be horizontally attached to other Class 1 buildings such as terrace houses, row houses, or townhouses in which case they must be separated by a *common wall* that has fire-resisting and sound insulation properties. Class 1 buildings cannot be located above or below any other dwelling (or any other class of building) other than a private garage. Class 1 buildings consist of two sub classifications:

(a) **Class 1a**: a single dwelling being a detached house; or one of a group of attached dwellings being a town house, row house or the like; and
(b) **Class 1b**: a boarding house, guest house or hostel that has a floor area less than 300 m^2, and ordinarily has less than 12 people living in it. It can also be four or more single dwellings located on one allotment which are used for short-term holiday accommodation.

Class 2: are apartment buildings. Class 2 buildings typically are multi-unit residential buildings (containing 2 or more *sole-occupancy units*) where people live above and below each other.

Class 2 buildings may also be single storey attached dwellings where there is a common space below. For example, two dwellings above a common basement or carpark.

Class 3: are residential buildings, other than a building of Class 1 or 2. They are a common place of long-term or transient living for a number of unrelated persons. Examples include:

(a) a boarding house, guest house, hostel, or lodging house (that are larger than the limits for a Class 1b building);
(b) a residential part of a hotel or motel;
(c) a residential part of a school;
(d) a residential part of a health-care building which accommodates members of staff;
(e) a residential part of a *detention centre; or*
(f) accommodation buildings for children, the elderly or people with disability, and which are not considered to be Class 9 buildings.

Class 4: A Class 4 part of a building is a dwelling or residence within a building of a non-residential nature (Class 5 to 9 buildings). There can only be one Class 4 part in a building. An example of a Class 4 part of a building would be a caretaker's residence in a storage facility.

Class 5: are office buildings used for professional or commercial purposes, excluding buildings of Class 6, 7 or 8. Examples include:

(a) Offices for accountants, lawyers or government agencies; or
(b) Medical practitioner's practice as long as treatment administered in the practice does not leave the patient unconscious or non-ambulatory, in which case it is a Class 9 building.

Class 6: are shops or buildings for the sale of goods by retail or the supply of services direct to the public, including:

(a) an eating room, café, restaurant, milk or soft drink bar;
(b) a dining room, bar, shop or kiosk portion of an hotel or motel;
(c) a hairdresser's or barber's shop, public laundry, or undertaker's establishment;
(d) a market or show room; or
(e) a service station.

Class 7: include two sub classifications:

(a) **Class 7a**: *public carparks*; and
(b) **Class 7b**: warehouses, storage buildings or buildings for the display of goods (or produce) that is for wholesale.

Class 8: a process-type building that includes the following:

(a) a laboratory (due to its high potential for a fire hazard);
(b) a building in which the production, assembling, altering, repairing, packing, finishing, or cleaning of goods or produce for sale takes place and includes factories, mechanic's workshop and such.

Class 9: a building of a public nature and contains three sub classifications:

(a) **Class 9a** – a *health-care building* including any parts of the building set aside as laboratories and includes a *health-care building* used as a *residential care building.*
(b) **Class 9b** – an *assembly building* in which people may gather for social, theatrical, political, religious or civil purposes. Includes schools, universities, childcare centres, pre-schools, sporting facilities, night clubs or public transport buildings.
(c) **Class 9c** – a *residential care building*.

Class 10: are non-habitable outbuilding or structure:

(a) **Class 10a** – a carport, *private garage*, shed or the like;
(b) **Class 10b** – a structure that is a fence, mast, antenna, retaining or free-standing wall, *swimming pool*, or the like.

A3.2 Multiple classification

Each part of a building must be classified separately, and:

(a) where parts have different purposes – if not more than 10% of the floor area of storey which is not a laboratory is used for a purpose which is a different classification, the classification applying to the major use may apply to the whole storey.
(b) Classes 9a, 9b, 10a and 10b are separate classifications; and
(c) a reference to:
  (i) Class 9 – is to Class 9a or 9b; and
  (ii) Class 10 – is to Class 10a or 10b.

As buildings can have mixed uses they can also have mixed (or multiple) classifications. For example, a building may have a basement carpark (Class 7a) with ground floor retail space (Class 6) and residential apartments above (Class 2). See Figure 2 below.

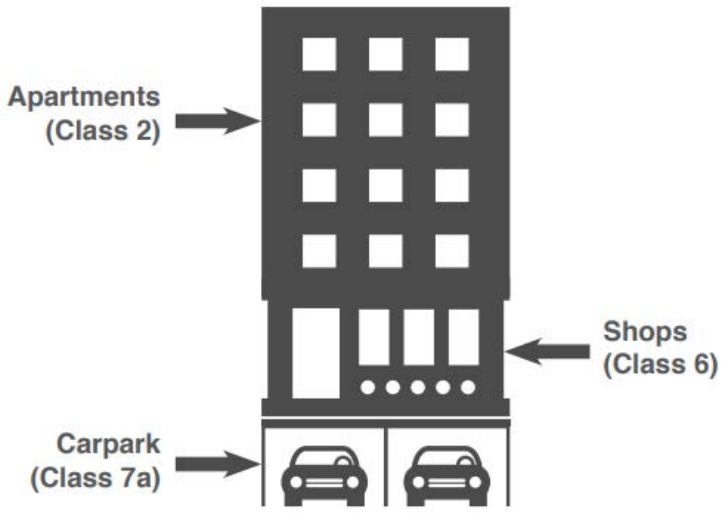


Figure 2 Buildings of Multiple classification

Each part of a building must be classified separately. However, where a part has a different purpose and is not more than 10% of the floor area of the storey it is on, then it may be considered to be ancillary to the major use.

For instance, if a single storey warehouse (Class 8) has an office (Class 5) which takes up only 8% of the floor area, the whole building can be classified as a Class 8. However, if the office takes up 12% of the floor area then the building has mixed uses and the warehouse (Class 8) and office (Class 5) must be classified separately.

A building (or a part of a building) may be designed to serve multiple purposes and may have more than one classification. For example, it is permissible for a building to be a Class 6/7, or a Class 5/6, or whatever is appropriate.

This allows flexibility in how the building might be used over time. For example, if a building is intended for retail shopping, storage or office space it may be designed as a Class 5/6/7. At the design stage, it may not be clear who the final tenant will be (or how they will be using their tenancy) so as long as the design meets the minimum requirements of all the classifications, it could be used for any of the purposes.

A4 UNITED BUILDINGS

A4.0 When buildings are united

Two or more buildings adjoining each other are considered to form one united building if they:

(a) are connected through openings in the walls dividing them; and
(b) together comply with all the requirements of this Code as though they are a single building.

A4.1 Alterations in a united building

After any *alteration* or any other action:

(a) a united building; or
(b) each building forming part of a united building; or
(c) each building if they cease to be connected through openings in the dividing walls,

must comply with all requirements for a single building.

A5 IMPORTANCE LEVELS AND DESIGN LIFE OF BUILDINGS

A5.0 Importance levels of buildings

The Importance Level of a building is dependant on its occupancy and use. Table 1 describes, in general terms, five categories of structure and gives some examples of each. For those buildings not specifically mentioned, the designer will need to exercise judgement in assigning the appropriate level.

Structures that have multiple uses shall be assigned the highest importance level applicable for any of those uses. Where access to a structure is via another structure of a lower importance level, then the importance level of the access structure shall be designated the same as the structure itself.

Table 1 Description of Building Importance levels

Consequences of Failure	Description	Importance Level	Comment
Low	Low consequence for loss of human life or small or moderate economic, social or environmental consequences.	1	Minor Structures (failure not likely to endanger human life)
Ordinary	Medium consequences for loss of human life, or considerable economic, social or environmental consequences.	2	Normal Structures or structures not falling into other levels
High	High consequence for loss of human life or very great economic, social or environmental consequences.	3	Major Structures (affecting crowds)
		4	Post Disaster Structures (Post Disaster Functions or Dangerous activities)
Exceptional	Circumstances where reliability must be set on a case by case basis.	5	Exceptional Structures (Beyond the scope of this code)

Building Importance levels shall be adopted based on the following table:

Table 2 Building Importance level definitions

Importance level	Description	Examples
1	Structures presenting a low degree of hazard to life and other property	Structures with a total floor area of <30 m2 Farm buildings, isolated structures, towers in rural situations Fences, masts, walls, in-ground swimming pools
2	Normal structures and structures not in other importance levels	Buildings not included in Importance Levels 1, 3 or 4 Single family dwellings Car parking buildings
3	Structures that as a whole may contain people in crowds or contents of high value to the community or pose risks to people in crowds	Buildings and facilities as follows: a) Where more than 300 people can congregate in one area b) Day care facilities with a capacity greater than 150 c) Primary school or secondary school facilities with a capacity greater than 250 d) Colleges or adult education facilities with a capacity greater than 500 e) Health care facilities with a capacity of 50 or more resident patients but not having surgery or emergency treatment facilities f) Airport terminals, principal railway stations with a capacity greater than 250 g) Correctional institutions h) Public assembly buildings, theatres and cinemas of greater than 1000 m2 i) Emergency medical and other emergency facilities not designated as post-disaster j) Power-generating facilities, water treatment and waste water treatment facilities and other public utilities not designated as post-disaster k) (k) Buildings and facilities not designated as post-disaster containing hazardous materials capable of causing hazardous conditions that do not extend beyond the property boundaries

4	Structures with special post-disaster functions	a) Buildings and facilities designated as essential facilities b) Buildings and facilities with special post-disaster function c) Medical emergency or surgical facilities d) Emergency service facilities such as fire, police stations and emergency vehicle garages e) Utilities or emergency supplies or installations required as backup for buildings and facilities of Importance Level 4 f) Designated emergency shelters, designated emergency centres and ancillary facilities g) Buildings and facilities containing hazardous materials capable of causing hazardous conditions that extend beyond the property Boundaries
5	Special structures (outside the scope of the building code acceptable probability of failure to be determined by special study)	Structures that have special functions or whose failure poses catastrophic risk to a large area (e.g. 100 km2) or a large number of people (e.g., 100 000) Major dams, extreme hazard facilities

A5.1 Building Design Life

The design life of a building or structure is the period of use as intended by the designer after which it may need to be replaced. Before this period has elapsed, it should remain fit for purpose.

The design life for normal structures is generally taken as 50 years. Design life will vary according to the type and use of the element being considered. The below list gives indicative design lives for various types of structure:

(a) Category 1: Temporary structures, not including structures or parts of structures that can be dismantled with a view to being re-used – 10 years.
(b) Category 2: Replaceable structural parts, e.g. gantry girders, bearings – 10 to 25 years.
(c) Category 3: Agricultural and similar buildings – 15 to 30 years.
(d) Category 4: Building structures and other common structures – 50 years.
(e) Category 5: Monumental building structures, bridges and other civil engineering structures – 100 years.

A6 BUILDING LEVELS

The minimum Floor level of any building Shall be no lower than 2.36m above mean seal level. For Funafuti Island this is 0.4m above the level of Benchmark 22 (BM22)

A7 SPECIFICATIONS

A7.0 STANDARDS ADOPTED BY REFERENCE

A7.0.0 Schedule of referenced documents

The Standards and other documents listed in Table 3 are referred to in this Code. In order to reduce possible confusion/conflict, the Standards produced by the Standards Association of Australia or by the Standards Association of New Zealand as seen to be specifically relevant, have been called up. However, the Code users are free to use any suitable mix of Australian and New Zealand Standards provided care is taken to follow consistent technical principles and prevalent practices. Where the Standards from either Australia or New Zealand do not cover any specific area, the relevant Standards issued by the British Standards Institution or the American Society for Testing and Materials may be used.

Table 3 Schedule of Referenced Documents

No	Title
AS/NZS 1170	Structural design actions
Port 0	General Principles
Part 1	Permanent imposed and other actions
Part 2	Wind Actions
Part 5	Earthquake Actions
AS/NZS 1221	Fire Hose Reels
AS 1271	Bourdon tube pressure and vacuum gauges
AS 1428	Design rules for access by the disabled
Part 1	Regulatory Requirements
AS 1530	Methods of fire tests on building Materials, components, and structures
Part 1	Combustibility test for materials
Part 2	Test for flammability of materials
Part 3	Test for early fire hazard properties of materials
Part 4	Fire-resistance tests on elements of building construction
AS 1657	Fixed platforms, walkways, stairways and ladders – Design, construction, and installation
AS 1664	Rules for the use of aluminium in structures (SAA Aluminium Structures Code)
AS 1668	The use of ventilation and air conditioning in buildings
Part 1	Fire and smoke control in buildings
Part 2	Mechanical ventilation in buildings
AS 1670	Fire detection, warning, control and intercom systems
AS 1720	Timber Structures

AS 1735	Lifts, escalator and moving walks (known as the SAA Lift Code)
Part 2	Passenger and goods lifts - electric

A7.1 FIRE RESISTANCE OF BUILDING ELEMENTS

A7.1.0 Scope

This Specification sets out the procedure for determining the Fire Resistance Level, FRL of structural members and other building elements.

A7.1.1 Rating

A building element has a FRL if:

(a) it is listed in, and complies with Table 1 of this Section;
(b) it is identical with a prototype that has been submitted to the Standard Fire Test and the FRL achieved by the prototype is confirmed in a report from a Registered Testing Authority which:
  (i) describes the method and condition of test and the form of construction of the tested prototype in full; and
  (ii) certifies that the application of restraint to the prototype complied with the Standard Fire Test;
(c) it differs in only a minor degree from a prototype tested under (b) and the FRL attributed to the structural member is confirmed in a report from a Registered Testing Authority which:
  (i) certifies that the structural member is capable of achieving the FRL despite the minor departures from the tested prototype; and
  (ii) describes the materials, construction and conditions of restraint which are necessary to achieve the FRL;
(d) it is designed to achieve the FRL in accordance with
  (i) AS 4100, AS/NZS 2327 and AISC Guidelines for Assessment of Fire Resistance of Structural Steel Members if it is a steel or composite structure; or
  (ii) AS 3600 if it is a concrete structure; or
  (iii) AS 1720.4 if it is a solid or glued-laminated timber structure.
(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.

A7.1.2 FRLs determined by calculation

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 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; and

(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* and
   (iii) *insulation*; and

(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 profile, 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; and
   (v) the design load of the building element in comparison with the tested prototype.

A7.1.3 Interchangeable materials

(a) Concrete and plaster: The 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: The FRL achieved with either gypsum perlite plaster or gypsum-vermiculite plaster applies equally for both plasters.

A7.1.4 Columns covered with lightweight construction

(a) Protection against injury: If the fire-resisting covering of a steel column is lightweight construction:
   (i) the covering must be protected by metal or other suitable material if the column is liable to damage from the movement of vehicles, materials or equipment; and

(ii) the voids must be filled solid with *non-combustible* material to a height of not less than 1.2m above the floor level to prevent indenting, if the covering is not in continuous contact with column; and

(b) Sealing at floor level: A plug of *non-combustible* material must seal all voids at each floor level, including voids between the column and its covering if:
   (i) a steel column extends through 2 or more storeys; and
   (ii) the fire-resisting covering is not in continuous contact with the column.

TABLE 1: FRLs DEEMED TO BE ACHIEVED BY CERTAIN BUILDING ELEMENTS

Building element	**Minimum thickness (mm) of principal material for FRL's**				
WALL					
	60/60/60	90/90/90	120/120/120	180/180/180	240/240/240
Masonry					
Ashlar	-	-	-	-	300
Calcium silicate			Refer AS3700		
Concrete			Refer AS3700		
Fired clay (inc terracotta)			Refer AS3700		
Concrete					
No-fines	-	-	-	150	170
Prestressed			Refer AS3600		
Reinforced			Refer AS3600		
Plain	-	-	-	150	170
Solid gypsum blocks	75	90	100	110	125
Gypsum — perlite or Gypsum vermiculite - plaster on metal lath and channel (non-loadbearing walls only)	50	50	65	-	-
CONCRETE COLUMN					
	60/60/60	90/90/90	120/120/120	180/180/180	240/240/240
Prestressed			Refer AS3600		
Reinforced			Refer AS3600		
HOT-ROLLED STEEL COLUMN					
	60/60/60	90/90/90	120/120/120	180/180/180	240/240/240
(inc a fabricated column) exposed on no more than 3 sides: Fire protection of **Concrete** — Cast in-situ— loadbearing	25	30	40	55	75
non-loadbearing					
unplastered	25	30	40	50	60
plastered 13mm—	25	25	30	40	50
Gypsum — Cast in-situ—	-	-	-	-	50

Gypsum — perlite or Gypsum-vermiculite plaster					
sprayed to contour	20	25	35	50	55
sprayed on metal lath	20	20	25	35	45
HOT-ROLLED STEEL COLUMN					
	60/60/60	90/90/90	120/120/120	180/180/180	240/240/240
(inc a fabricated column) exposed on no more than 3 sides and with column spaces filled: Fire protection of —					
Solid calcium-silicate masonry	50	50	50	50	65
Solid clay masonry	50	50	50	65	90
Solid concrete masonry	50	50	50	65	90
Solid gypsum blocks	50	50	50	50	65
Hollow terracotta blocks—					
plastered 13mm	50	50	50	65	90
HOT-ROLLED STEEL COLUMN					
	60/60/60	90/90/90	120/120/120	180/180/180	240/240/240
(inc a fabricated column) exposed on no more than 3 sides and with column spaces unfilled: Fire protection of —					
Solid calcium-silicate masonry	50	50	50	-	-
Solid clay masonry	50	50	65	-	-
Solid concrete masonry	50	50	65	-	-
Solid gypsum blocks	50	50	50	-	-
Hollow terracotta blocks—					
plastered 13mm	50	50	65	-	-
HOT-ROLLED STEEL COLUMN					
	60/-/-	90/-/-	120/-/-	180/-/-	240/-/-
(inc. a fabricated column) exposed on 4 sides: Fire protection of —					
Concrete — Cast in-situ—					
loadbearing	25	40	45	65	90
non-loadbearing					
unplastered	25	30	40	50	65
plastered 13mm—	25	25	30	40	50
Gypsum — Cast in-situ—	-	-	-	-	50
Gypsum — perlite or Gypsum-vermiculite plaster					

sprayed to contour	25	30	40	55	65
sprayed on metal lath	20	20	30	40	50
HOT-ROLLED STEEL COLUMN					
	60/-/-	90/-/-	120/-/-	180/-/-	240/-/-
(inc. a fabricated column) exposed on 4 sides and with column spaces filled: Fire protection of —					
Solid calcium-silicate masonry here	50	50	50	65	75
Solid clay masonry	50	50	50	75	100
Solid concrete masonry	50	50	50	75	100
Solid gypsum blocks	50	50	50	65	75
Hollow terracotta blocks— plastered 13mm	50	50	50	75	100
HOT-ROLLED STEEL COLUMN					
	60/-/-	90/-/-	120/-/-	180/-/-	240/-/-
(inc. a fabricated column) exposed on 4 sides and with column spaces unfilled: Fire protection of —					
Solid calcium-silicate masonry here	50	50	50	-	-
Solid clay masonry	50	50	65	-	-
Solid concrete masonry	50	50	65	-	-
Solid gypsum blocks	50	50	50	-	-
Hollow terracotta blocks— plastered 13mm	50	50	65	-	-
BEAM					
	60/-/-	90/-/-	120/-/-	180/-/-	240/-/-
Concrete —					
Prestressed			Refer AS3600		
Reinforced			Refer AS3600		
Hot-rolled Steel (inc. an open-web joist girder truss etc) exposed on no more than 3 sides: Fire protection of —					
Concrete — Cast in-situ—	25	30	40	50	65
Gypsum — perlite or Gypsum-vermiculite plaster					
sprayed to contour	20	25	35	50	55
sprayed on metal lath	20	20	25	35	45
Hot-rolled Steel (inc. an open-web joist girder truss etc) exposed on 4 sides: Fire protection of —					

Concrete — Cast in-situ—	25	40	45	60	90
Gypsum — perlite or Gypsum-vermiculite plaster					
sprayed to contour	25	30	40	55	65
sprayed on metal lath	20	20	30	40	50
FLOOR, ROOF OR CEILING					
	60/60/60	90/90/90	120/120/120	180/180/180	240/240/240

Concrete —	
Prestressed	Refer AS3600
Reinforced	Refer AS3600

A7.2 ANNEXURE TO TABLE 1

A7.2.0 Mortar, plaster and plaster reinforcement

A7.2.0.0 Mortar for masonry

Masonry units of concrete must be laid in cement mortar or composition mortar complying with the relevant provisions of AS 3700.

A7.2.0.1 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 1m^3 of perlite or vermiculite to 640 kg of gypsum if the required thickness of the plaster is not more than 25 mm; and
(b) in 2 coats if the required thickness is more than 25 mm, the first in the proportion of 1m^3 of perlite or vermiculite to 800 kg of gypsum and the second in the proportion of 1m^3 perlite or vermiculite to 530 kg of gypsum.

A7.2.0.2 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; and
(b) may be finished with gypsum, gypsum- sand, gypsum-perlite or gypsum-vermiculite plaster or with lime putty.

A7.2.0.3 Plaster Reinforcement

If plaster used as fire-protection on walls is more than 19 mm thick

(a) it must be reinforced with expanded metal lathe that:
  (i) has a mass per unit area of not less than 1.84 kg/m;
  (ii) has not fewer than 98 meshes/m; and
  (iii) is protected against corrosion by galvanising or other suitable method; or
(b) 13mm x 13mm x 0.710 mm galvanised steel wire mesh; and
(c) 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.

A7.2.1 DIMENSIONS OF MASONRY

The thickness of concrete masonry is calculated as follows:

A7.2.1.0 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.

A7.2.1.1 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 equipment thicknesses of the units and the specified thickness of the joints between them as appropriate.

A7.2.1.2 Equivalent thickness

The equivalent thickness of a masonry unit is calculated by dividing the net volume by the area of one vertical face.

A7.2.1.3 Cavity Walls

The thickness of a cavity wall is the sum of the thicknesses of the leaves determined in accordance with 2.1 and/or 2.2 as appropriate.

A7.2.1.4 Cavity Walls of Different Materials

If the 2 leaves of a cavity wall are of units of different type, the thickness required is that listed for the less fire-resistant material (i.e. the greater thickness).

A7.2.2 SLENDERNESS RATIO OF MASONRY

A7.2.2.0 Maximum Value

The slenderness ratio of a masonry wall must not exceed the appropriate value in Table 3.1.

A7.2.2.1 Calculation

The slenderness ratio of a masonry wall is calculated in accordance with AS 3700. In the case of cavity walls, it is calculated for each leaf separately. Each leaf must satisfy Table 4.

Table 4 Maximum Slenderness ratios for Masonry Walls

MAXIMUM SLENDERNESS RATIOS FOR MASONRY WALLS			
TYPE OF UNIT	**FRL**		
	60/60/60	**90/90/90**	**120/120/120**

Concrete in which the basalt content of the aggregate is			
less than 45%	18	17	16
45% or more	22.5	21	19.5
Reinforced masonry - all types of unit designed for -			
axial forces and flexure-	27	27	27
flexure-with super-imposed axial forces less than 5% of load capacity-	36	36	36

A7.2.3 PROTECTION TO MASONRY REINFORCEMENT

In a building element of reinforced masonry designed for fire-resistance, the distance from the surface of the element to the surface of the reinforcement must not be less than 30 mm for FRL 60/60/60.

In a building element of reinforced masonry designed for fire-resistance, the distance from the surface of the element to the surface of the reinforcement must not be less than:

(a) for FRL 60/60/60 or 90/90/–0 - 30 mm;
(b) for FRL 120/120/1–0 - 40 mm;

A7.2.4 INCREASE IN THICKNESS BY PLASTERING

A7.2.4.0 General

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.

A7.2.4.1 Walls

If a wall of concrete masonry is plastered on both sides to an equal thickness of the wall for the purposes of Table 1 (but not for the purposes of Table 3.1) may be increased by the following proportions of the thickness of the plaster on one side:

(a) For concrete masonry in which the aggregate is of a density in excess of 1800 kg/m^3: 100%
(b) For concrete masonry in which the aggregate is of a density between 1600 and 1800 kg/m^3: 85%
(c) For concrete masonry in which the aggregate is of a density less than 1600 kg/m^3: 75%

A7.2.5 CONCRETE SLABS BEAMS WALLS AND COLUMNS

The requirements to meet specific values of FRL are those contained in AS 3600.

A7.2.6 GYPSUM-PERLITE OR GYPSUM-VERMICULITE PLASTER ON METAL LATH

A7.2.6.0 7.1 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; and
(b) the gypsum-perlite or gypsum-vermiculite plaster must be applied symmetrically to each exposed side of the lath.

A7.2.6.1 Columns

For the fire protection of steel columns with gypsum-perlite or gypsum-vermiculite on metal lath:

(a) the thickness of the plaster must be measured from the back of the lath;
(b) 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
(c) the plaster may be applied to self-furring lath with furring dimples to hold it not less than 10 mm clear of the column.

A7.2.6.2 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;
(b) the thickness of the plaster must be measured from the back of the lath.

A7.2.7 EXPOSURE OF COLUMNS AND BEAMS

A7.2.7.0 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.

A7.2.7.1 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.

A7.2.8 REINFORCEMENT FOR COLUMN AND BEAM PROTECTION

A7.2.8.0 Masonry

Concrete masonry for the protection of steel columns must have steel-wire or mesh reinforcement in every second course and lapped at the corners.

A7.2.8.1 Structural concrete

If a steel column or a steel beam is to be protected with structural concrete:

(a) the concrete must be reinforced with steel-wire mesh or steel-wire binding placed about 20 mm from its outer surface; and
(b) for concrete less than 50 mm thick, the steel wire must –e -
  (i) at least 3.15 mm in diameter; and
  (ii) spaced at not more than 100 mm vertically; or
(c) for concrete not less than 50 mm thick, the steel wire must be either:
  (i) of a diameter and spacing in accordance with (b); or
  (ii) at least 5 mm in diameter and spaced at not more than 150 mm vertically.

A7.2.8.2 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 10.3, the plaster must be reinforced with:
  (i) expanded metal lath complying with Section A7.2.0.3 Plaster Reinforcement; or
  (ii) galvanised steel mesh complying with Section A7.2.0.3.
(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 5.
(c) For the purposes of Table 5
  (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; and
  (iii) “underside” means the underside of any horizontal or non-vertical surface.

Table 5 Reinforcement of Gypsum-Perlite or Gypsum Vermiculite Plaster Sprayed to Contour

REINFORCEMENT OF GYPSUM-PERLITE OR GYPSUM-VERMICULATE PLAST ER 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	
Members with other shapes:		
Vertical	Any size	450
Non-vertical	Any size	300
Upper side of a horizontal surface	Not required	

A7.2.9 THICKNESS OF COLUMN AND BEAM PROTECTION

A7.2.9.0 Measurement of thickness

The thickness of the fire-protection to steel columns and steel beams (other than tire protection of gypsum-per-lite 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 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; and
(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 flange projects 65 mm or more from the web; and
    (ii) the thickness of the edge of the flange (inclusive of any splice plate) is not more than 40 mm.

A7.3 EARLY FIRE HAZARD TEST FOR ASSEMBLIES

A7.3.0 Scope

This Specification sets out the procedures for determining the Early Fire Hazard indices of components and assemblies. These tests classify building materials, their surface finishes and furnishings according to:

(a) their tendencies to ignite;
(b) their tendencies to spread flame;
(c) the heat they develop once ignition has occurred; and
(d) their tendencies to produce smoke.

A7.3.1 Form of test

Tests must be carried out in accordance with AS/NZS 1530.3 and AS 1530.4.

A7.3.2 Test specimens

Test specimens must incorporate:

(a) all types of joints; and
(b) all types of perforations, recesses or the like for pipes, light switches or other fittings, which are proposed to be used for the member or assembly of members in the building.

A7.3.3 Concession

Clause 3 does not apply to joints, perforations, recesses or the like that are larger than those in the proposed application and have already been tested in the

particular form of construction concerned and found to comply with the conditions of test.

A7.3.4 Smaller specimen permitted

A testing laboratory may carry out the test at pilot scale if a specimen (which must be not less than 900 mm) will adequately represent the proposed construction in the building, but the results of that test do not apply to construction larger than limits defined by the laboratory conducting the pilot examination.

SECTION B – STRUCTURE

THIS SECTION APPLIES TO ALL BUILDINGS

Performance Requirements

Deemed to Satisfy Provisions

B1 Structural Provisions

B2 Demolition

B3 Glazing and Windows – Structure and Safety

B8 STRUCTURAL PROVISIONS

B1.1 PERFORMANCE REQUIREMENTS

B8.1.1 OBJECTIVES

A building and all connected services must be designed and constructed to fulfil the following objectives:

(a) prevent death and injury to people from structural failure, structural behaviours and consequences of Disasters
(b) avoid distress to occupants as a result of deflection vibration degradation or other similar causes
(c) avoid damage to neighbouring property
(d) satisfy the intended use.

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

B1.2 REQUIRED PERFORMANCE

B1.2.1 General Requirements

Buildings and their elements must be designed and constructed in order 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 and frequency of all possible loads, dynamic responses and internal actions
(b) the properties of the materials used in the building, and
(c) the foundation conditions.

B1.2.2 Design Loads

The design and construction must take into account the loads resulting from the following acting either singly or in possible combinations:

~~(a)~~ permanent actions (*dead loads*)
(b) imposed actions (*live loads* arising from occupancy and use)
(c) temperature variations
(d) earth pressure
(e) wind
(f) resonance effects
(g) impact
(h) explosion/implosion
(i) fire
(j) water and other liquids
(k) fatigue resulting from fluctuating loads
(l) differential displacement
(m) adverse effects due to closeness of other buildings
(n) any other expected loads.

B1.2.3 Structural Durability

Buildings must achieve the intended design life or period of durability as indicated in Section A5.2.

B1.2.4 Design and Construction

The 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, and
(d) want of accuracy in the methods used to predict the structural performance of the building.

The design of buildings must satisfy:

(a) during the lifespan of the building the probability of experiencing unacceptable deflections or vibrations must not exceed 5%.
(b) the probability of risk of structural failure must not exceed the following within the lifespan of the building.

Table 6 PROBABILITY OF STRUCTURAL FAILURE BASED ON STRUCTURAL IMPORTANCE LEVEL

PROBABILITY OF STRUCTURAL FAILURE BASED ON STRUCTURAL IMPORTANCE LEVEL		
Importance Level	**Annual probability of failure**	**Probability of failure over a 50 year design life**
IL1	0.004%	0.2%
IL2	0.002%	0.1%
IL3	0.001%	0.05%
IL4	0.0005%	0.025%

B1.2.5 Site works

The following criteria must be satisfied for

(a) Site works as necessary must be carried out to ensure the stability of the building site during the expected life of the building.
(b) While carrying out site works, any damage to existing structures or adjacent property must be avoided.
(c) Alterations to the ground-water level resulting from site works must not be allowed to affect the stability of any building.

B1.2.6 Foundations and Waterproofing

Foundations must be appropriately sized, reinforced and drained to promote stability of the building and/or site, and must be protected from water infiltration and hydrostatic pressure due to a high-water table, including potential, current and future fluctuations unless the building or site is specifically designed for this to occur.

B1.2.7 Corrosion protection of reinforcement and embedded steel

All steel reinforcement and other embedded steel must be suitably protected against corrosion.

B1.3 DEEMED-TO-SATISFY PROVISIONS

B1.3.1 General requirements

The performance requirements of B1.2 are deemed to be satisfied by following the requirements of B1.3.2,B1.3.3, B1.3.4 and B1.3.5.

Alternatively, for Class 1 buildings compliance with the Home Building Manual of Tuvalu is deemed to satisfy the structural provisions of the Building Code.

B1.3.2 Design Loads

The general requirements of B1.2.2 are satisfied if the building or structure can resist loads determined in accordance with the following:

Dead and Live actions

Calculation in Accordance with AS/NZS 1170.0 and AS/NZS 1170.0

Wind loads

Calculation in Accordance with AS/NZS 1170.2 with the following modifications:

a) The Design Wind Speeds, V_{des}, shall be taken as per the table below for all directions:

Building height (m)	Design Wind Speed:- General(m/s)	Design Wind Speed:- (Shielded Zones m/s
<3	47	44
5	52	49
8	54	51
10	55	
15	57	
20	58	
25	61	

Note: For intermediate heights interpolation is permitted. For buildings higher than 25m specialist advice should be sought.

b) The Values above need not be further adjusted by Terrain Category, Direction multiplier, Topographic multipliers or climate change multiplier.

c) For buildings less than 8m high that are sited at least 2 rows of buildings back from open terrain, the Shielded Zone Values can be used. All other sites should use the General Design wind speeds.
d) The values above are for Importance level 2 buildings. For other importance levels multiply the wind speeds by:

Importance level	Factor
1	0.91
2	1.0
3	1.05
4	1.11

Earthquake loads

Due to the low seismicity of Tuvalu, no specific requirement to design for earthquakes.

Tsunami Loads

Buildings 2 stories greater, designated as Tsunami refuges, shall be designed for a line load of 35kN/m width of applied laterally at the level of the 1st above ground level. Alternatively, a special study shall be undertaken.

Flood Loads

Buildings shall be designed for the effects of flooding in accordance with ASCE 7-16, Chapter 5.

Other actions

The principles of structural mechanics shall apply. Any specific loads to which the structure shall be subjected shall be taken into account during the design.

B1.3.3 Design and Construction

The requirements of B1.1 for materials, design and forms of construction are satisfied if they comply with the following:

(a) **Masonry:**
  (i) Code of practice for design of Masonry structures: AS3700 or NZS 4230
  (ii) Code of practice for Masonry construction: materials and workmanship: NZS 4210

(b) **Concrete:**
  (i) Code of practice for design of Concrete structures: AS 3600 or NZS 3101
  (ii) Code of practice for Concrete construction: NZS 3109
  (iii) Specification for Concrete construction for minor works: NZS 3124

(c) **Steel Reinforcement:** Code of practice for Steel for the reinforcement of concrete: AS/NZS 4671

(d) **Steel construction**: Code of practice for design of Steel Structures: AS 4100 or NZS 3404 Parts 1 and 2

(e) **Aluminium construction**: Code of practice for design of Aluminium Structures: AS/NZS 1664 Parts 1 and 2

(f) **Timber construction**: Code of practice for design of Timber Structures: AS 1720 Parts 1 to 5 or NZS 3603

(g) **Footings and Slabs**: Code of practice for design of Footings and Slabs for Class 1 and 10a buildings: AS 2870

(h) **Piling**: Code of practice for Piling design and installation: AS 2159

(i) **Glass and Glazing**:
  (i) Code of practice for selection and installation of Glass in Buildings: AS 1288
  (ii) Code of practice for glazing of windows and doors: AS 2047 or NZS 4223

(j) **Protection from termites**: In areas subject to infestation by subterranean termites:
  (i) Physical barriers: AS 3660
  (ii) Soil treatment: AS3660
  (iii) Chemical treatment: AS3660

(k) **Roof construction**:
  (i) Sheet Roof: AS 1562 Parts 1 to 3
  (ii) Tile Roof: AS4046
  (iii) Plastic Roof: AS/NZS 4256

(l) **Particleboard structural flooring**: Particleboard flooring: AS/NZS 1860 Parts 1 and 2

(m) **External wall cladding**: No structural damage when tested to TR 440 to withstand impact from a 4 kg piece of timber of nominal cross-section 100 mm x 50 mm striking end on at a velocity of 15 m/s.

B1.3.4 Structural durability

The following minimum durability requirements shall apply when the structural integrity of the building depends on material durability:

(a) Concrete construction:
    (i) Greater than 30 m inland: Exposure Classification B2 as per AS 3600 or NZS 3101;
    (ii) Offshore or less than 30 m inland: Exposure Classification C as per AS 3600 or NZS 3101;
(b) Steel construction: Category E-M as per AS 2312 Parts 1 and 2;
(c) Masonry construction: As per AS 3600 or NZS 3101 for concrete construction;
(d) Timber construction to be treated as follows:
    (i) Members in contact with the ground: H5 as per NZS 3602;
    (ii) All other structural members: H3 as per NZS 3602 as a minimum; and
    (iii) All non-structural timber: H1.2 as per NZS 3602 as a minimum.

B1.3.5 Termite Protection

Methods of termite treatment must include an appropriate and effective combination of one, any or all of the following in the design and construction of buildings and facilities, appropriate to the foundation type, ground floor type, and adjacent ground treatment:

(a) physical barriers that comply with AS 3660, such as:
    (i) metal ant-caps as traditionally used for elevated timber framing
    (ii) stainless steel mesh either to the perimeter and around plumbing pipes, or full ground cover under slab on ground
    (iii) graded granite consisting of crushed and angular granite particles laid and compacted under slab on ground, plus collars around plumbing pipes or perimeter and penetration installation where the slab is laid according to AS 3600
    (iv) combined termite and moisture barrier such as two layers of LDPE (Low Density Polyethylene) plastic chemically treated to provide waterproofing and termite protection functions in one product
    (v) metal flashing using marine grade aluminium
(b) soil treatment that complies with AS 3660
(c) chemical treatment that complies with AS 3660

The following building materials are exempt from requiring termite treatment:

(a) steel, aluminium or other metals
(b) concrete, masonry, or reinforced cement
(c) timber that is naturally resistant to termites, such as:
    (i) native cypress pine (Callitris spp.)
    (ii) river red gum (Eucalyptus corymbosa)
    (iii) grey box (Eucalyptus moluccana)
    (iv) yellow box (Eucalyptus melliodora)
    (v) ironbark (Eucalyptus siderophloia)
(d) timber treated with an acceptable preservative
(e) plastics and polycarbonates
(f) other material approved for exemption by the Government of Tuvalu

Hand-sprayed chemicals for termite protection under concrete slabs must:

(a) provide evidence that they have a reasonable lifespan before they can be used
(b) be an approved product according to Australian and/or New Zealand standards
(c) be combined with a reticulation system to allow maintenance and re-application

Suspended floors that require termite protection must have:

(a) access doors or panels that allow access for inspection, maintenance and treatment
(b) a minimum clearance of 400 mm between the finished ground level and the floor or any other obstructions (bearers, floor joists, plumbing pipes, etc.)
(c) cross-floor ventilation between the suspended floor and the ground that is:
    (i) cleared of all debris and vegetation
    (ii) cross-ventilated by means of openings
    (iii) contains no dead air spaces
    (iv) graded to prevent surface water ponding under the building
    (v) evenly spaced ventilation openings
(d) provided in both leaves of a double leaf masonry wall, with inner-leaf openings being aligned with outer-leaf openings to allow an unobstructed flow of air

Interior walls constructed in sub-floor spaces must be provided with openings having an unobstructed area equivalent to that required for the adjacent external openings and be evenly distributed to promote air flow.

Where the ground or sub-floor space is excessively damp or subject to frequent FLOODING:

(a) the area of sub-floor ventilation must be increased by 50%, or
(b) a sealed impervious membrane must be provided over the ground, or
(c) H3 preservative treated timbers in accordance with AS 1684.2, AS 1684.3 or AS 1684.4 must be used

All penetrations for site servicing or other means through a foundation, slab on grade or suspended floor must be adequately protected for termite infestation.

Concrete paths or driveways placed against a building or facility may require a chemical reticulation system to be installed in the ground before installation where there is a danger of termite infestation.

Any attachments to a building or facility such as a wood deck, covered porch, fence etc. must have adequate termite protection between the attachment and the external wall.

When construction is complete and/or an Occupancy Permit is issued, the builder must provide the owner information on the termite management system installed and the owner’s ongoing maintenance responsibilities.

B9 DEMOLITION

B9.1 PERFORMANCE REQUIREMENTS

B9.1.1 Demolition of buildings

Procedures and methods of demolition must be adequate to prevent death and injury to persons and avoid damage to adjacent property.

While buildings are demolished, the following must be ensured:

(a) safety of the public and of the site personnel from injury or death.
(b) avoidance of damage and nuisance from dust, vibrations, noise, water, fire, smoke and fumes.
(c) continued access to other properties.
(d) the exhibition of appropriate notices warning the public, and
(e) prevention of damage to public services such as water and sewerage pipes, electricity and telephone lines, etc., and allow their continued use.

B9.1.2 Design and planning of demolition

The method and sequence of demolition must be planned in detail with due allowance for the following:

(a) the sudden release of locked up forces such as with pre-stressed concrete, arches, cantilevers, etc.
(b) the height of the structure.
(c) clear space available.
(d) the presence of dangerous or inflammable materials such as gas cylinders, aerosol spray cans, drums containing flammable material or explosive dusts, foam plastics, etc.
(e) the structural condition of the building.
(f) the presence of basements, cellars, vaults and other voids and if so the effect of removal of cross-walls and the like.
(g) the requirement for any cutting, welding or burning.
(h) the requirement for temporary supports, shoring, scaffolding and the like, and the loads including impact loads that they may have to take.
(i) the loads from the stationing and operation of demolition equipment, especially if supported on parts of the building being demolished, and
(j) decommissioning and removal of any connected and/or redundant services
(k) any other likely factors.

B9.2 DEEMED-TO-SATISFY PROVISIONS

B9.2.1 General requirements

The planning and execution of demolition must:

(a) not put at risk the safety and health of the public and of the workers
(b) avoid damage to other properties
(c) avoid nuisance to others
(d) allow continued access to other properties, and

(e) prevent damage to public services and allow continued operation of such services.

B9.2.2 Applicable standard

The requirements of B2.1 are satisfied if demolition is carried out to AS 2601 The demolition of structures.

B10 GLAZING AND WINDOWS – STRUCTURE AND SAFETY

B10.1 PERFORMANCE REQUIREMENTS

Glazing is to be installed in a building to avoid undue risk of injury to people.

Glass installations that are at risk of being subjected to human impact must have glazing that:

(a) if broken on impact, will break in a way that is not likely to cause injury to people; and
(b) resists a reasonably foreseeable human impact without breaking; and
(c) is protected or marked in a way that will reduce the likelihood of human impact.

B10.2 DEEMED-TO-SATISFY PROVISIONS

B10.2.1 Human impact on glazing

(a) Glazing of windows and other openings and their support systems designed only against wind loads are not safe against human impact. In order to provide for reasonable safety against injury or death resulting from glass breakage and possible falls, glazing and its support framing must be designed for the levels of risk shown in Table B1.6. The impact energy that the glass and its framing must resist for different levels of risk and for different configurations of glazing is given in Figure B1.6.
(b) The following must be taken into account while designing glazing against human impact:
    (i) laminated glass and toughened glass are considered to be safety glass in terms of injury potential from fragments and splinters. Wired glass and heat-strengthened glass are not safety glasses.
    (ii) annealed or laminated glass which has minor abrasion damage or has been sand blasted on the tension face has its impact strength severely reduced.
    (iii) the strength of glass can be substantially reduced by the lapse of time.
(c) The barrier protection shown in Figure B1.4 must be designed to AS/NZS 1170.1. The deflection of the barrier must not exceed 50% of the distance between the handrail and the glass when a concentrated force of 1.2 kN is applied to the face of the barrier.

Table 7 Risk level for class of building for assessment of required strength of glazing

Risk level for class of building for assessment of required strength of glazing			
Height of fall in case of glazing failure	**Risk**		
	High	**Medium**	**Low**
more than 6m	2, 6, 9b	3, 4, 5.7, 8, 9a	
3m to 6m		2, 6, 9b	3, 4, 5, 7, 8, 9a
up to and including 3m		6, 9b	2, 3, 4, 5, 7,8,9a

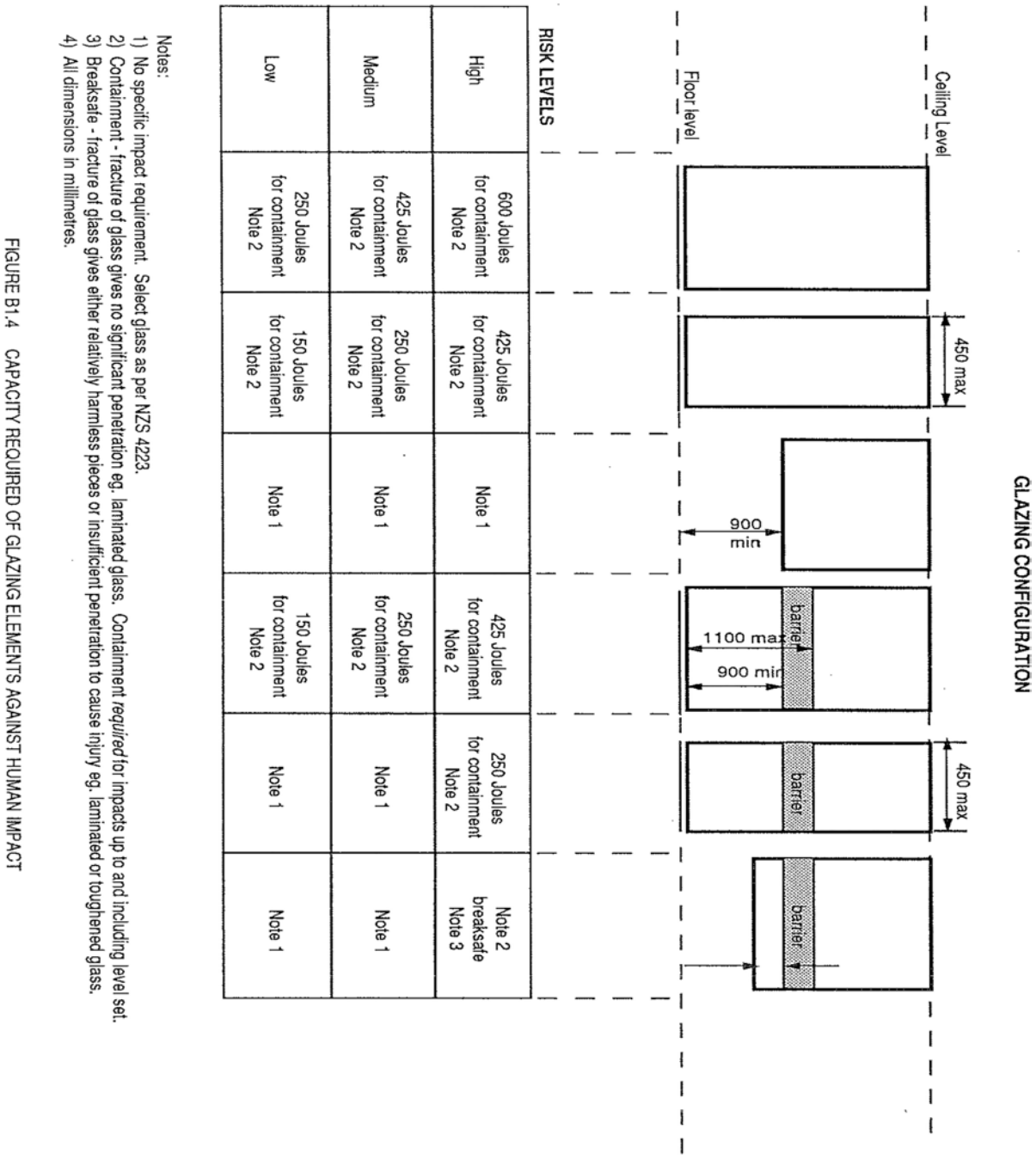


FIGURE B1.4 CAPACITY REQUIRED OF GLAZING ELEMENTS AGAINST HUMAN IMPACT

Notes:
1) No specific impact requirement. Select glass as per NZS 4223.
2) Containment - fracture of glass gives no significant penetration eg. laminated glass. Containment *required* for impacts up to and including level set.
3) Breaksafe - fracture of glass gives either relatively harmless pieces or insufficient penetration to cause injury eg. laminated or toughened glass.
4) All dimensions in millimetres.

Figure 3 Capacity required of Glazing Elements against Human Impact

SECTION DC – FIRE RESISTANCE

THIS SECTION APPLIES TO DWELLINGS AND OUTBUILDINGS (Class 1 & 10)

Performance Requirements

Deemed to Satisfy Provisions

DC1 Fire Resistance and Stability

DC11 FIRE RESISTANCE AND STABILITY

DC11.1 Performance Requirements

DC11.1.1 Objectives

DCP1 A Class 1 or Class 10 building must be so designed and constructed that the following objectives are fulfilled:

(a) it is protected from fire in any other building; and
(b) materials used in the construction be such that if there is a fire in the building:
  (i) the spread of fire and the generation of smoke and toxic gases will be minimised;
  (ii) stability will be maintained for a period at least sufficient for the occupants to escape and to ensure the safety of fire-fighters; and
  (iii) there will be little risk of collapse onto adjoining property.

DC11.2 Required Performance

DC11.2.1 External Walls

External walls of Class 1 buildings, located within 1.5 m of the allotment boundary or 3 m from surrounding buildings other than of Class 10 (a) on the same allotment must:

(a) remain stable and not allow the passage of destructive heat, flames, smoke or gases through them for an hour, in the event of a fire; and
(b) not allow the passage of flames, smoke or gases through windows for an hour and such windows must not be openable.

DC11.2.2 Common Walls

A *common wall* must:

(a) if it separates a Class 1 building from any Class other than 10 (a), remain stable and prevent the passage of destructive heat, flames, smoke or gases for an hour, in the event of a fire;
(b) if it separates a Class 1 building from a Class 10 (a) building on different allotment be not combustible.

DC11.2.3 Underside of Floors

The underside of a floor separating 2 sole-occupancy units each being a separate domicile must not be *combustible*.

DC11.2.4 Sarking

Any *sarking-type material* used in a Class 1 building must have a *flammability index* of less than 5.

DC12 DEEMED-TO-SATISFY PROVISIONS

DC12.1 External walls of Class 1 buildings

Except as permitted by Sections DC12.4 or DC12.5, an *external wall* of a Class 1 building, and any openings in that wall, must comply with Section DC12.2 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.

DC12.2 Class 1 buildings: Construction of external walls

(a) *External walls* referred to in Clause DC12.1 must have a Fire Resistance Level, FRL of not less than 60/60/60.
(b) Openings in *external walls* referred to in Clause DC12.1 must:
  (i) be protected with *fire windows* or glass block or other construction with a FRL of at least - /60/- ; and
  (ii) not be fitted with openable *windows*.

DC12.3 Class 10a buildings: External walls

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 set back less than 1.5 m from the allotment boundary other than with a road alignment or public space.

DC12.4 Allowable encroachments

The distance from an allotment boundary or between buildings must be the shortest distance measured from the outermost point of the building or buildings concerned, except that:

(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 meters, aerials or antennae;
(d) pergolas or sun blinds; and
(e) unroofed terraces, landings, steps or ramps, not more than 1 m in height

may encroach into that distance if thereby 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.

DC12.5 Exceptions

Section DC12.1 does not apply to:

(a) an *external wall* that previously complied with this Part and is reclad, if the recladding does not reduce the distance to the boundary or building by more than 150 mm; or
(b) an *open garage*.

DC12.6 Common walls

A *common wall* must:

(a) be of masonry or concrete, or be fully lined with fire-protective covering and extend to the underside of a non-combustible roof or not less than 450 mm above a roof with a combustible lining;
(b) have a FRL of not less than 60/60/60 if it separates Class 1 buildings, or a Class 1 building and a Class 10 (a) building, on different allotments; or
(c) be lined with a *non-combustible* material if it separates Class 10a buildings on different allotments.

DC12.7 Separating floors

The underside of a floor separating *sole-occupancy units*, each being a separate domicile and located one above the other, must be lined with material with a FRL of not less than 30/30/30.

DC12.8 Sarking-type materials

Any *sarking-type material* used in a Class 1 building must have a *Flammability Index* of not more than 5.

SECTION DD – ACCESS AND EGRESS

THIS SECTION APPLIES TO DWELLINGS AND OUTBUILDINGS (Class 1 & 10)

Performance Requirements

Deemed to Satisfy Provisions

DD1 Construction of Stairs and Exits

DD2 Access for People with Disabilities

PERFORMANCE REQUIREMENTS

DEEMED-TO-SATISFY PROVISIONS

DD1 Construction of Stairs and Exits

DD1.1 Treads and risers

DD1.2 Curved stairs

DD1.3 Balustrades

DD1.4 Parapets on flat roofs

DD1.5 Number of exits

DD1.6 Ramp in exits

DD1.7 Dimensions of exits

DD2 Access for People with Disabilities

DD2.1 Access to buildings

A13 ACCESS AND EGRESS

A1.6 PERFORMANCE REQUIREMENTS

GD1.6.1 OBJECTIVES

The design, construction, alteration, operation, maintenance and demolition of buildings, and construction sites must:

(a) safeguard people from injury during movement into, within, and out of buildings and sites
(b) safeguard people from injury resulting from the movement of vehicles on the site
(c) ensure that a person with disability is able to approach a building and site, enter it and adequately carry out activities and functions where required to be accessible.

A1.7 REQUIRED PERFORMANCE

GD1.7.1 Stairways and Exits

A Class 1 or 10 building must be so designed and constructed that the following are fulfilled:

(a) Stairways, ramps and passageways must be such as to provide safe passage for the users of the building.
(b) Stairways, ramps, floors and balconies, and any roof to which people normally have access, must have bounding walls, balustrades or other barriers where necessary to protect users from the risk of falling.
(c) Stairways must provide safe and reasonably comfortable dimensions for goings and risers. In any case, the pitch of the stairway must be maintained within limits of 23° and 42°.
(d) If any ramp is used the slope must not exceed 1:8.
(e) A Class 1 building must have provision for fast exit during any emergency.

GD1.7.2 Access for People with Disabilities

For Class 1, 2 and 10 buildings, it is not mandatory to provide access for people with disabilities.

If the occupants require disabled access, or the building is to be future proofed to allow disabled access, access requirements shall be as per Section ND3 of the Building Code.

A14 DEEMED-TO-SATISFY PROVISIONS

A1.8 Construction of Stairs and Exits

GD1.8.1 Treads and risers

(a) A stairway must be suitable to provide safe passage in relation to the nature, volume and frequency of likely usage.
(b) A stairway in any building satisfies (a) if it has:
  (i) 2 to 18 risers in each flight
  (ii) going and riser dimensions in accordance with Figure DD1.1 and Table DD1.1 that are constant throughout each flight
  (iii) risers which do not have any openings that would allow a 125 mm sphere to pass through between the treads
  (iv) treads which have a non-slip finish or a suitable non-skid strip near the edge of the nosing
  (v) treads of solid construction (not mesh or other perforated material) if the stairway is more than 10 m high or connects more than three storeys; and
  (vi) the tread must not exceed the going by more than 20 mm.

GD1.8.2 Curved stairs

Curved stairs must comply with the relevant requirements of DD as well as the following:

(a) For the purposes of satisfying Table DD1.1 the going must be measured:
  (i) along half way across the width of the stair where the clear width is less than 900mm; and
  (ii) 300 mm from each side of the stair where the clear width is 900 mm or more.
(b) All steps must have the same uniform taper.
(c) The going at the narrow end of the steps must be not less than 75 mm.
(d) Winders are not permitted.

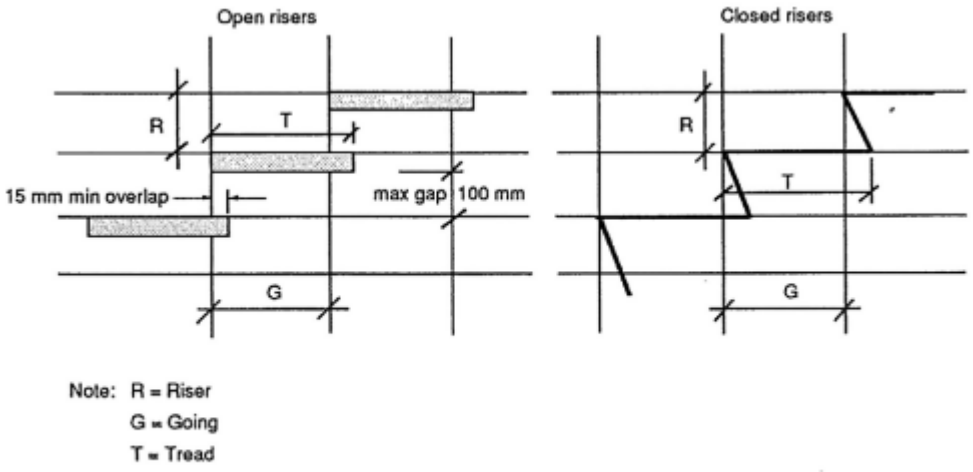


FIGURE DD1.2.1 - MEASUREMENT OF RISER, GOING AND TREAD

TABLE DD1.2.1

RISER DIMENSIONS (mm) TO MATCH GOING

GOINGmm

Pitch	230	240	250	260	270	280	290	300	310	320	330
42°											
41°	200										
40°	192	200									
39°	186	194	200								
38°	180	187	195	200							
37°	173	181	188	196	200						
36°	167	174	182	188	196	200					
35°	161	168	175	182	189	195	200				
34°	155	162	168	175	182	188	195	200			
33°	149	156	162	169	175	181	188	195	200		
32°		144	156	162	168	174	181	187	194	200	
31°			150	156	162	167	174	180	186	192	198
30°				150	156	161	167	173	179	185	190
29°					150	155	161	167	173	179	183
28°						150	155	160	165	170	175
27°							148	153	158	163	168
26°								146	151	156	161
25°										149	154
24°											147

NOTE: Actual riser dimension may be selected to suit the inter-landing height. However, the value of the riser dimension must not be outside the maximum or minimum dimensions shown for each value of going.

GD1.8.3 DD1.3 Balustrades

(a) A continuous balustrade must be provided along the side of any stairway or ramp, or any corridor, hallway, balcony, bridge or the like, if:
  (i) it is not bounded by a wall; and
  (ii) the change in level is more than 1 m

(b) A balustrade must prevent, as far as practicable:
  (i) children climbing over or through it
  (ii) persons accidentally falling from the floor; and
  (iii) objects which might strike a person at a lower level accidentally falling from the floor surface.

(c) At balconies a balustrade satisfies (b) if:
  (i) it has a height of not less than 930 mm above the balcony floor
  (ii) the space between balusters or the width of any opening in the balustrade is not more than 100 mm except where the space between the rails or the height of the opening is not more than 100 mm
  (iii) all parts of the balustrade more than 150 mm and less than 760 mm from the floor or nosings are vertical or otherwise do not provide a toe-hold; and
  (iv) it does not have any openings more than 100 mm wide within 150 mm of the floor level.

(d) In stairways and ramps (including access bridges and landings) a balustrade satisfies (b) if:
  (i) it has a height of not less than 865 mm above the nosings of the stair treads and the floor of the landing, balcony, corridor, hallway, access bridge or the like
  (ii) the space between balusters or the width of any opening in the balustrade (including any openable window or panel) is not more than 125 mm except where the space between rails or the height of the opening is not more than ~~100~~ 125 mm; and
  (iii) all parts of the balustrade more than 150 mm and less than 760 mm from the floor or nosings are vertical or otherwise do not provide a toe-hold.

GD1.8.4 Parapets on flat roofs

Where a flat roof or other elevated place has regular access a parapet or balustrade of not less than 1.2 m height above the surface of the roof or elevated place must be provided. The width of any opening in the parapet or balustrade must not exceed 100 mm.

GD1.8.5 Number of exits

Every Class 1 building must have two exits. At least one of these exits must provide an easy means of egress in case of any emergency without reducing security to the building. Such emergency exits may take the form of a trap door on an elevated floor or some such arrangement.

Windows and other such openings used as emergency exits must have a minimum clear dimension of 560 mm and a minimum clear area of opening of 0.6 m^2. The shutter must be capable of opening to 90° to the wall. The top of the windowsill must

be no more than 900 mm from the floor inside. The height of the windowsill from the ground or floor outside must not exceed 1800 mm.

GD1.8.6 Ramp in exits

A ramp may be used in place of a stairway. The gradient of any such ramp must be no steeper than 1:8.

GD1.8.7 Dimensions of exits

The clear minimum width of a stairway or ramp must be 760 mm. The unobstructed height throughout must be not less than 2 m.

A1.9 Access for People with Disabilities

GD1.9.1 Access to buildings

If the occupants require disabled access, or the building is to be future proofed to allow disabled access, access requirements shall be as per Section GD3 of the Building Code.

SECTION DE – ELECTRICITY

THIS SECTION APPLIES TO DWELLINGS AND OUTBUILDINGS (Class 1 & 10)

Performance Requirements

Deemed to Satisfy Provisions

DE1 Electrical Safety

DE1.1 General requirements

DE1.2 Plug Sockets

DE2 Amenity

DE2.1 Light switch layout

A15 ELECTRICAL SAFETY

A1.10 PERFORMANCE REQUIREMENTS

GD1.10.1 OBJECTIVES

All electrical work associated with a Class 1 or 10 building must meet the following objectives:

GD1.10.2 Electrical Safety

It must be designed and installed to prevent electrocution, burns or fire.

GD1.10.3 Amenity

It must satisfy the reasonable expectations of the occupants by ensuring that it is adequate for their intended use, both current and anticipated.

A1.11 REQUIRED PERFORMANCE

GD1.11.1 Electrical safety

The 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) 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;
(d) be adequately protected against damage arising from exposure to weather, water or excessive dampness mechanical loads and other such agents expected under normal conditions of use; and
(e) ensure that the main switch is normally accessible only to the occupants.

GD1.11.2 Amenity

The supply system must have an adequate number of plug sockets of minimum 10 Amperes capacity to serve the reasonable anticipated needs of the occupants.

A16 DEEMED-TO-SATISFY PROVISIONS

A1.12 Electrical safety

GD1.12.1 General requirements

All electrical wiring and installations in or on any class 1 and 10 building must ensure safety from electric shock and fire. This requirement is satisfied if all electrical work associated with the building is done to comply with AS/NZS 3000: Electrical installations (known as the Australian/New Zealand Wiring Rules). The capacity of the system must allow for the long term anticipated requirements of the occupants.

Prior to the livening of any electrical system, the systems shall be reviewed and certified as being compliant with the relevant standards by an appropriately qualified electrician. A certificate of Compliance shall accompany application for Code Compliance Certification.

GD1.12.2 Plug sockets

Plug sockets must:

(a) have their individual switch;
(b) be located so that:
  (i) cords need not be taken across doorways;
  (ii) trailing cords do not have to cross circulation routes;
(c) not be located behind door-swings;
(d) in the kitchen, be located 250 mm above worktops at the back of benches or on a return wall where it exists; and
(e) in the kitchen be located away from any sink or water outlet

GD1.12.3 Photovoltaic/Solar Energy Systems

All photovoltaic/solar energy systems shall fully comply with the requirements of AS/NZS 5033.

Photovoltaic/solar panel systems shall be fixed to the main structure of the building.

Roofs containing photovoltaic solar panels must be designed for the full panel and ballast *dead load*, including concentrated loads from support frames in combination with roof *live load*, and any other applicable loads.

A1.13 DE2 Amenity

GD1.13.1 DE2.1 Light switch layout

The layout of light switches must follow the main night-time circulation routes such as from the entrance hall to the living area to the bedrooms to the bathroom and toilet. Crossing any major space in the dark must be avoided. The switches must be located close to door openings.

SECTION DF – HEALTH AND AMENITY

THIS SECTION APPLIES TO DWELLINGS AND OUTBUILDINGS (Class 1 & 10)

Performance Requirements

Deemed to Satisfy Provisions

DF1 Damp and Weatherproofing

DF2 Cooking and Sanitary Facilities

DF3 Room Sizes and Heights

DF4 Light and Ventilation

DF5 Water-supply Plumbing

DF6 Sanitary Plumbing and Discharge

DF7 Roof Drainage

Specifications

PERFORMANCE REQUIREMENTS

DEEMED-TO-SATISFY PROVISIONS

DF1 Damp and Weatherproofing

DF1.1 Site drainage

DF1.2 Building on land subject to dampness

DF1.3 Drainage of land external to building

DF1.4 Weatherproofing of roofs and walls

DF1.5 Pliable roof sarking

DF1.6 Water proofing of wet areas in Buildings

DF1.7 Damp-proof courses and mortars

DF1.8 Acceptable damp-proof courses

DF1.9 Damp-proofing of floors on the ground

DF2 Cooking and Sanitary Facilities

DF2.1 Facilities required

DF3 Room Sizes and Heights

DF3.1 Height of rooms

DF3.2 Reduced height permissible

DF3.3 Ceiling fans

DF 3.4Floor area

DF4 Light and Ventilation

DF4.1 Provision of natural light

DF4.2 Methods and extent of natural lighting

DF4.3 Natural light borrowed from adjoining room

DF4.4 Artificial lighting

DF4.5 Ventilation of rooms

DF4.6 Natural ventilation

DF4.7 Ventilation borrowed from adjoining room

DF4.8 Restriction on position of WCs and urinals

DF4.9 Airlocks

DF4.10 Sub-floor ventilation

DF5 Water supply Plumbing

DF5.1 General requirements

DF5.2 Means of compliance

DF5.3 Pipes which are not easy to access

DF5.4 Access to Domestic-type Water Heaters

DF5.5 Rainwater storage

DF6 Sanitary Plumbing and Drainage

DF6.1 General

DF6.2 Means of compliance

DF6.3 Fixture unit ratings

DF6.4 Trapping of fixtures and appliances

DF6.5 Fixture discharge pipes

DF6.6 Unvented branch drains

DF6.7 Venting

DF6.8 Design of pipes and drains

DF6.9 Gully traps other than floor waste gullies

DF6.10Floor waste gullies

DF6.11Inspection openings

DF7 Roof Drainage

DF7.1 Design of roof gutters

DF7.2 Design of downpipes

DF7.3 Incompatible metals for gutters

Specification

DFS2.1 Latrines for Areas where there is no Water Supply

DFS5.5 Rainwater Storage

A17 PERFORMANCE REQUIREMENTS

A1.14 OBJECTIVES

DFP1 The design and construction of Class 1 buildings must meet the following objectives:

(a) freedom from unhealthy and uncomfortable damp and wet conditions
(b) proper facilities for the preparation and cooking of food and the cleaning of utensils
(c) adequate facilities for personal washing and the washing of clothes
(d) hygienic toilet facilities with adequate privacy and which will not be a nuisance to anyone
(e) sufficient living space for privacy and comfort
(f) adequate light and ventilation consistent with the requirements of health hygiene and comfort
(g) where a public or private water supply exists, an appropriate safe and hygienic system of plumbing for the supply of water for domestic needs
(h) where a reticulated system of water supply is installed in the building, an appropriate system of drainage for the hygienic conveyance of sewage and wastewater
(i) a roof drainage system is to be provided, it must give reasonable protection against the overflow of rainwater into the building; and
(j) unhealthy ponding of water in the allotment must not be allowed and the erection of the building or any alteration to it and the site must not adversely affect the drainage of other allotments or of any public land.
(k) Provide appropriate rainwater storage

A1.15 REQUIRED PERFORMANCE

GD1.15.1 Damp and weatherproofing

Buildings must be so sited and suitable damp and weatherproofing provided where necessary to prevent:

(a) moisture or damp affecting the stability of the building
(b) the creation of any unhealthy or dangerous condition
(c) damage or defacement from moisture present at the completion of construction
(d) causing undue damage to adjoining property
(e) the accumulation of surface water against the building or beneath the floor; or
(f) adversely affecting the drainage of neighbouring allotments or of any public infrastructure.

Visible water must not be allowed to remain under or around for more than 1 hour after 10 minutes of maximum rainfall resulting from a storm water with a return period of 5 years.

B1.3.6 Cooking and sanitary facilities

Adequate cooking, toilet and washing facilities must be provided for the occupants of a building, having regard to its use and size. Suitable facilities must also be available for the preparation and cooking of food, the cleaning of utensils and the laundering of clothes.

GD1.15.2 Room sizes

The *floor area*, plan dimensions and ceiling heights of rooms and other spaces must be adequate for living purposes.

GD1.15.3 Light and ventilation

The standard of light and ventilation within a building must be adequate for the occupants, having regard to health hygiene and comfort.

GD1.15.4 Water supply plumbing

Water supply plumbing systems are to deliver water to the tap outlet or fixture at a pressure and flow suitable for use considering the anticipated needs of the user and the simultaneous use of the connected system by others.

Materials are to be selected based on the type of use and where water is used for human consumption suitable precautions must be taken to ensure that unsafe or unhygienic materials do not enter the supply system.

The installation of hot water systems must not impair the safety of occupants and users. Suitable precautions are to be taken to ensure that the temperature of water being stored and distributed is safe for the users and the public.

Water services must be safely accessible where possible to allow for ongoing maintenance and repair of the system. Where a service is concealed or difficult to access, provisions are to be put in place to limit the risk of damage caused by leaks and a means to isolate the system for repair.

Where rainwater from roof run off is a source of supply, precautions are to be taken to ensure that the rainwater harvesting and storage system is of an appropriate capacity and design to meet the anticipated needs of the user. The system must be capable of providing a sufficient, clean, uncontaminated water supply, and be able to be safely operated and maintained.

GD1.15.5 Sanitary plumbing and drainage

Sanitary plumbing must be designed to efficiently drain on site sanitary and waste-water fixtures and drainage points with minimal risk of blockage considering the anticipated discharge volumes and simultaneous use of the connected fixtures by users.

Any waste-water or sanitary fixture connected to the plumbing and drainage system is to be provided with a water seal trap to prevent the escape of foul sewer gases. Traps can be integral to the fixture or at the point of connection to the plumbing system.

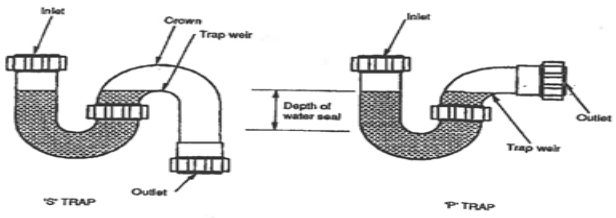


FIGURE DF6.1.2 EXAMPLES OF FIXTURE TRAPS

Sanitary plumbing and drainage systems must be laid to gradients which permit self-cleansing velocities consistent with their discharge loading, unless other suitable arrangements are made to ensure that the system is kept free of the accretion of sewage and other waste matter

Adequate ventilation provisions are to be provided to ensure trap seals are maintained by introducing fresh air into the sewer system and foul sewer gases are expelled in a manner which does not produce unhygienic conditions nor create any nuisance to anyone

Where on-site sanitation systems (e.g. dry/ composting latrine, wet pit latrine, septic tank, aqua privy, biogas plant or similar) are utilised, precautions are to be taken to ensure that the onsite sanitation system is of an appropriate capacity, location and design to meet the anticipated needs of the user. The system must be capable of providing safe disposal of the anticipated sanitary load, and minimising the risk of pollution, disease transmission and public nuisance.

GD1.15.6 Roof drainage

The roof drainage system must be provided and be capable of handling peak intensities of rainfall as follows:

(a) Eaves gutters and downpipes: a 20-year return period intensity.
(b) Eaves gutter overflow measures: a 100-year return period intensity
(c) Internal box gutters, valley gutters and downpipes: a 100-year return period intensity.

GD1.15.7 Site drainage

The immediate site around the building must have suitable drainage so that no ponding results.

Visible water must not be allowed to remain under or around the building for more than 1 hour after 10 minutes of maximum rainfall resulting from a storm with a return period of 5 years.

Flood waters or waves resulting from a storm or cyclone with a return period of 30 years must not be allowed to enter a building.

GD1.15.8 Minimum Insulation

The Walls and Roof of an enclosed habitable dwelling shall be insulated to minimise the use of electricity.

A18 DEEMED-TO-SATISFY PROVISIONS

A1.16 DAMP AND WEATHERPROOFING

GD1.16.1 Site Drainage

The construction of a site drainage system, including overflows, and the position and manner of discharge of a storm water drain must not:

(a) result in the entry of water into any building or other allotments
(b) affect the stability of any building; or
(c) create any unhealthy or dangerous condition within or around any building.

GD1.16.2 Building on land subject to dampness

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.

GD1.16.3 Drainage of land external to building

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.

GD1.16.4 Weatherproofing of roofs and walls

The building envelope including roofs and external walls must be constructed to prevent rain or dampness penetrating to the inner parts of a building.

GD1.16.5 Pliable roof sarking

Pliable roof *sarking-type material* used under roof or wall coverings must comply and be fixed in accordance with AS 4200.

GD1.16.6 Water proofing of wet areas in buildings

The following parts of a building must be impervious to water:

(a) In any building: the floor surface or substrate in a shower enclosure, or within 1.5 m measured horizontally from a point vertically below the shower fitting, if there is no enclosure.
(b) The wall surface or substrate:
    (i) of a shower enclosure, or if the shower is not enclosed, within 1.5 m and exposed to a shower fitting, to a height of 1.8 m above the floor

(ii) immediately adjacent or behind a bath, trough, basin, sink, or similar fixture, to a height of 300 mm above the fixture if it is within 75 mm of the wall.

(c) The junction between the floor and wall if the wall and floor are required to be impervious to water.

(d) The junction between the wall and fixture if the wall is required to be impervious to water.

GD1.16.7 Damp-proof courses and mortars

Moisture from the ground must be prevented from reaching:

(a) the lowest floor timbers and the walls above the lowest floor joists
(b) the walls above the damp-proof course; and
(c) the underside of a suspended floor constructed of a material other than timber, and the supporting beams or girders.

GD1.16.8 Acceptable damp-proof courses

A damp-proof course must consist of:

(a) a material that complies with AS/NZS 2904; or
(b) suitable termite shields placed on piers; or
(c) other suitable material.

GD1.16.9 Damp-proofing of floors on the ground

If a floor of a room is laid on the ground or on filling, moisture from the ground must be prevented from reaching the upper surface of the floor and adjacent walls by:

(a) the insertion of a vapour barrier in accordance with AS 2870; or
(b) other suitable means.

A1.17 COOKING AND SANITARY FACILITIES

GD1.17.1 Facilities required

Cooking and sanitary facilities must be provided as shown in Table DF2.1.

TABLE DF2.1
PROVISION OF COOKING AND SANITARY FACILITIES

MINIMUM FACILITIES REQUIRED	
In all cases	**(a)** facilities for the preparation and cooking of food, and for the cleaning of utensils
Where there is piped water supply to the kitchen and ablution areas	**(b)** a kitchen sink in a kitchen **(c)** a shower or other adequate personal washing facilities **(d)** clothes washing facilities **(e)** a closet pan and facilities for washing hands
Where there is piped water supply only to a tap in the kitchen or up to a stand – pipe in the vicinity of the building or where there is no piped water supply	**(f)** a paved raised platform with a paved area and drain around it **(g)** a suitable type of privy as per Specification DF2.1

NOTE:
i. If any of these facilities are detached from the main building, they must be set aside for the exclusive use of the occupants of the building.
ii. Where the layout allows it, facilities in (c), (d) and (e) can be in the same room.

A1.18 ROOM SIZES AND HEIGHTS

GD1.18.1 Height of rooms

Minimum heights below the ceiling and any framing excluding minor projections such as cornices, are:

(a) *habitable room* – average 2.4m and minimum of 2.1m; and
(b) bathroom, shower room, water closet, laundry, pantry, or the like – 2.1m

GD1.18.2 Reduced height permissible

These heights may be reduced if the reduction does not unduly interfere with the proper functioning of the room.

GD1.18.3 Ceiling fans

Ceiling fans and other such appliances must be at a minimum vertical clearance of 2.1m.

GD1.18.4 Floor Areas

The minimum floor area of any habitable room excluding a kitchen must be 6 m^2. The minimum size of a toilet must be 1.5 m x 1.0 m and of a shower cubicle, 1.0 x 1.0 m.

A1.19 LIGHT AND VENTILATION

GD1.19.1 Provision of natural light

Natural lighting must be provided to all habitable rooms.

GD1.19.2 Methods and extent of natural lighting

Direct natural lighting must be provided by windows that:

(a) have an aggregate light transmitting area measured excluding framing members, glazing bars or other obstructions of not less than 10% of the floor area of the room
(b) face:
    (i) a court or other space open to the sky; or
    (ii) an open verandah, open carport, or the like
(c) are not less than a horizontal distance of 1 m from any boundary of an adjoining allotment that they face.

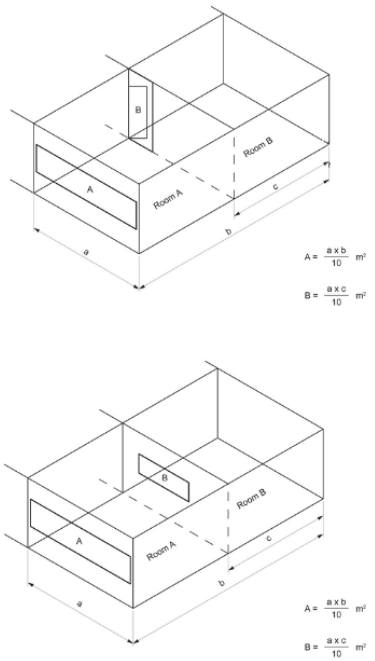
GD1.19.3 Natural light borrowed from adjoining room

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,

Figure 3.8.4.1 Method of determining areas of openings for borrowed light



and the areas specified in (a) and (b) may be reduced as appropriate if direct natural light is provided from another source.

GD1.19.4 Artificial lighting

Artificial lighting must be provided to sanitary compartments, bathrooms, shower rooms, airlock and laundries, if natural lighting of a standard equivalent to that required by DF4.2 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.

GD1.19.5 Ventilation of rooms

A *habitable room*, sanitary compartment, bathroom, shower room, laundry and any other room occupied by a person for any purpose must be provided with natural ventilation complying with Section DF4.6.

Where it is not practical to provide natural ventilation for any sanitary compartment, bathroom, shower or laundry, it is permissible to substitute natural ventilation with a mechanical ventilation system. In such a case the system must satisfy the requirements of AS 1668:2.

GD1.19.6 Natural ventilation

Required natural ventilation must be provided by permanent windows, openings, doors or other devices:

(a) with an aggregate opening or openable size not less than 10% of the floor area of the room required to be ventilated; and

(b) which open to:
  (i) a court, or space open to the sky; or
  (ii) an open verandah, open carport, or the like.

  and are screened to prevent entry of birds, rodents, leaves, and other similar objects.

Wherever possible:

(a) Larger openings must be placed on the downwind, or leeward, facade, and smaller openings on the breeze, or windward, facade to promote air circulation within the building.

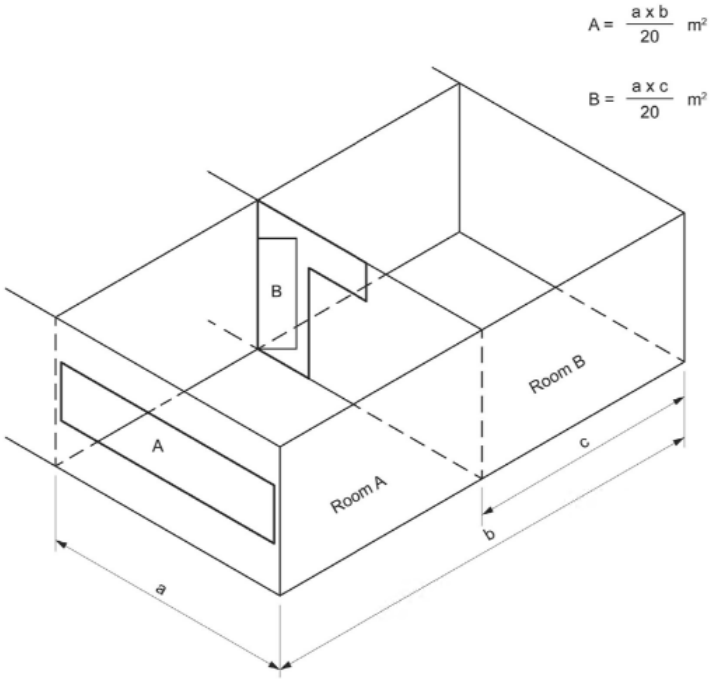
GD1.19.7 Natural ventilation borrowed from adjoining room

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:

(a) the room to be ventilated or from which ventilation is borrowed is not a sanitary compartment;
(b) the room from which ventilation is borrowed is not a 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; and
(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.

Note: The ventilating areas specified may be reduced as appropriate if direct natural ventilation is provided from another source.

Figure 3.8.5.1 Method of determining areas of openings for borrowed ventilation



GD1.19.8 Restriction on position of WCs and urinals

A room containing a closet pan or urinal must not open directly into:

(a) a kitchen; or
(b) a room for storage or consumption of food, except if it is in a building containing only one habitable room.

GD1.19.9 Airlocks

If a room containing a closet pan or urinal is prohibited under DF4.8 from opening directly to another room:

(a) access must be by an airlock, hallway or other room; or
(b) the room containing the closet pan or urinal must be provided with an exhaust fan.

GD1.19.10 Sub-floor ventilation

(a) Suitable provision must be made to prevent undue deterioration of the lowest floor of a building because of dampness, other conditions on the allotment or the design of the building.
(b) The following would satisfy the requirements of (a):
    (i) where timber is used, the floor framing must be suspended with an absolute minimum of 250 mm and an average minimum of 400 mm clearance from the ground underneath, to the floor and the immediate surrounds of the building. The average clearance must be determined as the average of the clearances at the corners of a 3 m square grid covering the building plan. Sub-floor ventilation must be provided with ventilation openings totalling not less than 3% of the peripheral vertical area between the ground and the boundary of the floor. These openings are to be spaced uniformly at not more than 1.8 m apart,
    (ii) where other than timber is used the following must be provided:
        - Sub-floor ventilation if the floor is suspended
        - An impervious cover over the ground surface beneath the building; or
        - The floor members suitably treated.

A1.20 WATER SUPPLY PLUMBING

GD1.20.1 General requirements

Water supply plumbing must ensure:

(a) the appropriateness of the materials and products used;
(b) the correct sizing of water services for the intended use;
(c) the control of cross contamination and prevention of backflow;
(d) adequate care in the installation of the services;
(e) suitable provision of main and subsidiary storage as required to ensure water is available;

(f) adequate connections to sanitary fixtures without endangering health and hygiene; and
(g) the installation of hot water systems to provide safe and adequate service;
(h) protect uses from illness, injury or loss due to failure of water supply system
(i) Minimise water and energy use where possible and safeguard the environment

GD1.20.2 Means of compliance

The requirements of GD1.20.1 are satisfied if all plumbing for water supply is carried out to the relevant provisions of:

(a) AS/NZS 3500.1 – for cold water services or for a Class 1a or Class 10 building only, Section 2 of AS/NZS 3500.5
(b) AS/NZS 3500.4 – for heated water services or for a Class 1a or Class 10 building only, Section 2 of AS/NZS 3500.5
(c) AS/NZS 4020 – Testing of products in contact with drinking water

GD1.20.3 Pipes which are not easy to access

Particular attention is drawn to the provisions in AS/NZS 3500.1 and AS/NZS 3500.4 which prohibit the installation of pipes and fittings of certain materials in locations which are concealed or difficult to access. These include pipes made of ABS, galvanised steel, polybutylene and UPVC.

Pipes and fittings made of copper, copper alloy, stainless steel, ductile iron, cast iron and polyethylene when used in concealed or difficult to access locations must follow the special precautions specified in AS/NZS 3500.1 and AS/NZS 3500.4 .

GD1.20.4 Installation of domestic-type water heaters

(a) A household water heater which is installed in a building must:
  (i) be supported on construction sufficient to carry its full capacity weight and braced against any possible wind loads
  (ii) be positioned to enable adequate access for operation, maintenance and removal; and
  (iii) provide suitably for any overflow, especially if installed in a concealed location.
(b) AS 3500.4 is the relevant standard for the installation of a household water heater.
(c) Solar thermal systems shall comply with AS/NZS 2712 and shall be sufficiently braced against any applicable wind loadings. Consideration of additional gravity loads due to solar thermal systems shall be given during the structural design of the building.

GD1.20.5 Rainwater harvesting and storage

Where rainwater from roof run-off is a source of supply, the rainwater harvesting and storage system shall be designed and installed in accordance with the latest rainwater harvesting and storage guidance from the Government of Tuvalu.

This shall include but not be limited to:

(a) Capacity – The system shall be of sufficient capacity to provide a reliability of supply with a failure rate not less than that stipulated in current Government guidance and not less than a 5-year ARI drought. Sizing shall consider the local rainfall variability, roof catchment area, collection efficiency, anticipated daily water consumption, and storage volume. Unless specified otherwise by the authority the rainwater storage volume shall be not less than 3000L per building occupant.
(b) Materials – All materials (including roof, flashings, coatings, guttering, pipe and tank/ storage materials) shall be suitable for use in contact with drinking water (compliant with AS/NZS 4020) and minimise the risk of contaminants leaching into the water supply.
(c) Monitoring and maintenance – The system shall be designed such that it can be safely operated and maintained by the user, including but not limited to safe access to roof, gutters, pipework and tank to enable regular monitoring, cleaning and maintenance.
(d) Contamination prevention – As far as reasonably practicable, the location, design, installation and maintenance the system shall minimise opportunity for atmospheric contaminants, dust, organic and animal matter, and vermin to fall on, accumulate and/or enter the water supply system, giving consideration to opportunities such as:
    - first-flush systems
    - screening and vermin proofing of water tank inlets and openings
    - the optimal location of the building
    - utilisation of safe roof materials.
    - provisions to facilitate regular and safe roof and gutter maintenance.
(e) Drainage – Overflow pipes shall be fitted to tanks for the disposal of excess inflow of rainwater and must be directed to a suitable location such that performance requirements for site drainage are complied with.

The Government of Tuvalu guidance on rainwater harvesting and storage can be obtained from Tuvalu Sustainable & Integrated Water & Sanitation Policy 2012-2021 (PRIF).

A1.21 DF6 SANITARY PLUMBING AND DRAINAGE

GD1.21.1 General Requirements

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; and
(d) that foul gases are not allowed to produce unhygienic conditions or any nuisance to anyone.

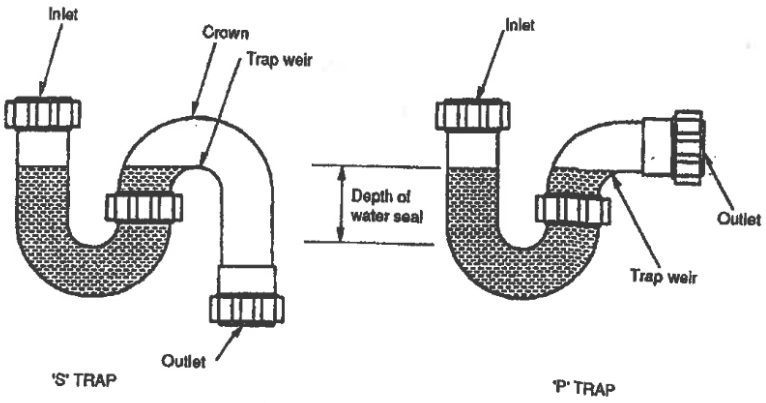


FIGURE DF6.1.2 EXAMPLES OF FIXTURE TRAPS

GD1.21.2 Means of compliance

The requirements of GD1.21.1 are satisfied if all sanitary plumbing and drainage works are carried out to the relevant provisions of AS/NZS 3500.2: Sanitary plumbing and drainage and its amendments or for Class 1a and Class 10 buildings only, Section 4 of AS/NZS 3500.5.

GD1.21.3 Onsite sanitation/ wastewater treatment systems

Where there is no connection to a utility sewer network. A onsite sanitation/ wastewater treatment system must be in accordance with AS/NZS 1546.1, AS/NZS 1546.2, AS/NZS 1546.3 or AS/NZS 1547 as appropriate, and the latest guidance from the Government of Tuvalu.

This shall include, but not be limited to:

(a) Type/ technology – The type of onsite sanitation/ wastewater treatment system shall comply with the latest relevant Government guidance.
(b) Capacity – The system, including any disposal pits, effluent soakaway and the like, shall be of sufficient capacity to safely and adequately treat and dispose of the anticipated sanitary loading with an acceptable frequency of maintenance and sludge disposal in accordance with the latest Government guidance. Consideration shall be given to the local ground and subsoil groundwater conditions of the site.
(c) Monitoring and maintenance – The system shall be designed such that it can be safely operated and maintained by the user, including but not limited to safe access to pipework, chambers and pits for maintenance and sludge disposal.
(d) Precautions – As far as reasonably practicable, the location, design, installation and maintenance of the system shall minimise the risk of pollution, disease transmission and public nuisance, ensuring:
- disease transmitting flies and other insects do not have access to the excreta
- there is no visual or odour nuisance to the public or the neighbours
- sub-soil water is not polluted if it is likely to be used for domestic purposes

- the biological oxygen demand (BOD) of any resulting effluent is limited to the requirements of the Government of Tuvalu so that streams, rivers and oceans are not polluted.
- latrines are screened from public view and are adequately separated from dwellings, neighbouring properties, street boundaries in accordance with the latest relevant Government guidance.
- effluent disposal is adequately separated from wells or other sources of potable water, streams, lagoons, or other water bodies or sensitive environmental receptors in accordance with the latest relevant Government guidance.

(e) Water efficiency – all latrines and onsite sanitation/ wastewater treatment systems shall achieve the water efficiency requirements set out in the latest relevant Government guidance in order to minimise water required for flushing and disposal.

The Government of Tuvalu guidance on Onsite sanitation/ wastewater treatment system scan be obtained from Tuvalu Sustainable & Integrated Water & Sanitation Policy 2012-2021 (PRIF).

A1.22 ROOF DRAINAGE

GD1.22.1 General Requirements

Gutters and downpipes shall be provided and must have sufficient capacity to reasonably prevent the ingress of rainwater into the building.

The peak intensities of rainfall that the gutters and associated downpipes must be able to handle are as follows:

(a) Eaves gutters: a 20-year return intensity of 115 mm/hr

(b) Box and valley gutters: a 100-year return intensity of 150 mm/hr

(c) Gutters and downpipes for temporary buildings: a 5-year return intensity of rainfall of 85 mm/hr.

Eaves gutters other than for temporary buildings must have a designed freeboard of 25 mm and box gutters, 35 mm.

GD1.22.2 Means of compliance

The requirements of Section GD1.22.1 are satisfied if the requirements of AS/NZS 3500.3 or for a Class 1 or Class 10 building section 5 of AS/NZS 3500.5 are met. Specification NFS7.2 gives some guidance on these requirements.

A1.23 WALL AND ROOF INSULATION

GD1.23.1 Insulation General Requirements

Insulating products with a minimum thermal resistance given in the table below shall be provided to roofs, walls, floors and glazing.

Element	Position of Insulation	Minimum thermal resistance(R-Value)
Trussed Roof	Over Ceiling Battens between bottom chords	R2
Skillion Roof	Between Rafters	R2
External Framed Walls	In Framing Cavity	R1.4
External Concrete/Block Walls	Not Required	
Glazing	All glazing	R0.10
Floors	Not required	

SECTION DG – ANCILLARY PROVISIONS

THIS SECTION APPLIES TO DWELLINGS AND OUTBUILDINGS (Class 1 & 10)

Performance Requirements

Deemed to Satisfy Provisions

DG1 Minor Structures and Components

DG2 Gas Appliances, Fireplaces, Chimneys and Flues

A19 PERFORMANCE REQUIREMENTS

A1.24 OBJECTIVES

This Section contains more specific requirements for particular parts of Class 1 and 10 buildings.

Parts of buildings and structures must be so designed and constructed that the following requirements in addition to those listed for Sections B, DC, and DF where relevant, are fulfilled.

A1.25 REQUIRED PERFORMANCE

GD1.25.1 Minor structures and components

Aesthetics

Any minor structure such as fencing awnings and the like must be suited to the general surroundings as well as the occupancy of the building and the neighbourhood.

Animal houses

Accommodation for animals and poultry must not lead to unsanitary conditions for the occupier or neighbours and the public including contamination of waterways. The accommodation must be such that the animals or poultry are not subjected to serious discomfort or overcrowding.

Use of the air space over public places

The use of the air space over public places such as footpaths and roads is prohibited. All buildings must be limited to ensure that normal public use of such places is not obstructed.

GD1.25.2 Gas Appliances, Fireplaces, chimneys and flues

Gas appliances, fireplaces, chimneys and flues must be adequately constructed or separated to prevent:

(a) ignition of nearby parts of the building; or
(b) escape or discharge of smoke to the inside of the building or to adjacent windows, ventilation inlets, or the like.

Pressure vessels located in a building are to be installed in a manner which will provide adequate safety for occupants. When located in a building, a pressure vessel must be installed to avoid the likelihood of:

(a) leakage from the vessel which could cause damage to the building; and
(b) rupture or other mechanical damage of the vessel which could cause damage to the building or injury to occupants.

A20 DEEMED-TO-SATISFY PROVISIONS

A1.26 MINOR STRUCTURES AND COMPONENTS

GD1.26.1 Poultry and other domestic animal houses

A building used for keeping domestic birds or animals must be not less than:

(a) 15 m from any source of potable water; and
(b) 12 m from any Class 1 building; and
(c) 10 m from any boundary adjoining a public road or other public space; and
(d) 20 m from the boundary adjoining an allotment containing or intended to contain any building other than a Class 1 building; and
(e) 5 metres from the top of the bank of any watercourse (whether permanent or intermittently flowing.

The floor of the building must be constructed of suitable material. Suitable arrangements must be made for the collection and disposal of animal wastes, so that they do not create a nuisance or encourage the breeding of flies and other pests. The size and general arrangements in the building must be conducive to the welfare of the poultry or animals.

There must be suitable provision to prevent animal waste from creating undue hazard to on the site or neighbouring sites.

GD1.26.2 Fences

Any fencing or free-standing wall must be suited to the occupancy of the building within. It must not detract from the general aesthetic appearance of the surroundings. If any barbed wire or other such fencing is used it must be at a height of not less than 2 m above the finished level of any existing or intended adjacent footpath.

GD1.26.3 Projections over public places

Buildings must not project beyond the allotment boundary and are subject to building setbacks from the boundary. Architectural features such as eaves, cornices, clocks, lamps, ventilating equipment, trade signs, hoardings, flag poles, bay or oriel windows and such like, as well as a platform or balcony to provide additional means of egress from an existing building may not project over public footpaths or roads without the approval of the Director of Works/Commissioner of Police on Funafuti and Pule Kaupule on outer islands.

A1.27 GAS APPLIANCES, FIREPLACES, CHIMNEYS AND FLUES

GD1.27.1 Chimney and flue deemed-to-satisfy

A chimney or flue must be constructed:

(a) to withstand the temperatures 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) discharge in a position that will cause fire to spread to nearby combustible materials or allow smoke to penetrate through nearby-windows, ventilation inlets, or the like
(d) in such a manner as to prevent rainwater penetrating to any part of the interior of the building
(e) such that its termination is not less than:
    (i) 600 mm above any point of penetration of or contact with the roof; and
    (ii) 900 mm above any opening or openable part in any building, which is within 3 m horizontal distance of the chimney or flue; and
(f) so that it is accessible for cleaning.

GD1.27.2 Open fireplaces deemed-to-satisfy

An open fireplace, or solid-fuel burning 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; and
    (iv) 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 155 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; and
    (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 90 mm; and
    (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; and
(d) suitable damp-proof courses or flashing to maintain weatherproofing.

GD1.27.3 Gas Appliances deemed-to-satisfy

(a) Gas bottles for appliances must be located outside the external walls of any buildings or structures;
(b) Installation of gas appliances must comply with AS/NZS 5601.1; and
(c) Storage and handling of LPG cylinders must comply with AS/NZS 1596 and its amendments.

SECTION GC – FIRE RESISTANCE

THIS SECTION APPLIES TO PUBLIC BUILDINGS AND GROUP DWELLINGS (Class 2 TO 9)

Performance Requirements

Deemed to Satisfy Provisions

GC1 Fire Resistance and Stability

GC2 Compartmentation and Separation

GC3 Protection of Openings

Specifications

GC21 PERFORMANCE REQUIREMENTS

GC21.1 OBJECTIVES

The design and construction of buildings must fulfil the following objectives:

Fire Resistance and Structural Stability

(a) A building must be constructed so that it is protected from fire within and from any adjacent building.
(b) Materials used in the construction must be such that if there is a fire in the building:
  (i) the spread of fire and the generation of smoke and toxic gases will be minimised;
  (ii) stability will be maintained for a period at least sufficient for the occupants to escape and to ensure the safety of firefighters; and
  (iii) there will be little risk of collapse onto adjoining property.

Compartmentation and Separation

Buildings must be constructed to localise the effects of fire to the areas of origin. Adequate levels of passive fire protection must be provided so that sufficient time is available for the users and others to escape from the effects of fire and as an alternative, to allow the users to stay safely within unaffected compartments for the duration reasonably required to put out the fire by active means.

Protection of Openings

Openings must be protected and service penetrations must be fire-stopped to maintain separation and compartmentation.

GC21.2 REQUIRED PERFORMANCE

GC21.2.1 Fire Resistance and Stability

In order to maintain the *structural adequacy* and stability of any building for a sufficient time for the safety of the users, firefighters and other emergency services, the following must be ensured:

(a) the loadbearing elements must have the Fire Resistance Level, (FRL) appropriate to the function of use of the building, the expected fire load density, the fire risk, the height of the building, its location with reference to the availability of external firefighting resources, and the fire control measures available within the building;
(b) the FRL of structural elements must be at least equal to that of other elements to which they provide support; and
(c) the collapse of elements with a lower FRL must not result in the collapse of elements with a higher FRL.

GC21.2.2 Compartmentation and Separation

The size of a *fire compartment* must also 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.

Building compartment size and separating construction must be such that the potential size of a fire and the 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; and
(b) control the spread of fire or smoke to adjoining buildings; and
(c) facilitate access to the building by firefighters.

GC21.2.3 Protection of Openings

Openings of any nature in the envelope surrounding *fire compartments* must be so protected that they do not allow the passage of heat, flames, smoke and gases in the event of a fire within or outside the compartment and for a period sufficient to:

(a) allow the safe evacuation of all affected people; and
(b) allow firefighters to fight the fire.

The sufficiency of the duration allowed must take into account the nature of occupancy of the building as well as the proximity of other buildings and their occupancy.

GC22 DEEMED-TO-SATISFY PROVISIONS

GC22.1 FIRE RESISTANCE AND STABILITY

GC22.1.1 Type of construction required

(a) The minimum Type of *fire-resisting construction* of a building must be that give in the Table below, except as allowed for:
  (i) open spectator stands and indoor sports stadiums in GC1.4; and
  (ii) lightweight construction in GC1.5
(b) Type A construction is the most fire-resistant and Type C the least fire-resistant of the Types of construction.

Rise in storeys	Class of building 2, 3, 9	Class of building 5, 6, 7, 8
4 or more	A	A
3	A	B
2	B	C
1	C	C

GC22.1.2 Calculation of rise in storeys

In calculating the *rise* in *storeys*:

(a) a storey that has an average internal height of more than 6 m is counted as:
  (i) one storey if it is the only storey above the ground; or
  (ii) 2 storeys in any other case; and
(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 ceilings is not more than 1 m above the average finished level of the ground at the *external wall*, or if the *external wall* is more than 12 m long, the average for the 12 m part where the ground is lowest.

GC22.2 Mixed Types of construction

A building may be of mixed Types of construction if no part of the building is supported by, or vertically over, a part of less *fire-resisting* Type.

GC22.3 Open spectator stands and indoor sports stadiums

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.

GC22.4 Lightweight construction

Lightweight construction must comply with Specification GC1.5 if it is used in construction which is required to be fire-resisting.

GC22.5 Early Fire Hazard Indices

The Early Fire Hazard Indices of materials and assemblies inside Class 2 to 9 buildings must comply with Specification GC4.10.

GC22.6 Non-combustible building elements

(a) In a building *required* to be of Type A or B construction, the following building elements and their components must be *non-combustible*:
  (i) *External walls* and *common walls*, including all components incorporated in them including the facade covering, framing and insulation.
  (ii) The flooring and floor framing of lift pits.
  (iii) Non-*loadbearing internal walls* where they are *required* to be *fire-resisting*.
(b) A *shaft*, being a lift, ventilating, pipe, garbage, or similar *shaft* that is not for the discharge of hot products of combustion, that is non-*loadbearing*, must be of *non-combustible* construction in:
  (i) a building *required* to be of Type A construction; and
  (ii) a building i to be of Type B construction, subject to C2.10, in:
    - a Class 2, 3 or 9 building; and
    - a Class 5, 6, 7 or 8 building if the *shaft* connects more than 2 storeys.
(c) A *loadbearing internal wall* and a *loadbearing fire wall*, including those that are part of a *loadbearing shaft*, must comply with Specification GC4.1.
(d) The requirements of (a) and (b) do not apply to the following:

(i) Gaskets.
(ii) Caulking.
(iii) Sealants.
(iv) Termite management systems.
(v) Glass, including laminated glass.
(vi) Thermal breaks associated with glazing systems.
(vii) Damp-proof courses.

(e) The following materials may be used wherever a *non-combustible* material is *required*:
(i) Plasterboard.
(ii) Perforated gypsum lath with a normal paper finish.
(iii) Fibrous-plaster sheet.
(iv) Fibre-reinforced cement sheeting.
(v) 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.
(vi) *Sarking-type materials* that do not exceed 1 mm in thickness and have a *Flammability Index* not greater than 5.
(vii) Bonded laminated materials where:
- each lamina, including any core, is *non-combustible*; and
- each adhesive layer does not exceed 1 mm in thickness and the total thickness of the adhesive layers does not exceed 2 mm; and
- 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.

GC22.7 COMPARTMENTATION AND SEPARATION

GC22.7.1 Application

This Part does not apply to an *open-deck carpark* or *open spectator stand*.

GC22.7.2 General floor area limitations

(a) The size of any *fire compartment* in a Class 5, 6, 7, 8 or 9b building must not exceed the relevant maximum *floor area* and volume set out in Table GC2.2 except as permitted in Section GC2.3.
(b) 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.

TABLE GC2.2
TYPE OF CONSTRUCTION REQUIRED

MAXIMUM SIZE OF FIRE COMPARTMENTS				
	TYPE OF CONSTRUCTION OF BUILDING			
CLASS 5, 6, 7, 8 OR 9b		TYPE A	TYPE B	TYPE C
	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 NE1.6 and if fully protected with a sprinkler system and water supply to NZS 4541 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 Type A; and

(ii) where the sprinkler system has a single water supply to Type C:

- 2000 m^2 in Class 2, 3 and 5 with a rise of no more than 4 storeys
- 4 times in all other classes.

(c) The size of any *fire compartment* in a Class 3 building must not exceed 600 m^2 except if fully protected by a sprinkler system to any Class of water supply to NZS 4541, this area may be increased to 1500 m^2.

GC22.7.3 Large isolated buildings of Class 5, 6, 7, 8 or 9b

The *floor area* of a *fire compartment* in a large isolated building may exceed that specified in Table GC2.2 to the following limits and conditions:

(a) Up to 18000 m^2 if:

(i) the building is Class 7 or 8, it contains not more than 2 storeys and an *open space* complying with Section GC2.4(a) not less than 18 m wide is provided around the building; or

(ii) the building is of any Class and is protected throughout with a *sprinkler system* and perimeter vehicular access complying with Section GC2.4(b) is provided.

If more than one building is on the allotment:

(i) Each building complies with (a) or (b); or

(ii) If the buildings are closer than 6 m 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).

GC22.7.4 Requirements for open spaces and vehicular access

(a) An *open space* required by Section GC2.3 must:

(i) be wholly within the allotment except as in (iii);

(ii) include vehicular access in accordance with (b);

(iii) be next to the boundaries of the allotment, and may include any road, river, or public place adjoining the allotment;

(iv) not be used for the storage or processing of materials; and

(v) 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 fire-fighting 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.

(b) The vehicular access *required* by this Part:

(i) must be capable of providing emergency vehicle access and passage from the public road;
(ii) must have a minimum unobstructed width of 6 m and in no part be built upon or used for any purpose other than vehicular or pedestrian movement;
(iii) may be substituted by a public road if the building faces and is accessible from the road and is no further than 45 m from it;
(iv) must be such that reasonable pedestrian access from the vehicular access to the building is available; and
(v) must be of adequate load bearing capacity and unobstructed height to permit the operation and passage of Fire Brigade vehicles.

GC22.7.5 Class 9a buildings

The building must be divided into *fire compartments* with a maximum *floor area* of 2000 m^2 and further:

(a) *Ward areas* must be subdivided with walls of minimum FRL of 60/60/60 into *floor areas* of not more than 850 m^2 and again subdivided into parts of 425 m^2 maximum *floor area* with smoke proof walls complying with (c);
(b) other than *ward areas* must be subdivided into parts with a maximum *floor area* of 425 m^2 with smoke proof walls complying with (c);
(c) a wall *required* to be smoke-proof must:
  (i) be *non-combustible* and extend to the underside of the floor above or of the roof covering;
  (ii) only have doorways which are fitted with smoke doors complying with Specification GC4.11 and which do not extend higher than 800 mm from the underside of an imperforate roof covering, floor or ceiling above it; and
  (iii) not incorporate any other opening which is not smoke-proof; and
(d) *Fire compartments* must be separated from the remainder of the building by *fire walls* and:
  (i) in Type A construction: floors and roof or ceiling as required in GC24.1.5;
  (ii) in Type B construction: floors with a FRL of not less than 90/90/90, and if fully protected with a *sprinkler system* of 60/60/60; and
  (iii) in Type C construction: floors with a FRL of not less than 60/60/60.

GC22.7.6 Separation of openings in external walls

In any building which is other than:

(a) fully protected with *a sprinkler system*;
(b) an *open deck car park*; or
(c) of one or two *storeys rise*,

if any part of a window or other opening in an *external wall* (except openings in the same stairway) is situated above another opening in the storey next below, the opening must be protected by:

(a) a slab or other horizontal construction that:

(i) projects outwards from the external face of the wall not less than 1100 mm;
(ii) extends along the wall not less than 450 mm beyond the openings concerned; and
(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 in height;
(ii) extends not less than 600 mm above the upper surface of the intervening floor; and
(iii) is of *non-combustible* material having a FRL not less than 60/60/60; or

(c) providing the *window* or opening in the upper storey with a glazing system with a FRL of not less than -/60/30. 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.

NOTE: These requirements are separate from the structural requirements for glazing in Sections B1.3 and ~~B1.4~~ B3.1.

GC22.7.7 Separation by fire walls

A part of a building separated from the remainder of the building by a *fire wall* is treated as a separate building if:

(a) the *fire wall*:
(i) extends through all storeys and spaces in the nature of storeys that are common to that part and any adjoining part of the building;
(ii) is carried through to the underside of the roof covering; and
(iii) has the relevant FRL prescribed by Specification GC4.1 for each of the adjoining parts; and if these are different, the greater FRL;

(b) any openings in a *fire wall* comply with Part GC3;

(c) timber purlins or other *combustible* material do not pass through or cross the *fire wall*; and

(d) 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:
(i) the covering of the higher roof, or not less than 6 m above the covering of the lower roof;
(ii) 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;
(iii) the lower roof if its covering is *non-combustible* and the lower part has a *sprinkler system*; or
(iv) the design of the building must otherwise restrict the spread of fire from the lower part to the higher part.

GC22.7.8 Separation of classifications in the same storey

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 GC4.1 for that element for the classifications concerned; or
(b) the parts must be separated in that storey by a *fire wall* with whichever is the greater of the higher FRL prescribed in Specification GC4.1 for the classifications concerned.

GC22.7.9 Separation of classifications in different storeys

If parts of different classification are situated one above the other in adjoining storeys they must be separated as follows:

(a) Type A or B construction - The floor between the adjoining parts must have a FRL not less than that prescribed in Specification GC4.1 for the classification of the lower storey.
(b) Type C construction - The underside of the floor (including the sides and underside of any floor beams) must have a *fire-protective covering*.

GC22.7.10 Separation of lift shafts

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 as prescribed by specification GC4.1 if it connects more than:

(a) Two storeys in an unsprinklered building; or
(b) Three storeys in a sprinklered building.

The openings for the lift landing doors and services must be protected in accordance with Part GC3.

GC22.7.11 Stairways and lifts in one shaft

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.

GC22.7.12 Separation of equipment

A wall having a FRL of not less than 60/60/60 must bound a room housing equipment comprising:

(a) lift motors and lift control panels;
(b) the main electrical switchboard in a building with an *effective height* of more than 25 m;
(c) *required* stair pressurising 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 GE2.6; or

(iii) equipment that is otherwise adequately separated from the remainder of the building.

GC22.7.13 Electricity substations

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;
(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* fire doors having a FRL of - /120/60;
(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; and
(d) any openings, fans or grilles for natural or mechanical ventilation must be located only on an *external wall* unless protected with an *automatic* fire shutter having a FRL of -/120/60.

GC23 PROTECTION OF OPENINGS

GC23.1 Application of Part

(a) This Part does not apply to:
  (i) 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
  (ii) *non-combustible* ventilators for sub-floor or cavity ventilation, if each does not exceed 45 x 10^3 mm^2 in face area and is spaced not less than 2 m from any other ventilator in the same wall.
(b) This Part 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.

GC23.2 Protection of openings in external walls

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 Section GC3.4 if it is situated closer from 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 adjoining the allotment; or
  (iii) 6 m from another building on the allotment that is not Class 10; and
(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.

GC23.3 Separation of openings in different fire compartments

Unless they are protected in accordance with Section GC3.4, the distance between openings in *external walls* in compartments separated by a *fire wall* must not be less than that set out in Table GC3.3.

TABLE GC3.3

DISTANCE BETWEEN OPENINGS IN DIFFERENT COMPARTMENTS

ANGLE BETWEEN WALLS	MINIMUM DISTANCE BETWEEN OPENINGS
0^0 (walls opposite)..	6 m
more than 0^0 to 45^0	5 m
more than 45^0 to 90^0	4 m
more than 90^0 to 135^0	3 m
more than 135^0 to 160^0	2 m

GC23.4 Acceptable methods of protection

(a) Where protection is required, doorways, windows, and other openings must be fitted with suitable:
  (i) Doorways: - /60/30 *self-closing* or *automatic* fire doors and fire shutters;
  (ii) Windows: -/60/30 *fire windows* (automatic or permanently fixed in the closed position) or -/60/30 automatic fire shutters;
  (iii) Other openings: construction having a FRL not less than - /60/30;
  These methods of protection may be replaced with specifically engineered external drenchers provided an adequate supply of water can be ensured.

(b) Fire doors, smoke doors, fire windows and fire shutters satisfy (a) if they comply with Specification GC3.11.

GC23.5 Doorways in fire walls

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*, and each doorway 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 GC4.1 for the *fire wall*; and

(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 GC4.1 for the *fire wall*; and
   (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.

GC23.6 Sliding fire doors

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 deactivated, allows the door to be fully closed not less than 20 seconds, and not more than 30 seconds, after release; and

(b) thermal or smoke detectors as appropriate must be installed on each side of the doorway, in accordance with AS 1905 Part 1 or 2; and

(c) an audible warning device located near the doorway and a red flashing warning light of a suitable intensity 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; and

(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.

GC23.7 Protection of doorways in horizontal exits

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 GC4.1 for the *fire wall*; or

(b) in all other (excluding Classes 1 and 10) classes of buildings, by a single fire door which has a FRL of not less than that required by Specification GC4.1 for the fire wall,

and each door must be *self-closing* or provided with *automatic* release of any hold-open device upon detection of smoke or fire.

GC23.8 Openings in fire-isolated exits

(a) A doorway that does not open to a road or open space must be protected by a *self- closing* or *automatic* - /60/30 fire door if it opens to a *fire-isolated stairway*, *fire-isolated passageway* or *fire-isolated ramp*.

(b) A window in an *external wall* of *a fire-isolated stairway, fire-isolated passageway* or *fire-isolated ramp* must be protected in accordance with Section GC3.4 if it is within 6 m of, and exposed to:
  (i) a *fire-source feature*; or
  (ii) another window or other opening in a wall of the same building, unless they both serve the same fire-isolated enclosure.

GC23.9 Service penetrations in fire-isolated exits

Fire-isolated exits must not be penetrated by any service other than:

(a) electrical wiring associated with a lighting or pressurising system serving the exit;
(b) ducting associated with the pressurising system if it:
  (i) is constructed of material having a FRL of not less than 60/60/60 where it passes through any other part of the building; and
  (ii) does not open into any other part of the building; or
(c) water supply pipes for fire services or domestic use.

GC23.10 Openings in fire-isolated lift shafts

(a) Doorways: If a lift shaft is required to be fire-isolated under Part GC2, an entrance doorway to that shaft must be protected by - /60/30 fire doors that:
  (i) comply with AS 1735.11; and
  (ii) are set to remain closed except when discharging or receiving passengers, goods or vehicles.
(b) Lift indicator panels: 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 x 10^3 mm^2 in area.

GC23.11 Bounding construction: Class 2, 3 and 4 buildings

(a) A doorway in a Class 2 or 3 building must be protected if it provides access from a *sole-occupancy unit* to:
  (i) a *public corridor*, public hallway, or the like;
  (ii) a room not within a *sole-occupancy unit*:
  (iii) the landing of an internal non-fire-isolated stairway that serves as a required exit; or
  (iv) another *sole-occupancy unit*.
(b) A doorway in a Class 4 part must be protected if it provides access to any other internal part of the building.
(c) Protection for a doorway must be at least:
  (i) in a building of Type A or B construction: a self-closing - /60/30 fire door; and
  (ii) in a building of Type C construction: a self-closing tight fitting solid core door not less than 35 mm thick in a rebated frame.
(d) 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.

GC23.12 Openings in floors for services

In a building of Type A and B construction, services associated with the functioning of the building and passing through a floor must either be installed in shafts complying with Specification GC4.1 or protected in accordance with Section GC3.14.

GC23.13 Openings in shafts

In a building of Type A or B construction, an opening in a wall providing access to a ventilating, pipe, garbage 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, 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.

GC23.14 Openings for service installations

An electrical, electronic, plumbing, mechanical ventilation or air-conditioning, or other service that penetrates a building element (other than an *external wall* or roof) that is required to have a FRL or a resistance to the incipient spread of fire, must be installed so that the fire-resisting performance of the building element is not impaired.

GC23.15 Installation deemed-to-satisfy

Installation satisfies Section GC3.14 if:

(a) the method and materials used are identical with a prototype assembly of the service and building element which has achieved the required FRL or resistance to the incipient spread of fire;
(b) it complies with (a) except for the insulation criterion relating to the service when:
    (i) the service is farther than 100 mm from any combustible material; and
    (ii) it is not located in a required exit;
(c) in the case of ventilating or air-conditioning ducts or equipment the installation is in accordance with AS 1668.1;
(d) the service is a metal pipe installed in accordance with Specification GC4.12 and it penetrates a wall, floor or ceiling, but not a ceiling required to have a resistance to the incipient spread of fire;
(e) the service is sanitary plumbing installed in accordance with Specification GC4.12 and it:
    (i) is of metal or UPVC pipe; and
    (ii) penetrates the floors of a Class 5, 6, 7, 8 or 9b building; and
    (iii) is in *sanitary compartments* which are separated from other parts of the building by walls with the FRL required by Specification GC4.1 for a stair shaft in the building and a self-closing -/60/30 fire door;
(f) the service is a wire or cable, or a cluster of wires or cables installed in accordance with Specification GC4.12 and it penetrates a wall, floor or ceiling, but not a ceiling required to have a resistance to the incipient spread of fire; or

(g) the service is an electrical switch, outlet, or the like, and it is installed in accordance with Specification GC4.12.

GC24 SPECIFICATIONS

GC24.1 FIRE-RESISTING CONSTRUCTION

GC24.1.1 Scope

This Specification contains requirements for the fire-resisting construction of building elements.

GC24.1.2 General Requirements

GC24.1.2.0 Exposure to fire-source features

(a) A part of a building element is exposed to a *fire-source feature* if there is no obstruction to any horizontal line between that part and the *fire-source feature* or a vertical projection of the feature. Where another part of the building obstructs any such horizontal line, the part under consideration will still be considered exposed if the obstruction has:
  (i) a FRL of not less than 30/-/-; or
  (ii) is transparent or translucent.

(b) A part of a building element is not exposed to a *fire-source feature* if the *fire-source feature* is:
  (i) 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
  (ii) 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.

(c) If various distances apply for different parts of a building element:
  (i) the entire element must have the FRL applicable to that part having the least distance between itself and the relevant *fire-source feature*; or
  (ii) 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.

GC24.1.2.1 Fire protection for a support of another part

A part of a building that gives direct vertical or lateral support to another part required to have a FRL, must have a FRL in respect of structural adequacy not less than the greater of:

(a) that required for the part it supports; or
(b) that required for the part itself,

and be *non-combustible* if the part it supports is required to be *non-combustible*.

GC24.1.2.2 Lintels

A lintel must have the FRL required for the part of building in which it is situated. It need not have the FRL if 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;
  (ii) a non-loadbearing 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-loadbearing; or
  (ii) not more than 1.8 m wide if the masonry is loadbearing and part of one of the leaves of a cavity wall.

GC24.1.3 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.

GC24.1.4 General concessions

(a) Steel columns: Except in a fire wall or common wall, a steel column need not have a FRL in a building that contains only one storey.
(b) Timber Columns: In a building that contains only one storey, a timber column may be used provided:
  (i) in a *fire wall* or *common wall*, the column has the required FRL.
  (ii) in all other cases, the column has a FRL of not less than 30/-/-.
(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 one or more of the following:
  (i) Hot water or other water tanks.
  (ii) Ventilating ductwork, ventilating fans and their motors.
  (iii) Air-conditioning chillers.
  (iv) Window cleaning equipment.
  (v) Lift equipment.
  (vi) Other service units that are *non-combustible* and do not contain *combustible* fluids.

GC24.1.5 Type A Fire-Resisting Construction

GC24.1.5.0 Fire-resistance of building elements

In a building required to be of Type A construction:

(a) each part mentioned in Table 3, and any beam or column in it, must have a FRL not less than that listed in the Table, for the particular Class of building concerned;
(b) *external walls, common walls* and floors must be *non-combustible*;
(c) any *internal wall* required to have a FRL must extend to:
  (i) the underside of the floor next above;
  (ii) the underside of a roof complying with Table 3; or

(iii) a ceiling which is immediately below the roof and has a resistance to the incipient spread of fire to the roof space of 60 minutes;

(d) must be of non-combustible construction and if of lightweight construction comply with Specification GCS1.5;

(e) any flooring and floor framing in a lift pit must be *non-combustible*; and

(f) 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
TYPE A CONSTRUCTION: FRL OF *BUILDING* ELEMENTS

BUILDING ELEMENT	FRL (in minutes) Structural adequacy/Integrity/ Insulation	
	CLASS OF *BUILDING*	
	2, 3 or 4 part	5, 6, 7, 8 or 9
EXTERNAL WALL or other external building element excluding a roof, where the distance from any fire-source feature to which it is exposed is -		
For loadbearing parts -		
less than 1.5 m	90/90/90	120/120/120
1.5 to less than 3 m	90/60/60	120/90/90
3 or more	90/60/30	120/60/30
For non-loadbearing parts -		
less than 1.5 m	90/90/0	120/120/120
1.5 to less than 3 m	90/60/60	120/90/90
3 or more	-/-/-	-/-/-
EXTERNAL COLUMN not incorporated in an external wall, where the distance from any fire-source feature to which it is exposed -		
less than 3 m	90/-/-	120/-/-
3 m or more	-/-/-	-/-/-
COMMON WALLS AND FIRE WALL	90/90/90	120/120/120
INTERNAL WALLS		
Fire-resisting lift or stair shafts -		
Loadbearing	90/90/90	90/90/90
Non-loadbearing	90/90/90	90/90/90
Bounding public corridors, public hallways and the like		
Loadbearing	90/90/90	90/-/-
Non-loadbearing	60/60/60	-/-/-
Between or bounding sole-occupancy units -		
Loadbearing	90/90/90	90/-/-
Non-loadbearing	60/60/60	-/-/-
Ventilating, pipe, garbage, and like shafts not used for the discharge of hot products of combustion -		
Loadbearing	90/90/90	90/90/90
Non-loadbearing	90/90/90	90/90/90
OTHER LOADBEARING INTERNAL WALLS; and INTERNAL BEAMS, TURSSES and COLUMNS	90/-/-	90/-/-
FLOORS	90/90/90	120/120/120
ROOFS	90/60/30	120/60/30
MAIN ROOF BEAMS	90/-/-	120/-/-

GC24.1.5.1 Concessions for floors

The following floors need not comply with Clause 3.1:

(a) A floor laid directly on the ground.
(b) In a Class 2, 3, 5 or 9 building if 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.
(c) It is a timber stage floor in a Class 9b building laid over a floor having the required FRL if the space below the stage is not used as a dressing room, store room, or the like.
(d) It separates 2 storeys within the same sole-occupancy unit in a Class 2 building.

GC24.1.6 Floor loading of Class 5 and 9b buildings: Concession

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 a FRL, of 90/90/90; or
(b) the roof, if that is next above (including roof beams) may have a FRL 90/60/30.

GC24.1.7 Roof superimposed on concrete slab: Concession

A roof not complying with Clause 3.1 as to fire-resisting construction may be superimposed on a concrete slab roof if:

(a) the superimposed roof and any construction between it and the concrete slab roof are non-combustible throughout; and
(b) the concrete slab roof complies with Table 3.

GC24.1.8 Roof: Concession

A roof need not comply with Table 3 if its covering is non-combustible and the building—

(a) has a sprinkler system complying with Specification NE1.5 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.

GC24.2 Roof lights

If a roof is required to have a FRL or be *non-combustible*, a roof light installed in that roof must:

(a) have an aggregate area not more than 20% of 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 the wall are protected in accordance with Section GC3.4;
(iii) any roof light in an adjoining sole-occupancy unit if the walls bounding the unit are required to have a FRL; and
(iv) any roof light in an adjoining fire-separated section of the building; and

(c) be installed in a way that will maintain the level of protection to the roof space provided by a required ceiling with a resistance to the incipient spread of fire.

GC24.3 Internal columns and walls: Concession

If under Clause 3.5 a roof that does not have a FRL is used in a building with an effective height of not more than 25 m, internal columns which are not those referred to in Clause 3.1(f) and load bearing internal walls which are not fire walls, in the storey immediately below that roof may have a FRL of 60/60/60.

GC24.4 Open spectator stands and indoor sports stadiums Concession

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 loadbearing walls supporting only the roof if they are *non-combustible*.
(c) any non-loadbearing part of an *external wall* less than 3 m:
  (i) from any *fire-source feature* to which it is exposed if it has a FRL of not less than 60/60/60 and is *non-combustible*; or
  (ii) from an *external wall* of another *open spectator stand* if it is *non-combustible*.

GC24.5 Carparks: Concessions

The FRLs in Table 3.9 apply to a carpark that is sprinkler protected or an open deck carpark instead of these in Table 3.

TABLE 3.9 FRL FOR CARPARKS	
BUILDING ELEMENT	FRL
Column or beam – less than 4.5 m from a fire-source feature to which it is exposed	60/-/-
Wall – less than 3 m from a fire-source feature to which it is exposed	60/60/60
Other steel column – ratio of exposed surface area to mass per unit length not greater than 26 m2/tonne	-/-/-
Any other column (other than a column supporting only the roof)	60/-/-
Fire wall or lift or stair shaft	90/90/90
Any other steel floor beam – which is in continuous contact with a concrete floor slab and has a ratio of exposed surface area to mass per unit length not more than 30 m2/tonne	-/-/-
Any other floor beam	60/-/-
Floor slab or vehicle ramp	60/60/60
Roof and columns supporting only the roof	-/-/-

GC24.6 Mezzanine floors: Concession

Except in a Class 9b building which is a spectator viewing area that accommodates more than 100 persons under Section ND1.13, mezzanine floors and any supporting building elements need not have a FRL or be *non-combustible* if every wall or column that supports any part of the building other than the mezzanine floor or floors within 6 m of a mezzanine floor has its FRL increased from that otherwise required, as set out in Table 3.10.

Table 3.10 **Increased FRLs – Construction surrounding mezzanines**	
Level otherwise required for any RFL criterion (mins)	Increase in level to (not less than):
90	60
60	90
90	120

The increase in level applies to each FRL criterion (structural adequacy, integrity or insulation) relevant to the building element concerned.

GC24.7 Type B Fire-Resisting Construction

GC24.7.1 Fire-resistance of building elements

In a building required to be of Type B construction:

(a) each part mentioned in Table 4, and any beam or column in it, must have a FRL not less than that listed in the Table for the particular Class of building concerned;

(b) a *common wall*, the flooring and floor framing in any lift pit, and an *external wall* where a FRL is listed in Table 4, must be *non-combustible*;

(c) if a stair shaft supports any floor or a structural part of it:
  (i) the floor or part must have a FRL of 60/ - / - or more; or
  (ii) 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;

(d) any *internal wall* which is required to have a FRL must extend to-
  (i) the underside of the floor next above;
  (ii) 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
  (iii) the underside of the roof covering if it is *non-combustible*, or 450 mm above the roof covering if it is *combustible*, and must not be crossed by timber purlins or other *combustible* material,

  unless the wail bounds a sole-occupancy unit in the topmost (or only) storey and there is only one unit in that storey;

(e) an *internal wall* required to be fire-resisting must be of *non-combustible* construction, and if it is of lightweight construction, it must comply with Specification GC4.9;

(f) lift, ventilation, pipe, garbage, and similar shaft which are not for the discharge of hot products of combustion and not loadbearing, must be of *non-combustible* construction in Class 2 to 9 buildings; and

(g) all *external walls* and *fire walls* within 1.5 m of the boundary, excluding a boundary adjoining a public road or stream or other open water channel, must be extended to not less than 450 mm above the adjoining roof line to form a parapet.

TABLE 4 TYPE B CONSTRUCTION: FRL OF BUILDING ELEMENTS		
	FRL (in minutes) Structural adequacy/Integrity/Insulation	
***BUILDING* ELEMENT**	**CLASS OF *BUILDING***	
	2, 3 or 4 part	5, 6, 7, 8 or 9
EXTERNAL WALL or other external building element excluding a roof, where the distance from any fire-source feature to which it is exposed is -		
For loadbearing parts -		
less than 1.5 m	60/60/60	90/90/90
1.5 to less than 3 m	60/60/30	90/90/60
3 or more	60/30/-	90/90/60
9.0 to less than 18 m	60/-/-	90/30/-
For non-loadbearing parts -		
less than 1.5 m	60/60/60	90/90/90
1.5 to less than 3 m	60/60/30	90/90/60
3 or more	-/-/-	-/-/-
EXTERNAL COLUMN not incorporated in an external wall, where the distance from any fire-source feature to which it is exposed -		
less than 3 m	60/-/-	90/-/-
3 m or more	-/-/-	-/-/-
COMMON WALLS AND FIRE WALL	60/60/60	90/90/90
INTERNAL WALLS		
Fire-resisting lift or stair shafts -		
Loadbearing	60/60/60	60/60/60
Non-loadbearing	60/60/60	60/60/60
Bounding public corridors, public hall-ways and the like - High end		
Loadbearing	60/60/60	60/-/-
Non-loadbearing	60/60/60	-/-/-
Between or bounding sole-occupancy units -		
Loadbearing	60/60/60	60/-/-
Non-loadbearing	60/60/60	-/-/-
OTHER LOADBEARING INTERNAL WALLS; and INTERNAL BEAMS, TURSSES and COLUMNS	60/-/-	60/-/-
FLOORS	60/30/30	60/60/60
MAIN ROOF BEAMS	60/-/-	60/-/-
*See NC2.5(d) for Class 9a buildings		

GC24.7.2 Carparks: Concessions

The FRLs in Table 4.2 apply to a carpark that is fully sprinkler protected or an open deck carpark instead of those in Table 4.

TABLE 4.2 FRL FOR CARPARKS	
BUILDING ELEMENT	FRL
Column or beam – less than 4.5 m from a fire-source feature to which it is exposed	60/-/-
Wall – less than 3 m from a fire-source feature to which it is exposed	60/60/60
Other steel column – ratio of exposed surface area to mass per unit length not greater than 26 m2/tonne	-/-/-
Any other column	60/-/-
Fire wall or lift or stair shaft	60/60/60
Any other steel floor beam - which is in continuous contact with a concrete floor slab and has a ratio of exposed surface area to mass per unit length not more than 30 m2/tonne	-/-/-
Any other floor beam	60/-/-

GC24.8 Type C Fire-Resisting Construction

GC24.8.1 Fire-resistance of building elements

In a building required to be of Type C construction:

(a) A building element listed in Table 5, and any beam or column incorporated in it, must have a FRL not less than that listed in the Table for the particular Class of building concerned.

(b) An *external wall* that is required by Table 5 to have a FRL may be considered to have a FRL if the outer part of the wall has the required FRL.

(c) A *fire wall* or an *internal wall* bounding a sole occupancy unit or separating adjoining units, if it is of lightweight construction, must comply with Specification GC4.9.

(d) In a Class 2 or 3 building an *internal wall* which is required by Table 5 to have a FRL must extend:

(i) to the underside of the floor next above if that floor has a FRL of at least 30/30/30 or to a fire protective covering on the underside of the floor;

(ii) 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

(iii) to the underside of the roof covering if it is *non-combustible*, or 450 mm above the adjoining roof covering if it is *combustible*, and must not be crossed by timber purlins or other *combustible* material,

unless the wall bounds a sole-occupancy unit in the topmost (or only) storey and there is only one unit in that storey.

(e) All *external walls* and *fire walls* within 1.5 m of the boundary, excluding a boundary adjoining a public road or stream or other open water channel, must be extended to not less than 450 mm above the adjoining roof line to form a parapet.

TABLE 5 TYPE C CONSTRUCTION: FRL OF BUILDING ELEMENTS			
	FRL (in minutes) Structural adequacy/Integrity/Insulation		
***BUILDING* ELEMENT**	**CLASS OF *BUILDING***		
	2	3 or 4 part	5, 6, 7, 8 or 9
EXTERNAL WALL or other external building element excluding a roof, where the distance from any fire-source feature to which it is exposed is -			
less than 1.5 m	60/60/60	60/60/60	60/60/60
EXTERNAL COLUMN not incorporated in an external wall, where the distance from any fire-source feature to which it is exposed -			
less than 1.5 m	60/-/-	60/-/-	90/-/-
3 m or more	-/-/-	-/-/-	
COMMON WALLS AND FIRE WALL	60/60/60	60/60/60	60/60/60
INTERNAL WALLS			
Bounding public corridors, public hallways and the like -	30/30/30	60/60/60	-/-/-
Between or bounding sole-occupancy units -	30/30/30	60/60/60	-/-/-
Bounding a stair if required to be rated	30/30/30	60/60/60	-/-/-
NOTE: See NC2.5(d) for floors of Class 9a buildings			

GC24.8.2 Carparks: Concessions

The FRLs in Table 5.2 apply to a sprinkler protected or open deck carpark instead of those in Table 5.

TABLE 5.2 FRLs FOR CARPARKS	
***BUILDING* ELEMENT**	**FRL**
Column or beam - less than 1.5 m from a fire- source feature to which it is exposed	60/-/-
Wall - less than 1.5 m from a fire-source feature to which it is exposed	60/-/-
Other steel column - ratio of exposed surface area to mass per unit length not greater than 26 m2/tonne	-/-/-
Any other column	60/-/-
Any other steel floor beam - which is in continuous contact with a concrete floor slab and has a ratio of exposed surface area to mass per unit length not more than 30 m2/tonne	-/-/-
Any other floor beam	60/-/-

GC24.9 STRUCTURAL TESTS FOR LIGHTWEIGHT CONSTRUCTION

GC24.9.1 Scope

This Specification contains the tests to be applied and criteria to be satisfied by *lightweight construction*.

GC24.9.2 Definition

Lightweight construction is:

(a) *fire-resisting construction* which:
  (i) is not in continuous contact with the principal construction that it protects from fire; or
  (ii) is of sheet or board material, plaster, render, sprayed application, or other material similarly susceptible to damage by pressure or abrasion;
(b) *fire-resisting construction* which incorporates or comprises:
  (i) concrete containing pumice, perlite, vermiculite, or other soft material; or
  (ii) masonry having a thickness less than 70 mm.

GC24.9.3 Application

The tests prescribed in this specification apply to construction other than concrete or masonry which need not be tested in accordance with this specification if it is designed:

(a) in accordance with this Code; and
(b) to resist, as serviceability loads, the appropriate pressure and impact defined in this Specification.

GC24.9.4 Test methods

Tests must be carried out in accordance with the following:

(a) **Materials tests**: in accordance with the methods specified for the constituent materials of construction in the Standards adopted by reference in this Code.
(b) **For resistance to static pressure**: The provisions for testing walls under transverse load in ASTM E72-80, except that the chamber method must not be used.
(c) **For resistance to Impact**: The provisions for testing wall systems in ASTM E695-79 (1985), except that:
  (i) the points of impact must be set at 1.5 m above finished floor level or 1.5 m above the part of the specimen that corresponds to finished floor level; and
  (ii) the diameter of the impact bag must be between 225 mm and 260 mm and the bag must weigh 27.2 + 0.1 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; and
  (iv) the method may be used also for Walls that depart from the vertical or that are curved and in cases where the pendulum bag and suspension cannot be vertical at the instant of impact on a concave surface or a surface

inclined towards the impact, the height of drop is the net height at the point of impact.

(d) **For resistance to surface indentation**: for all materials irrespective of composition: AS/NZS 2588.

(e) **For resistance of lift shaft construction to repetitive load**: as for 3(b) except that:
   (i) the load must be applied dynamically at a frequency not less than 1 Hz and not more than 3 Hz; and
   (ii) it is sufficient to test one specimen with the pressure applied from the side of the construction on which the lift will operate.

GC24.9.5 Test specimens

Tests must be carried out on construction in situ or on specimens of the construction in accordance with Clause 4 except that:

(a) test specimens of the construction must be supported at top and bottom (or at each end if tested horizontally) by components identical with, and in a manner identical with, the actual construction; and

(b) the heights of the test specimens (or lengths, if the specimens are tested horizontally) must be identical with the height between those supports in the actual construction.

GC24.9.6 Criteria of compliance

The following criteria must be adopted to determine compliance with this specification:

(a) **Material**: Must comply with the applicable Standard adopted by reference in this Code.

(b) **Damage**: The construction must show no crack, penetration or permanent surface deformation to a depth of more than 0.5 mm nor must there be any other non-elastic deformation nor fastener failure.

(c) **Deflection - Static pressure**: Under static pressure the deflection of the construction must not be more than:
   (i) 1/240th of the height between supports (the span of the construction as tested);
   (ii) 30 mm; or
   (iii) 20 mm for lift shafts unless the requirements of Clause 15.2(a) of AS 1735.2 are fulfilled.

(d) **Deflection – impact**: Under impact the instantaneous deflection of the construction must not be more than:
   (i) 1/120th of the height between supports (the span of the construction as tested);
   (ii) 30 mm; or
   (iii) 20 mm for lift shafts unless the requirements of Clause 15.2(a) of AS1735.2 are fulfilled.

(e) **Surface indentation (AS/NZS 2588):** No impression must be more than 5 mm in diameter.

GC24.9.7 Wall systems

Wall systems that are required to be *fire resisting* bounding *public corridors*, public hallways and the like, and between or bounding sole-occupancy units must be subjected to the following tests and must fulfil the following criteria:

(a) The materials tests of Clause 4(a) and the materials properties criteria of Clause 6(a).
(b) A static test by the imposition of a uniformly distributed load (or its equivalent) of 0.25 kPa in accordance with Clause 4(b) and the damage and deflection criteria of Clauses 6(b) and (c) respectively.
(c) A dynamic test by the imposition of the impact of the impact bag falling through a height of 100 mm in accordance with Clause 4(c) and the damage and deflection criteria of Clause 6(b) and (d) respectively.
(d) The surface indentation test of Clause 4(d) and the surface indentation criterion of Clause 6(e).

GC24.9.8 Construction bounding means of egress

Construction bounding means of egress including wall systems for use in lift shafts, stair shafts, fire-isolated passageways and fire-isolated ramps that are required to be fire-resisting must be subjected to the following tests and must fulfil the following criteria:

(a) The materials tests of Clause 4(a) and the materials properties criteria of Clause 6(a),
(b) A static test by the imposition of a uniformly distributed load (or its equivalent) of 0.35 KPa in accordance with Clause 4(k) and the damage and deflection criteria of Clauses 6(b) and (c) respectively.
(c) A dynamic test with the impact bag failing through a height of 150 mm in accordance with Clause 3(c) and the damage and deflection criteria of Clauses 6(b) and (d) respectively.
(d) The surface indentation test of Clause 4(d) and the surface indentation criterion of Clause 6(e).

GC24.9.9 Requirements for certain Class 9b buildings

Wall systems for use in spectator stands, sports stadia, cinemas or theatres, railway or bus stations, or airport terminals in:

(a) lift shafts or stair shafts;
(b) external and internal walls bounding public corridors, public hallways and the like, including fire-isolated and non-fire-isolated passageways or ramps,

must be subjected to the following tests and must fulfil the following criteria:

(i) The materials tests of Clause 4(a) and the materials properties criteria of Clause 6(a).
(ii) A static test by the imposition of a uniformly distributed load {or its equivalent) of 1.0 kPa in accordance with Clause 4(b) and the damage and deflection criteria of Clauses 6(b) and (c) respectively.

(iii) A dynamic test with the impact bag falling through a height of 350 mm in accordance with Clause 4(c) and the damage and deflection criteria of Clauses 6(b) and (d) respectively.
(iv) The surface indentation test of Clause 4(d) and the criterion of Clause 6(e).

GC24.9.10 Lift shafts

In addition to the requirements of Clauses 8 and 9, wall systems for use in lift shafts that are required to be fire-resisting must be subjected to dynamic test by the imposition of 106 cycles of a uniformly distributed load (or its equivalent) between 0 and 0.35 kPa in accordance with Clause 4(e) and must fulfil the damage criteria of Clause 6(b).

GC24.10 EARLY FIRE HAZARD INDICES

GC24.10.1 Scope

This Specification sets out requirements in relation to the Early Fire Hazard Indices of materials, linings and surface finishes inside buildings.

GC24.10.2 Class 2 to 9 buildings: General requirements

Except where superseded by Clause 3 or 4, any material or component used in a Class 2, 3, 5, 6, 7, 8, or 9 building must:

(a) in the case of a *sarking-type material*, have a *Flammability Index* not more than 5;
(b) in the case of other materials, have:
  (i) a *Spread-of-flame index* not more than 9; and
  (ii) a *Smoke-developed index* not more than 8 if the *Spread-of-flame index* is more than 5;
(c) be completely covered on all faces by concrete or masonry not less than 50 mm thick; or
(d) in the case of a composite member or assembly, be constructed so that when assembled as proposed in a building:
  (i) any material which does not comply with (a) or (b) is protected on all sides and edges from exposure to the air;
  (ii) the member or assembly, when tested in accordance with Specification AS2.4, has a *Smoke-developed index* and a *Spread-of-Flame Index* not exceeding those prescribed in (b); and
  (iii) 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.

GC24.10.3 Fire-isolated exits

In a *fire-isolated stairway, fire-isolated passageway*, or *fire-isolated ramp* in a Class 2 to 9 building:

(a) a material, other than a *sarking-type material*, used in a ceiling, as an attachment to a structural member or as the finish, surface or lining of a structural member must:
  (i) have a *Spread-of-flame index* of 0;
  (ii) have a *Smoke-developed index* of not more than 2; and
  (iii) if *combustible*, be attached directly to a *non-combustible* substrate and not exceed 1 mm in finished thickness;
(b) a *sarking-type material* used in the form of an exposed wail or ceiling, or as a finish or attachment thereto, must have a *Flammability Index* of 0.

GC24.10.4 Class 2, 3 and 9 buildings: Public areas

A material, other than a *sarking-type material* must have a *Spread-of-flame index* of 0 and a *Smoke-developed index* not more than 5 if it is used:

(a) in a Class 2, 3, 9a or 9b building as a finish, surface, lining or attachment to any wall or ceiling in an internal public corridor, hallway, or the like, which is a means of egress to:
  (i) a stairway required to be fire-isolated or an external stairway used instead; or
  (ii) a passageway, or ramp, required to be fire-isolated; or
(b) in a Class 9b building which is used as a theatre, public hall, or the like:
  (i) as a finish, surface, lining, or attachment to any ceiling, wall or floor; or
  (ii) as the covering of fixed seating in the audience seating area; or
  (iii) in a cinema projection room.

GC24.10.5 Acceptable materials

A material complies with Clauses 2, 3 or 4 if it is:

(a) plaster, cement render, concrete. terrazzo, ceramic tile or the like; or
(b) a *fire-protective covering*.

GC24.10.6 Fire-retardant coatings

When paint or fire-retardant coatings are used in order to make a substrate comply with a required *Spread-of-flame index, Smoke-developed index* or *Flammability Index*, this fact must be clearly marked on an easily visible label or labels and permanently fixed to the building element so that the coating will not be scraped off or otherwise made ineffective, without re-coating to preserve the fire-retardant properties.

If any coating used will retain the required fire-retardant properties for only a limited period, it must be replaced before the expiry of such period so that the required properties are not diminished.

GC24.10.7 7. Exempted building parts and materials

The requirements in this Specification for a *Spread-of-flame index, Smoke-developed index* or *Flammability Index* do not apply to:

(a) timber-framed windows;

(b) solid timber handrails or skirtings;
(c) timber-faced solid-core or fire doors;
(d) electrical switches, outlets, cover plates or the like;
(e) materials used for:
    (i) roof covering or membranes, or roof insulating material, applied in continuous contact with a substrate; or
    (ii) adhesives; or
    (iii) damp-proof courses, flashings, caulking, sealing, ground moisture barriers, or the like;
(f) paint, varnish, lacquer or similar finish, other than nitrocellulose lacquer;
(g) a clear or translucent roof-light of glass fibre reinforced polyester if:
    (i) the roof in which it is installed forms part of a building in Type C construction;
    (ii) the material is used as part of the roof covering;
    (iii) it is not prohibited by any other clause of this Code;
    (iv) it is not closer than 1.5 m from another roof-light of the same type;
    (v) each roof-light is not more than 14 m^2 in area; and
    (vi) the area of the roof-lights is not more than 20% of roof surface; or
(h) any other material which does not significantly increase the hazards of fire.

GC24.11 FIRE DOORS, SMOKE DOORS, FIRE WINDOWS AND SHUTTERS

GC24.11.1 Scope

This Specification sets out requirements for the construction of fire doors, smoke doors, fire windows and fire shutters.

GC24.11.2 Fire doors

A required fire door must comply with AS1905, except that:

(a) it may be fully glazed or incorporate glazing if the tested prototype was similarly glazed;
(b) the radiation level at a distance of 365 mm from the lace of the glazing must not exceed 10 kW/m^2 during the period corresponding to that for insulation in the required FRL;
(c) the rise in average temperature on the side of the tested prototype remote from the furnace must not exceed 140°C (except in any glazed part) during the first 30 minutes of the fire test.

GC24.11.3 Smoke doors

A required smoke door:

(a) may have one or 2 door leaves;
(b) must swing:
    (i) in the direction of egress; or
    (ii) in both directions if the path of travel to exits is in either direction;
(c) must be self-closing and may be fitted with an automatic release device; and
(d) must be constructed of:

(i) solid-core timber at least 35 mm thick, glazed panels in a timber frame at least 35 mm thick, or a metal frame, with a mid-rail or suitable crash bar; or
(ii) PVC, or other suitable material;
and if necessary, be fitted with smoke seals.

GC24.11.4 4. Fire shutters

A required fire shutter 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; and
  (iii) did not have a rise in average temperature on the side remote from the furnace of more than 140°C during the first 30 minutes of the test; or
(b) is a steel shutter complying with AS1905 if a metallic fire shutter is not prohibited by Section GC3.5.

GC24.11.5 5. Fire windows

A required fire window must be:

(a) identical in construction with a prototype that has achieved the required FRL; and
(b) installed in the same manner and in an opening that is not larger than the tested prototype.

GC24.12 PENETRATION OF WALLS, FLOORS AND CEILINGS BY SERVICES

GC24.12.1 Scope

This Specification prescribes materials and methods of installation for services that penetrate walls, floors and ceilings required to have a FRL.

GC24.12.2 Application

(a) This Specification applies to installations permitted under this Code as alternatives to systems that have been demonstrated by test to fulfil the requirements of Section GC3.14.
(b) 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.

GC24.12.3 Metal pipes

(a) A metal pipe that is not normally filled with liquid must not penetrate a wall, floor or ceiling within 100 mm of any combustible material unless wrapped or fire stopped to satisfy the requirements of Clause 7, and must be constructed of:
  (i) copper alloy or stainless steel with a wall thickness of at least 1 mm; or

(ii) cast iron or steel (other than stainless steel) with a wall thickness of at least 2 mm,

(b) An opening for a metal pipe must:
   (i) be neatly formed, cut or drilled;
   (ii) be no closer than 200 mm to any other service penetration; and
   (iii) accommodate only one pipe.

(c) A metal pipe 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 tagging or thermal insulation fulfils the requirements of Clause 7.

(d) The gap between a metal pipe and the wall, floor or ceiling it penetrates must be fire- stopped in accordance with Clause 7.

GC24.12.4 Pipes penetrating sanitary compartments

If a pipe of metal or UPVC penetrates the floor of a sanitary compartment in accordance with Section GC3.15(e) of this Code:

(a) the opening must be neatly formed and no larger than is necessary to accommodate the pipe or fitting; and

(b) the gap between pipe and floor must be fi re-stopped in accordance with Clause 7.

GC24.12.5 Wires and cables

If a wire or cable or duster 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 opening; and

(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; and

(c) the gap between the service and the wall, floor or ceiling must be fire-stopped in accordance with Clause 7.

GC24.12.6 Electrical switches and outlets

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 nor 600 mm vertically of any opening or recess on the opposite side of the wall; nor
   (ii) extend beyond half the thickness of the wall; and

(b) the gap between the service and the wall, floor or ceiling must be fire-stopped in accordance with Clause 7.

GC24.12.7 Fire-stopping

(a) **Material**: The material used for fire-stopping of service penetrations must be in accordance with AS 4072, and must have:

(i) demonstrated in a system tested in accordance with Section GC3.15(a) of this Code 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 (e) 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 7(a) (i) or (ii).

(c) **Hollow construction**: if a pipe penetrated a hollow wall (such as a stud wall, a cavity wail 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 the material is:

(i) installed in accordance with 7(b) to a thickness of 25 mm all round the service for the full length of the penetration; and

(ii) restrained, independently of the service, from moving or parting from the surfaces of the service and of the wall, floor or ceiling.

(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 7(c); 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.

(e) **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 square 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.

(iv) Two thermocouples complying with AS 1530.4 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

SECTION GD – ACCESS AND EGRESS

THIS SECTION APPLIES TO PUBLIC BUILDINGS AND GROUP DWELLINGS (Class 2 TO 9)

Performance Requirements

Deemed to Satisfy Provisions

ND1 Provision for Escape

ND2 Construction of Exits

ND3 Access for People with Disabilities

GD25 PERFORMANCE REQUIREMENTS

GD25.1 OBJECTIVES

A building must be so designed and constructed that the following objectives are fulfilled:

GD25.1.1 Provision for escape

There must be adequate means of escape in case of fire or other emergency from all parts of the building to a place of safety.

GD25.1.2 Construction of exits

(a) Stairways, ramps and passageways must be such so as to provide safe passage for the users of the building.
(b) Stairways and ramps must not be uncomfortable or strenuous to use.
(c) Stairways, ramps, floors and balconies, and any roof to which people normally have access, must have bounding walls, balustrades or other barriers where necessary to protect users from the risk of falling.
(d) Vehicle ramps and any floor to which vehicles have access must have kerbs or other barriers where necessary to provide protection to pedestrians and to the structure of the building.

GD25.1.3 Access for people with disabilities

Reasonable provision must be made in the design of a building, having regard to its use and location, to facilitate access and circulation by people with disabilities.

GD25.2 REQUIRED PERFORMANCE

The design and construction of buildings must allow all occupants in any or all fire compartments to get to:

(a) any one of more than one exit within 2.5 minutes; or
(b) in the case of buildings with 3 or fewer storeys or a basement of less than 50 m^2 floor area, to a single exit within 1 minute.

The design and construction of exits must allow for the following optimum conditions during evacuation in any emergency:

(a) a density in the exit of 2.0 persons/m^2 of exit floor area
(b) a speed of movement along the slope of the exit of 0.5 m/s; and
(c) an average flow of 1.18 persons per second per metre effective width of exit.

In the case of occupancies such as hospitals where evacuation needs the assistance of others and/or of equipment, additional consideration must be given to the design of exits.

The pitch of any stairway or slope of a ramp must not be unsafe or uncomfortable.

The size of openings in any bounding wall, balustrade or the like must be such as to prevent very young mobile children from going through them and injuring

themselves. These must also be designed to discourage young children under 5 years of age from gaining any foothold and climbing over them.

People with disabilities must have the facility to gain reasonable access to buildings so that they are not at any material disadvantage when compared with others.

GD26 DEEMED-TO-SATISFY PROVISIONS

GD26.1 Provision for Escape

GD26.1.1 Application

This Part applies to all buildings except the internal parts of a sole-occupancy unit in a Class 2 or 3 building or Class 4 part.

GD26.1.2 Number of exits required

(a) **All buildings**: Every building must have at least one *required exit*.
(b) **Class 2 to 9 buildings**: In addition to any *horizontal exit*, not less than two exits must be provided from each storey if the building has a rise of 1 or more storeys.
(c) **Basements**: In addition to any *horizontal exit*, not less than 2 exits must be provided from any storey if egress from that storey involves an upward vertical climb within the building of more than 1.5 m, unless:
  (i) in addition to a single exit other than a *horizontal exit*, one or more openable or easily breakable windows or other openings are available in which case the top of the sill must be no higher than 1.5 m from the floor level of the room. In addition, the windows or openings must have one clear dimension of at least 600 mm and a minimum opening of 0.6 m^2. The windows or openings must be clear of any surrounding ground by at least 1 m horizontally and the vertical drop from the sill to the ground outside, no more than 2 m; or
  (ii) 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, not more than 20 m.
(d) **Class 9 buildings**: In addition to any *horizontal exit* and subject to (e) and (f) not less than 2 exits must be provided from:
  (i) each storey if the building has a rise of three or more storeys or an effective height of more than 10 m
  (ii) any storey which includes a ward area in a Class 9a building
  (iii) each storey in a Class 9b building used as an early childhood centre; and
  (iv) any storey or mezzanine that accommodates more than 100 persons, calculated under Section ND1.13.
(e) **Exits from divided wards**: In a Class 9a building, at least one exit must be provided from every portion of a storey which has been divided in accordance with Section GC2.5.
(f) **Exits in open spectator stands**: 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.

GD26.1.3 When fire-Isolated exits are required

Every required exit other than an external stairway or open ramp must be:

(a) fire-isolated if it connects 2 or more consecutive storeys.

Exception: These requirements do not apply to exits that form part of an *open spectator stand*.

GD26.1.4 Exit travel distances

(a) **Class 2 and 3 buildings and Class 4 parts**:
  (i) The entrance doorway of any *sole-occupancy unit* must be not more than 6 m from an exit or from a point at which travel in different directions to 2 exits is available. Further the route of travel within the unit from any point other than from a kitchen or cooking area, to the doorway must not traverse through a kitchen or cooking area; and
  (ii) no point on the floor of a room which is not in a *sole-occupancy unit* must be more than 20 m from an exit or from a point at which travel in different directions to 2 exits is available, in which case the maximum distance to one of those exits must not exceed 40 m from the starting point.

(b) **Class 5 to 9 buildings**:
Subject to (c), (d) and (e):
  (i) No point on a floor must be more than 20 m from an exit, or a point from which travel in different directions to 2 exits is available, in which case the maximum distance to one of those exits must not exceed 40 m from the starting point.
  (ii) In a Class 5 or 6 building, the distance to a single exit serving at the level of access to a road or open space may be increased to 30 m.

(c) **Class 9a buildings**: In a ward area in a Class 9a building:
  (i) 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; and
  (ii) the maximum distance to one of those exits must not be more than 30 m from the starting point.

(d) **Open spectator stands**: The distance of travel to an exit in a Class 9b building used as an *open spectator stand* must be not more than 60 m.

(e) **Assembly buildings**: in a Class 9b building other than a *school* or *early childhood centre*, the distance to one of the exits may be 60 m if:
  (i) 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;
  (ii) the room is smoke separated from the circulation space by construction such that:
    - any wall be *non-combustible* and extend to the underside of the floor above or of the roof covering
    - only have doorways which are fitted with smoke doors complying with Specification GCS3.4 and which do not extend higher than 800 mm from the underside of an imperforate roof covering, floor or ceiling above it; and

(iii) 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.

GD26.1.5 Distance between alternative exits

Exits that are required as alternative means of egress must be:

(a) distributed as uniformly as practicable within or around the storey served:
(b) not less than 9 m apart; and
(c) not more than:
  (i) 45 m apart in a Class 2 or 3 building or a storey containing a ward area in a Class 9a building; or
  (ii) 60 m apart in all other cases.

GD26.1.6 Dimensions of exits

In a required exit or path of travel to an exit:

(a) the unobstructed height throughout must be not less than 2 m
(b) if the storey or mezzanine pertains to a Class 2 or 3 buildings or accommodates not more than 100 persons, the unobstructed width except for doorways must be:
  (i) not less than 1 m; or
  (ii) 2 m in a passageway from a ward area
(c) if the storey or mezzanine accommodates more than 100 persons and not more than 200 persons the aggregate width, except for doorways, must be not less than:
  (i) 1 m plus 250 mm for each 25 persons (or part) in excess of 100; or
  (ii) 2 m in a passageway from a ward area in Class 9a buildings
(d) if the storey or mezzanine accommodates more than 200 persons, the aggregate width, except for doorways, must be increased to:
  (i) 2 m plus 500 mm for every 60 persons (or part} in excess of 200 persons if egress involves a change in floor level by a stairway or ramp with a gradient more than 1:12; or
  (ii) in any other case, 2 m plus 500 mm for every 75 persons (or part) in excess of 200
(e) in an open spectator stand which accommodates more than 2000 persons the width except for doorways must be increased to 17 m plus a width (in meters) equal to the number in excess of 2000 divided by 600
(f) the clear openings of a doorway must be not less than:
  (i) in ward areas: 1.6 m wide or 1.25 m if it is a horizontal exit
  (ii) in areas used by students in a school: 870 mm wide
  (iii) the width of exit required by (b), (c), (d) or (e), minus 250 mm, or
  (iv) in any other case except where it opens to a sanitary compartment or bathroom: 760 mm wide; and
(g) the required width of exit must not diminish in the direction of travel to a road or open space.

GD26.1.7 Travel via fire-isolated exits

(a) A doorway from a room must not open directly into a stairway, passageway or ramp that is required to be smoke or fire-isolated unless it is from:
  (i) a public lobby, public corridor, hallway, or the like
  (ii) a *sole-occupancy unit* occupying all of a storey; or
  (iii) a sanitary compartment, airlock or the like.
(b) Each stairway or ramp that is required to be smoke or fire-isolated must provide independent egress from the storey served and discharge:
  (i) directly, or by way of a fire-isolated passageway, to a road or open space; or
  (ii) into a storey or space within the confines of the building that is enclosed for not more than 1/3 of its perimeter and used only 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.
(c) if more than 2 access doors, other than from a sanitary compartment or the like, open to a fire-isolated exit in the same storey:
  (i) a smoke lobby in accordance with Section GD2.2.6 must be provided; or
  (ii) the exit must be pressurised in accordance with Section NE2.7.
(d) A ramp must be provided at any change in level less than 600 mm in a fire-isolated passageway in a Class 9 building.

GD26.1.8 External stairways

An external stairway may serve as a required exit instead of a smoke isolated or fire-isolated stairway in a building with an effective height of not more than 25 m if the stairway (including any connecting bridges) is of *non-combustible* construction throughout, and:

(a) if any part of the stairway is exposed to, and less than 6 m from, a window, doorway or the like in an external wall, the stairway must be fully shielded in the affected area from such window or doorway by *non-combustible* construction with a FRL of not less than 60/60/60;
(b) if any part of the stairway is exposed to, and less than 6 m but more than 3 m from, a window, doorway or the like in an external wall of any building, the window doorway or the like must be protected in accordance with Section GC3.4.

GD26.1.9 Travel by non-fire-isolated stairways or ramps

(a) A non-fire-isolated stairway serving as a required exit must provide a continuous means of travel by its own flights of stairs and landings from every storey served to the level at which egress to a road or open space is provided.
(b) in a Class 2, 3 or 4 building, the distance between the doorway of a room or sole-occupancy unit and the point of egress to a road or open space by way of any required stairway or ramp that is not fire-isolated must not exceed:
  (i) 30 m in a building of Type C construction; or
  (ii) 60 m in all other cases.
(c) In a Class 5 to 9 building, the distance from any point on a floor and a point of egress to a road or open space by way of a required non-fire-isolated stairway or ramp must not exceed 80 m.

(d) In a Class 2, 3 or 9a building, a required non-fire-isolated stairway or ramp must discharge at a point not more than:
  (i) 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
  (ii) 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.

(e) In a Class 5 to 8 or 9b building, a required non-fire-isolated stairway or ramp must discharge at a point not more than:
  (i) 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
  (ii) 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.

(f) If 2 or more exits are required and are provided by means of internal non-fire-isolated stairways or non-fire isolated ramps, each exit must:
  (i) provide separate egress to a road or open space; and
  (ii) be suitably smoke separated from each other at the level of discharge.

GD26.1.10 Discharge from exits

(a) An exit must not be blocked at the point of discharge and where necessary, suitable barriers must be provided to prevent vehicles from blocking the exit, or access to it.

(b) if a required exit leads to an open space, the path of travel to the road must have an unobstructed width throughout of not less than:
  (i) the minimum width of the required exit; or
  (ii) 1 m; whichever is the greater.

(c) If an exit discharges to open space that is at a level different from the public road to which it is connected, the path of travel to the road must be by:
  (i) a ramp or other incline having a grade of not more than 1:8 at any part, or 1:14 if required by Section ND3; or
  (ii) a stairway complying with this Code, except if the exit is from a Class 9a building.

(d) The discharge point of alternative exits must be located as far apart as practicable.

(e) In a Class 9b building which is an 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.

(f) 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.

GD26.1.11 Horizontal exits

Horizontal exits must:

(a) not be counted as a *required exit*, when:
  (i) between *sole-occupancy units*; or

(ii) in a Class 9b building used as an early childhood centre, primary or secondary school;

(b) 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; and

(c) have a clear area on each side of the fire wall to accommodate the total number of persons (calculated under Section ND1.13) from both parts of the storey, of not less than:
   (i) 2.5 m^2 per patient in a Class 9a building; and
   (ii) 0.5 m^2 per person in any other case.

GD26.1.12 Non-required stairways, ramps or escalators

Escalators, moving walkways or non-required non-fire-isolated stairways or pedestrian ramps:

(a) must not be used in a ward area in a Class 9a building

(b) may connect any number of storeys if they are:
   (i) in an *open spectator stand* or indoor sports stadium
   (ii) in a carpark or an atrium; or
   (iii) outside a building

(c) must not connect, directly or indirectly, more than two consecutive storeys at any level in a Class 5, 6, 7, 8 or 9 building; and

(d) in any other case, must not connect more than two consecutive storeys, provided that one of those storeys is situated at a level at which there is direct egress to a road or open space.

GD26.1.13 Number of persons accommodated

The number of persons accommodated in a storey, room or mezzanine floor must be determined with consideration to the purpose for which it is used and the layout of the floor area by:

(a) calculating the sum of the numbers obtained by dividing the floor area of each part of the storey by the number of square metres per person listed in Table ND1.13 according to the use of the part, excluding spaces set aside for:
   (i) lifts, stairs, ramps and escalators, corridors, hallways, lobbies, and the like
   (ii) service ducts and the like, sanitary compartments or other ancillary uses

(b) reference to the seating capacity in an assembly building or room; or

(c) any other suitable means of assessing its capacity.

TABLE GD 1.13

AREA PER PERSON ACCORDING TO USE

TYPE OF USE	**m^2 per person**
Art gallery, exhibition area, museum	4

Bar, café, church, dining room	1
Board room	2
Boarding house	15
Computer room for main frame and mini computers	25
Court room – judicial area - public seating	10 1
Dance floor	0.5
Dormitory	8
Early childhood centre	4
Factory – (a) machine shop, fitting shop, or like place for cutting, grading, finishing or fitting of metal or glass, except in the fabrication of structural steelwork or manufacture of vehicles or bulky products	5
(b) areas used for 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 who will occupy the space during working hours.	Area per person determined by the use of the plant or equipment.
Garage – public	30
Gymnasium	3
Hospital ward area	10
Hostel, hotel, motel, guest house & backpacker facilities	15
Indoor sports stadium – arena	10
Kiosk	1
Kitchen, laundry (other than domestic) and laboratory	10

Library - reading space - storage space	2 30
Office, including one for typewriting or document copying or with desk-top computers	10
Plant Room for - ventilation, electrical or other service units - boilers or power plant	 30 50
Reading Room	2
Restaurant	1
School - common staff room - individual staff room - general classroom - multi-purpose hall - residential part - trade and practical area: - primary - secondary	2 10 2 1 10 4 As for Workshop
Shop - space for sale of goods – (a) at a level entered direct from the open air or any lower level (b) all other levels	 3 5
Showroom – display	5
Spectator stand, audience viewing area: - bench seating - fixed seating - seating not fixed - standing viewing area	 450 mm/person number of seats 1 0.3

Storage space	30
Theatre dressing room	4
Transport terminal	2
Workshop - for maintenance staff - for manufacturing process	30 (in the whole area) As for factory

TABLE ND1.13.1 AREA PER PERSON ACCORDING TO USE		
TYPE OF USE		**m^2 per person**
Art gallery, exhibition area, museum		4
Bar, café, church, dining room		1
Board room		2
Boarding house		15
Computer room for main frame and mini computers		25
Court room	Judicial	10
	Public seating	1
Dance floor		0.5
Dormitory		8
Early childhood centre		4
Factory	Machine stop, 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
	Areas used for fabrication and processing other than those in (a)	50
	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
Garage	Public	30
(a) Gymnasium		3
(a) Hospital ward area		10
(a) Hostel, hotel, motel, guest house		15
Indoor sports stadium	Arena	10
(a) Kiosk		1
(a) Kitchen, laundry (other than domestic) and laboratory		10
Library	Reading space	2
	Storage space	30
(a) Office, including one for typewriting or document copying or with desk-top computers		10
Plant room for	Ventilation, electrical or other service units	30
	Boilers or power plant	50
(a) Reading Room		2
(a) Restaurant		1
School	Common staff room	2
	Individual staff room	10
	General classroom	2
	Only as for others	
	Multi-purpose hall	1

	Trade and practical area:	Primary	4
		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		5
Skating rink, based on rink area			1.5
Spectator stand, audience viewing area:			
	Bench seating		450 mm/ person
	Fixed seating		number of seats
	Seating not fixed		1
	Standing viewing area		0.3
Storage space			30
Swimming pool, based on pool area			1.5
Telephone exchange – private			30
Theatre dressing room			4
Transport terminal			2
Workshop	For maintenance staff		30 (in the whole area)
	For manufacturing processes		as for factory

GD26.1.14 Measurement of distances

The nearest part of an exit means in the case of:

(a) **a *fire-isolated stairway, fire-isolated passageway, fire-isolated ramp***: the nearest part of the doorway providing access to them
(b) **a non-*fire-isolated stairway***: the nearest part of the nearest riser
(c) **a *non-fire-isolated ramp***: the nearest part of the junction of the floor of the ramp and the floor of the storey
(d) **a doorway opening to a road or open space**: the nearest part of that doorway
(e) **a *horizontal exit***: the nearest part of the doorway.

GD26.1.15 Method of measurement

The following rules apply:

(a) 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.

(b) Subject to (d) and (f), the distance from the doorway of a room or *sole-occupancy unit* in a 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.

(c) Subject to (d) and (f), the distance between exits is measured in a straight line between the nearest parts of those exits.
(d) Only the shortest distance is taken along a corridor, hallway, external balcony or other path of travel that curves or changes direction.
(e) 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.
(f) If a wall (including a demountable internal wall) that does not bound:
    (i) a room; or
    (ii) a corridor, hallway or the like.
    causes a change of direction in proceeding to a required exit, the distance is measured along the path of travel past that wall.
(g) If permanent fixed seating is provided, the distance is measured along the path of travel between the rows of seats.

GD26.2 Construction of Exits

GD26.2.1 Application of Part

Except for Sections GD2.2.15 and GD2.2.18, this Section does not apply to the internal parts of a sole-occupancy unit in a Class 2 or Class 3 building or a Class 4 part.

GD26.2.2 Fire-isolated stairways and ramps

A stairway or ramp (including any landings) that is required to be within a fire-resisting shaft must be constructed:

(a) of *non-combustible* materials; and
(b) so that if there is local failure, it will not cause structural damage to, or impair the fire-resistance of the shaft.

GD26.2.3 Non-fire-isolated stairways and ramps

In a building having a rise of more than two storeys, required stairs and ramps (including landings and any supporting structural members) which are not required to be within a fire-resisting shaft, must be constructed according to Section ND2.2, or only of:

(a) reinforced or pre-stressed concrete; or
(b) steel in no part less than 6 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%; and
(iii) has not been joined by means of glue unless it has been laminated and glued with resorcinol formaldehyde or resorcinol phenol formaldehyde glue.

GD26.2.4 Separation of rising and descending stair flights

If a 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; and
(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.

GD26.2.5 Open access ramps and balconies

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; and
  (ii) are evenly distributed along the open sides of the ramp or balcony; and
(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.

GD26.2.6 Smoke lobbies

A smoke lobby required by Section GD2.1.9 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 a FRL of not less than30/30/- (which may be plasterboard, 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 of 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 to Specification GCS3.4, which are self-closing or held open by a fail-safe automatic magnetic release device; and
(d) be pressurised to Section NE2.7 as part of the exit if the exit is required to be pressurised.

GD26.2.7 Installations in exits and paths of travel

(a) Access to service shafts and services other than to firefighting or detection equipment as permitted in Section GE, must not be provided from a fire-isolated stairway, passageway or ramp.
(b) An opening to any chute or duct conveying hot products of combustion must not be located in any part of a required exit or any corridor, hallway, lobby or the like leading to a required exit.
(c) Gas or other fuel services must not be installed in a required exit.
(d) Services or equipment must not be installed in a required exit or in any corridor, hallway, lobby or the like leading to a required exit if it comprises:
    (i) electricity meters, distribution boards or duds
    (ii) central telecommunications distribution boards or equipment; or
    (iii) electrical motors or other motors serving equipment in the building
    unless it is enclosed by *non-combustible* construction or a fire protective covering.

GD26.2.8 Enclosure of space under fire-isolated stairs and ramps

(a) **Fire-isolated stairways and ramps**: If the space below a required fire-isolated stairway or ramp is within the fire-isolated shaft, it must not be enclosed to form a cupboard or similar enclosed space.
(b) **Non-fire-isolated stairways and ramps**: The space below a required non fire-isolated stairway (including an external stairway) or ramp must not be enclosed to form a cupboard or other enclosed space unless:
    (i) the enclosing walls and ceilings have a FRL of not less than 60/60/60; and
    (ii) any access doorway to the enclosed space is fitted with a self-closing -/60/30 fire door.

GD26.2.9 Width of stairways

(a) The required width of a stairway must:
    (i) be measured clear of all obstructions such as handrails, projecting parts of balustrades, columns, beams, and the like; and
    (ii) extend without interruption, except for ceiling cornices, to a height not less than 2 m vertically above a line along the nosings of the treads or the floor of the landing.
(b) A required stairway that exceeds 2 m in width is counted as having a width of only 2 m unless it is divided by a balustrade or handrail continuous between landings and each division is less than 2 m wide.

GD26.2.10 Ramps
GD26.2.11 Pedestrian ramps

(a) 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 the requirements for a fire-isolated stairway.
(b) A ramp serving as a required exit must have a gradient of not more than:
    (i) 1:12 in areas used by patients in a Class 9a building; or
    (ii) 1:14 if required by Section GD1.13
    (iii) 1:10 if subject to wetting; or

(iv) 1:8 in any other case

(c) The floor surface of a ramp must have a non-slip finish.

GD26.2.12 Service ramps

Service ramps must not be steeper than 1:3. Where they are steeper than 1:8 cleats must be provided at the spacing shown in Table ND2.10.2. Two examples are shown in figure ND2.10.2.

TABLE ND2.10.2
SPACING OF CLEATS FOR SERVICE RAMPS

Ramp slope not more than	CLEAT SPACING (mm)	
	Goods carried	No goods carried
1:6	360	460
1:5	330	430
1:4	300	400
1:3	280	380

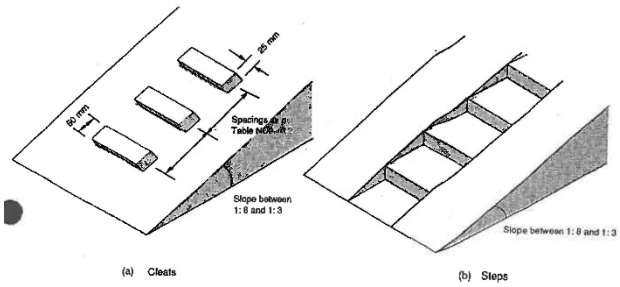


FIGURE ND2.10.2 EXAMPLES OF SERVICE RAMPS WITH CLEATS

GD26.2.13 Fire-isolated passageways

A fire-isolated passageway must be enclosed by walls, floors, and ceilings of *non-combustible* construction with a FRL of:

(a) not less than that required for the stairway or ramp shaft if the passageway discharges from a fire-isolated stairway or ramp; or

(b) in any other case not less than 60/60/60.

GD26.2.14 Roof as open space

If an exit discharges to a roof of a building, the roof must:

(a) have a FRL of not less than 120/120/120; and

(b) not have any roof lights or other openings within 3 m of the path of travel of persons using the exit to reach a road or open space.

GD26.2.15 Goings and risers

(a) A stairway must have:

(i) not more than 18 and not less than 2 risers in each flight; and

(ii) going (G), riser (R) and quantity (2R + G) in accordance with Table ND2.13, except as permitted by (b) and (c);and

(iii) constant goings and risers throughout each flight, except as permitted by (b) and (c), and the dimensions of goings (G) and risers (R) in accordance with (a)(ii) are considered constant if the variation between:

(A) adjacent risers, or between adjacent goings, is no greater than 5 mm; and

(B) the largest and smallest riser within a flight, or the largest and smallest going within a flight, does not exceed 10 mm; and

(iv) risers which do not have any openings that would allow a 125 mm sphere to pass through between the treads; and

(v) treads which have:

(A) a surface with a slip-resistance classification not less than that listed in Table ND2.14 when tested in accordance with AS 4586; or

(B) a nosing strip with a slip-resistance classification not less than that listed in Table ND2.14 when tested in accordance with AS 4586; and

(vi) treads of solid construction (not mesh or other perforated material) if the stairway is more than 10 m high or connects more than 3 storeys; and

(vii) in a Class 9b building, not more than 36 risers in consecutive flights without a change in direction of at least 30°; and

(viii) in the case of a required stairway, no winders in lieu of a landing.

Table ND2.13 Riser and going dimensions

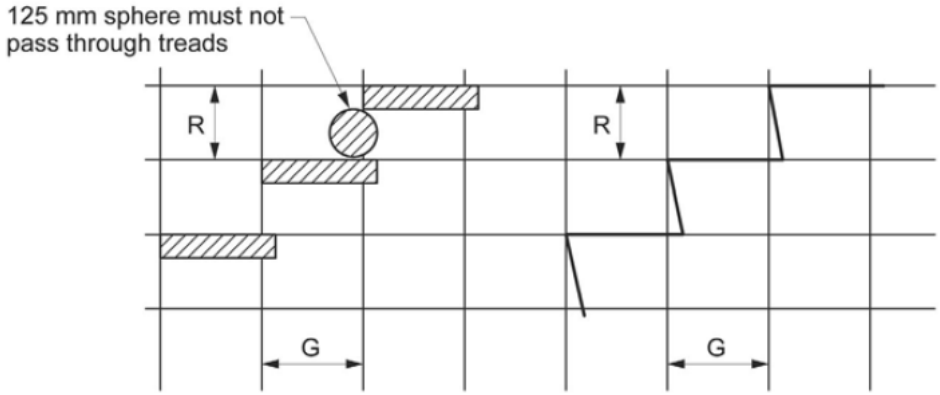
Stairway location	Riser (R)	Going (G) Note 3	Quantity (2R+G)
Public	Max: 190 mm Min: 115 mm	Max: 355 mm Min: 250 mm	Max: 700 mm Min: 550 mm
Private Note 1	Max: 190 mm Min: 115 mm	Max: 355 mm Min: 240 mm	Max: 700 mm Min: 550 mm

Notes to Table ND2.13:

1. Private stairways are:
   a. stairways in a sole-occupancy unit in a Class 2 building or Class 4 part of a building; and
   b. in any building, stairways which are not part of a required exit and to which the public do not normally have access.
2. Going and riser dimensions must be measured in accordance with Figure ND2.13.
3. The going in tapered treads (except winders in lieu of a quarter or half landing) in a curved or spiral stairway is measured:

a. 270 mm in from the outer side of the unobstructed width of the stairway if the stairway is less than 1 m wide (applicable to a non-required stairway only); and
b. 270 mm from each side of the unobstructed width of the stairway if the stairway is 1 m wide or more.
c. All steps must have the same uniform taper
d. The going at the narrow end of the steps must be not less than 75 mm
e. Winders are not permitted.

Figure ND2.13 Riser and going dimensions



GD26.2.16 Landings

In a stairway:

(a) landings having a maximum slope of 1:50 may be used in any building to limit the number of risers in each flight and each landing must:
  (i) be not less than 750 mm long measured 500 mm from the inside edge of the landing; and
  (ii) 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; and
(b) in a Class 9a building:
  (i) the area of any landing must be sufficient to move a stretcher, 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
  (ii) 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.

GD26.2.17 Thresholds

The threshold of a doorway must not incorporate a step or ramp at any point closer to the doorway than the width of the door leaf unless:

(a) in patient care areas in a Class 9a building, the door sill is not more than 25 mm above the finished surface of the ground, balcony or the like to which the doorway opens; or
(b) in a Class 9c building, a ramp is provided with a maximum gradient of 1:8 for a maximum height of 25 mm over the threshold; or
(c) in other cases:
  (i) the doorway opens to a road, open space or external balcony; and
  (ii) the door sill is not more than 190 mm above the finished surface of the ground, balcony, or the like, to which the doorway opens.

GD26.2.18 Barriers to prevent falls

(a) In a Class 2, 3, 4, 5, 6 or 9 building and a Class 7 building used as a public carpark, a continuous balustrade must be provided along the side of any stairway or ramp, or any corridor, hallway, balcony, bridge or the like, if:
  (i) it is not bounded by a wall; and
  (ii) the change in level is more than 1 m
  except at the perimeter of a stage, rigging loft, loading dock, an area accessible only to maintenance staff, or the like.
(b) A balustrade required by (a) must prevent, as far as practicable:
  (i) children climbing over or through it;
  (ii) persons accidentally falling from the floor; and
  (iii) objects which might strike a person at a lower level accidentally falling from the floor surface.
(c) in low-risk areas such as *fire-isolated stairways, fire-isolated ramps* or external stairways that are provided instead of *fire-isolated stairways*, other areas used exclusively for emergency purposes and other stairways and ramps (including access bridges and landings) where the change in level is not more than 2 m, a balustrade satisfies (b) if:
  (i) the balustrade has a height of not less than 865 mm above the nosings of the stair treads and the floor of the landing, access bridge or the like; and
  (ii) A 125 mm sphere must not be able to pass through any opening. (including any openable window or panel)
  .
(d) At balconies a balustrade satisfies (b) if:
  (i) it has a height of not less than 1m above the balcony floor;
  (ii) A 125 mm sphere must not be able to pass through any opening.;
  (iii) all parts of the balustrade more than 150 mm and less than 760 mm from the floor or nosings are vertical or otherwise do not provide a toehold; and
(e) In stairways and ramps (including access bridges and landings) where the change in level is more than 2 m, a balustrade satisfies (b) if:
  (i) it has a height of not less than 865 mm above the nosings of the stair treads and the floor of the landing, balcony, corridor, hallway, access bridge or the like
  (ii) A 125 mm sphere must not be able to pass through any opening. (including any openable window or panel); and

(iii) all parts of the balustrade more than 150 mm and less than 760 mm from the floor or nosings are vertical or otherwise do not provide a toehold.

(f) A balustrade or other barrier in front of fixed seating in a mezzanine floor or balcony in a Class 9b building satisfies (b) if it complies with (d), or:
   (i) it is not less than 700 mm in height above the mezzanine floor or balcony floor and a horizontal projection extends not less than 1 m outwards from the top of the balustrade; and
   (ii) A 125 mm sphere must not be able to pass through any opening.

(g) In all other locations a balustrade or other barrier satisfies (b) if it complies with (d).

GD26.2.19 Handrails

(a) Except in a Class 7 or 8 building other than a public carpark, suitable handrails must be provided where necessary to assist and provide stability to persons using a ramp or stairway.

(b) Handrails satisfy (a) if they are:
   (i) located along at least one side of the ramp or flight of stairs;
   (ii) located along each side if it is a Class 9b building that is used as an early childhood centre or as a primary school, or if the total width of the stairway or ramp is 2 m or more;
   (iii) in a Class 9b building used as a primary school:
      (A) have one handrail fixed at a height of not less than 865 mm; and
      (B) have a second handrail fixed at a height between 665 mm and 750 mm,
      measured above the nosings of stair treads and the floor surface of the ramp, landing or the like;
   (iv)
   (v) not more than 2 m apart in the case of intermediate handrails;
   (vi) in any other case fixed at a height of not less than 865 mm above the nosings of stair treads and the floor surface of the ramp, landing, or the like; and
   (vii) continuous between stair flight landings and have no obstruction on or above them that will tend to break a handhold.

(c) 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:
   (i) fixed not less than 50 mm clear of the wall; and
   (ii) where practicable, continuous for their full length.

(d) Handrails in a Class 9c residential care building must be provided along at least one side of every passageway or corridor used by residents, and must be:
   (iii) fixed not less than 50 mm clear of the wall; and
   (iv) where practicable, continuous for their full length.

GD26.2.20 Fixed platforms, walkways and ladders

Fixed platforms, walkways, non-required stairways, handrails, balustrades and ladders must comply with AS 1657 in:

(a) a Class 7 or Class 8 building, or part of a building; and
(b) lift motor rooms, plant rooms, and the like; or
(c) 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 building or Class 4 part of a building.

GD26.2.21 Doorways and doors

A doorway serving as a required exit, forming part of a required exit, or in a patient care area of a Class 9a building:

(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; and
    (iii) it is held in the 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; and
    (ii) the door can be opened manually under a force of not more than 10 kg; and
(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 10 kg if there is a malfunction or failure of the power source; or
    (ii) it must open automatically if there is a power failure or on the activation of a fire or smoke alarm anywhere in the part served by the door.

A doorway in a resident use area of a Class 9c building must not be fitted with:

(a) a sliding fire door; or
(b) a sliding smoke door; or
(c) a revolving door; or
(d) a roller shutter door; or
(e) a tilt-up door.

GD26.2.22 Swinging doors

A swinging door in a required exit or forming part of a required exit:

(a) must not encroach:
    (i) 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; and
    (ii) when fully open, by more than 100 mm on the required width of the required exit, and

    the measurement of encroachment in each case is to include door handles or other furniture or attachments to the door

(b) must swing in the direction of egress unless:
    (i) it serves a building or part with a floor area not more than 200 m^2, it is the only required exit from the building or part and it is fitted with advice for holding it in the open position; or
    (ii) it serves a sanitary compartment or airlock (in which case it may swing in either direction); and
(c) must not otherwise impede the path or direction of egress.

GD26.2.23 Operation of latch

A door in a required exit, forming part of a required exit or in the path of travel to a required exit must be readily openable without a key from the side that faces a person seeking egress, by a single hand downward or horizontal pushing action on a single device which is located between 900 mm and 1100 mm from the floor, unless:

(a) it serves a vault, strong room, sanitary compartment, or the like; or
(b) it serves only, or is within:
    (i) a *sole-occupancy unit* in a Class 2 building or a Class 4 part
    (ii) a *sole-occupancy unit* in a Class 5, 6, 7 or 8 building with a floor area not more than 200 m2; 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 failsafe control switch, not contained within a protective enclosure, to actuate a device to unlock the door; or
    (ii) by hand by a person or persons, specifically nominated by the owner, properly instructed as to the duties and responsibilities involved and available at all times when the building is lawfully occupied so that persons in the building or part may immediately escape if there is a fire or other emergency; or
(d) it is fitted with a failsafe device which automatically unlocks the door upon the activation of any sprinkler system or smoke or thermal detector system installed throughout the building, and is readily openable when unlocked.
(e) is in a Class 9a or 9c building and:
    (i) is one leaf of a two-leaf door complying with Section GD2.1.6(f) provided that it is not held closed by a locking mechanism and is readily openable; and
    (ii) the door is not required to be a fire door or smoke door.

GD26.2.24 Re-entry from fire-isolated exits

Doors must not be locked from inside a fire-isolated stairway, fire-isolated ramp or fire-isolated passageway enclosure to prevent re-entry to the storey or room it serves in:

(a) a Class 9a or Class 9c building; or
(b) a building more than 25 m in effective height unless;

(iii) all the doors are automatically unlocked by a failsafe device upon the activation of a fire alarm, and at least at every fourth storey the doors are not able to be locked and a sign is fixed on it stating that re-entry is available; or

(iv) an intercommunication system, or an audible or visual alarm system, operated from within the enclosure is provided near the doors and a sign is fixed adjacent to such doors explaining its purpose and method of operation.

GD26.2.25 Signs on doors

(a) A sign, to alert persons that the operation of certain doors must not be impaired, must be installed where it can readily be seen on, or adjacent to:

(i) a *required*:

- 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; and
- smoke door, 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; and

(ii) a:

- fire door forming part of a horizontal exit; and
- smoke door that swings in both directions; and
- door leading from a fire isolated exit to a road or open space, on each side of the door.

(b) A sign referred to in (a) must be in capital letters not less than 20 mm high in a colour contrasting with the background and state

(i) for an automatic door held open by an automatic hold-open device "FIRE SAFETY DOOR—DO NOT OBSTRUCT"; or

(ii) for a self-closing door:
"FIRE SAFETY DOOR
DO NOT OBSTRUCT
DO NOT KEEP OPEN"; or

(iii) for a door discharging from a fire-isolated exit:
"FIRE SAFETY DOOR—DO NOT OBSTRUCT".

GD26.3 Access for People with a Disability

GD26.3.1 Application of Part

This Part applies to buildings and parts of buildings that must be accessible as required by Table ND3.1, unless exempted by Section GD2.3.4

GD26.3.2 Access to buildings

Access for people with disabilities must be provided to buildings as set out in Table ND3.2 by means of a continuous path of travel in accordance with AS 1428.1 or NZS 4121:

(a) from the main points of a pedestrian entry at the boundary of the allotment
(b) from any carpark space on the allotment (whether within or outside the building):
    (i) that is set aside for people with disabilities using the building; or
    (ii) if there are no carpark spaces set aside for them, from any carpark area that serves the building; and
(c) from any other building on the allotment to which access for people with disabilities is required.

In a building required to be accessible, an accessway must be provided through the principal pedestrian entrance, and:

(i) through not less than 50% of all pedestrian entrances including the principal pedestrian entrance; and
(ii) in a building with a total floor area more than 500 m2, a pedestrian entrance which is not accessible must not be located more than 50 m from an accessible pedestrian entrance,

except for pedestrian entrances serving only areas exempted by GD2.3.4.

Access must be provided, to the degree necessary, to enable identification of accessways at appropriate locations which are easy to find.

TABLE ND3.2
REQUIREMENTS FOR ACCESS FOR PEOPLE WITH DISABILITIES

CLASS OF BUILDING	ACCESS REQUIREMENTS
Class 3	To and within -
(a) If the building contains -	
more than 10 units up to 49 units	one *sole-occupancy unit*.
more than 49 but not more than 99	2 *sole-occupancy units*.
more than 99 units	3 *sole-occupancy units*.
(b) If accommodation is provided for more than 10 persons other than in *sole-occupancy units* -	
up to 49 beds	2 beds.
more than 49 but not more than 99	4 beds.
more than 99	6 beds.
(c) Common areas of buildings that are *required* to be accessible	the entrance floor and to all public areas on that floor.
Class 5 and 6	To and within the entrance floor if its *floor area* is more than 500 m².
Class 7	To and within the entrance floor if the total *floor area* of the building is more than 3000 m².
Class 8	To and within the entrance floor if the total *floor area* of the building excluding any part used as a laboratory, is more than 1000 m².
AND **Class 5, 6, 7 and 8**	To and within any floor if irrespective of *floor area*, the floor is not more than 190 mm at the point of entrance above or below the adjacent finished ground level; and within any other floor to which vertical access by way of a ramp, step or kerb ramp, or passenger lift is provided.

TABLE ND3.2 Continued
REQUIREMENTS FOR ACCESS FOR PEOPLE WITH DISABILITIES

CLASS OF BUILDING	ACCESS REQUIREMENTS
Class 9a	To and within all areas normally accessible to the public, patients or staff.
Class 9b - An *assembly building* not being a *school* or an *early childhood centre*	To and within every room that accommodates more than 100 persons, and if fixed seating is provided, not less than 1 wheelchair space for each 200 seats, or part, with a minimum of 2 spaces; and within any other floor to which vertical access by way of a ramp, step or kerb ramp, or passenger lift is provided.
An *early childhood centre*	To and within every room used by children.

Note: The calculation of *floor area* and the number of persons accommodated are in accordance with ND1.13.

For the purposes of this Table, a double bed counts as 1 bed.

Table ND3.1 Requirements for access for people with a disability (AUS GCC 2019)

Class of building	Access requirements
Class 1b (a) Dwellings located on one allotment [Note 1] and used for short-term holiday accommodation, consisting of— (i) 4 to 10 dwellings (ii) 11 to 40 dwellings (iii) 41 to 60 dwellings (iv) 61 to 80 dwellings (v) 81 to 100 dwellings (vi) more than 100 dwellings (b) A boarding house, bed and breakfast, guest house, hostel or the like, other than those described in (a)	 To and within— 1 dwelling 2 dwellings 3 dwellings 4 dwellings 5 dwellings 5 dwellings plus 1 additional dwelling for each additional 30 dwellings or part thereof in excess of 100 dwellings. To and within— 1 bedroom and associated sanitary facilities; and not less than 1 of each type of room or space for use in common by the residents or guests, including a cooking facility, sauna, gymnasium, *swimming pool*, laundry, games room, eating area, or the like; and rooms or spaces for use in common by all residents on a floor to which access by way of a ramp complying with AS 1428.1 or a passenger lift is provided.
Note 1: A community or strata-type subdivision or development is considered to be on a single allotment.	
Class 2 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.

Class of building	Access requirements
	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*; and (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 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*; and (b) to and within rooms or spaces for use in common by the residents, located on the levels served by the lift or ramp.
Sole-occupancy units If the building or group of buildings contain—	To and within—
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.
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	To and within all areas normally used by the occupants.
Class 6	To and within all areas normally used by the occupants.
Class 7a	To and within any level containing *accessible* carparking

Class of building	Access requirements
	spaces.
Class 7b	To and within all areas normally used by the occupants.
Class 8	To and within all areas normally used by the occupants.
Class 9a	To and within all areas normally used by the occupants.
Class 9b *Schools* and *early childhood centres* An *assembly building* not being a *school* or an *early childhood centre*	To and within all areas normally used by the occupants. To 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*; and (b) to and within rooms or spaces for use in common by the residents, located on the levels served by the lift or ramp.
Sole-occupancy units If the building or group of buildings contain—	To and within—
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 *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 *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 *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	To and within— (a) an *accessible* sanitary facility; and

Class of building	Access requirements
	(b) a change room facility; and (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.

GD26.3.3 Parts of buildings to be accessible

(a) Access for people with disabilities must be provided:
  (i) from the doorway at the entrance floor providing access to any *sanitary compartment* required for the use of people with disabilities; and
  (ii) to areas normally used by the occupants, excluding any plantroom, commercial kitchen, cleaners' storeroom, maintenance accessway, rigging loft, or the like.

(b) A path of travel providing required access must not include a stairway, turnstile, revolving door, escalator or other impediment which would prevent a person in a wheelchair using it.

(c) Access, finishes and fittings, including passageways, ramps, step or kerb ramps, passenger lifts, signs, doorways and other parts of the building required by this Part must comply at least with the provisions of AS 1428.1, or NZS 4121.

GD26.3.4 Exemptions

The following areas are not required to be accessible:

(a) An area where access would be inappropriate because of the particular purpose for which the area is used;

(b) An area that would pose a health or safety risk for people with a disability; or

(c) Any path of travel providing access only to an area exempted by (a) or (b).

SECTION GE – SERVICES AND EQUIPMENT

THIS SECTION APPLIES TO PUBLIC BUILDINGS AND GROUP DWELLINGS (Class 2 TO 9)

Performance Requirements

Deemed to Satisfy Provisions

NE1 Fire Fighting Equipment

NE2 Smoke Control

NE3 Lift Installations

NE4 Emergency Lighting and Exit Signs

NE5 Maintenance of Safety Installations

NE6 Electrical Work

Specifications

A27 PERFORMANCE REQUIREMENTS

A1.28 OBJECTIVES

A building and all connected services must be so designed and constructed that the following objectives are fulfilled:

GD1.28.1 Firefighting equipment

Having regard to the size and use of the building and its type of construction, 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 adjoining buildings or allotments; and
(c) facilitate the fighting of fire to minimise damage to the building and its contents.

GD1.28.2 Smoke control

Air-handling systems installed in a building must:

(a) provide suitable air for the health and safety of the occupants; and
(b) incorporate reasonable measures to minimize the spread of smoke in the event of fire to escape paths from the building, to other compartments and to enable access by fire fighters.

GD1.28.3 Lift installations

Lifts where provided must have regard to the nature of any emergency:

(a) to assist in the evacuation of the occupants; and
(b) to facilitate access by firefighting and emergency personnel.

GD1.28.4 Emergency lighting and exit signs

(a) Emergency lighting and exit signs must be provided where necessary to facilitate safe egress in an emergency upon failure of the normal lighting.
(b) Suitable alarm systems must be provided to alert occupants of an emergency, initiate automatic fire fighting systems and summon emergency personnel.

GD1.28.5 Maintenance of safety installations

Equipment, installations and components critical to the safety of the building or the occupants must be adequately maintained in such condition that will enable their proper performance.

GD1.28.6 Electrical work

All electrical work must meet the following objectives:

(a) It must prevent electrocution, burns or fire; and
(b) It must satisfy the reasonable expectations of the users by ensuring that it is adequate for their intended use, both current and anticipated.

A1.29 REQUIRED PERFORMANCE

GD1.29.1 Active firefighting

In determining the type and extent of active firefighting systems that must be provided for a building, the following must be taken into account:

(a) the class of occupancy;
(b) proximity to *fire-source features*;
(c) Type of construction in relation to fire resistance;
(d) size of fire compartments;
(e) effective height;
(f) the flow rate and pressure of available water supply;
(g) the capacity of the Fire Brigade or other firefighting organisation that serves the area where the building is located; and
(h) the technical resources available locally to satisfactorily install and regularly test and maintain the active firefighting system.

GD1.29.2 Fire and smoke alarms

Reliable detection and warning systems must be installed for automatic operation in the event of a fire or generation of unacceptable levels of smoke. In the case of:

(a) buildings frequented by the public and where flammable and consumer goods are displayed;
(b) occupancies of excessive hazard of moderate size or larger;
(c) buildings with sleeping accommodation.

the detection systems on initiation must automatically activate suitable firefighting systems.

GD1.29.3 Smoke control

Air handling systems in buildings must be no more complex than what is given in the Deemed-to-Satisfy Provisions unless satisfactory evidence is produced to show that the level of expertise available on an ongoing basis would be adequate to keep them regularly tested serviced and maintained in a sound condition. Air handling systems must be such that smoke is not transported from the compartment of origin to escape paths and other fire compartments or storeys to a concentration that might affect the safety of the occupants or hinder the work of fire fighters.

GD1.29.4 Lift installations

Lift installations in buildings must be capable of transporting stretchers without discomfort. Effective warning must be displayed against the use of lifts during fires or earthquakes.

GD1.29.5 Emergency lighting

Emergency lighting must be provided to clearly indicate exits and the doors guarding such exits must be identifiably marked. Emergency lighting must be available to facilitate the occupants to reach the exits without confusion and to safely negotiate

the exits until they can be in a road or open space. The route to the exits must be identifiably marked.

In hospitals and in areas where emergency personnel operate, there must be adequate emergency lighting to avoid patient trauma or hardship and to permit the staff to carry out emergency functions.

All emergency lighting must automatically operate in the event of any failure of normal lighting for a period long enough for the evacuation of all the occupants, plus a margin. Such lighting must give an adequate level of illumination to allow evacuation without hindrance.

GD1.29.6 Electrical safety

The 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) be constructed and installed to ensure that no part of the system can be subjected to a voltage higher than that for which the system was designed;
(d) when the neutral of the supply is earthed, have a 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;
(e) where it is a common supply system, it be compatible that the safety features of the system itself are not impaired;
(f) where it has a multiple earthed neutral system, have an adequate connection between the neutral conductor and earth at each consumer's premises;
(g) be adequately protected against damage arising from exposure to weather, water or excessive dampness mechanical loads and other such agents expected under normal conditions of use; and
(h) ensure that the main switch is normally accessible only to the occupants.

GD1.29.7 Amenity

The supply system must have an adequate capacity to serve the reasonable anticipated needs of the users.

A28 DEEMED-TO-SATISFY PROVISIONS

A1.30 Firefighting Equipment

GD1.30.1 Application of Part

This Part applies to Class 2, 3, 4, 5, 6, 7, 8 and 9 buildings.

GD1.30.2 Fire mains and water supply

(a) 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.
(b) In the case of buildings with a rise of 4 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. The system provided may in addition serve any required sprinkler system or other required water type inbuilt fire protection system.
(c) A fire main and water supply system must comply with Specification A1.36

GD1.30.3 Riser main system

Riser mains to NZS 4510 must be provided in buildings with a rise of 4 storeys or more.

GD1.30.4 Where hydrants are required

(a) **General**: One or more hydrants must be provided:
    (i) in each storey with a floor area of more than 750 m^2
    (ii) in every storey if the building contains 4 ~~5~~ storeys or more; and
(b) **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 6 m spray from the nozzle of a 120 m fire hose.
    External hydrants must be located:
    (i) not closer than 6 m from a building unless protected from it with a wall having a FRL of not less than 60/60/30 extending at least 2 m each side and 3 m above the hydrant outlets; and
    (ii) not more than 20 m unobstructed distance from hard standing access for a fire pump appliance.
(c) **Internal hydrants**:
    (i) 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.
    (ii) Internal hydrants must be located on the floor not more than 4 m from a required exit, or in a required stairway, passageway or ramp so as not to encroach on the required width of the exit.
(d) Hydrants for the ground floor of a building may be external hydrants.

GD1.30.5 Hose reels

Hose reels must be installed in buildings as listed in Table NE1.5 and must:

(a) not be located:
    (i) within a fire-isolated exit; or

(ii) so that the hose will need to pass through the doorway fitted with a fire or smoke door; except a door to a sole-occupancy unit in a Class 2, 3 or 4 building;

(b) be located:

(i) not more than 4 m from a required exit on each floor of the building (including the ground floor and adjacent to any hydrants required within the building; and

(ii) 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;

(c) serve only the floor on which they are located except that a hose reel may serve a sole-occupancy unit of not more than 2 storeys, or a unit with a mezzanine floor, if the hose reel is located at the level of egress from that unit; and

(d) comply with AS/NZS 1221 and NZS 4503.

TABLE NE1.5

REQUIREMENTS FOR FIRE HOSE REELS

OCCUPANCY	FIRE HOSE REELS REQUIRED
Class 2	If more than 4 residential storeys contained.
Class 3	If more than 2 residential storeys contained.
Class 5, 6, 7, 8 or 9b	(a) any storey if floor area of storey more than 750 m^2 ; or (b) if more than 3 storeys contained.
Class 9a	All buildings.
And all Classes	Where an internal hydrant is required.

GD1.30.6 Sprinklers

A required sprinkler system must:

(a) comply with Specification A1.37; and

(b) be installed in buildings as listed in Table NE1.6.

TABLE NE1.6 REQUIREMENTS FOR SPRINKLERS	
OCCUPANCY **Occupancies of excessive hazard**	WHEN SPRINKLERS ARE REQUIRED in fire compartments with (a) a floor area of more than 2000 m2, or (b) a volume more than 10,000 m3.
Class 6	in fire compartments with: (a) a floor area of more than 2000 m2, or (b) a volume more than 12,000 m3.
Class 9a with overnight accommodation	The requirements for fire sprinklers may be removed at the discretion of the Building Controller or Building Control Committee.
All Classes except open-deck car park	in buildings more than 25 m in effective height or with a rise in excess of 6 storeys. The water supply for the sprinkler system must be to Class A.
Carparks other than open-deck carparks	(a) if accommodating more than 40 vehicles: (b) if incorporating structural steel members with a FRL less than 60/-/-
NOTE: (a) Occupancies of excessive fire hazard are listed in the annexure to Specification NE1,6. (b) See NC 2.3 for requirements for sprinklers in large isolated buildings.	

GD1.30.7 Portable fire extinguishers

Portable fire extinguishers containing an extinguishing agent suitable for the risk being protected must be installed in accordance with NZS 4503 in all buildings except:

(a) a Class 2 or 3 building; or
(b) in the case of water type extinguishers, a building or part of a building served by a fire hose reel.

Table NE1.7 shows the commonly available portable extinguishers and their selection for appropriate class and type of fires.

Table NE1.7 PORTABLE FIRE EXTINGUISHER SELECTION CHART					
		CONTENTS OF EXTINGUISHER ARE			
Class and Type of Fire / Type of Extinguisher		WATER	FOAM	DRY CHEMICAL	CARBON DIOXIDE
A	Ordinary combustibles (wood, paper, etc)	✓ YES MOST SUITABLE	✓YES	✓YES	✓YES
B	Flammable liquids	X NO	✓YES SPECIAL FOAM REQUIRED FOR ALCOHOL-TYPE-FIRE	✓YES	✓YES
C	Flammable gases	X NO	X NO	✓YES	✓YES
D	Combustible metals	X NO	X NO USE SPECIAL PURPOSE EXTINGUISHERS ONLY	X NO	X NO
E	Fire involving live electrical equipment	X NO	X NO	✓YES	✓YES
NOTE: (a) Occupancies of excessive fire hazard are listed in the annexure to Specification NE1,6. (b) See NC 2.3 for requirements for sprinklers in large isolated buildings.					

GD1.30.8 Fire and smoke alarms

A suitable automatic fire and smoke alarm system complying with Specification A1.39 must be installed in:

(a) each storey if the building has a rise of 1 or more storeys;
(b) a Class 3 building:
    (i) in all residential rooms and common areas; or
    (ii) in a special accommodation house or home for the aged, children, sick or physically or mentally disabled persons or the like; and
(c) a Class 9a building:
    (i) in wards or bedrooms; or
    (ii) in a clinic or day surgery, having areas where surgical procedures are performed at a height of 1 storey or more;

Type A, B or C alarm systems are acceptable for Class 3 buildings, 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.

GD1.30.9 Fire precautions during construction

In a building under construction:

(a) not less than one fire extinguisher to suit Class A, B and C fires and electrical fires must be provided at all times on each floor adjacent to each required exit or temporary stair or exit and;
(b) after the building has reached an effective height of 12 m:
    (i) the required hydrants and 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; and
    (ii) any required fire brigade booster connection must be installed.

GD1.30.10 Provision for special hazards

Suitable additional provision must be made if special problems of fighting fire could arise because of:

(a) the nature or quantity of materials stored, displayed or used in a building or on the allotment; or
(b) the location of the building in relation to a water supply for firefighting purposes.

A1.31 Smoke Control

GD1.31.1 Smoke venting

Buildings must have a system to control smoke as listed in Table NE2.1.

TABLE NE2.1
REQUIREMENTS FOR SMOKE CONTROL

BUILDING	SYSTEM
Sole-occupancy units in Class 2, 3 or 4 buildings. Single-storey buildings where the floor area of a fire compartment or storey does not exceed 500 m2 and is not served by a central mechanical ventilation plant.	No requirement
Single-storey buildings, or the top storey of multi-storey buildings	Either: (a) Windows; panels or the like in accordance with NE2.3 (b) Roof vents in accordance with NE2.5, or (c) Smoke exhaust systems in accordance with NE2.6.
Multi-storey buildings excluding the top storey	Windows, panels or the like in accordance with NE2.3.
Class 6 buildings with enclosed malls exceeding 40 m in length.	Smoke exhaust systems in accordance with NE2.6

GD1.31.2 Exclusion of smoke from fire-isolated exits

Smoke must be excluded from fire-isolated exits in accordance with Table NE2.2.

TABLE NE2.2
MEANS OF EXCLUDING SMOKE FROM FIRE-ISOLATED EXITS

EXIT TYPE	REQUIREMENT
A required fire-isolated stairway serving any storey above an effective height of 25 m. A required fire-isolated stairway serving 3 or more below-ground storeys. A required fire-isolated ramp or fire-isolated passageway having a path of travel more than 60 m along it to a road or open space.	Either: (a) a pressurisation system in accordance with NE2.7; or (b) Open access ramps or balconies in accordance with ND2.5
NOTE: A below-ground storey is one where egress involves an upward vertical climb of more than 1.5 m.	

GD1.31.3 Natural smoke venting

Windows, doors, panels, or the like, provided to control the movement of smoke must:

(a) be as evenly distributed as practicable; and
(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.

GD1.31.4 Air-handling systems

If an air-handling system is installed in a building it must operate in accordance with Specification A1.40.

GD1.31.5 NE2.5 Roof Vents

Required roof vents must comply with AS 2665, except that:

(a) smoke curtains may divide the space below the roof into compartments with area not more than 1500 m^2;
(b) all roof vents within the same compartment must open at the same time; and
(c) roof vents must be activated by:
    (i) except in a Class 7 or 8 building, a sprinkler system if it is installed throughout the building; or
    (ii) a fire detection and alarm system which complies with AS 1670 Parts 1, 3 or 6; 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.

GD1.31.6 NE2.6 Smoke exhaust systems

A required smoke exhaust system must comply with Specification A1.41.

GD1.31.7 Pressurisation

A required pressurisation system must:

(a) comply with AS 1668.1;
(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; and
(c) not serve more than one fire-isolated exit system and not form part of any other air-handling system.

A1.32 Lift Installations

GD1.32.1 Application of Part

This Part applies to Class 2, 3, 4, 5, 6, 7, 8 and 9 buildings.

GD1.32.2 Stretcher facility in lifts

(a) If passenger lifts are installed in any building with an effective height of more than 25 m, at least one lift serving all storeys of the building must accommodate a raised stretcher with a patient lying on it horizontally by providing a clear space 600 mm wide x 2000 mm long x 1200 mm high above the floor level.

GD1.32.3 Warning against use of lifts in fire or earthquake

A warning sign must:

(a) be displayed where it can be readily seen:

(i) near every call button panel for a passenger lift or group of lifts throughout a building; except
(ii) a small lift such as a dumbwaiter or the like that is for the transport of goods only; and

(b) comply with the details and dimensions of Figure NE3.3 and consist of:
(i) incised, inlaid or embossed letters on a metal, wood, plastic or similar plate securely and permanently attached to the wall; or
(ii) letters incised or inlaid directly into the surface of the material forming the wall.

FIGURE NE3.3 - WARNING SIGN FOR PASSENGER LIFTS

A1.33 Emergency Lighting, Exit Signs and Warning Systems

GD1.33.1 Application of Part

This Part applies to Class 2, 3, 4, 5, 6, 7, 8 and 9 buildings.

GD1.33.2 NE4.2 Emergency lighting requirements

An emergency lighting system must be installed:

(a) in every *fire-isolated stairway, fire-isolated ramp* or *fire-isolated passageway*;
(b) in every storey of a Class 5, 6, 7, 8 or 9 building where the storey has a floor area more than 300 m^2:
(i) in every passageway, corridor, hallway, or the like, which is part of the path of travel to an exit;
(ii) in any room having a floor area more than 100 m^2 if it does not open to a corridor or space which has emergency lighting; and
(iii) in any room having a floor area more than 300 m^2.
(c) in every passageway, corridor, hallway, or the like, having a length of more than 6 m from the entrance doorway of any *sole-occupancy unit* in a Class 2 or Class 3 building or Class 4 part of a building~~,~~ to the nearest doorway opening directly to:
(i) a *fire-isolated stairway, fire-isolated ramp* or *fire-isolated passageway*;
(ii) an external stairway serving instead of a smoke or fire-isolated stairway under Section ND1.8;
(iii) an external balcony leading to a *fire-isolated stairway, fire-isolated ramp* or *fire-isolated passageway*; or
(iv) a road or open space;
(d) in every required non *fire-isolated stairway*~~;~~
(e) in a *sole-occupancy unit* in a Class 5, 6, or 9 building if:
(i) the floor area of the unit is more than 300 m^2; and
(ii) an exit from the unit does not open to a road or open space or to an external stairway, passageway, balcony or ramp, leading directly to a road or open space;

(f) in every room or space to which there is public access in every storey in a Class 6 or 9b building where:
  (i) the floor area in that storey is more than 300 m^2;
  (ii) any point on the floor of that storey is more than 20 m from the nearest doorway opening directly to a stairway, ramp, passageway, road or open space;
  (iii) egress from that storey involves a vertical upward climb within the building of more than 1.5 m; or
  (iv) the storey provides a path of travel from any other storey required by (i), (ii), or (iii) to have emergency lighting;
(g) in a Class 9a *health-care building*:
  (i) in every passageway, corridor, hallway, or the like, serving a ward area or patient treatment room; and
  ~~(ii)~~ in every ward area or patient treatment room having a floor area of more than 120 m^2. ~~;~~

GD1.33.3 Measurement of distance

Distances, other than vertical rise, must be the shortest measurement along the corridor or the path of travel whether by straight lines, curves or a combination of both.

GD1.33.4 Design and operation of emergency lighting

Every required emergency lighting system must comply with AS/NZS 2293.1.

GD1.33.5 Exit signs

Exit signs must be installed and be clearly visible to persons approaching the exit, on or near:

(a) every door providing direct egress from a storey to:
  (i) an enclosed stairway, passageway or ramp serving as a required exit;
  (ii) an external stairway, passageway or ramp serving as a required exit; and
  (iii) an external access balcony leading to a required exit;
(b) every door from an enclosed stairway, passageway or ramp at every level of discharge to a road or open space;
(c) every horizontal exit; and
(d) every door serving as, or forming part of, a required exit.

GD1.33.6 Direction signs

If the exits will not otherwise be readily apparent to persons occupying or visiting the building, exit signs with directional arrows must be installed in appropriate positions in corridors, hallways, lobbies, and the like, indicating the direction to a required exit.

GD1.33.7 Class 2, 3 and 4 buildings: Exemptions

Section GD1.33.5 does not apply to:

(a) a Class 2 building in which every door referred to is clearly and legibly labelled on the side remote from the exit or balcony:

(i) with the word “EXIT’ in capital letters 25 mm high in a colour contrasting with that of the background; or

(ii) by some other suitable method; and

(b) an entrance door of a Class 2, 3 or 4 sole-occupancy unit.

GD1.33.8 Design and operation of exit signs

Every required exit sign must comply with AS/NZ 2293.1.

A1.34 Maintenance of Safety Installations

GD1.34.1 Application of Part

This Part applies to Class 2, 3, 4, 5, 6, 7, 8, and 9 buildings.

GD1.34.2 Maintenance requirements

Safety installations in buildings must be adequately maintained to the requirements of Table NE5.2.

TABLE NE5.2
SCHEDULE OF MAINTENANCE

ITEM TO BE INSPECTED OR TESTED	NATURE OF INSPECTION AND/OR TEST, AND FREQUENCY
1. OPENING PROTECTION	
A required fire door, fire window, fire shutter or smoke door	Operate and inspect for compliance with the provisions of Part NC3 and Specification NC3.4 Monthly
2. MEANS OF EGRESS	**Inspect to ensure compliance with Section ND**
(a) Exits and paths of travel including doors, doorways and exit signs	Monthly
(b) Required handrails and balustrades	Annually
(c) Arrangements for safe egress in buildings with special security provisions	Monthly
3. SIGNS	
(a) Signs concerning use of lifts in the event of fire	Inspect for legibility and installation in compliance with Part NE4 Annually
(b) Exit sign illumination:	
Internally-illuminated signs	Check that the lamp matches the approved lamp-rating marked on the sign fitting Monthly
Externally-illuminated signs	Check that the illumination is adequate Monthly
4. EMERGENCY LIGHTING	
Required emergency lighting	(a) Operate in conditions of simulated failure of power to the distribution board concerned and check for compliance with the provisions of Part NE4 Monthly (b) Where batteries are involved: Test and inspect as prescribed in AS 1670 as though they are installed pursuant to the provisions of that Standard or where AS 1670 is not relevant, test or inspect as appropriate Monthly (c) Check battery charger for correct operation Monthly
5. FIRE FIGHTING SERVICES & EQUIPMENT	
(a) Required portable fire extinguishers	As prescribed in NZS 4503
(b) Required fire hose reels	As prescribed in NZS 4503
(c) Required hydrants and riser main system	As prescribed in NZS 4503

6. SPRINKLERS	
(a)Required sprinkler system	As prescribed in NZS 4541
(b) Plans containing reference information	Inspect for presence and legibility to comply with NZS 4541
7. AIR-HANDLING SYSTEMS	
(a) Simulate activation of detectors	Operate and check for correct operation in accordance with Specification NE2.4 and NE2.6. Ensure that the system is left in correct operating condition
	As in NZS 4512
(b) Detectors	Test and inspect as though they are prescribed for installations under NZS 4512
Associated batteries	Check battery charger for correct operation
	As in NZS 4512
(c) Fire situations	Check to ensure compliance with AS 1668.1
	Annually
(d) Fire-control panels	Test and inspect as though the panel is installed as a Fire Indicator Board under NZS 4512
	As in NZS 4512
(e) Pressurising of stairs, ramps and passageways	Operate, test and inspect to ensure compliance with AS 1668.1
	Monthly
8. MANUAL FIRE ALARMS	Operate to see if in working order
	As in NZS 4512
9. *AUTOMATIC* FIRE ALARMS	
(a) Required automatic alarms	As prescribed in NZS 4512
(b) Special situations and precautions and outdoor applications	Inspect for compliance with NZS 4512
10. LIFTS	
Lifts and associated equipment for operation in event of emergency	Operate under simulated emergency conditions and check for compliance with the provisions of NE3
	Quarterly
STRUCTURAL FIRE PROTECTION	
Compartmentation and fire protection of structural members	Ascertain that any work performed or any occurrence, accidental or otherwise, has not resulted in any reduction in the FRL or other fire protection provision of any part of the building installed as required
	Annually

A1.35 Electrical Work

GD1.35.1 Safety

GD1.35.2 General requirements

All electrical wiring and installations in or on any Class 2 to 9 building must ensure safety from electric shock and fire. This requirement is satisfied if all electrical work associated with the building is done to comply with AS/NZS 3000: Electrical installations (known as the Australian/New Zealand Wiring Rules). The capacity of the system must allow for the long term anticipated requirements of the occupants.

GD1.35.3 Plug and power sockets

Plug and power sockets must:

(a) have their individual switch;
(b) be located so that:

(i) cords and cables need not be taken across doorways; and
(ii) trailing cords and cables do not have to cross circulation routes;
(c) not be located behind door-swings; and
(d) in the kitchen in Class 2, 3 and 4 buildings be located 250 mm above worktops at the back of benches or on a return wall where it exists.
(e) in the kitchen be located away from any sink or water outlet.

GD1.35.4 Meter and distribution board

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 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.

GD1.35.5 Light-switch layout

(a) The layout of light switches in Class 2, 3 or 4 buildings must follow the main night-time circulation routes such as from the entrance hall to the living area to the bedrooms to the bathroom and toilet. Crossing any major space in the dark must be avoided. The switches must be located close to door openings.
(b) All stairs must have two way switching at the top and the bottom.

GD1.35.6 Photovoltaic/Solar Energy Systems

All photovoltaic/solar energy systems shall fully comply with the requirements of AS/NZS 5033.

Photovoltaic/solar panel systems shall be fixed to the main structure of the building. Roofs containing photovoltaic solar panels must be designed for the full panel and ballast *dead load*, including concentrated loads from support frames in combination with roof *live load*, and any other applicable loads.

A29 SPECIFICATIONS

A1.36 FIRE MAINS AND WATER SUPPLY SERVICES

GD1.36.1 Scope

This Specification refers to fire mains and water supply services for firefighting equipment in buildings.

GD1.36.2 General requirements

A *fire main* must:

(a) be capable of supplying water at the flow rates and pressures necessary for the satisfactory operation of the required firefighting equipment;
(b) not incorporate plastic pipes above ground; and
(c) not be used for other than firefighting 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 disadvantaged 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; and
(iv) any system valve which can isolate flow in the fire main is secured in the open position by a padlocked metal strap.

In buildings with a sprinkler system with a dual supply to Class A of NZS 4541, 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.

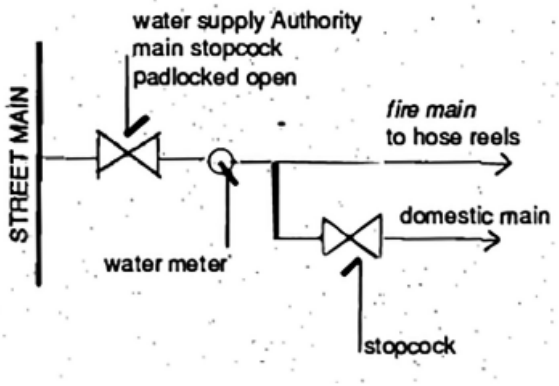


FIGURE 2 - WATER SUPPLY RETICULATION: COMBINED SERVICES

GD1.36.3 3. Water supplies for sprinkler systems

All water supplies for sprinkler systems must satisfy the requirements of NZS 4541. Furthermore:

(a) a Class C single supply system must comprise:
  (i) a street main which may be boosted by a diesel fire pump unit;
  (ii) onsite storage or any source allowed by the Standard; or
  (iii) a combined supply from two street mains which individually are inadequate; and
(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; and
  (ii) a separate onsite storage or other source allowed by the Standard, with an independent electric or diesel fire pump.

GD1.36.4 Fire pump enclosures

Fire pumps must be located in a room or enclosure which has a FRL of not less than 60/60/60 and is:

(a) within the building; or
(b) external but not within 6 m of the building and any *fire-source feature*.

GD1.36.5 Booster and charged dry riser main connections and cabinets

(a) 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. If the system is fitted with a pressure gauge, the gauge must comply with AS 1349, and have a full-scale reading of not less than 25% more than the pressure to which the system has been hydrostatically tested.
(b) Cabinets may be located:
  (i) 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;
  (ii) remote from the building if they are at the boundary of the allotment, within sight of the main entrance to the building, adjacent to the principal vehicular access to the allotment and located not less than 10 m from the external wall of any building; or
  (iii) in any other suitable position.
(c) A permanent fade and water-resistant plan, equal to photo-engraved anodized aluminium, must be displayed in a prominent position within the cabinet, showing the following information:
  (i) the layout of the building and adjacent streets;
  (ii) 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;
  (iii) the operational discharge pressure and pressure at zero flow of any pump installed in the system;
  (iv) the capacity of any tank connected to the system;
  (v) the height of the highest hydrant outlet above the lowest booster inlet connection; and
  (vi) the year of installation of the system.
(d) Suitable provision must be made for the drainage of water from within a booster or charged dry rise main system cabinet.

A1.37 FIRE SPRINKLER SYSTEMS

GD1.37.1 Scope

This specification sets out requirements for the design and installation of *automatic fire sprinkler systems*.

GD1.37.2 Adoption of NZS 4541

An *automatic fire sprinkler system* and associated water supply must comply with NZS 4541 subject to this Specification. For further details of water supply requirements, see Specification A1.36.

GD1.37.3 Interpretation

A reference to FRR in NZS 4541 means FRL as defined in this code.

GD1.37.4 Definition of a sprinklered building

Notwithstanding NZS 4541, a building or a part of a building is deemed to be sprinklered if:

(a) in the case of a whole building, the building complies with Section GC of this Code and is sprinklered throughout; or
(b) in the case of a part of a building:
    (i) the part is sprinklered throughout and fire-separated from the un-sprinklered part in accordance with Section GC2, and
    (ii) any opening in the fire separating construction between the sprinklered and un-sprinklered parts is protected in accordance with Section GC3.

GD1.37.5 Exceptions

Where a building or part of a building is required to be sprinklered throughout, the exceptions nominated in Clause 207 of NZS 4541 apply except that a fire door in accordance with Section GC3 of this code must be used for protection of openings.

GD1.37.6 Sprinkler valve enclosures

Sprinkler alarm valves must be located in a secure enclosure or room of adequate size, and where the valves are located within a building, the enclosure and required access to it must be suitable for the Fire Service.

GD1.37.7 Connection to evacuation alarm

The sprinkler system must be appropriately connected to any evacuation alarm system in the building to initiate the alarm in the event of activation of any sprinkler head and also have a direct connection to the Fire Service.

A1.38 ANNEXURE TO A1.37

GD1.38.1 OCCUPANCIES OF EXCESSIVE FIRE HAZARD

This annexure contains a graded list of examples of excessive fire hazard. The examples do not cover all possibilities and there could be many other occupancies of excessive fire hazard. The Fire Authority having jurisdiction must be consulted in case of any doubt about occupancies not included in this Annexure.

ORDINARY HAZARD OCCUPANCIES Group III Special	
Flash fires are likely to occur in these occupancies. These include the following:	
1. OPENING PROTECTION	
Chemical works and chemists (manufacturing or analytical) producing or using flammable solids, liquids, dusts and the like Copra kilns- Cork factories Cotton mills (preparatory processes Distilleries (still-houses)	Exhibitions Fibre glass products manufactures Film and television studios Flax and hemp scutch mills Flax, jute and hemp mills (preparatory processes) Match factories Oil mills (crushing and solvent extraction)
EXTRA HIGH HAZARD OCCUPANCIES Process risks	
Examples of extra high hazard process risks are as follows:	
Aircraft hangars Celluloid manufacturers and celluloid goods manufacturers Fire lighter manufacturers Fireworks manufacturers Floor cloth and linoleum manufacturers Foam plastics and foam plastics goods manufacturers and warehouses	Foam rubber and foam rubber goods manufacturers and warehouses LPG bulk storage Paint, colour and varnish works Resin, lamp black and turpentine manufacturers Rubber substitute manufacturers Tar distillers Woodwool manufacturers

High piled storage risks

Extra high hazard high piled storage risks are subdivided into four categories. Fires in materials belonging to Categories II, III and IV produce exceptionally intense fires with a high rate of heat release. The four categories are:

(a) **Category I**: Category I comprises ordinary combustible materials and *non-combustible* materials in combustible wrappings, excluding those items specified under Categories II, III and IV, stored in bulk, in pallets or on racking, to heights exceeding 4 m.
Examples of Category I storage are as follows:

Carpets
Clothing

Electrical appliances

Fibreboard (high density Hardboard)

Glassware and crockery (in cartons)

Groceries (items, not packaged)

Metal goods (in cartons)

Textiles

All forms of paper storage other than those specified under Categories II and III

(b) **Category II**: Examples of Category II storage are as follows:

Aerosol packs with flammable contents

Baled cork
Baled waste paper

Cartons and carton flats
Cartons containing alcohols in cans or bottles
Cartons of canned lacquers which dry by solvent evaporation
Chipboard

Fibreboard (low density soft board)

Linoleum products

Palletized whisky stocks
Plastics (non-foamed) other than celluloid

Rolled pulp and paper (horizontal storage)
Rolled asphalt paper (horizontal storage)

Veneer sheets

Wood patterns
Wooden furniture

(c) **Category III**: Examples of Category III storage are as follows:

Bitumen coated or wax coated paper

Celluloid

Esparto (loose)

Flammable liquids in combustible containers
Foamed plastics and foamed rubber products (with or without cartons) other than those specified in Category IV

Rolled pulp and paper (vertical storage)

Rolled asphalt paper (vertical storage)
Rubber goods

Ventilated wood stacks

Waxed or asphalt coated paper and containers in cartons

Woodwool
Wooden pallets and wooden flats (idle)

All materials having wrappings or preformed containers of foamed plastics

(d) **Category IV**: Examples of Category IV storage are as follows:

Rolls of sheet foamed plastics or foamed rubber

Off-cuts and random pieces of foamed plastics or foamed rubber

A1.39 FIRE DETECTION AND ALARM SYSTEMS

GD1.39.1 Scope

This Specification describes the installation and operation of automatic fire detection and alarm systems. The automatic systems may also be used to operate a smoke control system within a building.

GD1.39.2 Automatic systems

An automatic fire detection and alarm system must comply with NZS 4512 subject to this Specification

GD1.39.3 Purpose

The purpose of a fire detection and alarm system is to:

(a) warn the occupants of any fire within the building;
(b) alert the local Fire Service;
(c) activate any installed automatic smoke control system; and
(d) provide for manual operation as an evacuation system.

GD1.39.4 Connection to extinguishing systems

Systems designed to NZS 4512 for the actuation of any fire extinguishing system must operate on a dual circuit to permit automatic operation of an evacuation alarm.

GD1.39.5 Location of smoke detectors

Smoke detectors must be:

(a) wherever possible, surface mounted and external to air conditioning and ventilation ducts, unless a point sampling system with maximum sensitivity level of 0.5% smoke obscuration is used;
(b) located at natural collection points for hot smoke having regard to the ceiling geometry and its effects on the migratory path;
(c) situated no closer than 3 m from smoke doors or fire doors; and
(d) of the 'photo-electric' type if installed within ducts or atmospheres contaminated with sub-micron dust and other particles likely to set off an ionisation type detector.

GD1.39.6 Threshold levels

(a) Sampling systems must comply with AS1670, with response times and alarm thresholds maintained at minimum levels and no alarm delay permitted on the highest alarm threshold.
(b) The setting of alarm threshold levels for addressable detectors used within intelligent systems must not exceed the sensitivity levels nominated in:
    (i) AS 1668.1; and
    (ii) NZS 4512.

GD1.39.7 Manually operated evacuation, fire alarm systems

(a) Required manually operated evacuation alarm systems must comply with NZS 4512 for installation, operation and maintenance. The three systems considered are:
    Type A: Simple mechanical means;
    Type B: Simple electrical system, not monitored; and
    Type C: Electrical systems continuously monitored by connection to the fire service station.
(b) When Type B systems are installed, the following warning notice must be clearly marked near each manual call point:
    NOT CONNECTED TO A FIRE SERVICE IN CASE OF FIRE PHONE showing the telephone number of the fire authority in the locality.
    Type B systems may be substituted with a self-contained battery-operated system provided care is taken to ensure that the battery has sufficient charge available at all times.
(c) Location
    Manual call points must be located not more than:
    (i) for Class 3 buildings, 20 m from the doorway of any *sole-occupancy unit*;
    (ii) for Class 5,6,7,8 and 9b buildings;
    (iii) 20 m travel distance from any point on the floor; and
    (iv) for Class 9a buildings:
        - 12 m from any point of the floor of a ward area; or

- 6 m from the entrance doorway of any room which may be occupied by a sleeping, sedated or dependent patient.

A1.40 AIR HANDLING SYSTEMS IN BUILDINGS

GD1.40.1 1. Scope

This Specification outlines the performance and operation of mechanical ventilation and air conditioning systems as they relate to smoke control in buildings.

GD1.40.2 2. Commonly used systems

The following commonly used systems may be installed:

(a) small standalone or window units without ducting;
(b) central chilled water systems with fan coil units located in each storey 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 plant where all the conditioning is done and with the ducting system connecting several fire compartments or storeys.

GD1.40.3 3. Action on detection of smoke fire or flame

In the case of small units, the power supply to the units must be switched off 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 pressurisation system must operate; and
(c) any required smoke exhaust system or smoke and heat vent must operate.

GD1.40.4 4. Compliance

The action required under 3 (a), (b) or (c) must be automatic and be activated by:

(a) smoke detectors located in each storey or fire compartment in accordance with Specification A1.39 and with ducted systems, located just upstream of the supply fan as well as in the main return air duct; or
(b) by any other suitable fire alarm system, including a *sprinkler system*, installed within the building.

A1.41 SMOKE EXHAUST SYSTEMS

GD1.41.1 Scope

This Specification describes the performance and method of operation of smoke exhaust systems in buildings which are designed to:

(a) remove smoke from within the building using ducted or roof mounted exhaust fans; or

(b) in a shopping centre complex or mall, remove smoke from within pedestrian malls to maintain for as long as possible a tenable escape path for the occupants.

GD1.41.2 Fan capacity

Fan systems must have an exhaust capacity in accordance with the height of the building as specified in Figure 2.

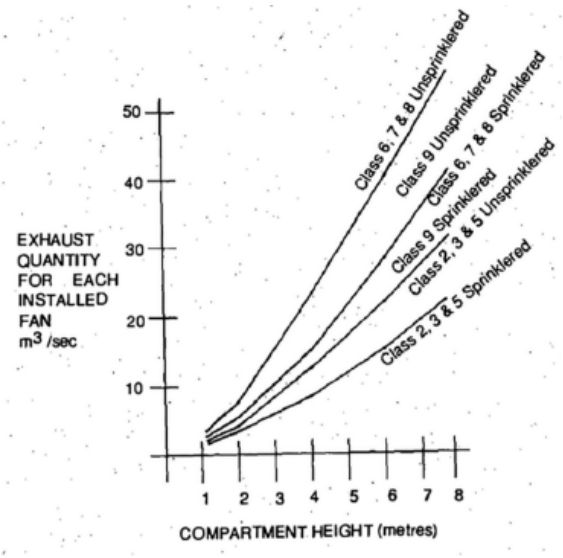


FIGURE 2 - EXHAUST CAPACITY OF FANS

GD1.41.3 Compartmentation at ceiling level

The storey or room at ceiling level:

(a) must be divided into compartments not more than 1500 m^2 in area by smoke curtains in accordance with AS 2665; or
(b) in a shopping centre complex or mall, must have:
  (i) smoke curtains or toughened or wired glass or *non-combustible* bulkheads which extend not less than 1 m beneath an imperforate ceiling; or
  (ii) ceiling coffers not less than 500 mm deep, each containing a smoke exhaust fan

across the full width of the mall to divide it into lengths of not more than 40 m.

GD1.41.4 Location of fans and discharge

Exhaust fans must be located so as not to cause undue turbulence, and:

(a) in a shopping centre complex or mall:
  (i) be spaced no more than 40 m apart and not more than 20 m from the end of the mall;
  (ii) not be at a mall intersection unless there is an open area where the ceiling is raised not less than 2 m above the ceiling in the mall; and
  (iii) be located at natural collection points for the hot smoky gases within each smoke compartment having regard to the ceiling geometry and its effects on the migratory path of the smoke;

(b) in other buildings, be located so that each fan must serve not more than one 1500 m^2 root compartment; and
(c) discharge directly to the outside and in a manner that will not spread fire or smoke to adjacent fire compartments or buildings.

GD1.41.5 Make-up air

Low level fresh air inlet openings or doors must be sized to provide adequate low velocity (velocity not exceeding 2.5m/s) fresh air make up to satisfy the exhaust performance of the installed smoke exhaust fans, care being exercised in the number and location of such openings and their disturbance of the smoke layer due to turbulence created by the incoming air.

GD1.41.6 Operation of fans

All smoke exhaust fans must start sequentially and be activated by the operation in the area served by the fan of:

(a) a *sprinkler system*;
(b) a fire detection and alarm system which complies with Specification A1.39;
(c) a detector system comprising:
  (i) smoke detectors spaced not more than 30 m apart and 15 m from any curtain, bulkhead or wall and with not less than one detector for each 500 m^2 of floor area; or
  (ii) rate of rise heat detectors spaced not more than 15 m apart and 7.5 m from any curtain, bulkhead or wall and with not less than one detector for each 250 m^2 of floor area,

  and not less than 2 detectors located on opposite sides of each fan inlet; or
(d) in a shopping centre complex or mall:
  (i) optical smoke detectors in each smoke compartment with at least one detector for each 150 m^2 of floor area, arranged in at least 2 groups so that on activation of an alarm group in the respective smoke compartment full exhaust is initiated, and on activation of a second group and following a 30 second check period, an alarm is transmitted to the fire service station, and
  (ii) a manual break glass alarm at each exit from a shop with a floor area of more than 1000 m^2 arranged to activate the exhaust system and transmit an alarm to the Fire Brigade.

GD1.41.7 Protection of wiring

Power supply wiring for roof mounted exhaust fans must be MIMS (copper) cable or otherwise suitably fire protected where it passes through other storeys and might be affected by fire remote from the floor served by the plant.

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.

GD1.41.8 Resistance to high temperatures

If not adequately shielded from the airflow, each smoke exhaust fan, complete with its drive, flexible connections, control gear and wiring must:

(a) be able to operate in a smoke laden environment; and
(b) 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; and
(c) 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; and
(d) 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; and
(e) have any high temperature overload devices installed, automatically overridden during the smoke exhaust operation

SECTION GF – HEALTH AND AMENITY

THIS SECTION APPLIES TO PUBLIC BUILDINGS AND GROUP DWELLINGS (Class 2 TO 9)

Performance Requirements

Deemed to Satisfy Provisions

NF1 Damp and Weatherproofing

NF2 Sanitary and Other Facilities

NF3 Room Sizes

NF4 Light and Ventilation

NF5 Water supply Plumbing

NF6 Sanitary Plumbing and Drainage

NF7 Roof Drainage

Specifications

GF30 PERFORMACE REQUIREMENTS

GF30.1 OBJECTIVES

A building must be designed and constructed to meet the following objectives:

GF30.1.1 Damp and Weatherproofing

Suitable drainage systems, damp and weatherproofing must be provided where necessary to prevent:

(a) moisture or damp affecting the stability of the building and/or causing deterioration of building elements:
(b) the creation of any unhealthy or dangerous conditions, or loss of amenity for occupants;
(c) causing damage to adjoining property;
(d) the accumulation of surface water against the building or beneath the floor; or
(e) adversely affecting the drainage of other allotments or of any public infrastructure.

GF30.1.2 Cooking and Sanitary Facilities

Adequate cooking, toilet and washing facilities must be provided for the occupants of a building, having regard to its use and size. In residential buildings other than those meant for transient occupants, suitable facilities must also be available for the preparation and cooking of food, the cleaning of utensils and the laundering of clothes.

GF30.1.3 Room Sizes

The floor area, plan dimensions and ceiling heights of rooms and other spaces within a building must be adequate for their use or purpose.

GF30.1.4 Light and Ventilation

The standard of light and ventilation within a building must be adequate for the occupants, having regard to the use or purpose of the building.

GF30.1.5 Water Supply Plumbing

Each building is to be provided with an appropriate, safe and hygienic system of plumbing for the supply of water for domestic use on demand

GF30.1.6 Sanitary Plumbing

Each building is to be provided with an appropriate system of sanitary drainage for the hygienic waterborne conveyance and removal of domestic wastewater.

GF30.1.7 Roof Drainage

Where provided, a roof drainage system must give reasonable protection against the ingress of rainwater into the building.

GF30.1.8 Site Drainage

Provisions must be made to convey surface water away from buildings, structures and neighbouring properties in a safe manner which avoids ponding of water in the allotment. Where a new building, structure or alteration is made, it must not adversely affect any existing surface or ground water course without adequate provisions made to provide equal or better performance to the existing condition.

GF30.2 REQUIRED PERFORMANCE

GF30.2.1 Damp and weatherproofing

Water and damp conditions must not be allowed to:

(a) affect the stability of buildings;
(b) create ill health or discomfort for the occupants;
(c) damage or deface buildings as a result of moisture present at the completion of construction; or
(d) cause damage to adjacent property.
(e) Allow water or moisture ingress into the building

GF30.2.2 Cooking and sanitary facilities

Any cooking facility provided must not spread smoke which may affect health or create a nuisance to the occupants or neighbours. Washing and clothes laundering facilities provided in residential buildings must be consistent with the size and occupancy of the building. The standard of toilet and washing facilities provided must in any building not create a nuisance or lead to ill health to the occupants or neighbours. These facilities must be located conveniently and the number of units provided must be consistent with the size and class of occupancy. Smoke extraction units from kitchens and other process operations in Class 6, 8 or 9 buildings must ensure that the progressive build-up of soot, grease and the like does not lead to a fire or unhealthy conditions.

GF30.2.3 Room sizes

The size and disposition of rooms in a building must be consistent with the requirements of health and hygiene.

GF30.2.4 Light and ventilation

Lighting via artificial or natural means shall be adequate for occupants at day or night. Where no mechanical ventilation is provided, natural ventilation openings shall be adequate for the intended occupancy of the building.

Where air handling systems are provided in a building, there must be adequate provision for natural ventilation to cater for any prolonged failure of the system.

GF30.2.5 Water supply plumbing

Water supply plumbing systems are to deliver water to the tap outlet or fixture at a pressure and flow suitable for use considering the anticipated needs of the user and the simultaneous use of the connected system by others.

Materials are to be selected based on the type of use and where water is used for human consumption suitable precautions must be taken to ensure that unsafe or unhygienic materials do not enter the supply system.

The installation of hot water systems must not impair the safety of occupants and users. Suitable precautions are to be taken to ensure that the temperature of water being stored and distributed is safe for the users and the public.

Water services must be safely accessible where possible to allow for ongoing maintenance and repair of the system. Where a service is concealed or difficult to access, provisions are to be put in place to limit the risk of damage caused by leaks and a means to isolate the system for repair.

Where rainwater from roof run off is a source of supply, precautions are to be taken to ensure that the rainwater harvesting and storage system is of an appropriate capacity and design to meet the anticipated needs of the user. The system must be capable of providing a sufficient, clean, uncontaminated water supply, and be able to be safely operated and maintained.

GF30.2.6 **Sanitary plumbing and drainage**

Sanitary plumbing must be designed to efficiently drain on site sanitary and waste-water fixtures and drainage points with minimal risk of blockage considering the anticipated discharge volumes and simultaneous use of the connected fixtures by users.

Any waste-water or sanitary fixture connected to the plumbing and drainage system is to be provided with a water seal trap to prevent the escape of foul sewer gases. Traps can be integral to the fixture or at the point of connection to the plumbing system.

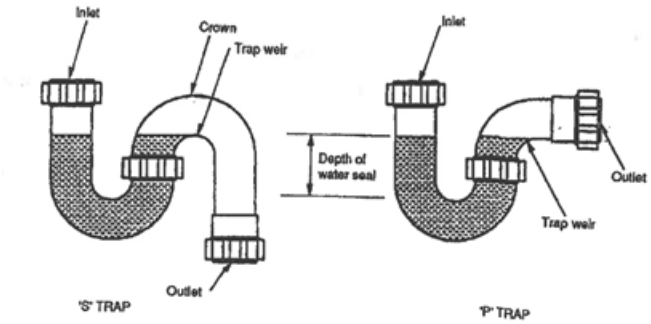


FIGURE DF6.1.2 EXAMPLES OF FIXTURE TRAPS

Sanitary plumbing and drainage systems must be laid to gradients which permit self-cleansing velocities consistent with their discharge loading, unless other suitable arrangements are made to ensure that the system is kept free of the accretion of sewage and other waste matter

Adequate ventilation provisions are to be provided to ensure trap seals are maintained by introducing fresh air into the sewer system and foul sewer gases are

expelled in a manner which does not produce unhygienic conditions nor create any nuisance to anyone.

Where on-site sanitation systems (e.g. septic tank, packaged wastewater treatment system, biogas plant or similar) are utilised, precautions are to be taken to ensure that the onsite sanitation system is of an appropriate capacity, location and design to meet the anticipated needs of the user. The system must be capable of providing safe disposal of the anticipated sanitary load, and minimising the risk of pollution, disease transmission and public nuisance.

GF30.2.7 **Roof drainage**

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) Eaves gutter overflow measures: a 100-year return period intensity
(c) Internal box gutters, valley gutters and downpipes: a 100-year return intensity.

Any known local variation in rainfall intensity must be taken into account. Sufficient allowance must be made for the possibility of overflow into the building due to ripples and turbulence in the flowing water during cyclonic winds.

GF30.2.8 **Site drainage**

The immediate site around the building must have suitable drainage so that no ponding results. Visible water must not be allowed to remain under or around the building for more than 1 hour after 10 minutes of maximum rainfall resulting from a storm with a return period of 5 years.

Flood waters or waves resulting from a storm or cyclone with a return period of 30 years must not be allowed to enter a building.

GF31 DEEMED-TO-SATISFY PROVISIONS

GF31.1 Damp and Weatherproofing

GF31.1.1 **Site drainage**

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 condition within or around any building.

GF31.1.2 **Building on land subject to dampness**

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.

GF31.1.3 Drainage of land external to building

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.

GF31.1.4 Weatherproofing of roofs and walls

Roofs and *external walls* (including openings for windows doors and the like) must be constructed to prevent rain or dampness penetrating to the inner parts of a building, unless it is:

(a) a Class 7, 8 or 10 building where in the particular case there is no necessity for compliance;
(b) a garage, tool shed, sanitary compartment, or the like, forming part of a building used for other purposes; or
(c) an *open spectator stands* or open deck carpark.

GF31.1.5 Pliable roof sarking

Pliable roof *sarking-type material* used under roof or wall coverings must comply and be fixed in accordance with AS/NZS 4200.1 and AS 4200.2.

GF31.1.6 Water proofing of wet areas in buildings

The following parts of a building must be impervious to water:

(a) In any building: the floor surface or substrate in a shower enclosure, or within 1.5 m measured horizontally from a point vertically below the shower fitting, if there is no enclosure.
(b) In a Class 3, 5, 6, 7, 8 or 9 building: the floor surface or substrate in a bathroom or shower room, slop sink compartment, laundry or sanitary compartment which is used in common by the occupants.
(c) The wall surface or substrate:
    (i) of a shower enclosure, or if the shower is not enclosed, within 1.5 m and exposed to a shower fitting, to a height of 1.8 m above the floor.
    (ii) immediately adjacent or behind a bath, trough, basin, sink, or similar fixture, to a height of 300 mm above the fixture, for the extent of the fixture, if it is within 75 mm of a wall.
(d) The junction between the floor and wall if the wall and floor are required to be impervious to water.
(e) The junction between the wall and fixture if the wall is required to be impervious to water.
(f) Penetrations such as for taps, spouts and floor wastes where they occur in surfaces required to be waterproof.

GF31.1.7 Damp-proof courses

Except in a building that is exempt from weatherproofing under Section GF31.1.4, moisture from the ground must be prevented from reaching:

(a) the lowest floor timbers and the walls above the lowest floor joists;
(b) the walls above the damp-proof course; and
(c) the underside of a suspended floor constructed of a material other than timber, and the supporting beams or girders.

GF31.1.8 **Acceptable damp-proof courses**

A damp-proof course must consist of:

(a) a material that complies with AS/NZS 2904;
(b) suitable termite shields placed on piers.

GF31.1.9 **Damp-proofing of floors on the ground**

If a floor of a room is laid on the ground or on filling:

(a) moisture from the ground must be prevented from reaching the upper surface of the floor and adjacent walls by:
the insertion of a vapour barrier in accordance with AS 2870.1; and damp-proofing need not be provided if the building is exempt from weatherproofing under Section GF31.1.4.

GF31.2 Sanitary and Other Facilities

GF31.2.1 Facilities for residential buildings other than Class 1 and 10

Sanitary and other facilities for Class 2 and 3 buildings, and Class 4 parts of buildings, must be provided in accordance with Table NF2.1

Class 2

(i) Within each *sole-occupancy unit*, provide—
(A) a kitchen sink and facilities for the preparation and cooking of food; and
(B) a bath or shower; and
(C) a closet pan; and
(D)a washbasin.

(ii) For laundry facilities, provide either—
(A)in each *sole-occupancy unit*—
(aa) clothes washing facilities, comprising at least one washtub and a space for a washing machine; and
(bb)clothes drying facilities comprising clothes line 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 facilities; or
(B)a separate laundry for each 4 *sole-occupancy units*, or part thereof, that must comprise—
(aa)clothes washing facilities, comprising at least one washtub and a space for a washing machine; and

For the purposes of (a)(i) and (a)(ii), a kitchen sink or washbasin must not be counted as a laundry washtub

(iii) For the purposes of (a)(i) and (a)(ii), a kitchen sink or washbasin must not be counted as a laundry washtub

(bb)clothes drying facilities comprising clothes line 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.

Class 3

For facilities in Class 3 buildings other than residential care buildings, the following applies:
(i)For residents in each building or group of buildings, provide—
(A)a bath or shower; and
(B)a closet pan; and
(C)a washbasin,
for each 10 residents for whom private facilities are not provided.
(ii)Notwithstanding (b)(i), 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.
(iii)Facilities for employees must be provided in accordance with F2.3.
(iv)Facilities required by (b)(i), (ii) or (iii) need not be situated in the same building.

(c)For facilities in Class 3 residential care buildings, the following applies: (i)For residents in each building or group of buildings, provide— (A)a shower, closet pan and wash basin for each 8 residents or part thereof where private facilities are notprovided; and (B)a suitable bath for each 30 residents or part thereof. (ii)For the purposes of (c)(i), urinals must not be taken into consideration in calculating the number of facilities.
Class 4 (d)For the sole-occupancy unit of a Class 4 part of a building, provide— (i)a kitchen sink and facilities for the preparation and cooking of food; and (ii)a bath or shower; and (iii)a closet pan; and (iv)a washbasin; and (v)clothes washing facilities, comprising a washtub and space in the same room for a washing machine; and (vi)a clothes line or hoist, or space for a heat-operated drying cabinet or similar appliance for the exclusive use of the occupants; and (vii)for the purposes of (d)(v), a kitchen sink or washbasin must not be counted as a laundry washtub.
Class 9c For facilities in Class 9c buildings, the following applies: (i)For residents in each building or group of buildings, provide— (A)a closet pan and wash basin for each 6 residents or part thereof where private facilities are not provided; and (B)a shower for each 7 residents or part thereof for where private facilities are not provided; and (C)a suitable bath, fixed or mobile. (ii)In addition to the facilities required by (e)(i), provide— (A)one kitchen or other adequate facility for the preparation and cooking or reheating of food including a kitchen sink and washbasin; and (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; and (C)one clinical hand washing basin for each 16 residents or part thereof. (iii)For the purposes of (e)(i), urinals must not be taken into consideration in calculating the number of facilities.

GF31.2.2 **Calculation of number of occupants and fixtures**

(a) The number of persons accommodated must be calculated according to Table ND1.13 if it cannot be more accurately determined by other means.

(b) Unless the premises are predominantly used by one sex, or numbers of male and female users are known, sanitary facilities must be provided equally for both sexes.

(c) In addition, where the nature of employment of an employee 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.

GF31.2.3 **Facilities in Class 3 to 9 Buildings**

a) Separate sanitary facilities for males and females must be provided for Class 3, 5, 6, 7, 8 or 9 buildings in accordance with Table NF2.3.

b) If not more than 10 people are employed, a unisex facility may be provided instead of separate facilities for each sex.

c) If the majority of employees are of one sex, not more than 2 employees of the other sex may share toilet facilities if the facilities are separated by means of walls, partitions and doors to afford privacy

d) Not less than one washbasin must be provided where closet pans or urinals are provided.

e) Employees and the public may share the same facilities in a Class 6 and 9b building (other than a school or early childhood centre) provided the number of facilities provided is not less than the total number of facilities required for employees plus those required for the public.

f) Adequate means of disposal of sanitary products must be provided in sanitary facilities for use by females.

g) Separate sanitary facilities for males and females need not be provided for patients in a ward area of a Class 9abuilding.

h) A Class 9a health-care building must be provided with—
   (i) one kitchen or other adequate facility for the preparation and cooking or reheating of food including a kitchen sink and washbasin; and
   (ii) (ii)laundry facilities for the cleansing and drying of linen and clothing or adequate facilities for holding and dispatchor treatment of soiled linen and clothing, sanitary products and the like and the receipt and storage of clean linen; and
   (iii) (iii)one shower for each 8 patients or part thereof; and
   (iv) (iv)one island-type plunge bath in each storey containing a ward area.

i) A Class 9b *early childhood centre* must be provided with—
   (i) a kitchen or food preparation area with a kitchen sink, separate hand washing facilities, space for a refrigerator and space for cooking facilities, with—
      a. (A)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; and
      b. (B)the ability to facilitate supervision of children from the facilities if the early childhood centre accommodates children younger than 2 years old; and
   (ii) one bath, shower or shower-bath; and
   (iii) if the centre accommodates children younger than 3 years old—
   (A)a laundry facility comprising a washtub and space in the same room for a washing machine; and
   (B)a bench type baby bath, which is within 1 m of the nappy change bench; and
   (C)a nappy changing bench which—
   (aa)is within 1 m of separate adult hand washing facilities and bench type baby bath; and
   (bb)must be not less than 0.9 m2 in area and at a height of not less than 850 mm, but not more than 900mm above the finished floor level; and
   (cc)must have a space not less than 800 mm high, 500 mm wide and 800 mm deep for the storage of steps; and
   (dd)is positioned to permit a staff member changing a nappy to have visibility of the play area at all times.

j) Class 9b theatres and sporting venues must be provided with one shower for each 10 participants or part thereof.

Proposed Revised Table NF2.3 sanitary facilities in Class 3,5,6,7& 8 buildings

Table F2.3 Sanitary facilities in Class 3, 5, 6, 7, 8 or 9 buildings

User Group	Closet Pans		Urinals		Washbasins	
	Design Occupancy	**Number**	**Design Occupancy**	**Number**	**Design Occupancy**	**Number**
Class 3, 5, 6 and 9 other than *schools*						
Male employees	1 — 20 > 20	1 Add 1 per 20	1 — 10 11 — 25 26 —50 >50	0 1 2 Add 1 per 50	1 — 30 > 30	1 Add 1 per 30
Female employees	1 — 15 > 15	1 Add 1 per 15	N/A	N/A	1 — 30 > 30	1 Add 1 per 30
Class 7 and 8						
Male employees	1 — 20 > 20	1 Add 1 per 20	1 — 10 11 — 25 26 —50 >50	0 1 2 Add 1 per 50	1 — 20 > 20	1 Add 1 per 20
Female employees	1 — 15 > 15	1 Add 1 per 15	N/A	N/A	1 — 20 > 20	1 Add 1 per 20
Note: Sanitary facilities need not be provided for a Class 8 *electricity network substation*						
Class 6 — department stores, shopping centres						
Male patrons	1 — 1200 > 1200	1 Add 1 per 1200	1 — 600 >600	1 Add 1 per 1200	1 — 600 >600	1 Add 1 per 1200
Female patrons	1 — 300 301 — 600 >600	1 2 Add 1 per 1200	N/A	N/A	1 — 600 601 — 1200 >1200	1 2 Add 1 per 1200
Note: Sanitary facilities need not be provided for patrons if the total number of persons accommodated in the building is not more than 600.						
Class 6 — restaurants, cafes, bars						
Male patrons	1 — 100 101 — 300 >300	1 2 Add 1 per 200	1 — 50 51 — 100 101 — 150 151 — 200 201 — 250 >250	1 2 3 4 5 Add 1 per 100	1 — 50 51 — 200 >200	1 2 Add 1 per 200
Female patrons	1 — 25 26 — 50 51 — 100 101 — 150 151 — 200 201 — 250 >250	1 2 3 4 5 6 Add 1 per 100	N/A	N/A	1 — 50 51 — 150 >150	1 2 Add 1 per 200
Note: Sanitary facilities need not be provided for patrons if the total number of persons accommodated in the building is not more than 20.						
Class 9a — *health-care buildings*						
Male patients	1 — 16 >16	2 Add 1 per 8			1 — 8 > 8	1 Add 1 per 8
Female patients	1 — 16 >16	2 Add 1 per 8	N/A	N/A	1 — 8 > 8	1 Add 1 per 8
Class 9b — *schools*						
Male employees	1 — 20 > 20	1 Add 1 per 20	1 — 10 11 — 20 21 — 45 >45	0 1 2 Add 1 per 30	1 — 30 > 30	1 Add 1 per 30
Female employees	1 — 5 >5	1 Add 1 per 15	N/A	N/A	1 — 30 > 30	1 Add 1 per 30
Male students	1 — 25 26 — 75 76 — 150 151 — 200 > 200	1 2 3 4 Add 1 per 100	1 — 50 51 — 100 >100	1 2 Add 1 per 100	1 — 10 11 — 50 51 — 100 > 100	1 2 3 Add 1 per 75
Female students	1 —10 11 — 25 26 — 100 > 100	1 2 Add 1 per 25 Add 1 per 50	N/A	N/A	1 — 10 11 — 50 51 — 100 > 100	1 2 3 Add 1 per 75
Class 9b — *early childhood centres*						
Children	1 — 30 > 30	2 Add 1 per 15	N/A	N/A	1 — 30 > 30	2 Add 1 per 15
Note: Facilities for use by children must be— (a) junior pans; and (b) washbasins with a rim height not exceeding 600mm; and (c) accessible from both indoor and outdoor play areas.						
Class 9b — theatres and cinemas with multiple auditoria, art galleries or the like						
Male participants	1 — 20	1	1 — 10	1	1 — 10	1

User Group	Closet Pans		Urinals		Washbasins	
	Design Occupancy	Number	Design Occupancy	Number	Design Occupancy	Number
	> 20	Add 1 per 20	> 10	Add 1 per 10	> 10	Add 1 per 10
Female participants	1 — 10 > 10	1 Add 1 per 10	N/A	N/A	1 — 10 > 10	1 Add 1 per 10
Male spectators or patrons	1 — 250 251 — 500 >500	1 2 Add 1 per 500	1 — 100 >100	1 Add 1 per 100	1 — 150 >150	1 Add 1 per 150
Female spectators or patrons	1 — 10 11 — 50 >51	1 2 Add 1 per 60	N/A	N/A	1 — 80 81 — 250 251 — 430 > 430	1 2 3 Add 1 per 200
Class 9b —single auditorium theatres and cinemas						
Male patrons	1 — 50 51 — 250 251 — 500 >500	0 1 2 Add 1 per 500	1 — 50 51 — 100 >100	0 1 Add 1 per 100	1 — 50 51 — 150 >150	0 1 Add 1 per 150
Female patrons	1 — 50 51 — 110 111 — 170 171 — 230 231 — 250 >250	0 3 4 5 6 Add 1 per 80	N/A	N/A	1 — 50 51 — 150 >150	0 1 Add 1 per 150
Class 9b — sports venues or the like						
Male participants	1 — 20 > 20	1 Add 1 per 20	1 — 10 > 10	1 Add 1 per 10	1 — 10 > 10	1 Add 1 per 10
Female participants	1 — 10 > 10	1 Add 1 per 10	N/A	N/A	1 — 10 > 10	1 Add 1 per 10
Male spectators or patrons	1 — 250 251 — 500 > 500	1 2 Add 1 per 500	1 — 100 > 100	1 Add 1 per 100	1 — 150 > 150	1 Add 1 per 150
Female spectators or patrons	1 — 15 16 — 60 61 — 120 > 120	1 2 3 Add 1 per 70	N/A	N/A	1 — 60 61 — 200 201 — 350 > 350	1 2 3 Add 1 per 150
Class 9b — churches, chapels or the like						
Male patrons	1 — 300 >300	1 Add 1 per 500	1 — 200 > 200	1 Add 1 per 200	1 — 250 > 250	1 Add 1 per 250
Female patrons	1 — 150 > 150	1 Add 1 per 150	N/A	N/A	1 — 250 > 250	1 Add 1 per 250`
Class 9b — public halls, function rooms or the like						
Male patrons	1 — 100 >100	1 Add 1 per 200	1 — 50 51 — 100 101 — 150 151 — 200 201 — 250 >250	1 2 3 4 5 Add 1 per 100	1 — 50 51 — 200 >200	1 2 Add 1 per 200
Female patrons	1 — 25 26 — 50 51 — 100 101 — 150 151 — 200 201 — 250 >250	1 2 3 4 5 6 Add 1 per 100	N/A	N/A	1 — 50 51 — 150 >150	1 2 Add 1 per 200
Note: Sanitary facilities need not be provided for patrons if the total number of persons accommodated in the building is not more than 20.						
Notes: 1. Number — means the number of facilities *required*. 2. > — means greater than 3. Employees — a reference to employees includes owners and managers using the building. 4. A reference to "add 1 per 100 or 150, 250, 500" etc. includes any part of that number.						

GF31.2.4 **Facilities for people with disabilities**

Sanitary facilities must be provided in accordance with Table NF2.4 accessible unisex sanitary compartments must be provided in accessible parts of the building in accordance with Table NF2.4(a); and accessible unisex showers must be provided in accordance with Table NF2.4(b)

Table NF2.4(a) Accessible unisex sanitary compartments

Class of building	Minimum accessible unisex sanitary compartments to be provided
Class 1b	(a) Not less than 1; and (b) where private *accessible* unisex *sanitary compartments* are provided for every *accessible* bedroom, common *accessible* unisex *sanitary compartments* need not be provided.
Class 2	Where *sanitary compartments* are provided in common areas, not less than 1.
Class 3 and Class 9c	(a) In every *accessible sole-occupancy unit* provided with *sanitary compartments* within the *accessible sole-occupancy unit*, not less than 1; and (b) at each bank of *sanitary compartments* containing male and female *sanitary compartments* provided in common areas, not less than 1.
Class 5, 6, 7, 8 or 9 — except for within a *ward area* of a Class 9a *health-care building*	Where F2.3 requires closet pans— (a) 1 on every *storey* containing *sanitary compartments*; and (b) where a *storey* has more than 1 bank of *sanitary compartments* containing male and female *sanitary compartments*, at not less than 50% of those banks.
Class 10a except— (a) a Class 10a appurtenant to another Class of building; and (b) a *sanitary compartment* dedicated to a single caravan/camping site	At each bank of *sanitary compartments* containing male and female *sanitary compartments*, not less than 1.

Table F2.4(b) Accessible unisex showers

Class of building	Minimum accessible unisex showers to be provided
Class 1b	(a) Not less than 1; and (b) where private *accessible* unisex showers are provided for every *accessible* bedroom, common *accessible* unisex showers need not be provided.
Class 2	Where showers are provided in common areas, not less than 1.
Class 3 and Class 9c	(a) In every *accessible sole-occupancy unit* provided with showers within the *accessible sole-occupancy unit*, not less than 1; and (b) 1 for every 10 showers or part thereof provided in common areas.
Class 5, 6, 7, 8 or 9 — except for within a *ward area* of a Class 9a *health-care building*	Where F2.3 requires 1 or more showers, not less than 1 for every 10 showers or part thereof.
Class 10a except— (a) a Class 10a appurtenant to another Class of building; and (b) a *sanitary compartment* dedicated to a single caravan/camping site	Where showers are provided, 1 for every 10 showers or part thereof.

GF31.2.5 **NF2.5 Construction of sanitary compartments**

(a) Partitions: Other than in any early childhood centre, sanitary compartments must have doors and partitions that separate adjacent compartments and extend:

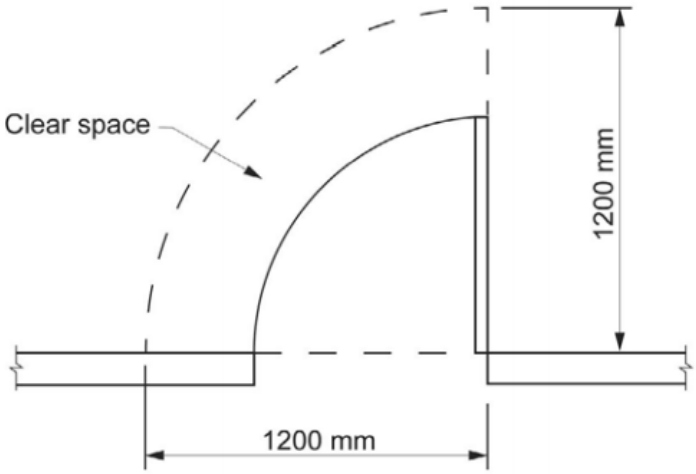
(i) from floor level to the ceiling in the case of a unisex facility; or
(ii) to a height of not less than 1500 mm above the floor if primary school children are the principal users, or 1800 mm above the floor in all other cases.

(b) Facilities for people with disabilities: The construction and layout of sanitary compartments for use by people with disabilities must comply with AS 1428.1 or NZS 4121.

(c) The door to a fully enclosed sanitary compartment must—
(i) open outwards; or
(ii) slide; or
(iii) be readily removable from the outside of the sanitary compartment, unless there is a clear space of at least 1.2 m, measured in accordance with Figure NF2.5, between the closet pan within the sanitary compartment and the doorway.

(d) In an early childhood centre, facilities for use by children must have each sanitary compartment 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.

Figure F2.5 Construction of sanitary compartments



GF31.2.6 **Interpretation: Urinals and washbasins**

(a) A urinal may be either:
(i) an individual stall or wall hung urinal;
(ii) each 600 mm length of a continuous urinal trough; or
(iii) a closet pan used in place of a urinal.

(b) A washbasin may be either:
(i) an individual basin; or
(ii) a part of a hand wash trough served by a single water tap.

GF31.2.7 **Microbial (legionella) control**

Hot water, warm water and cooling water systems in a building other than a system serving only a single sole-occupancy unit in a Class 2 or 3 building or Class 4 part of a building must be installed in accordance with AS/NZS 3666.1

GF31.2.8 **Waste management**

(a) In a Class 9a health-care building, at least one slop-hopper or other device, other than a water closet pan or urinal, must be provided— (i) on any storey containing ward areas or bedrooms to facilitate emptying of containers of sewage or dirty water; and (ii) with a flushing apparatus, tap and grating.
(b) In a Class 9c building, the following facilities must be provided for every 60 beds or part thereof on each storey containing resident use areas— (i) one slop-hopper or other device other than a water closet pan or urinal for the safe handling and disposal of liquid and solid wastes with a flushing apparatus, tap and grating; and (ii) an appliance for the disinfection of pans or an adequate means to dispose of receptacles.

GF31.3 Room Sizes

GF31.3.1 **Height of rooms**

Minimum heights below the ceiling and any framing excluding minor projections such as cornices, are:

(a) Class 2, or 3 buildings, or Class 4 parts:
  (i) *habitable room*: 2.4 m
  (ii) laundry or the like: 2.1 m; and
  (iii) corridor or passageway: 2.1 m.
(b) Class 5, 6, 7 and 8 buildings:
  (i) areas other than in (b)(ii): 2.4 m; and
  (ii) corridor, passageway, or the like: 2.1 m.
(c) Class 9a building:
  (i) ward area: 2.4 m
  (ii) operating theatre or delivery room: 3.0 m; and
  (iii) treatment room, clinic, waiting room, passageway, corridor, or the like: 2.4 m.
(d) Class 9b buildings:
  (i) school classroom or other assembly building or part that accommodates not more than 100 persons: 2.4 m; and
  (ii) theatre, public hall or other assembly building or part that accommodates more than 100 persons: 3.0 m.
(e) Class 9c building—
  (i) a kitchen, laundry, or the like — 2.1 m; and
  (ii) a corridor, passageway or the like — 2.4 m; and
  (iii) a habitable room excluding a kitchen — 2.4 m; and
(f) in any building—Ancillary and other spaces:

(i) a bathroom, shower room, sanitary compartment, airlock, tea preparation room, pantry, store room, garage, car parking area, or the like — 2.1 m; and
(ii) commercial kitchen — 2.4 m; and
(iii) above a stairway, ramp, landing or the like — 2 m measured vertically above the nosing line of stairway treads or the floor surface of the ramp, landing or the like.

GF31.3.2 Reduced height permissible

These heights may be reduced if the reduction does not unduly interfere with the proper functioning of the room in:

(a) attic rooms
(b) rooms with a sloping ceiling or projection below ceiling line; or
(c) other rooms or spaces.

GF31.3.3 Ceiling fans

Ceiling fans and other such appliances must be at a minimum vertical clearance of 2.1 m.

GF31.3.4 Size of rooms

In Class 2, 3 or Class 4 parts, *habitable rooms* excluding kitchens must have a minimum *floor area* of 6m^2. The size of a toilet must be not less than 1.5m x 0.75 m and of a shower cubicle, 0.74 m x 0.74 m.

GF31.4 Light and Ventilation

GF31.4.1 Provision of Natural Light

Natural lighting must be provided in:

(a) Class 2 buildings and Class 4 parts: to all *habitable* rooms
(b) Class 3 buildings: to all bedrooms and dormitories.
(c) Class 9a and 9c buildings: to all rooms used for sleeping purposes.
(d) Class 9b buildings: to all general-purpose classrooms in primary or secondary schools and all playrooms or the like for the use of children in an early childhood centre.

GF31.4.2 Methods and extent of natural lighting

Direct natural lighting must be provided by windows that:

(a) have an aggregate light transmitting area measured excluding framing members, glazing bars or other obstructions of not less than 10% of the *floor area* of the room;
(b) face:
  (i) a court or other space open to the sky; or
  (ii) an open veranda, open carport, or the like;

(c) are not less than a horizontal distance from any adjoining allotment, or a wall of the same building or another building on the allotment that they face, that is the 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 or 9c building: 3 m; and
  (iii) 50% of the square root of the height of the wall in which the window is located, measured in metres from its sill.
(d) In a Class 9c aged care building, a required window must be transparent and located— (i) in an external wall with the window sill not more than 1 m above the floor level;
(e) In a Class 9b early childhood centre, the sills of 50% of windows in children's rooms must be located not more than 500 mm above the floor level.

GF31.4.3 **Natural light borrowed from adjoining room**

Natural lighting to a room in a Class 2 or 4 building, or in a sole-occupancy unit of a Class 3 building may come through a glazed panel or opening from an adjoining room (including an enclosed veranda) if:

(a) in a Class 2 or 3 building or Class 4 part, both rooms are within the same sole-occupancy unit or the enclosed veranda is on common property;
(b) 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; and
(c) the adjoining room has windows with an aggregate light transmitting area of not less than 10% of the combined floor areas of both rooms.

The areas specified in (b) and (c) may be reduced as appropriate if direct natural light is provided from another source.

GF31.4.4 **Artificial lighting**

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; and
(b) if natural lighting of a standard equivalent to that required by Section NF4.2 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, in:
  (i) Class 4 parts: to sanitary compartments, bathrooms, shower rooms, airlocks and laundries;
  (ii) Class 2 buildings: to sanitary compartments, bathrooms, shower rooms, airlocks, laundries, common stairways and other spaces used in common by the occupants of the building; and
  (iii) Class 3, 5, 6 7 8 and 9 buildings: to all rooms that are frequently occupied and all corridors, lobbies, internal stairways, other circulation spaces and paths of egress.

GF31.4.5 **Ventilation of rooms**

(a) A *habitable* room, office, shop, factory, workroom, sanitary compartment, bathroom, shower room, laundry and any other room occupied by a person for any purpose must have adequate flow through or cross ventilation and air quality, including sufficient air changes and fresh air quantities.
(b) Provision of either:
    (i) natural ventilation complying with Section GF31.4.6; or
    (ii) a mechanical ventilation or air conditioning system complying with AS 1668.2, with provision for natural ventilation to Section GF31.4.6 for use in case of a lengthy failure of the mechanical system, satisfies (a).

    Where the required ventilation relies on mechanical or air-conditioning systems, *habitable* rooms, offices, shops, factories, workrooms or commercial laundries must have alternate natural ventilation for use in case of a lengthy failure of the mechanical system. The extent of natural ventilation available must be not less than 25% of that required under Section GF31.4.6. Otherwise the mechanical system must have a complete standby system including for power generation.

GF31.4.6 **Natural ventilation**

Required natural ventilation must be provided by permanent windows, openings, doors or other devices:

(a) with an aggregate opening or openable size not less than 10% of the *floor area* of the room required to be ventilated; and
(b) which open to:
    (i) a court, or space open to the sky; or
    (ii) an open verandah, open carport, or the like.

GF31.4.7 **Ventilation borrowed from adjoining room**

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, and:

(a) in a Class 2 building, a sole-occupancy unit of a Class 3 building or a Class 4 part of a building:
    (i) the room to be ventilated is not a sanitary compartment;
    (ii) ventilation is not borrowed from a kitchen to another *habitable room*;
    (iii) 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; and
    (iv) 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;
(b) in a Class 5, 6, 7, 8 or 9 building:
    (i) 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; and

(ii) 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; and

(c) the ventilating areas specified in (a) and (b) may be reduced as appropriate if direct natural ventilation is provided from another source.

GF31.4.8 Restriction on position of WCs and urinals

A room containing a closet pan or urinal must not open directly into:

(a) a kitchen or pantry
(b) a public dining room or restaurant
(c) a dormitory in a Class 3 building
(d) a room used for public assembly; or
(e) a workplace normally occupied by more than one person.

GF31.4.9 Airlocks

If a room containing a closet pan or urinal is prohibited under Section GF31.4.8 from opening directly to 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; and
(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.

GF31.4.10 Sub-floor ventilation

(a) Suitable provision must be made to prevent undue deterioration of the lowest floor of a building because of dampness, other conditions on the allotment or the design of the building.
(b) The following would satisfy the requirements of (a):
  (i) where timber is used, the floor framing must be suspended with an absolute minimum of 250 mm and an average minimum of 400 mm clearance from the ground underneath to the floor and the immediate surrounds of the building. The average clearance must be determined as the average of the clearances at the corners of a 3 m square grid covering the building. Subfloor ventilation must be provided with ventilation openings totalling not less than 3% of the peripheral vertical area between the ground and the boundary of the floor. These openings are to be spaced uniformly and at not more than 1.8 m apart.
  (ii) where other than timber is used:

- subfloor ventilation must be provided if the floor is suspended;
- an impervious cover provided over the ground surface beneath the building; or
- the floor members suitably treated.

GF31.4.11 **Public carparks**

Every storey of a *public carpark* must have:

(a) a mechanical ventilation system complying with AS 1668.2; or
(b) a suitable system of permanent natural ventilation in accordance with AS 1668:4.

GF31.4.12 **Uncovered space for Class 4 parts**

Class 4 parts of buildings must have sole access to a space open to the sky of 20 m^2 minimum area. Of this 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.

GF31.4.13 **Ventilation of Specialised Areas**

Where the building contains areas or rooms that are not covered elsewhere in this Section, systems shall be provided in compliance with AS 1668:2. This includes (but is not limited to) areas such as commercial kitchens, rubbish rooms, cleaner's cupboards, and healthcare rooms.

GF31.5 Water Supply Plumbing

GF31.5.1 **General requirements**

Water supply plumbing must ensure:

(j) the appropriateness of the materials and products used;
(k) the correct sizing of water services for the intended use;
(l) the control of cross contamination and prevention of backflow;
(m) adequate care in the installation of the services;
(n) suitable provision of main and subsidiary storage as required to ensure water is available;
(o) adequate connections to sanitary fixtures without endangering health and hygiene; and
(p) the installation of hot water systems to provide safe and adequate service;
(q) protect uses from illness, injury or loss due to failure of water supply system
(r) Minimise water and energy use where possible and safeguard the environment

GF31.5.2 **Means of compliance**

The requirements of GF31.5.1 are satisfied if all plumbing for water supply is carried out to the relevant provisions of:

(a) AS/NZS 3500.1 – for cold water services
(b) AS/NZS 3500.4 – for heated water services
(c) AS/NZS 4020 – Testing of products in contact with drinking water

GF31.5.3 **Pipes which are not easy to access**

Particular attention is drawn to the provisions in AS/NZS 3500.1 and AS/NZS 3500.4 which prohibit the installation of pipes and fittings of certain materials in locations which are concealed or difficult to access. These include pipes made of ABS, galvanised steel, polybutylene and UPVC.

Pipes and fittings made of copper, copper alloy, stainless steel, ductile iron, cast iron and polyethylene when used in concealed or difficult to access locations must follow the special precautions specified in AS/NZS 3500.1 and AS/NZS 3500.4 .

GF31.5.4 **Installation of domestic type water heaters**

(a) A household water heater which is installed in a building must:
  (i) be supported on construction sufficient to carry its full capacity weight and any possible wind;
  (ii) be positioned to enable adequate access for operation, maintenance and removal; and
  (iii) suitably provide for any overflow, especially if installed in a concealed location.

(b) AS/NZS 3500.4 is the relevant standard for the installation of a household water heater.
Solar thermal systems shall comply with AS/NZS 2712 and shall be sufficiently braced against any applicable wind loadings. Consideration of additional gravity loads due to solar thermal systems shall be given during the structural design of the building.

GF31.5.5 **Rainwater harvesting and storage**

Where rainwater from roof run-off is a source of supply, the rainwater harvesting and storage system shall be designed and installed in accordance with the latest rainwater harvesting and storage guidance from the Government of Tuvalu.

This shall include but not be limited to:

(f) Capacity – The system shall be of sufficient capacity to provide a reliability of supply with a failure rate not less than that stipulated in current Government guidance and not less than a 5-year ARI drought. Sizing shall consider the local rainfall variability, roof catchment area, collection efficiency, anticipated daily water consumption, and storage volume.

(g) Materials – All materials (including roof, flashings, coatings, guttering, pipe and tank/ storage materials) shall be suitable for use in contact with drinking water (compliant with AS/NZS 4020) and minimise the risk of contaminants leaching into the water supply.

(h) Monitoring and maintenance – The system shall be designed such that it can be safely operated and maintained by the user, including but not limited to safe access to roof, gutters, pipework and tank to enable regular monitoring, cleaning and maintenance.

(i) Contamination prevention – As far as reasonably practicable, the location, design, installation and maintenance the system shall minimise opportunity for

atmospheric contaminants, dust, organic and animal matter, and vermin to fall on, accumulate and/or enter the water supply system, giving consideration to opportunities such as:
- first-flush systems
- screening and vermin proofing of water tank inlets and openings
- the optimal location of the building
- utilisation of safe roof materials.
- provisions to facilitate regular and safe roof and gutter maintenance.

(j) Drainage – Overflow pipes shall be fitted to tanks for the disposal of excess inflow of rainwater and must be directed to a suitable location such that performance requirements for site drainage are complied with.

The Government of Tuvalu guidance on rainwater harvesting and storage can be obtained from Tuvalu Sustainable & Integrated Water & Sanitation Policy 2012-2021 (PRIF).

GF31.6 Sanitary Plumbing and Drainage

GF31.6.1 General requirements

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; and
(d) that foul gases are not allowed to produce unhygienic conditions or any nuisance to anyone.

GF31.6.2 Means of compliance

The requirements of GF31.6.1 are satisfied if all sanitary plumbing and drainage works are carried out to the relevant provisions of AS 3500 - Part 2: Sanitary plumbing and sanitary drainage and all works comply with relevant legislation.

GF31.6.3 Certain floors to be drained

In a Class 2, 3 or 4 Part building the floor of each bathroom and laundry in a *sole-occupancy unit* which is located at other than the lowest level must be graded to permit drainage to a floor waste gully.

GF31.6.4 Grease trap

Where the nature of the occupancy is such that the wastewater contains grease, fats or oils to levels unacceptable to the Authority having jurisdiction, a suitable grease trap must be installed. The accumulated grease and oils must be removed at intervals sufficient to prevent their escape into the disposal system. After removal the grease and oils must be suitably disposed of. Where required, grease traps shall be compliant with the requirements of the Public Health Act.

GF31.6.5 Trade wastes

Any trade waste generated on site which unacceptable to the Authority having jurisdiction must be pre-treated before it enters the disposal system.

GF31.6.6 **Onsite sanitation/ wastewater treatment systems**

Where there is no connection to a utility sewer network. A onsite sanitation/ wastewater treatment system must be in accordance with AS/NZS 1546.1, AS/NZS 1546.2, AS/NZS 1546.3 or AS/NZS 1547 as appropriate, and the latest guidance from the Government of Tuvalu.

This shall include, but not be limited to:

(f) Type/ technology – The type of onsite sanitation/ wastewater treatment system shall comply with the latest relevant Government guidance.

(g) Capacity – The system, including any disposal pits, effluent soakaway and the like, shall be of sufficient capacity to safely and adequately treat and dispose of the anticipated sanitary loading with an acceptable frequency of maintenance and sludge disposal in accordance with the latest Government guidance. Consideration shall be given to the local ground and subsoil groundwater conditions of the site.

(h) Monitoring and maintenance – The system shall be designed such that it can be safely operated and maintained by the user, including but not limited to safe access to pipework, chambers and pits for maintenance and sludge disposal.

(i) Precautions – As far as reasonably practicable, the location, design, installation and maintenance of the system shall minimise the risk of pollution, disease transmission and public nuisance, ensuring:
- disease transmitting flies and other insects do not have access to the excreta
- there is no visual or odour nuisance to the public or the neighbours
- sub-soil water is not polluted if it is likely to be used for domestic purposes
- the biological oxygen demand (BOD) of any resulting effluent is limited to the requirements of the Government of Tuvalu so that streams, rivers and oceans are not polluted.
- latrines are screened from public view and are adequately separated from dwellings, neighbouring properties, street boundaries in accordance with the latest relevant Government guidance.
- effluent disposal is adequately separated from wells or other sources of potable water, streams, lagoons, or other water bodies or sensitive environmental receptors in accordance with the latest relevant Government guidance.

(j) Water efficiency – all latrines and onsite sanitation/ wastewater treatment systems shall achieve the water efficiency requirements set out in the latest relevant Government guidance in order to minimise water required for flushing and disposal.

The Government of Tuvalu guidance on Onsite sanitation/ wastewater treatment system scan be obtained from Tuvalu Sustainable & Integrated Water & Sanitation Policy 2012-2021 (PRIF).

GF31.7 Roof Drainage

GF31.7.1 General Requirements

Gutters and downpipes shall be provided and must have sufficient capacity to reasonably prevent the ingress of rainwater into the building.

The peak intensities of rainfall that the gutters and associated downpipes must be able to handle are as follows:

(a) Eaves gutters: a 20-year return intensity of 115 mm/hr

(b) Box and valley gutters: a 100-year return intensity of 150 mm/hr

(c) Gutters and downpipes for temporary buildings: a 5-year return intensity of rainfall of 85 mm/hr.

Eaves gutters other than for temporary buildings must have a designed freeboard of 25 mm and box gutters, 35 mm.

GF31.7.2 Means of compliance

The requirements of Section GF31.7.1 are satisfied if the requirements of AS/NZS 3500.3 are met. Specification GF32.1 gives some guidance on these requirements.

GF32 SPECIFICATIONS

GF32.1 SIZING OF GUTTERS AND DOWNPIPES

GF32.1.1 Design Criteria

The design of a roof drainage system is based on the following factors:

(a) Rainfall intensity and risk of flooding
(b) Catchment area of roof
(c) Gutter efficiency
(d) Spacing of downpipes.

GF32.1.2 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 overflowing the catchment system. Peak intensities for Tuvalu are as follows:

(a) 5-year return period: 90 mm/hr
(b) 20-year return period: 120 mm/hr
(c) 100-year return period : 160 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.

GF32.1.3 **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).

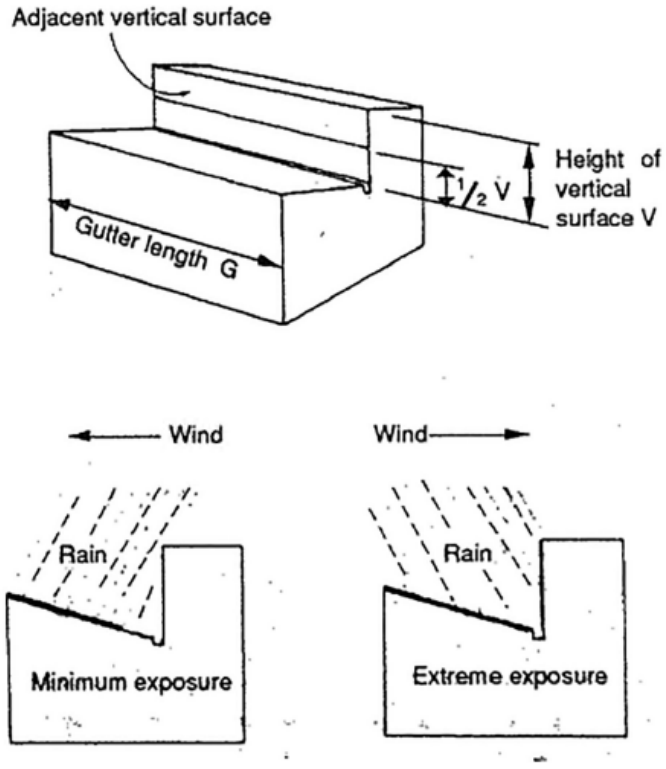


FIGURE 2.1 - EFFECT OF VERTICAL SURFACE ON CATCHMENT

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).

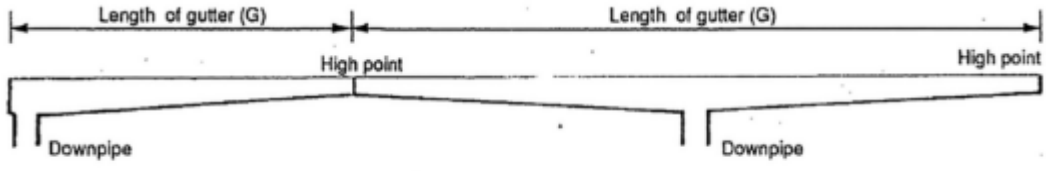


FIGURE 2.2 - MEASURING GUTTER LENGTH

GF32.1.4 **Eaves Gutter**

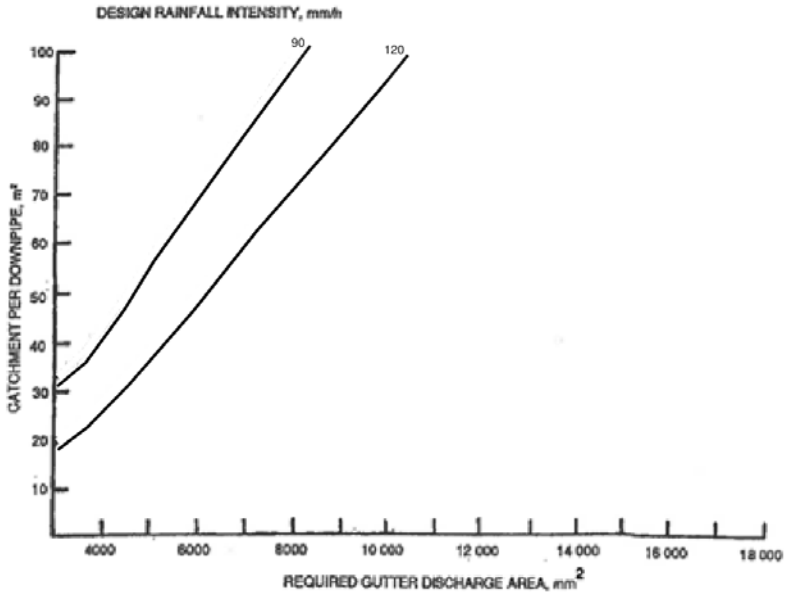
The procedure for the design of eaves gutters is as follows:

Size of eaves gutter

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 120 mm/hr intensity line in Figure 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 downpipes 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% of the gutter discharge area.

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.

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.

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.

GF32.1.5 **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, fixed 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.

Size of box gutter

Space the downpipes suitably and calculate the catchment area per downpipe. From Figure 4.1.1 using the calculated catchment area and 100 mm/hr rain intensity, determine the design flow for the gutter and the downpipe.

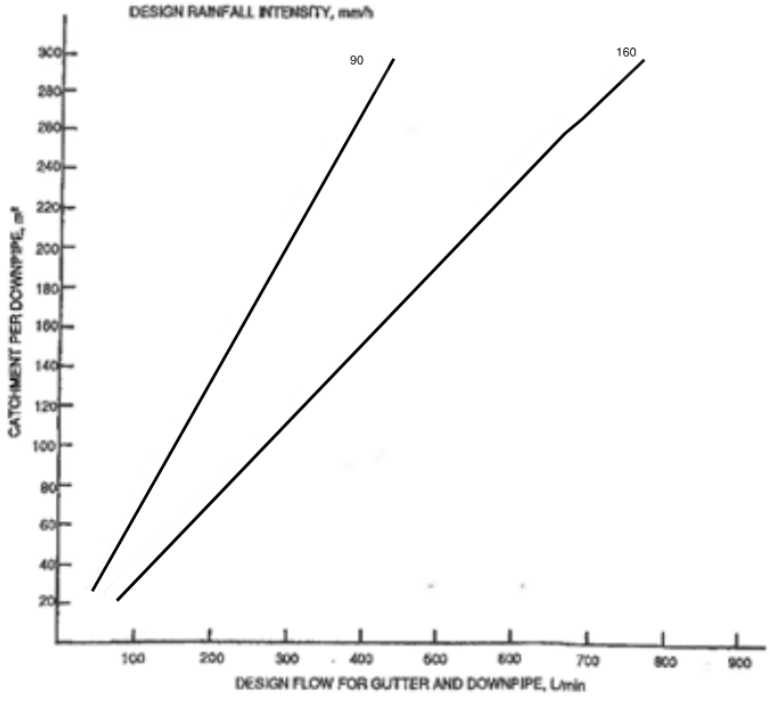


FIGURE 4.1.1 INTERNAL BOX GUTTER DESIGN FLOW

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 in Figure 4.1.3 and read off the depth adjusted for slope against the appropriate slope line. The minimum depth must be 80 mm.

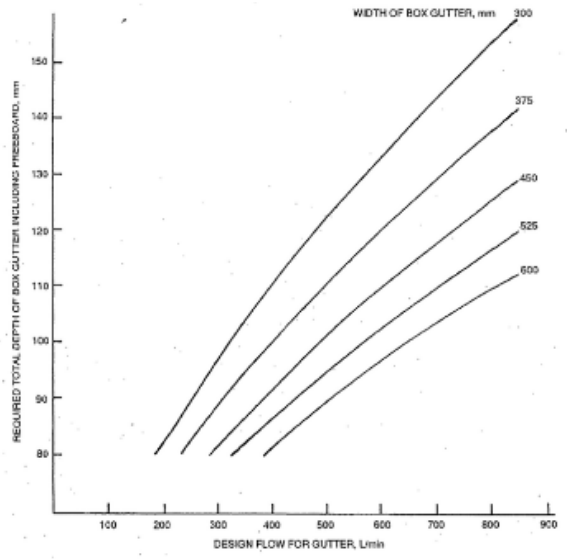


FIGURE 4.1.2 - REQUIRED DEPTH OF BOX GUTTER FOR DESIGN FLOW

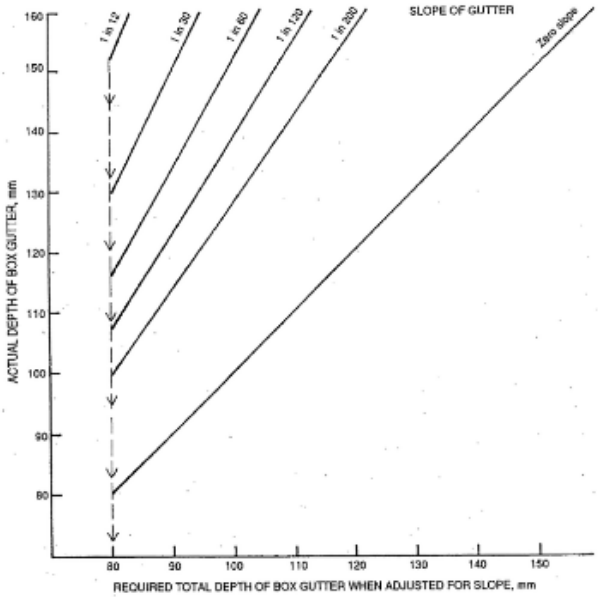


FIGURE 4.1.3 - BOX GUTTER DEPTH - ADJUSTED FOR SLOPE

Size of downpipe

The size of the downpipe can be determined from Figure 4.2 by reading against the design flow and the actual depth of the gutter determined from using Figure 4.1.3. The downpipes can be round or rectangular.

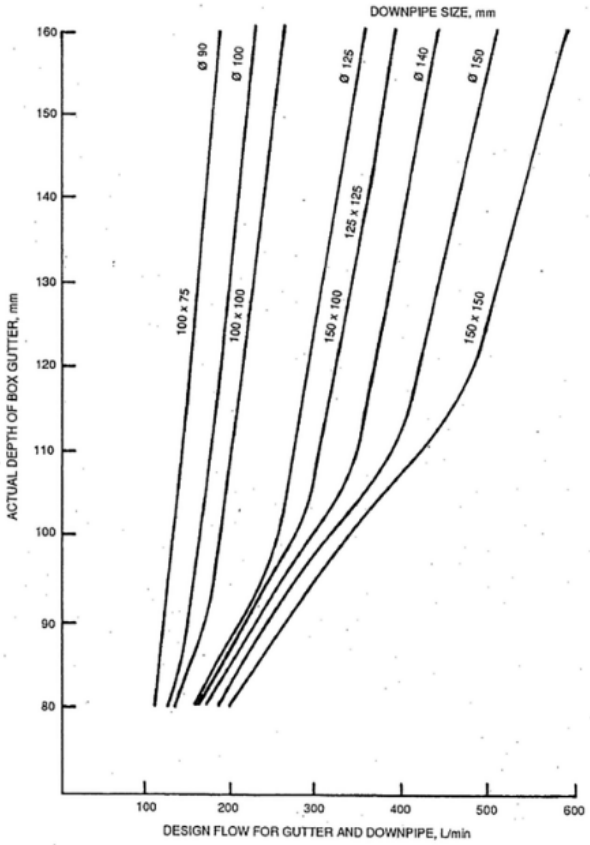


FIGURE 4.2 - REQUIRED SIZE OF DOWNPIPE FOR BOX GUTTER (RAINHEAD AND SUMP NOT CONSIDERED)

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% of the total cross-sectional area of the gutter that is an overflow area of 0.15 dw (see Figure 4.3.1).

FIGURE 4.3.1 - OVERFLOW OUTLET

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 and if it is the same width as the gutter, the depth of the gutter will have to be further increased by an amount equal to h in order to accommodate the flow of water in an overflow situation (see Figure 4.3.2).

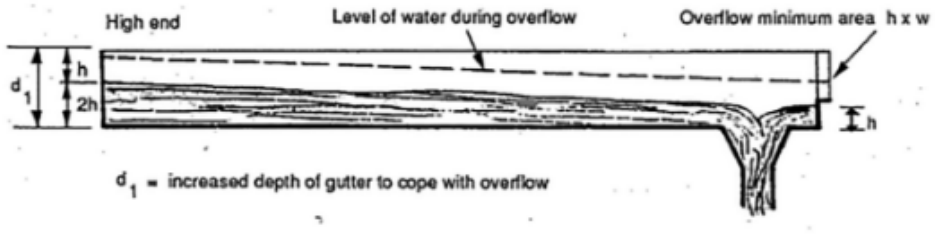


FIGURE 4.3.2 - OVERFLOW WITH BLOCKED DOWNPIPE

The slope factor must not be taken into account when determining the new depth for the gutter and 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.

GF32.1.6 Rainheads and Sumps

Rainheads

A 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 a 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. Rainheads should be designed to AS/NZS 3500.3

Sumps

Where a sump is fitted to the sole of a gutter it provides a local reservoir and the additional head increases the flow through the downpipe. Sumps should be designed to AS/NZS 3500.

GF32.1.7 Downpipes

Location

Downpipes should be located externally where possible. 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.

Swirl

The performance of an outlet with the head of water more than 1/3 of its diameter will be reduced if 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 or the sump.

Gratings

Where a grating or strainer is fitted 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.

GF32.1.8 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, which should also be considered.

GF32.1.9 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

GF32.1.10 Stormwater
General

Where a downpipe discharges into a stormwater gully it must terminate below the gully grating, and where the connection is made directly to a stormwater pipe underground, the internal diameter of the underground pipe must be equal to or 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 to allow access and maintenance of the system. 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 120 for concrete kerb channels.

Pipe sizes

Table 9.2 indicates 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 Table is for a rainfall intensity of 80 mm/hr. For other rainfall intensities, the horizontal area to be drained must be proportionally adjusted by multiplying the area by 80 and dividing by the required rainfall intensity. The proportionally adjusted area can be used in the Table to determine the pipe size.

TABLE 9.2

STORMWATER DRAIN SIZES TO TAKE FLOW FROM DOWNPIPES AND PAVEMENTS

Diameter of Pipe (mm)	Maximum horizontal projected areas (m2) that can be drained at various gradients when			
	1 in 50	1 in 100	1 in 150	1 in 200
100	320	210	180	160
150	860	600	500	370
200	1800	1300	1100	900
250	3400	2300	1800	1600
300	5300	3700	3100	2700
375	9600	6700	5500	4500
450	12,600	10,000	8100	6600

SECTION GG – ANCILLARY PROVISIONS

THIS SECTION APPLIES TO PUBLIC BUILDINGS AND GROUP DWELLINGS (Class 2 TO 9)

Performance Requirements

Deemed to Satisfy Provisions

GG1 Minor Structures and Components

GG2 Gas Appliances, Fireplaces, Chimneys and Flues

GG3 Atrium Construction

PERFORMANCE REQUIREMENTS

DEEMED-TO-SATISFY PROVISIONS

GG1 Minor Structures and Components

GG1.1 Swimming pools

GG1.2 Refrigerated chambers, strong rooms and vaults

GG1.3 Parapets on flat roofs

GG1.4 Projections over public places

GG1.5 Moveable awnings or sunshades over public places

GG1.6 Fences

GG1.7 Poultry and other domestic animal houses

GG2 Gas Appliances, Fireplaces, Chimneys and Flues

GG2.1 General requirements

GG2.2 Open fireplaces

GG2.3 Incinerator rooms

GG3 Atrium Construction

A33 PERFORMACE REQUIREMENTS

A1.42 OBJECTIVES

This Section contains more specific requirements for particular parts of buildings or structures.

Parts of buildings and structures must be so designed and constructed that the following requirements in addition to those listed for Sections B, GC, ND, NE and NF where relevant, are fulfilled.

A1.43 REQUIRED PERFORMANCE

GD1.43.1 Minor structures and components
GD1.43.2 Refrigerated chambers, strong rooms and vaults:

Refrigerated or cooling chambers, strong rooms and vaults, or the like, which are capable of entry by a person must have adequate safety measures to facilitate escape and for alerting persons outside the chamber or vault in the event of an emergency.

GD1.43.3 Safety at elevated places

Elevated places with regular access such as some flat roofs must have adequate protection to prevent anyone from falling.

GD1.43.4 Use of the air space over public places

The use of the air space over public places such as footpaths and roads is prohibited. All buildings must be limited to ensure that normal public use of such places is not obstructed.

If you propose to use the air space over public places this will require a technical justification to be processed and where over the road corridor will require approval from the Director of Works/Commissioner of Police, on Funauti and Pule Kaupule on outer islands.

GD1.43.5 Aesthetics

Any minor structure such as fencing, awnings and such must be suited to the general surroundings and the occupancy of the buildings and the neighbourhood.

GD1.43.6 Animal houses

Accommodation for animals and poultry must not lead to unsanitary conditions for the occupier or neighbours and the public including contamination of waterways. The accommodation must be such that the animals or poultry are not subjected to serious discomfort or overcrowding.

GD1.43.7 Gas appliances, fireplaces, chimneys and lues

Gas appliances, fireplaces, chimneys and flues must be adequately constructed or separated to prevent:

(a) ignition of nearby parts of the building; or

(b) escape or discharge of smoke to the inside of the building or to adjacent windows, ventilation inlets, or the like.

Pressure vessels located in a building are to be installed in a manner which will provide adequate safety for occupants. When located in a building, a pressure vessel must be installed to avoid the likelihood of:

(a) leakage from the vessel which could cause damage to the building; and
(b) rupture or other mechanical damage of the vessel which could cause damage to the building or injury to occupants.

GD1.43.8 Atrium construction

The construction of an *atrium* must not unduly increase the danger to occupants from fire or smoke.

A34 DEEMED-TO-SATISFY PROVISIONS

A1.44 Minor Structures and Components

GD1.44.1 Refrigerated chambers, strong rooms and vaults

(a) A refrigerated or cooling chamber which is of sufficient size for a person to enter must:
  (i) 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; and
  (ii) at all times, be able to be opened from inside without a key.
(b) A strong room or a vault in a building must have:
  (i) internal lighting controllable only from within the room; and
  (ii) a pilot light located outside the room but controllable only by the switch for the internal lighting.
(c) A refrigerated or cooling chamber, strong room or vault must have a suitable alarm device located outside but controllable only from within the chamber, room or vault.

GD1.44.2 Parapets on flat roofs

Where a flat roof or other elevated place has regular access, a parapet or balustrade of not less than 1 m height above the surface of the roof or elevated place must be provided. The width of any opening in the parapet or balustrade must not exceed 100 mm.

GD1.44.3 Projections over public places

Buildings must not project beyond the allotment boundary and are subject to building setbacks from the boundary. Architectural features such as eaves, cornices, clocks, lamps, ventilating equipment, trade signs, hoardings, flag poles, bay or oriel windows and such like, as well as a platform or balcony to provide additional means of egress from an existing building may not project over public footpaths or roads without the approval of the Director of Works/Commissioner of Police on Funauti and Pule Kaupule on outer islands.

Architectural features such as eaves, cornices, clocks, lamps, ventilating equipment, trade signs, hoardings, flag poles, bay or oriel windows and such like, as well as a 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 existing or intended finished level of footpaths; and
(b) The outer extremity of the feature must be set back 300 mm from the existing or intended kerb.

Any drainage from such architectural features (including drainage from air conditioning and other ventilation equipment) must be suitably taken down to a drain with downpipes which must also satisfy the required clearances.

GD1.44.4 Moveable awnings or sunshades over public places

Any moveable awnings or sunshades must be firmly fixed so that they do not create any danger obstruction or inconvenience to pedestrians and other users of the public place. Where proposed to be located on public footpaths or roads approval of the Road Manager is required. They must provide the following minimum clearances if they project over public places:

(a) 2.3 m above the finished levels of the footpath; and
(b) their outer extremity must be set back 750 mm from the kerb.

GD1.44.5 Fences

Any fencing or free-standing wall must be suited to the occupancy of the building within. It must not detract from the general aesthetic appearance of the surroundings. If any barbed wire or other such is used, it must be at a height of not less than 2 m above the finished level of any existing or intended adjacent footpath.

GD1.44.6 Poultry and other domestic animal houses

A building used for keeping domestic birds or animals must be not less than:

(a) 15 m from any source of potable water; and
(b) 12 m from any Class 1 building; and
(c) 10 m from any boundary adjoining a public road or other public space; and
(d) 20 m from the boundary adjoining an allotment containing or intended to contain any building other than a Class 1 building; and
(e) 5 metres from the top of the bank of any watercourse (whether permanent or intermittently flowing.

The floor of the building must be constructed of suitable material. Suitable arrangements must be made for the collection and disposal of animal wastes, so that they do not create a nuisance or encourage the breeding of flies and other pests. The size and general arrangements in the building must be conducive to the welfare of the poultry or animals.

A1.45 Gas Appliances, Fireplaces, Chimneys and Flues

GD1.45.1 Chimney or flue

A chimney or flue must be constructed:

(a) to withstand the temperatures 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) discharge in a position that will cause fire to spread to nearby combustible materials or allow smoke to penetrate through nearby windows, ventilation inlets, or the like;
(d) in such a manner as to prevent rainwater penetrating to any part of the interior of the building;
(e) such that its termination is not less than:
  (i) 600 mm above any point of penetration of or contact with the roof; and
  (ii) 900 mm above any opening or openable part in any building, within 3 m horizontal distance of the chimney or flue; and
(f) so that it is accessible for cleaning.

GD1.45.2 Open fireplaces

An open fireplace, or solid fuel burning 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; and
  (iv) 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 155 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; and
  (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 90 mm; and

(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; and

(d) suitable damp-proof courses or flashings to maintain weatherproofing.

GD1.45.3 Incinerator rooms

(a) If an incinerator is installed in a building any hopper giving access to a charging chute must be:
  (i) *non-combustible*;
  (ii) gas-tight when closed;
  (iii) designed to automatically return to the closed position after use;
  (iv) not attached to a chute that connects directly to a flue unless the hopper is located in the open air; and
  (v) not located in a required exit.

(b) If an incinerator is in a separate room, that room must be separated from other parts of the building by construction with a FRL of not less than 60/60/60.

GD1.45.4 Gas Appliances

(d) Gas appliances must be located outside the external walls of any buildings or structures;

(e) Installation of gas appliances must comply with AS/NZS 5601.1; and

(f) Storage and handling of LPG cylinders must comply with AS/NZS 1596 and its amendments.

A1.46 Atrium Construction

GD1.46.1 Application of Part
GD1.46.2 This Part 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 a FPAA101D or FPAA101H system) complying with Specification NES1.6; and
  (ii) one of those storeys is situated at a level at which there is direct egress to a road or open space.

GD1.46.3 Dimensions of atrium well

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.

GD1.46.4 Separation of atrium by bounding walls

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; and

(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 Table GC2.2.

GD1.46.5 Construction of bounding walls

Bounding walls must:

(a) have an FRL of not less than 60/60/60, and:
  (i) extend from the floor of the storey to the underside of the floor next above or to the underside of the roof; and
  (ii) have any door openings protected with self-closing or automatic –/60/30 fire doors; or

(b) 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 complying with Specification GCS3.4; and
  (ii) the walls and doors protected with wall-wetting systems in accordance with Specification NGS3.8; and
  (iii) a fire barrier with an FRL of not less than –/60/30 installed in any ceiling spaces above the wall.

GD1.46.6 Construction at balconies

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.

GD1.46.7 Separation at roof

In an *atrium*:

(a) the roof must have the FRL prescribed in Table 3 of Specification GCS1.1; or

(b) the roof structure and membrane must be protected by a sprinkler system (other than a FPAA101D or FPAA101H system) complying with Specification NES1.6.

GD1.46.8 Means of egress

All areas within an *atrium* must have access to at least 2 exits.

GD1.46.9 Fire and smoke control systems

Sprinkler systems, smoke control, fire detection and alarm systems, and emergency warning and intercom systems must be installed in compliance with Specification NGS3.8.

A35 SPECIFICATIONS

A1.47 Fire and smoke control systems in buildings containing atriums

GD1.47.1 Scope

This Specification sets out the requirements for the design and operation of systems of fire and smoke control in buildings containing an *atrium*.

GD1.47.2 Automatic fire sprinkler system
GD1.47.3 General requirement

A sprinkler system (other than a FPAA101D or FPAA101H system) complying with Specification NES1.6 must be installed in every building containing an atrium, except where varied or superseded by this Specification.

GD1.47.4 Roof protection

A roof of an *atrium* which does not have the FRL prescribed in Specification GCS1.1 or the Deemed-to-Satisfy Provisions of Section GC2 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.

GD1.47.5 Atrium floor protection

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*; and
(b) sprinkler heads of the fast response type.

GD1.47.6 Sprinkler systems to glazed walls
GD1.47.7 Location of protection

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 *atrium* well—to all glazing forming part of the bounding wall at each storey.

GD1.47.8 Sprinkler head location

Sprinklers must be located in positions allowing full wetting of the glazing surfaces without wetting adjacent sprinkler heads.

GD1.47.9 Head rating and response time

Sprinkler heads must be of the fast response type and have a maximum temperature rating of 74°C.

GD1.47.10 Water discharge rate

The rate of water discharge to protect glazing must be not 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; and
(b) on the side away from the *atrium* well: 0.167 L/s.m^2.

GD1.47.11 Water supply

In addition to that of the basic sprinkler protection for the building, 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 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*; and
(b) Where the walls are set back 3.5 m or more from the *atrium* well — wetting of a part not less than 12 m long on one storey.

GD1.47.12 Stop valves

(a) Basic sprinkler and wall wetting systems protecting a building containing an *atrium* must be provided with easily accessible and identified stop valves.
(b) Sprinkler and wall wetting systems must be provided with independent stop valves.
(c) Sprinkler heads protecting the roof of the *atrium* must be provided with a stop valve.
(d) Stop valve to wall wetting and roof sprinklers may be of the gate type.
(e) All sprinkler and wall wetting stop valves must be monitored to detect unauthorised closure.

A1.48 Smoke control system

GD1.48.1 General requirements

Except where varied or superseded by this Specification, mechanical air-handling systems in a building containing an *atrium* must comply with AS 1668.1.

GD1.48.2 Operation of atrium mechanical air-handling systems

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; and
(b) smoke exhaust fans serving the *atrium* are only activated when smoke enters the *atrium*; and
(c) central plant systems do not use the *atrium* as a return air path; and
(d) central plant systems which use return air paths remote from the *atrium*:
    (i) cycle to the full outside air mode; and
    (ii) stop supply air to the fire affected storey or fire compartment; and
    (iii) 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%; and
    (iv) continue to supply air to fire compartments or storeys other than the fire affected storey or fire compartment, and
(e) fans performing relief or exhaust duty from the atrium stop normal operation; and
(f) floor by floor, or unitary, air-handling plant serving a single fire compartment or storey:
    (i) ceases normal operation in the fire affected storey or fire compartment; and
    (ii) commences full relief or exhaust from that fire affected storey or fire compartment; and
    (iii) continue to supply air to fire compartments or storeys other than the fire affected storey or fire compartment.

GD1.48.3 Activation of smoke control system

(a) The smoke control system must be activated by:
    (i) operation of an automatic fire alarm; or
    (ii) operation of the sprinkler system; or
    (iii) a manual start switch.
(b) All controls for the smoke control system must be located:
    (i) in the fire control room; or
    (ii) in the emergency control centre, (if any); or
    (iii) adjacent to the sprinkler control valves; or
    (iv) incorporated in the Fire Indicator Panel.

GD1.48.4 Smoke exhaust system

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*; and

(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

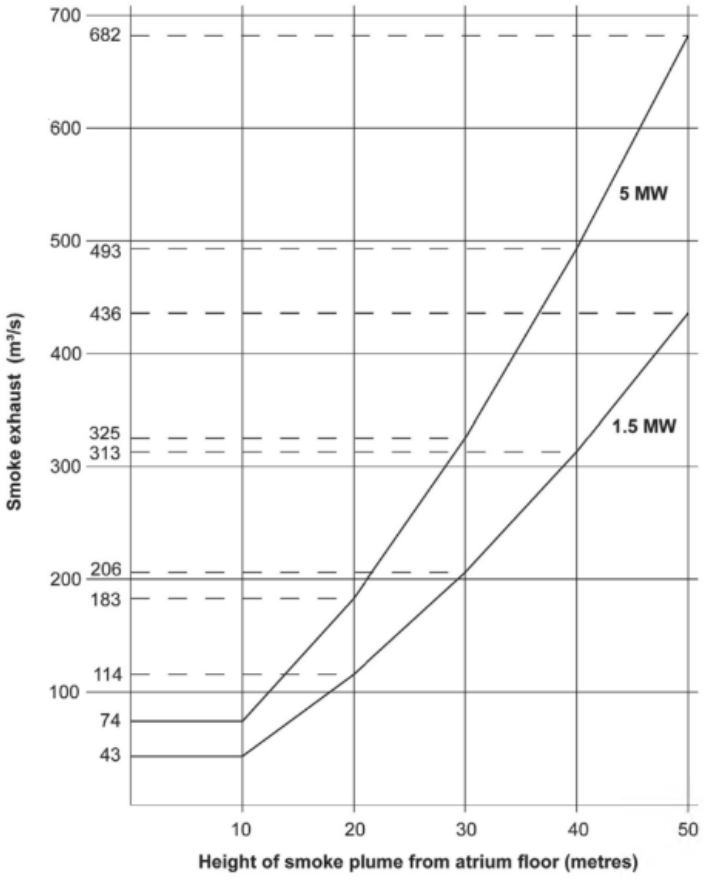
(ii) 20 m above the floor of an *atrium* or the floor of the highest storey where the bounding construction is set back more than 3.5 m from the *atrium* well if a Class 6, 7 or 8 part of the building is open to the *atrium*; and

(c) the smoke exhaust system discharging smoke at a rate of not less than that shown in Figure 3.4 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 3.4 Smoke exhaust rate



GD1.48.5 Upward air velocity

Notwithstanding 3.4(c), 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*; and
(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.

GD1.48.6 Exhaust fans

(a) 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.
(b) 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.
(c) *Atriums* other than those referred to in (b) must be provided with a minimum of 2 fans each capable of 50% of the total required smoke exhaust capacity.

GD1.48.7 Smoke and heat vents

Notwithstanding Clause 3.6, automatic vents complying with AS 2665 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; and
(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.

GD1.48.8 Make-up air supply

(a) Uniformly distributed make-up air must be provided to the atrium exhaust system from:
  (i) outside the atrium at or near the lowest storey level; and
  (ii) relief air from non-fire storeys.
(b) 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.
(c) The requirements of (a)(i) 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:
  (i) openings directly from the outside air to the atrium and located as close as practicable to the lowest level of the atrium; or
  (ii) 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

(iii) a combination of (i) and (ii).

A1.49 Fire detection and alarm system

GD1.49.1 General requirements

Except where superseded by this Specification, automatic fire detection and alarm systems in a building containing an *atrium* must comply with AS 1670.1.

GD1.49.2 Smoke detection system

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; and
(b) must operate at an obscuration level not greater than 0.5% per metre with compensation for external airborne contamination as necessary; and
(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; and
(d) must be calibrated to compensate for smoke dilution where sampling occurs within return air path common to more than one room; and
(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; and
    (ii) arranged to scan at 90 degrees orientation to adjacent beam units.

GD1.49.3 Smoke detection in spaces separated from the atrium by bounding walls

Smoke detection systems must be located at all return and relief air openings associated with the building air-handling systems and be:

(a) of the sampling type system as required in 4.2; or
(b) of the point type photoelectric smoke detector.

GD1.49.4 Alarm systems

(a) A break-glass fire alarm point must be provided at each door to a fire-isolated stairway, fire-isolated ramp, or fire-isolated passageway.
(b) A staged alarm must be provided where an air sampling type smoke detection system is provided for the *atrium*, and must operate as follows:
    (i) Alert building management when abnormal smoke levels of 0.03% obscuration per metre are detected.
    (ii) 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.
    (iii) 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.

(c) 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.

A1.50 Emergency warning and intercom systems

All buildings containing an *atrium* must be provided with an emergency warning and intercom system which:

(a) complies with AS 1670.4; and
(b) incorporates visual warning devices that:
  (i) operate upon the evacuation signal; and
  (ii) display the words “EVACUATE” in red with letters conforming with the requirements of the Deemed-to-Satisfy Provisions of Section NE4 for exit signs.

A1.51 Standby power system

(a) 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.
(b) The alternative power supply must:
  (i) be connected automatically if the normal power supply fails; and
  (ii) 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; and
  (iii) be connected to the safety systems by means of cabling ~~complying with C2.13(c)(iii) and (iv)~~ that:
    - have a classification in accordance with AS/NZS 3013 of not less than: WS53W if located in a position that could be subject to damage by motor vehicles or WS52W for otherwise; or
    - be enclosed or otherwise protected by construction having an FRL of not less than 120/120/120.
(c) The requirements of (a) are satisfied by:
  (i) 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
  (ii) two or more medium voltage supplies each taking electricity from separate electricity substations situated:
    - outside the building concerned; and
    - at a suitable distance from each other; or
  (iii) a single medium voltage supply taken from an electricity substation together with an electricity generating plant capable of:
    - generating a medium voltage supply; and
    - starting and taking the required electrical load within a period of not more than 30 seconds from the time of normal supply failure.

A1.52 System for excluding smoke from fire-isolated exits

Required fire-isolated exits in a building containing an *atrium* must be protected from the entry of smoke in accordance with Section NE.

SECTION GH – SPECIAL USE BUILDINGS

THIS SECTION APPLIES TO PUBLIC BUILDINGS (Class 2 TO 9)

Performance Requirements

Deemed to Satisfy Provisions

GH1 Theatres, Stages and Public Halls

GH2 Public Transport Buildings

GH3 Farm Buildings and Farm Sheds

Specifications

PERFORMANCE REQUIREMENTS

DEEMED-TO-SATISFY PROVISIONS

GH1 Theatres, Stages and Public Halls

GH1.1 Application of Part

GH1.2 Separation and smoke control

GH1.3 Proscenium wall construction

GH1.4 Seating area

GH1.5 Exits from theatre stages

GH1.6 Access to platforms and lofts

GH2 Public Transport Buildings

GH2.1 Application of Part

GH2.2 Accessways

GH2.3 Ramps

GH2.4 Handrails and grabrails

GH2.5 Doorways and doors

GH2.6 Lifts

GH2.7 Stairways

GH2.8 Unisex accessible toilet

GH2.9 Location of accessible toilets

GH2.10 Symbols and signs

GH2.11 Tactile ground surface indicators

GH2.12 Lighting

GH2.13 Hearing augmentation

GH2.14 Emergency warning systems

GH2.15 Controls

GH3 Farm Buildings and Farm Sheds

GH3.1 Application of Part

GH3.2 Fire resistance and separation

GH3.3 Provision for escape

GH3.4 Construction of exits

GH3.5 Fixed platforms, walkways, stairways and ladders

GH3.6 Thresholds

GH3.7 Swinging doors

GH3.8 Firefighting equipment

GH3.9 Fire hydrants and water supplies

GH3.10 Fire hose reels

GH3.11 Portable fire extinguishers

GH3.12 Emergency lighting requirements

GH3.13 Exit signs

GH3.14 Direction signs

GH3.15 Design and operation of exit signs

GH3.16 Sanitary facilities

GH3.17 Height of rooms and other spaces

GH3.18 Artificial lighting

Specifications

GHS1.2 Construction of Theatres with Proscenium Walls

A36 PERFORMACE REQUIREMENTS

A1.53 OBJECTIVES

This Section contains more specific requirements for particular special-use buildings.

Special-use buildings must be so designed and constructed that the following objectives, in addition to those listed for Sections B, GC, GD, GE, and GF where relevant, are fulfilled.

A1.54 REQUIRED PERFORMANCE

GD1.54.1 Theatres, Stages and Public Halls

The audience seating area and egress routes of a Class 9b building used as a theatre, public hall, or the like, must be protected against fire and smoke from any fire occurring on stage, in backstage areas, or in a rigging loft.

GD1.54.2 Public Transport Buildings

The deemed-to-satisfy provisions for public transport buildings in this part are in addition to those listed in Sections B, GC, GD, GE, and GF.

GD1.54.3 Farm Buildings and Farm Sheds

Farm buildings and *farm sheds* must be protected against fire and smoke from any fire occurring.

A37 DEEMED-TO-SATISFY PROVISIONS

A1.55 Theatres, Stages and Public Halls

GD1.55.1 Application of Part

This Part applies to every enclosed Class 9b building which:

(a) has a stage and any backstage area with a total floor area of more than 200 m^2; or
(b) has a stage with an associated rigging loft.

GD1.55.2 Separation and smoke control

The design of smoke control systems for theatres and public halls must fulfil up to date fire engineering principles and practices.

A theatre, public hall or the like must:

(a) have a smoke control system in accordance with AS 1668.1 where relevant; or
(b) have the stage, backstage area and accessible under-stage area, separated from the audience by a proscenium wall and have a mechanical exhaust system, both in accordance with Specification NHS1.2.

GD1.55.3 Proscenium wall construction

A proscenium wall and mechanical exhaust system required by Section NH1.2(b) must comply with Specification NHS1.2.

GD1.55.4 Seating area

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 3º;
  (ii) it has a riser height not more than 600 mm; and
  (iii) the height of any opening in the riser is not more than 100 mm;
(b) if an aisle divides the stepped floor and the difference in level between any 2 consecutive steps:
  (i) exceeds 230 mm but not 400 mm: an intermediate step must be provided in the aisle;
  (ii) exceeds 400 mm: 2 equally spaced steps must be provided in the aisle; and
  (iii) the going of intermediate steps must be not less than 270 mm and such as to provide as nearly as practicable equal treads throughout the length of the aisle; and
(c) the clearance between rows of fixed seats used for viewing performing arts, sport or recreational activities must be not less than:

(i) 300 mm if the distance to an aisle is not more than 3.5 m; or
(ii) 500 mm if the distance to an aisle is more than 3.5 m.

GD1.55.5 Exits from theatre stages

(a) The path of travel to an exit from a stage or performing area must not pass through the proscenium wall if the stage area is separated from the audience area with a proscenium wall.
(b) Required exits from backstage and under-stage areas must be independent of those provided for the audience area.

GD1.55.6 Access to platforms and lofts

A stairway that provides access to a service platform, rigging loft, or the like, must comply with AS 1657.

A1.56 Public Transport Buildings

GD1.56.1 Application of Part

This part applies to the passenger use areas of a Class 9b or Class 10 building used for public transport.

GD1.56.2 Accessways

(a) An *accessway* must comply with AS 1428.2
(b) If an *accessway* branches into 2 or more parallel tracks:
  (i) the ends of each track must be on the main pedestrian traffic routes; and
  (ii) the parallel tracks must have equal convenience and be located as close as practicable to the main pedestrian branch.
(c) The minimum unobstructed width of an *accessway* must be 1.2 m, except that:
  (i) the minimum unobstructed width of a moving walkway forming part of an *accessway* may be not less than 850 mm; and
  (ii) the minimum unobstructed width of a doorway in an *accessway* may be not less than 850 mm.
(d) Poles, columns, stanchions, bollards and fixtures must not project into an *accessway*.
(e) Obstacles that abut an *accessway* must have a *luminance contrast* with a background of not less than 30%.
(f) Manoeuvring areas that allow a 180-degree wheelchair turn must comply with clause 6.2 of AS 1428.2.
(g) A passing area must be provided at least every 6 m along any two-way *accessway* that is less than 1800 mm wide.
(h) Ground and floor surfaces must comply with clause 9 of AS 1428.2 and AS 1428.1. Supplement 1 provides criteria for the selection of floor surfaces.

GD1.56.3 Ramps

A ramp forming part of an *accessway* must comply with clause 8 of AS 1428.2.

GD1.56.4 Handrails and grabrails

(a) A handrail must comply with clause 10.1 of AS 1428.2.
(b) Handrails must be placed along an *accessway* wherever passengers are likely to require additional support or passive guidance.
(c) A grabrail must comply with clause 10.2 of AS 1428.2.
(d) A grabrail or handrail must be provided at fixed locations where passengers are required to pay fares.

GD1.56.5 Doorways and doors

Doorways and doors must comply with clause 11 (except clause 11.5.2) of AS 1428.2.

GD1.56.6 Lifts

Lift facilities must comply with AS 1735.12.

GD1.56.7 Stairways

Stairs must comply with:

(a) clause 9.1 of AS 1428.1, including the notes; and
(b) clause 9.2 of AS 1428.1; and
(c) clause 13.2, 13.3 and Figures 8 and 9 of AS 1428.2.

GD1.56.8 Unisex accessible toilet

If toilets are provided, there must be at least one unisex *accessible* toilet without an airlock that complies with AS 1428.1 clause 10, sanitary facilities.

GD1.56.9 Location of accessible toilets

Accessible toilets must be in the same location as other toilets.

GD1.56.10 Symbols and signs

(a) The international symbols for *accessibility* and deafness in accordance with clauses 14.2 and 14.3 of AS 1428.1 must be used to identify an *accessway* and which facilities and boarding points are *accessible*.
(b) Signs must be placed in accordance with clause 17.4 of AS 1428.2.
(c) The size of accessibility symbols must comply with Table 1 of AS 1428.2.
(d) The symbol for accessibility must incorporate directional arrows and words or, if possible, pictograms, to show passengers the way to *accessible* facilities such as toilets.
(e) Signs must comply with clause 17.1 and Figure 30 of AS 1428.2.
(f) If a sign incorporates raised lettering or symbols, they must be at least 0.8 mm above the surface of the sign.
(g) If an operator or provider supplements a notice with braille characters, they must be placed to the left of the raised characters.

GD1.56.11 Tactile ground surface indicators

Tactile ground surface indicators must be installed in accordance with AS 1428.4.1 and AS 1428.4.2 on an accessway and must indicate changes of direction in accordance with clause 18.1 of AS 1428.2.

GD1.56.12 Lighting

Any lighting provided must comply with minimum levels of maintenance illumination for various situations shown in the notes to clause 19.1 of AS 1428.2.

GD1.56.13 Hearing augmentation

If a public address system is installed, it must comply with clause 21.1 of AS 1428.2.

GD1.56.14 Emergency warning systems

(a) If an emergency warning system is installed, it must comply with clause 18.2.1, 18.2.2 and 18.2.3 of AS 1428.2.
(b) In the event of an emergency, provision must be made for people with vision impairment to locate the exit path.

GD1.56.15 Controls

Controls must comply with clause 11 of AS 1428.1.

A1.57 Farm Buildings and Farm Sheds

GD1.57.1 Application of Part

(a) This part applies to *farm buildings* and *farm sheds*.
(b) The deemed-to-satisfy provisions of this part take precedence where there is a difference to the deemed-to-satisfy provisions of Section GG or GF.

GD1.57.2 Fire resistance and separation

A *farm shed* must be separated from any other building or allotment boundary by a distance of not less than 6 m.

GD1.57.3 Provision for escape

(a) Except for Section ND1.2, ND1.4 to ND1.6, ND1.9, ND1.10(a), ND1.13(c), ND1.14 and ND1.15, the Deemed-to-Satisfy Provisions of ND1 do not apply to a *farm shed*.
(b) An *open space* adjacent to a *farm building* or a *farm shed* need not be directly connected with a public road.

GD1.57.4 Construction of exits

Except for Sections ND2.13, ND2.14, D2.16 and D2.17 ~~and D2.24,~~ the Deemed-to-Satisfy Provisions of Section ND2 do not apply to a *farm shed*.

GD1.57.5 Fixed platforms, walkways, stairways and ladders

A fixed platform, stairway, ladder and any going and riser, landing, handrail or barrier may comply with AS 1657 in lieu of D2.13, D2.14, D2.16 and D2.17 where it serves a farm building or a farm shed.

GD1.57.6 Thresholds

The threshold of a doorway that serves an area not *required* to be *accessible* by Sections ND3.1 and ND3.2 in a farm building need not comply with Section ND2.15 where the door sill is not more than 700 mm above the finished surface of the ground, floor or the like, to which the doorway opens.

GD1.57.7 Swinging doors

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*.

GD1.57.8 Firefighting equipment

The Deemed-to-Satisfy Provisions of Section GE1 do not apply to a *farm shed*.

GD1.57.9 Fire hydrants and water supplies

(a) A farm building:
  (i) with a total floor area greater than 500 m^2; and
  (ii) 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:
  (iii) provided with a fire hydrant system installed in accordance with AS 2419.1, except reference to '4 hours' water supply in clause 4.2 is replaced with '2 hours'; or
  (iv) located on the same allotment as an access point to a water supply which:
    - has a minimum total capacity of 144000 litres; and
    - is situated so as to enable emergency services vehicles access to within 4 m; and
    - is located within 60 m of the building and not more than 90 m from any part of the building.

(b) For the purposes of (a)(iv), water supply for a farm building must consist of one or any number of the following:
  (i) A water storage tank.
  (ii) A dam.
  (iii) A reservoir.
  (iv) A river.
  (v) A lake.
  (vi) A bore.
  (vii) A sea.

(c) If the whole or part of the water supply referred to in (a)(iv) is contained in a water storage tank, it must be:
  (i) located not less than 10 m from the building; and
  (ii) fitted with at least one small bore suction connection and one large bore suction connection where:
    - each suction connection is located in a position so as to enable emergency service vehicles access to within 4 m; and

- the suction connections are located not less than 10 m from the building; and
- ‘small bore suction connection’ and ‘large bore suction connection’ have the meanings contained in AS 2419.1.

GD1.57.10 Fire hose reels

A fire hose reel system need not be provided to serve a farm building where portable fire extinguishers are installed in accordance with Section NH3.11.

GD1.57.11 Portable fire extinguishers

(a) A *farm building* not provided with a fire hose reel system in accordance with Section NE1.5 must be provided with:
  (i) one portable fire extinguisher rated at not less than 5ABE in each room containing flammable materials or electrical equipment; and
  (ii) one portable fire extinguisher rated at not less than 4A60BE adjacent to every required exit door; and
  (iii) location signs complying with clauses 3.3 to 3.9 of AS 2444 above each required portable fire extinguisher.

(b) 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.

(c) A portable fire extinguisher required by (b) must be:
  (i) of ABE type; and
  (ii) not less than 4.5 kg in size; and
  (iii) installed in accordance with Section 3 of AS 2444.

GD1.57.12 Emergency lighting requirements

(a) An emergency lighting system need not be installed in a *farm building*:
  (i) with no artificial lighting as permitted by Section NH3.18; or
  (ii) with artificial lighting where, if that lighting fails due to an emergency, automatic power supply to the building is provided by a fuel-driven generator.

(b) An emergency lighting system need not be installed in a *farm shed*.

GD1.57.13 Exit signs

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.

GD1.57.14 Direction signs

In a *farm building* or a *farm shed*, if an exit is not readily apparent to persons occupying or visiting the building, exit signs complying with Section NH3.15 must be installed in appropriate positions in corridors, hallways, lobbies, and the like, indicating the direction to a required exit.

GD1.57.15 Design and operation of exit signs

(a) In a *farm building*, each required exit sign provided under Section NE4.5 and Section NH3.14 need not comply with Section NE4.8 if:
    (i) the use of illuminated exit signs may adversely impact the behaviour or welfare of animals being kept in the building; and
    (ii) non-illuminated exit signs are installed in accordance with the requirements of Appendix D of AS/NZS 2293.1 as for an externally illuminated exit sign, and clauses 5.6 and 5.8 of AS/NZS 2293.1.
(b) In a *farm shed*, each required exit sign provided under Section NE4.5 and Section NH3.14 need not comply with Section NE4.8 if:
    (i) non-illuminated exit signs are installed in accordance with the requirements of Appendix D of AS/NZS 2293.1 as for an externally illuminated exit sign, and clauses 5.6 and 5.8 of AS/NZS 2293.1; and
    (ii) the maximum viewing distance in clause 5.6 of AS/NZS 2293.1 is not more than 24 m.

GD1.57.16 NH3.16 Sanitary facilities

Section NF2.3 does not apply to a *farm shed*.

GD1.57.17 Height of rooms and other spaces

Section NF3.1 does not apply to a *farm shed* which has ceiling heights not less than:

(a) in a room, corridor, passageway or the like: 2.1 m; and
(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; and
(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.

GD1.57.18 Artificial lighting

(a) An artificial lighting system need not be provided in a *farm building* where:
    (i) occupants are provided with visibility sufficient for safe movement through suitable alternative means; and
    (ii) the use of artificial lighting could adversely affect the function of the building including, but not limited to:
        - the behaviour or welfare of animals being kept in the building; or
        - the cultivating or propagating of plants or fungi.
(b) An artificial lighting system need not be provided in a *farm shed*.

A38 SPECIFICATIONS

A1.58 CONSTRUCTION OF THEATRES WITH PROSCENIUM WALLS

GD1.58.1 Scope

This Specification contains the requirements for the construction of proscenium walls and mechanical ventilation for theatres, public halls, or the like.

GD1.58.2 Separation of stage areas, etc.

(a) Dressing rooms, scene docks, property rooms, workshops, associated storerooms and other ancillary areas must be:
  (i) located on the stage side of the proscenium wall; and
  (ii) separated from corridors and the like by construction having a FRL of not less than 60/60/60 and, if of lightweight construction, comply with Specification GCS1.5.

(b) The stage and backstage must be separated from other parts of the building, other than the audience seating area, by construction having a FRL of not less than 60/60/60 and if of lightweight construction, comply with Specification GCS1.5.

(c) Any doorway in the construction referred to in paragraphs (a) and (b) must be protected by a -/60/30 self-closing fire door.

GD1.58.3 Proscenium wall construction

A proscenium wall must:

(a) extend to the underside of the roof covering or the underside of the structural floor next above; and

(b) have a FRL of 60/60/60 or more and, if of lightweight construction, comply with Specification GCS1.5.

GD1.58.4 Combustible, materials not to cross proscenium wall

Timber purlins or other *combustible* material must not pass through or cross any proscenium wall.

GD1.58.5 Protection of openings in proscenium wall

Every opening in a proscenium wall must be protected:

(a) at the principal opening, by a curtain in accordance with Clause 6 which is:
  (i) capable of closing the proscenium opening within 35 seconds either by gravity slide or motor-assisted mechanisms;
  (ii) operated by a system of automatic heat-activated devices, manually operated devices or push-button emergency devices; and
  (iii) able to be operated from either the stage side or the audience side of the curtain; and

(b) at any doorway in the wall, by a self-closing - /60/30 fire door.

GD1.58.6 Proscenium curtains

A curtain required by Clause 5 must be:

(a) a fire safety curtain:
  (i) made of *non-combustible* material;
  (ii) capable of withstanding a pressure differential of 0.5 kPa over its entire surface area; and
  (iii) so fitted that, when fully closed, it inhibits the penetration of smoke around the perimeter of the opening from the stage; or
(b) a curtain:
  (i) having a *Spread-of-flame Index* not greater than 0 and a *Smoke-developed Index* not greater than 3; and
  (ii) protected by a deluge system of open sprinklers installed along the full width of the curtain.

GD1.58.7 Mechanical ventilation

Every stage must have a system of mechanical ventilation with sufficient capacity to exhaust an amount of air whichever is the greater of:

(a) 5,000 L/s; or
(b) the sum of:
  (i) 10 L/s.m^2 of the performing area of the stage; and
  (ii) 20 L/s.m^2 of the remaining area of the stage.

Made under my hand this _____ day of July, 2022

_____

HON. TIMI MELEI

Acting Minister for Public Works, Infrastructure, Environment, Labour, Meteorology and Disaster

Published at the Government Notice Board this _____ day of July, 2022 at Funafuti.

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DR. TUFOUA PANAPA

Acting Secretary to Government