

Cook Islands

BUILDING CODE



Cook Islands

BUILDING

CODE



COOK ISLANDS
RAROTONGA 2019



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Preface

This Cook Islands Building Code (CIBC) applies to all buildings in the Cook Islands and is empowered by its enabling legislation. It is accompanied by a Cook Islands Building Manual (CIBM) which contains practical details for some aspects of new structures which, if implemented, will be deemed to comply with the Cook Islands Building Code requirements.

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Both the Cook Islands Building Code and the Cook Islands Building Manual are available via the Infrastructure Cook Islands' website.

A Building Consent or permit is required for all new buildings and significant (as determined by the Building Controller) alterations to existing ones. The application for a Building Consent is to be made to the Building Controller at Infrastructure Cook Islands, who will co-ordinate the responses from related agencies.

These versions of the Cook Islands Building Code and Cook Islands Building Manual incorporate updates in practice and knowledge since the 1990 version. A majority of the Standards referenced are the latest versions of the appropriate New Zealand Standards – reflecting that the major source of materials and specialist skills continues to be New Zealand.

The design wind speeds for buildings of Normal Importance are based on a Category 3 cyclone. Temporary roof tie-down details for cyclones are those currently recommended by the Red Cross, and their recommendations have been adopted. Where a higher Category must be designed for, closer spacing will need to be calculated.

Attention is drawn to a number of land-use planning requirements and considerations – introduced in response to concerns raised in public-consultation sessions.

These include:

- Set-backs from boundaries
- Car-parking
- Access for emergency vehicles
- Minimum building platform heights (mitigation of the risk of future sea-level rise)
- Storm water management
- Earthworks
- Controlled use of native material and so on

The Cook Islands Building Code does not cover the following aspects and structures which are covered by other jurisdictions:

Structures

- Wharves, jetties
- Bridges, large culverts, drainage structures
- Tanks
- Towers – electricity, transmission, communication (including cell-phone), wind turbines
- Fences
- Environmental compliance
- Health & Safety

Acknowledgment

The revision of the Building Code and the Home Building Manual has been carried out under the auspices of Infrastructure Cook Islands (ICI), Minister responsible for Infrastructure Cook Islands, Secretary, Building Controller, senior staff of ICI. The work has been facilitated and Project Managed by several Volunteer Services Abroad (VSA) consultants.

The Wellington, New Zealand, office of BECA International Consultants Ltd as the contractor successful for this project has undertaken the revision of both the Code and the Manual and assisted with the consultation process. Independent consultant Graham Powell of Australia and New Zealand undertook a parallel review of the Act and its Regulations.

The consultation process was strongly supported by all key stakeholders both public and private sector, the communities and their leaders on all the islands in the Pa Enua, and a number of non-government agencies and organisations. The need for a revision was also discussed and supported by Members of the House of Ariki. Both the Cook Islands Building Code and the Cook Islands Building Manual were endorsed by Cabinet and approved for the review of the Building Act 1990.

The Government of the Cook Islands is humbly grateful for the funding of the review provided through Emergency Management Cook Islands by the following donors partners; Secretariat of Pacific Communities, European Union, ACP-EU Building Safety and Resilience in the Pacific.

Meitaki Maata.



Introduction

ABOUT THIS CODE

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

WHAT IS IN THE CODE?

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

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 provide for other suitable action.

The Code covers those aspects of buildings' structure, fire resistance, access and egress, fire-fighting equipment, mechanical ventilation, lift installations, and certain aspects of health and amenity.

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 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, mostly New Zealand Standards have been called up. Detailed specifications have been given where necessary.

PROFESSIONAL CERTIFICATION

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

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

ADMINISTRATIVE ARRANGEMENTS

This Code has been brought into effect by enabling building control legislation which prescribes or “calls up” the technical requirements which have to be satisfied in order to gain approval:

The enabling legislation consists of an Act of Parliament and subordinate legislation. It empowers the Administration to regulate certain aspects of the building process and contains the necessary administrative provisions for the work of the Approval 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 -

- **Plan submission and approval procedures. Issue of building permits.**
- **Inspections during and after construction. Provision of evidentiary certificates.**
- **Issue of certificates of occupancy or compliance.**
- **Accreditation or approval of materials or components.**
- **Review and enforcement of standards.**
- **Fees and charges.**

ADMINISTRATIVE DISCRETION

The Code is drafted with the object 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 an informed judgement is required on the standard which would be suitable in particular circumstances.

Accordingly, in a 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.

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**This section applies
to all *BUILDINGS***

Section A
**GENERAL
PROVISIONS**

A1 INTERPRETATION

A2 ACCEPTANCE OF DESIGN AND CONSTRUCTION

A3 CLASSIFICATION OF BUILDINGS AND STRUCTURES

A4 UNITED BUILDINGS

A5 PLANNING REQUIREMENTS

Section A

—GENERAL PROVISIONS

BUILDING PERMIT PROCESS

In order to construct any building structure in the Cook Islands, you must apply for a Building Permit. This ensures that any development complies with the relevant Cook Islands Building Codes and Regulations to certify that the final building is safe and fit for purpose.

There are three agencies involved in the granting of a Building Permit. These are;

1) National Environment Service (NES)

The National Environment Service ensure that there is no environmental impact of any new building or development. The applicant shall submit an Environmental Significance Declaration outlining the proposed development and detailing any potential environmental impacts.

Once the declaration has been reviewed, and if no environmental concerns have been identified, a permit will be issued. If there are some concerns about the development, some additional information may be required which may include an Environmental Impact Assessment or an Engineering Report.

Refer to <http://environment.gov.ck> for further details and the required forms to be submitted.

Once approval of the building or development has been received from NES, the next stage is to submit an application to the Ministry of Health to review and approve the sanitation and sewage system design.

2) Ministry of Health (MoH)

The Ministry of Health review and approve the design and installation of the sanitation and sewerage systems for a new developments or buildings for Rarotonga and Aitutaki. This includes the proposed sewage treatment and management. The applicant shall submit a sanitation and sewage system appropriate for the development and in compliance with the health, environment and building regulations.

Refer to the below documents for further information on compliance requirements:

- Public Health (Sewage and Wastewater Treatment and Disposal) Regulations 2014
- Public Health Act 2004
- Approved Standards Applicable to the Design and Construction of Sewage Systems, MoH
- Approved Standards and Operating Procedures Applicable to the Operation of Sewage Systems, MoH

Refer to <http://www.health.gov.ck/clientsconsumers/sewage-and-sanitation> for Further details.

Once approval of the sanitation and sewage system design for the building or development has been received from MoH, the next stage is to submit a final application to Infrastructure Cook Islands for final approval that the design complies with the Building Regulations and Cook Islands Building Code.

3) Infrastructure Cook Islands (ICI)

Infrastructure Cook Islands administer the application of the Building Acts and Regulations and the associated Cook Islands Building Code. This includes minimum dimensional requirements and site layouts, structural integrity and safety, disabled access requirements, electrical installation and safety and mechanical ventilation requirements, among other key design aspects.

Refer to the below documents for further information on compliance requirements

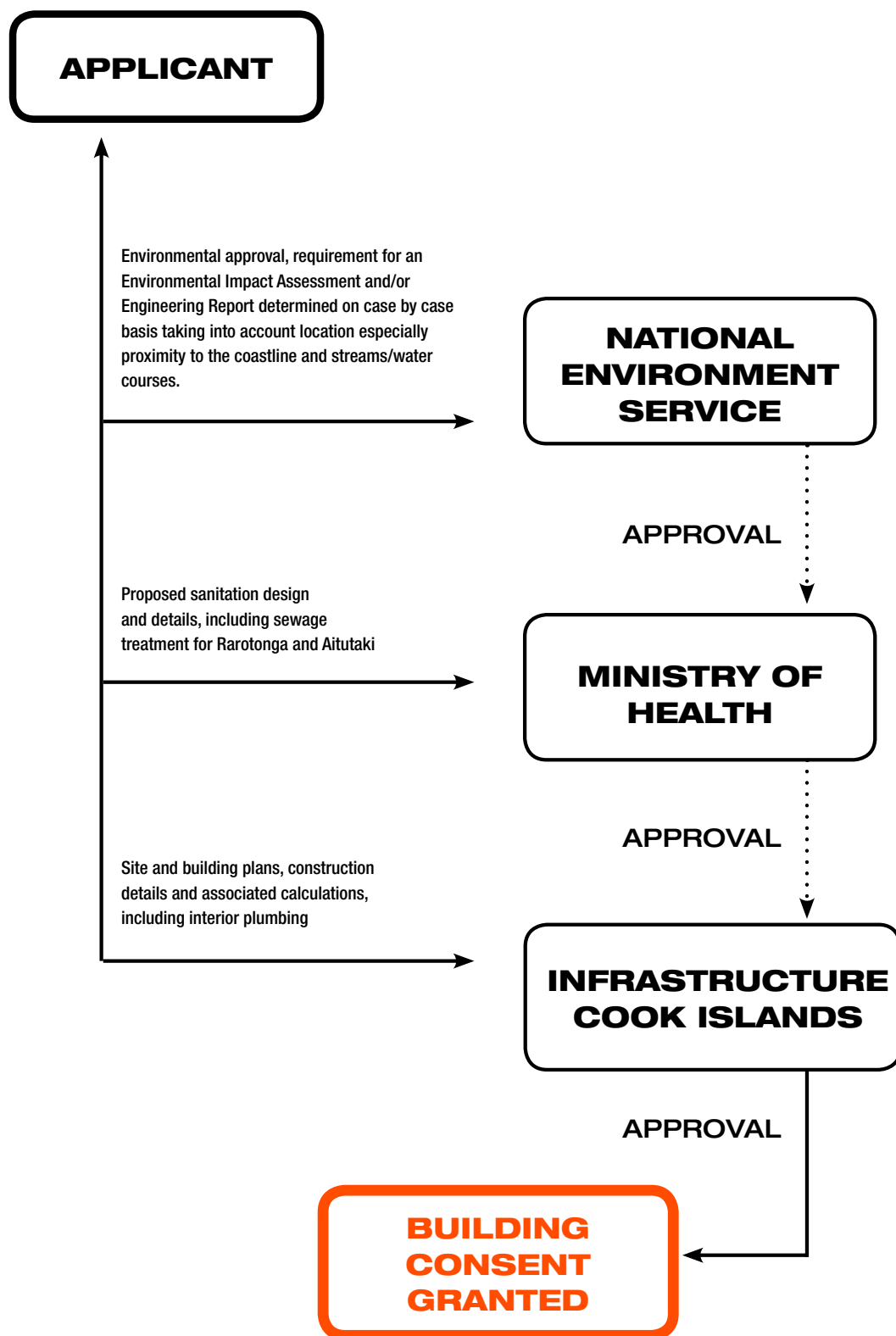
- The Cook Islands Building Code
- The Cook Islands Building Manual (for domestic residential dwellings only).

Refer to www.ici.gov.ck for further information and key forms to be completed.

Once approval has been granted by ICI, a Building Permit will be issued, allowing the applicant to commence with the construction phase of the new building or development.

Note that this is not the end of the regulatory review requirement. Throughout construction, ongoing inspections of the site works will be required by representatives of NES, MoH and ICI. The frequency and extent of these inspections should be discussed and agreed with the three agencies during the application process and should then be coordinated throughout the construction phase.

The flow diagram below provides a high-level overview of the full process.



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:

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

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.

Atrium - a space within a building that connects 2 or more storeys, 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.

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.

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

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

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.

Charged Dry-Riser Main System - one or more riser mains in a building complete with all required fittings, not permanently connected to a fire main. Instead of leaving the system dry, it is charged with water from any convenient domestic supply in order to make it self-monitoring against inadvertently left open hydrant valves and leakage.

Combustible -

- (a) applied to a material - means combustible under AS1530.1
- (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.

Curtain Wall - a non-loadbearing external wall that is not a panel wall.

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

It 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 waste water from branch drains and/or from fixture discharge pipes and conveys them to the sewer.

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.

Emergency Shelter - a building or structure designated as a refuge during severe cyclones and other natural hazards as applicable.

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 horizontal exit.

External Wall - an outer wall of a building which is not a common wall.

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

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-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 plaster 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,

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 A2.3, for:

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

and expressed in that order.

Fire-resisting - applied to a structural member or other part of a building, means having the FRL required for that structural member or other part.

Fire-resisting Construction - one of the Types of construction referred to in Part NC1.

Fire-separated Section - a part of a building which is separated from the remainder by fire walls in accordance with Part NC2 and thereby regarded as a separate building.

Fire-source Feature -

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

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 NC1.1.

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

Flammability Index - the index number determined under AS 1530.2.

Floor Area -

- (a) in relation to a storey - the area of that storey measured over the enclosing walls (if any) and that part of any common wall located within the allotment; and
- (b) 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.

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) a nursing home, hospital, convalescent home, infirmary or similar institution or home for sick or disabled persons needing full-time nursing care; or
- (b) a clinic or day surgery unit where:
 - (i) prescribed surgical procedures are performed on people who do not require overnight care as in-patients in a hospital; and
 - (ii) the surgical procedures include a potential requirement for general anaesthesia, major regional anaesthesia or intravenous sedation.

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 valved 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 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 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.

Lightweight Construction - see Specification NC1.5.

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

Mezzanine Floor - 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.

Non-combustible -

(a) applied to a material - means not combustible except that the material may have a combustible surface finish if the finish is not more than 1 mm thick and the Spread-of-flame index of the assemblage is 0;

(b) applied to construction or part of a building - means constructed of non-combustible material on all exposed faces.

The following materials, though combustible or containing combustible fibres, may be used wherever non-combustible materials are required:

- (i) plasterboard.
- (ii) perforated gypsum lath with a normal paper finish.
- (iii) fibrous plaster sheet conforming to AS 2185.
- (iv) cellulose fibre cement sheeting.
- (v) any other material not less fire-protective than any of the materials from (i) to (iv).

Open-deck Carpark - a carpark in which all parts of the parking storeys are cross-ventilated by permanent unobstructed openings in not fewer than 2 opposite or approximately opposite sides, and:

(a) where each side that provides ventilation is not less than 1/6 of the area of any other side; and

(b) the openings are not less than 1/2 of the wall area of the side concerned.

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

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.

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

Private Garage -

(a) any garage of a Class 1 building; or

(b) any single storey of a building of another Class capable of accommodating not more than 3 vehicles, if there is only one such storey in the building.

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

(a) if legislation so requires, a registered professional consultant in the relevant discipline; or

(b) a Corporate Member of a recognised 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.

REGISTERED TESTING AUTHORITY -

(a) National Building Technology Centre

PO Box 30

CHATSWOOD NSW 2067

AUSTRALIA;

(b) Australasian Certification Authority for Reinforcing and Structural Steel (ACRS)

PO Box 1369

Crows Nest NSW 1585

AUSTRALIA;

(c) Council of Scientific and Industrial Research Organisation; Division of Building Research

PO Box 56

HIGHETT VIC 3190

AUSTRALIA;

(d) An organisation registered by the National Association of Testing Authorities (NATA) to test in the relevant field;

(e) Building Research Association of New Zealand

Private Bag, PORIRUA

NEW ZEALAND;

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

(g) An organisation recognised by NATA or TELARC through a mutual recognition agreement;

(h) Fire Insurers Research and Testing Organisation Melrose Avenue BOREHAMWOOD
LONDON (UK);

(i) National Institute of Standards and Technology, GAITHERSBURG, MD 20899 **USA**;

(j) Underwriters Laboratories Incorporated 333 Pfingsten Road NORTHBROOK, IL 60062 **USA**; or

(k) National Research Council Division of Building Research 75 boul de Mortagne Boucherville Quebec **CANADA**

(l) Alternative testing authorities may be proposed if required. Supporting documentation for any alternative testing authority must be submitted. This must demonstrate capability, testing methodology and accreditation as necessary.

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.

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 NC1.2 at any part of the external walls of the building -

(a) above the finished ground next to that part; or

(b) if 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 Main - a pipe to convey water for fire brigade use to all floors of a building and, where appropriate, to the roof. A riser main system must consist of either a wet-riser main system or a charged-dry-riser main system.

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

Sparking-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.

Service Station - a garage which is not a private garage and is for the servicing of vehicles, other than only for 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.

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 1530.

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.

Spread-of-Flame Index - the index number for spread of flame under AS 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 space that contains only:

- (i) a lift shaft, stairway or meter room;
- (ii) a bathroom, shower room, water closet, or other sanitary compartment; or
- (iii) 3 vehicles or less; or
- (iv) a combination of the above.

(b) a mezzanine floor.

Structural Adequacy - in relation to a FRL means the ability to maintain stability and adequate loadbearing capacity under AS1530.4.

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

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.

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.

Waste Water - dissolved and suspended waterborne waste which may consist of sewage and/or trade waste.

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.

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

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 New Zealand or other body, that 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, Etc.

A reference to a document under A1.2 refers to the latest edition or issue, together with any amendment, listed in Specification A1.3 and only so much as is relevant in the context in which the document is quoted.

A1.4 Differences between referenced documents and this Code

This Code overrules any difference arising between it and any Standard, rule, specification or provision in a document listed in Specification A1.3. Furthermore, 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. 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.

ACCEPTANCE OF DESIGN AND CONSTRUCTION

A2.1 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 Clause A2.3) shall be provided for all materials imported from overseas and shall be provided to the Building Controller on request.

A2.2 Material durability

Building materials, components and construction methods shall be sufficiently durable to ensure that the building, without reconstruction or major renovation, satisfies the other functional requirements of this Code throughout the life of the building (see B1.7 for specific materials, otherwise a minimum of 50 years by default).

In particular:

- (a) all timber imported for structural applications shall be treated to a minimum of H3.2 (as per NZS 3602).
- (b) all non-structural timber shall be treated to a minimum of H1.2 (as per NZS 3602).

A2.3 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 or 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 Association of Australia or Standards New Zealand; or
- (e) any other form of documentary evidence that correctly describes the properties and 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.

A2.4 Fire-resistance of building elements

The FRL of a structural member or other building element must be determined in accordance with Specification A2.3. Any relevant testing or certification must be by an appropriately-qualified professional consultant or Registered Testing Authority.

A2.5 Early Fire Hazard indices

The Early Fire Hazard Indices of a component or assembly must be determined in accordance with Specification A2.4.

The Early Fire Hazard Indices of a component or assembly must be determined in accordance with Specification A2.4.

A2.6 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 the Cook Islands.

The use of locally-grown coconut timber and pine is permitted, provided that it can be shown to meet the requirements set out in Section B –Structure.

CLASSIFICATION OF BUILDINGS AND STRUCTURES

A3.1 Principles of classification

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.

A3.2 Classifications

Buildings are classified as follows:

Class 1: a residence which may comprise one or more buildings including any habitable outbuildings which in association constitute:

- (a) a single dwelling-house; or
- (b) a terrace house, townhouse or the like which may be detached or separated by a common wall; or
- (c) a dwelling-house used as a boarding-house, hostel, or the like, in which not more than 12 persons would ordinarily be resident; or
- (d) a building that does not exceed a rise of 3 storeys and contains:
 - (i) 2 or more sole-occupancy units where no such unit is located one above the other; or
 - (ii) only 2 sole-occupancy units located one above the other, and each unit has direct egress to a road or open space.

Class 2: a building containing 2 or more sole-occupancy units each being a separate dwelling, other than a building of Class 1.

Class 3: a residential building, other than a building of Class 1 or 2, which is a common place of living for a number of unrelated persons, including:

- (a) a boarding-house, guest house, hostel, or lodging-house;
- (b) a residential part of a hotel or motel;
- (c) a residential part of a school;
- (d) accommodation for the aged, disabled or children; and
- (e) a residential part of a health-care building which accommodates members of staff.

Class 4: a dwelling in a building that is Class 5, 6, 7, 8 or 9 if it is the only dwelling in the building.

Class 5: an office building used for professional or commercial purposes, excluding buildings of Classes 6, 7 and 8.

Class 6: a shop or other building for the sale of goods by retail or the supply of services direct to the public, including:

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

Class 7: a building which is -

- (a) for storage, or display of goods or produce for sale by wholesale; or
- (b) a public carpark.

Class 8: a laboratory, or a building in which a handicraft or process for the production, assembling, altering, repairing, packing, finishing, or cleaning of goods or produce is carried on for trade, sale, or gain.

Class 9: a building of a public nature:

- (a) **Class 9a** - a health-care building;
- (b) **Class 9b** - an assembly building; and

Class 9a includes a pathology laboratory in a health-care building, and **Class 9b** includes a trade workshop in a primary or secondary school, but excludes any other part of these buildings that are of another Class.

Class 10: a non-habitable outbuilding or structure:

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

A3.3 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 a 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.

UNITED BUILDINGS

A4.1 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.

A4.2 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.

PLANNING REQUIREMENTS

A5.1 General planning

This Section provides requirements on development planning in relation to building structures and sites.

Evidence of the following aspects of development planning conforming to the minimum standards is to be provided during the building permitting process.

A5.2 Minimum acceptable floor levels

The Building code sets Minimum Acceptable Floor Levels to protect buildings throughout the Cook Islands from the risk of flooding and coastal inundation. New buildings, reconstruction and extending existing buildings will need to comply with the Minimum Acceptable Floor Level requirements. If you wish to propose a different Floor Levels for your building this will require a technical justification to be processed.

Minimum Acceptable Floor Levels have been assessed based on the available information with the addition of a margin known as freeboard. Freeboard is the term given for an allowance in floor levels above the flood level, which allows for inaccuracies in information, construction tolerances, network failures and natural environmental factors such as wave and wind effects. A freeboard of 500mm above the flood level has been adopted for the Cook Islands.

Minimum Acceptable Floor Level

1. This Acceptable Solution is limited to buildings and sitework having a catchment area of no more than 0.25 hectares and which are:

- a)** Free from a history of flooding,
- b)** Not adjacent to a watercourse,
- c)** Not located in the coastal zone,
- d)** Not located in low lying area, and
- e)** Not located in a secondary flow path.

The Minimum Acceptable Floor Level for Suspended floors and slabs on ground shall be at least 150 mm above the finished level of the surrounding ground immediately adjacent to the building, and:

- a)** For sites level with or above the road, no less than 150 mm above the road crown on at least one cross-section through the building and roadway.
- b)** For sites below the road, no less than 150 mm above the lowest point on the site boundary.

2. This Acceptable Solution is to apply in all other situations:

The Minimum Acceptable Floor Level for a building shall be calculated as the highest of the following:

- 500 mm above the flood level predicted to occur in a 1% AEP (1 in 100 year ARI) rainfall event concurrent with a 5% AEP (1 in 20 year ARI) coastal water level event (including 500mm sea level rise above 2018 MSL), as predicted by suitable modelling; or
- 500 mm above the flood level predicted to occur in a 1% AEP (1 in 100-year) coastal water level event (including 500 mm sea level rise above 2018 MSL) concurrent with a 5% AEP (1 in 20-year) rainfall event, as predicted by suitable modelling

It is noted that in all situations boundary fences and other site development must not significantly hamper the flow of surface water from or through the site.

A5.3 Vehicle access provision

Vehicle crossings (driveways and the like) and associated vehicular access is to be designed and located to provide for safe, effective and efficient movement to and from the site and minimise potential conflicts between vehicles, pedestrians, and cyclists on the road network.

The number and size of vehicle accesses is to be minimised to be consistent and suitable for the requirements and proposed use of the building and site.

Vehicle access must not be constructed or provide vehicle access across that part of a site boundary which is located within 10m of any intersection as measured from the property boundary.

A5.4 Parking provision

The provision of off-street parking for vehicles shall be provided during the planning of a new developments and be consistent and suitable for the requirements and proposed use of the building and site. The minimum provisions in Table A5.3 are to be used as a basis for design.

Provision for suitable manoeuvring of vehicles within the site is to be provided to facilitate the provision of parking.

Standard for the provision of parking are available from Infrastructure Cook Islands

TABLE A5.4

BUILDING CLASS	MINIMUM OFF-STREET PARKING PROVIDED
Class 1	1 vehicle parking space per residential unit
Class 2	1 vehicle parking space per residential unit
Class 3	0.5 vehicle parking spaces per residential room
Class 4	1 vehicle parking space per residential unit
Class 5	1 vehicle parking space per 50 m2 of gross floor space
Class 6 a) & b)	1 vehicle parking space per 10 m2 of gross floor space
Class 6 c) & d)	1 vehicle parking space per 25 m2 of gross floor space
Class 7	1 vehicle parking space per 25 m2 of gross floor space
Class 8	1 vehicle parking space per 50 m2 of gross floor space
Class 9	1 vehicle parking space per 50 m2 of gross floor space
Class 10	No requirement – at designer’s discretion

A5.5 Building Setback

All buildings (excluding boundary fences and minor temporary structures) shall be set back from the boundaries of the property the distances shown in Table A5.4. If you wish to propose a reduced set back for your building this will require a technical justification to be processed and where adjacent to the road frontage will require approval from the Road Manage

TABLE A5.5

LOCATION	MINIMUM SETBACK	
RAROTONGA: Ara Tapu (Main Road)	Road frontage	The greater of 10 m from the centre of the road corridor, or 5 m from the boundary with the road
	All other boundaries	1.5 m from the boundary
RAROTONGA: All other roads	Road frontage	4 m from the boundary or edge of the road corridor.
	All other boundaries	1.5 m from the boundary
PA ENUA: All roads	Road frontage	3 m from the boundary or edge of the road corridor.
	All other boundaries	1.5 m from the boundary

A5.6 Maximum building height

Unless the Building Controller gives consent to an exception prior to construction, the maximum building height shall be 12 m from ground level.

A5.7 Emergency Vehicle access

Provision shall be made for emergency service vehicles to access the site and buildings to safeguard people from an unacceptable risk of injury or illness caused by fire, protect other property from damage caused by fire, and facilitate firefighting and rescue operations.

The location and design of vehicle access and buildings on the site shall allow for emergency service vehicles to access the site and buildings including the rear of buildings to efficiently facilitate firefighting and rescue operations.

Guidance on the access provisions for emergency services vehicles can be found in ‘Emergency Vehicle Access Guidelines’, produced by Fire and Emergency New Zealand and available at www.fireandemergency.nz. and DESIGNERS’ GUIDE Firefighting operations emergency vehicle access guide F5-02 GD.

EXCLUSIONS

The term ‘building’ is defined in A1.1. The following structural types are excluded from the requirements for buildings in this Code:

- a) Horizontal infrastructure – including bridges, wharves, jetties and pipework infrastructure. Guidance on the design of these types of structure can be obtained from Infrastructure Cook Islands.
- b) Stand-alone plant and machinery systems and their supporting structures if they are bespoke and supplied with the machinery or plant.
- c) A mast, pole or radio or television aerial that does not exceed 6 metres in height.

- d)** Traditional Kikau Houses with a plan area of not more than 25 m².
- e)** Are Umu structures.
- f)** Scaffolding and formwork used in the course of the construction process and that is temporary.
- g)** Any other exclusions as noted in the Building Regulations.

Notwithstanding the exclusions noted, all structures constructed in the Cook Islands shall adhere to the principles of the Cook Islands Building Code - namely that they be designed and constructed in such a manner as to ensure the safety and protection of users and the public.

STANDARDS ADOPTED BY REFERENCE

1. Schedule of referenced documents

The Standards and other documents listed in Table 1 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, users of the Code 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 should be used.

TABLE 1
SCHEDULE OF REFERENCED DOCUMENTS

No.	Title	Code Clause(s)
AS/NZS 1170	Structural design actions	
Part 0	General Principles	
Part 1	Permanent, imposed and other actions	
Part 2	Wind actions	
Part 5	Earthquake Actions	
AS/NZS 1221	Fire Hose Reels	NE1.5
AS 1271	Bourdon tube pressure and vacuum gauges	Spec NE1.2
AS 1428	Design rules for access by the disabled	ND3.2, ND3.3, NF2.5
Part 1	Regulatory requirements	
AS 1530	Methods of fire tests on building Materials components and structures	A1.1
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	Spec A2.4 Spec A2.4 Spec NC3.15
AS 1657	Fixed platforms, walkways, stairways and ladders - Design, construction and installation	ND2.18, NH1.6 DF6.11.5
AS 1664	Rules for the use of aluminium in structures (SAA Aluminium Structures Code)	B1.3
AS 1668	The use of ventilation and air conditioning in buildings	
Part 1	Fire and smoke control in buildings	NC3.15, NE2.7, Spec NE1.8 Spec NE1.9, NH1.2
Part 2	Mechanical ventilation in buildings	DF4.5, NF4 5, NF4.11
AS 1670	Fire detection, warning, control and intercom systems	Spec NE1. NE2.5
AS 1720	Timber Structures	B1,3 Spec A2.3
AS 1735	Lifts, Escalator and moving walks (known as the SAA Lift Code)	
Part 2	Passenger and goods lifts - Electric	Spec NC1.5 NE3.4

No.	Title	Code Clause(s)
Part 11	Fire-rated landing doors	NC3.10
Part 12	Facilities for persons with disabilities	ND3.3
AS 1860	Particleboard Flooring Installation	B1,3
AS 1926	Swimming pool Safety Standards	DG1.1
AS/NZS 2107	Acoustics - Recommended design sound levels and reverberation times for building interiors	NG1.1
AS 2159	Piling - Design and installation	Spec NE1.9
AS 2179	Specifications for rainwater goods, accessories and fasteners	B1.3
AS 2293	Emergency escape lighting and exit signs for buildings	NF7.2
Part 1	System design, installation and operation	NE4.4, NE4.8
AS 2327	Composite structures	Spec A2.3,
AS/NZS 2588	Gypsum plasterboard	Spec NC1.5
AS 2601	The demolition of structures	B2.2
AS 2665	Smoke/heat venting systems - Design, installation and commissioning	NC2.3, NE2.5
AS 2870	Residential slabs and footings	Spec NE2.6
AS 2904	Damp-proof courses and flashings	B1.3, DF1.9, NF1.9
AS 3000	Electrical installations (known as the Australian/ New Zealand Wiring Rules)	DF1.8, NF1.8
NZS 3101	The design of concrete structures	NE6.1.1
NZS 3109	Specification for concrete construction	B1.3
NZS 3124	Specification for concrete construction for minor works	B1.3
NZS 3404	Code for design of steel structures (Incorporating AS 1250)	B1.3
AS 3500	Plumbing and drainage Code	
Part 0	Glossary of terms	
Part 1	Water supply	DF5.2, DF5.3, NF5.2, NF5.3
Part 2	Sanitary plumbing and sanitary drainage	DF6.2, NF6.2
Part 3	Storm water drainage	NF7.2 Spec NF7.2

No.	Title	Code Clause(s)
Part 4	Hot water supply systems	DF5.2, DF5.3, DF5.4, NF5.2, NF5.3, NF5.4
AS 3600	Concrete Structures	Spec A2.3
NZS 3603	Code of practice for timber design	B1,3
AS 3660	Termite management	B1.3
AS 3700	Masonry in building (SAA Masonry Code)	Spec A2.3
AS 4072	Components for the protection of openings in fire-resistant separating elements Service penetrations and control joints	NC3.15
AS 4100	Steel Structures	Spec A2.3
NZS 4121	Design for access and mobility: Buildings and associated facilities	ND3.2, ND3.3, NF2.5
AS / NZS 4200	Pliable building membranes and underlays Materials	DF1.5, NF1.5
NZS 4210	Code of practice for masonry buildings, materials and workmanship	SpecA2.3, B1.3
NZS 4223	Code of practice for glazing in buildings	B1.3, Fig B1.4
NZS 4229	Code of practice for masonry buildings not requiring specific design	B1.3
NZS 4230	Code of practice for the design of masonry structures	Spec NC 3.4, NC3.6
NZS 4232	Performance criteria for fire-resisting enclosures	NE1.5, NE1.7
NZS 4503	Hand-operated firefighting equipment	NE1.2
NZS 4510	Fire hydrant systems for buildings	NE1.3
NZS 4512	<i>Automatic fire alarm systems in buildings</i>	Spec. NE1.8, NE2.5
NZS 4541	<i>Automatic fire sprinkler systems</i>	Table NC2.2, Spec. NE1.2, Spec. NE1.
TR 440	NBTC Technical Record 440 – Guidelines for the testing and evaluation of Products for cyclone-prone areas	B 1.3
AISC	Guidelines for assessment of fire resistance of structural steel members	Spec. A2.3
ASTM E72	Standard Test Methods of Conducting Strength Tests of Panels for Building Construction	Spec. NC1.5
ASTM E695	Standard Test Method of Measuring Relative Resistance of Wall, Floor, and Roof Construction to Impact Loading	Spec. NC1.5

FIRE-RESISTANCE OF BUILDING ELEMENTS

1. Scope

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

2. Rating

A building element has a FRL if:

- (a)** it is listed in, and complies with Table 1 of this Specification;
- (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 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.

3. FRLs determined by calculation

If the FRL of a building element is determined by calculation based on a tested prototype:

- (f)** the building element may vary from the prototype in relation to:
 - (i)** length and height if it is a wall;
 - (ii)** height if it is a column;
 - (iii)** span if it is a floor, roof or beam;
 - (iv)** conditions of support; and
 - (v)** to a minor degree, cross-section and components.
- (g)** 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

(h) 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 loads;
- (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 loads of the building element in comparison with those of the tested prototype.

4. 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.

5. 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 1.2 m above the floor to prevent indenting if the covering is not in continuous contact with the 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 ELEMENT				
BUILDING ELEMENT	THICKNESS OF PRINCIPAL MATERIAL (mm)			ANNEXURE REFERENCE Clause No.
	60/60/60	90/90/90	120/120/120	
WALL Masonry: Concrete with material density in kg/m ³ of:				
- 1600 or more	80	100	120	1,2,3,4,5
- less than 1600	70	90	110	1,2,3,4,5
Concrete	Piling - Design and installation			
- Reinforced/Pres tressed	See 2(d) (ii) of this Specification and 8 of Annexure to this Table			
Gypsum-per-lite or Gypsum-vermiculite				
Plaster on metal lath and channel	50	50	65	1,5,7
CONCRETE COLUMN				
Concrete:				
- Reinforced/Pres tressed				
HOT-ROLLED STEEL COLUMN (including a fabricated column) exposed on no more than 3 sides				
Fire protection of:				
Concrete - Cast				
In-situ				
- loadbearing	25			8,9,10,11
non-loadbearing:				
unplastered	25	30	40	8,9,10,11
- plastered 13 mm	25	25	30	1,5,8,9,10,11
Gypsum-per-lite or Gypsum-vermiculite plaster				
- sprayed to contour	20	25	35	1,10
- sprayed on metal lath	20	20	25	1,7

TABLE 1 ...continued

FRLs DEEMED TO BE ACHIEVED BY CERTAIN BUILDING ELEMENT

<i>BUILDING ELEMENT</i>	THICKNESS OF PRINCIPAL MATERIAL (mm)			ANNEXURE REFERENCE Clause No.
	60/60/60	90/90/90	120/120/120	
HOT-ROLLED STEEL COLUMN				
(Including a fabricated column) exposed on no more than 3 sides:				
Fire Protection of:				
Solid concrete masonry:				
Column spaces filled	50	50	50	1,2,3,4,5,8,9,11
Column spaces unfilled	50	50	65	1,2,3,4,5,8,11
	60/ - / -	90/- / -	120/ - / -	
HOT-ROLLED STEEL COLUMN				
(including a fabricated column) exposed on no more than 3 sides:				
Fire Protection of:				
Concrete - cast-in-situ:				
Loadbearing	25	40	45	8,9,10,11
Non-loadbearing:				
- Unplastered	25	30	40	8,9,10,11
- Plastered 13 mm	25	25	30	1,5,8,9,10,11
Gypsum-per-lite or Gypsum-vermiculite plaster:				
- Sprayed to contour	25	30	40	1,10
- Sprayed on metal lath	20	20	30	1,7
CONCRETE COLUMN				
Concrete:				
- Reinforced/Prestressed				
HOT-ROLLED STEEL COLUMN				
(including a fabricated column) exposed on no more than 4 sides:				
Fire protection of:				
Solid concrete masonry				
column spaces filled	50	50	50	1,2,3,4,5,8,9,11
column spaces unfilled	50	50	50	1,2,3,4,5,8,11

TABLE 1 ...continued				
FRLs DEEMED TO BE ACHIEVED BY CERTAIN BUILDING ELEMENT				
<i>BUILDING ELEMENT</i>	THICKNESS OF PRINCIPAL MATERIAL (mm)			ANNEXURE REFERENCE Clause No.
	60/60/60	90/90/90	120/120/120	
BEAM				
Concrete				
Reinforced/Prestressed see 2(d)(ii) of this Specification and Clause 6 of Annexure to this Table				
Hot-Rolled Steel (including ab open-web joist, girder, truss, etc.) Exposed				
Fire Protection of:				
Concrete - Cast-in-situ:	25	30	40	8,10,11
Gypsum-per-lite or Gypsum-vermiculite plaster:				
- Sprayed to contour	20	25	35	1,10
- Sprayed on metal lath	20	20	25	1.7
	60/ - / -	90/- / -	120/ - / -	
Hot-rolled Steel (incl. an open-web joist, girder, truss, etc.) exposed on 4 sides:				
Fire protection of:				
Concrete - Cast-in-situ:	25	40	45	8,10,11
Gypsum-per-lite or Gypsum-vermiculite plaster:				
- Sprayed to contour	25	30	40	1,10
- Sprayed on metal lath	20	20	30	1.7
	60/60/60	90/90/90	120/120/120	
FLOOR, ROOF OR CEILING				
Concrete:				
Reinforced/Prestressed - see 2(d)(ii) of this Specification and Clause 6 of Annexure to this Table				

ANNEXURE TO TABLE 1

1. MORTAR, PLASTER AND PLASTER REINFORCEMENT

1.1 Mortar for masonry

Masonry units of concrete must be laid in cement mortar or composition mortar complying with the relevant provisions NZS 4210.

1.2 Gypsum-perlite and gypsum-vermiculite plaster

Gypsum-perlite or gypsum-vermiculite plaster must be applied:

(a) in either one or 2 coats each in the proportions of 1 m³ 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 1 m³ of perlite or vermiculite to 800 kg of gypsum and the second in the proportion of 1 m³ of perlite or vermiculite to 530 kg of gypsum.

1.3 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.

1.4 Plaster reinforcement

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

(a) it must be reinforced with expanded metal lath that-

(i) has a mass per unit area of not less than 1.84 kg/m²;

(ii) has not fewer than 98 meshes/m; and

(iii) is protected against corrosion by galvanising or other suitable method; or

(b) 13 mm x 13 mm 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.

2. DIMENSIONS OF MASONRY

The thicknesses of masonry of calcium-silicate, concrete and fired clay are calculated as follows:

2.1 Solid units

For masonry in which the amount of perforation or coring of the units does not exceed 25% by volume (based on the overall rectangular shape of the unit) the thickness of the wall must be calculated from the manufacturing dimensions of the units and the specified thickness of the joints between them as appropriate.

2.2 Hollow units

For masonry in which the amount of perforation or coring of the units exceeds 25 % by volume (based on the overall rectangular shape of the unit) the thickness of the wall must be calculated from the equipment.

2.3 Equivalent thickness

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

2.4 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.

2.5 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).

3. SLENDERNESS RATIO OF MASONRY

3.1 Maximum value

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

3.2 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 3.1.

TABLE 3.1			
MAXIMUM SLENDERNESS RATIOS FOR MASONRY WALLS			
TYPE OF UNIT	THICKNESS OF PRINCIPAL MATERIAL (mm)		
	60/60/60	90/90/90	120/120/120
BEAM			
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

4. 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:

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

5. INCREASE IN THICKNESS BY PLASTERING

5.1 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.

5.2 Walls

If a wall of concrete masonry is plastered on both sides to an equal thickness, the thickness of the wall for the purposes of Table 1 (but not for the purposes of 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/m²: 100 %

(b) For concrete masonry in which the aggregate is of a density between 1600 and 1800 kg/m²: 85 %

(c) For concrete masonry in which the aggregate is of a density less than 1800 kg/m² : 75 %

6. CONCRETE SLABS BEAMS WALLS AND COLUMNS

The requirements to meet specific values of FRL are those contained in AS 3600. However, for simple structures, the following procedures may be adopted.

6.1 Structural adequacy criterion

Table 6.1A gives the minimum dimensions for meeting specific levels of structural adequacy for:

TABLE 3.1 MAXIMUM SLENDERNESS RATIOS FOR MASONRY WALLS	
(a) Solid or Hollow-core plain slabs	- The clear cover to the longitudinal reinforcement or tendons. A slab is continuous if it is flexurally-continuous along at least one edge under the imposed loads.
(b) Ribbed slabs with ribs spaced at not more than 1200 mm centre to centre	- The minimum width of the rib and the clear cover to the reinforcement or tendons of the ribs. The slabs spanning the ribs may be treated as plain slabs as in (a).
(c) Beams The upper surface of the beams must be integral with a slab or protected by one	- The minimum width of web (rectangular or uniformly-tapering cross-section) and the clear cover to the reinforcement or tendons.
(d) Solid or hollow-core vertical walls	- The clear cover to the reinforcement or tendons. The effective thickness of the wall must be at least equal to that given in Table 6.3 for the FRL for the insulation criterion equal in period to the required structural adequacy criterion. In addition, the slenderness ratio must not exceed the values given in Table 6.1B.
(e) Columns which are: Exposed on all sides of fire Built into or form part of a wall that does not have a fire separating function Built into or form part of a wall that has a lower value of structural adequacy than required for the column; or Built into and protrude by a distance in excess of the value of the clear cover to the longitudinal reinforcement.	- The minimum cross-sectional dimension and the clear cover to the reinforcement

6.2 Integrity criterion

This criterion is relevant only for slabs and walls and not for ribs, beams or columns. It is satisfied if the criteria for structural adequacy and insulation are met for the period equal to that required for the integrity of the slab or wall as appropriate.

6.3 Insulation criterion

This criterion is also relevant only for slabs and walls. It is met by meeting the requirement for minimum effective thickness as given in Table 6.3. The effective thickness of solid slabs and walls is the actual thickness. The effective thickness of hollow-core slabs and walls is the value of the nett cross-sectional area divided by the width of the cross-section. With hollow-core slabs and walls the thickness of concrete between voids and between any part of a void and the nearest surface must be not less than 25 mm or 20 % of the effective thickness of the slab.

TABLE 6.1 A				
FRL - REQUIREMENTS FOR STRUCTURAL ADEQUACY CRITERION				
<i>BUILDING ELEMENT</i>	FRL (Minutes)			
	30	60	90	120
Plain Slabs				
- Simply supported one-way, clear cover (mm) to:				
- reinforcement	15	20	25	30
- tendons	20	25	35	40
- Simply supported two-way, clear cover (mm) to:				
- reinforcement	10	15	25	25
- tendons	15	20	30	35
Continuous one-way and two-way, clear cover (mm) to:				
- reinforcement	10	15	15	15
- tendons	15	20	25	25
Ribs of plain slabs min. width x clear cover (mm) (mm)				
- simply-supported one-way and two-way ribbed slabs				
- reinforcement	80 x 15	110 x 25	135 x 35	150 x 45
- tendons	80 x 25	110 x 35	135 x 45	150 x 55
- continuous one way and two-way ribbed slabs min. width x clear cover (mm) (mm)				
- reinforcement	70 x 15	75 x 20	110 x 25	125 x 35
- tendons	70 x 25	75 x 30	110 x 35	125 x 45

TABLE 6.1 A...continued				
FRL - REQUIREMENTS FOR STRUCTURAL ADEQUACY CRITERION BUILDING ELEMENT FRL (Minutes)				
<i>BUILDING ELEMENT</i>	FRL (Minutes)			
	30	60	90	120
Beams min. width of web (mm) x clear cover (mm)				
Simply supported: - reinforcement	75 x 20	120 x 30 or 150 x 25 or 240 x 20	150 x 45 or 200 x 35 or 300 x 30 or 500 x 25	200 x 55 or 240 x 45 or 360 x 40 or 600 x 33
- tendons	75 x 25	120 x 35 or 150 x 30 or 240 x 25	150 x 55 or 200x45 or 300x40 or 500x35	200 x 65 or 240 x 55 or 360 x 50 or 600 x 43
Continuous: - reinforcement	75 x 20	120 x 20	150 x 25 or 200 x 20	200 x 35 or 240 x 25 or 380 x 20
- tendon	75 x 25	120x25	150 x 35 or 200 x 30	200 x 45 or 240 x 35 or 380 x 30
Vertical Walls clear cover in mm to reinforcement to tendons	20 30	20 30	35 30	40 30
NOTE:- Vertical walls must also satisfy the requirements of Table 6.1B				
Columns min. cross - sectional dimension (mm) x clear cover (mm) - to reinforcement	150 x 10	200 x 20 or 240 x 15	250 x 35 or 300 x 25	300 x 45 or 400 x 35

TABLE 6.1 B	
MAXIMUM ALLOWABLE SLENDERNESS RATIO FOR CONCRETE WALLS	
Ratio of design axial force to the product of gross cross-sectional area and the characteristic compressive cylinder strength at 28 days	Corresponding maximum value of slenderness ratio (effective height/thickness)
0.0	50
0.005	35
0.03	20
0.10	15
NOTES:	
<ol style="list-style-type: none"> 1. Values in between can be interpolated. 2. Design axial force = 1.1 dead load + 0.6 live load including impact. 3. The characteristic compressive strength in MPa is generally expressed as the grade of the concrete. 	

TABLE 6.3	
MINIMUM EFFECTIVE THICKNESS FOR INSULATION	
FRL for Insulation criterion minutes	Effective thickness mm
30	60
60	80
90	100
120	120

7.GYPSUM-PERLITE OR GYPSUM-VERMICULITE PLASTER ON METAL LATH

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.

7.2 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.

7.3 Beams

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

(a) the lath must be fixed at not more than 600 mm centres to steel furring channels and at least 20 mm clear of the steel;

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

8. EXPOSURE OF COLUMNS AND BEAMS

8.1 Columns

A column incorporated in or in contact on one or more sides with a wall of solid masonry or concrete at least 100 mm thick may be considered to be exposed to fire on no more than 3 sides.

8.2 Beams

A beam, open-web joist, girder or truss in direct and continuous contact with a concrete slab or a hollow block floor or roof may be considered to be exposed to fire on no more than 3 sides.

9. FILLING OF COLUMN SPACES

If steel columns are deemed to have FRLs of more than 120/-/-, the spaces between the fire-protective material and the steel (and any re-entrant parts of the column itself) must be filled solid with a fire-protective material like concrete or grout.

10. REINFORCEMENT FOR COLUMN AND BEAM PROTECTION

10.1 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.

10.2 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 be:

(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.

10.3 Gypsum-perlite or gypsum-vermiculite plaster sprayed to contour

(d) 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 Clause 1.4; or
 - (ii) galvanised steel mesh complying with Clause 1.4.
- (e) 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 10.3.
- (f) For the purposes of Table 10.3 -
- (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 10.3		
REINFORCEMENT OF GYPSUM-PERLITE OR GYPSUM-VERMICULITE PLASTER SPRAYED TO CONTOUR		
<i>SURFACE TO BE PROTECTED</i>	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	

11 THICKNESS OF COLUMN AND BEAM PROTECTION

11.1 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;

EARLY FIRE HAZARD TEST FOR ASSEMBLIES

1. 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.

2. Form of test

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

3. 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.

4. 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.

5. 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.

Cook Islands
**BUILDING
CODE 2018**

**This section applies
to all *BUILDINGS***

Section B
STRUCTURE

**Performance Requirements
Deemed-to-Satisfy Provisions**

B1 STRUCTURAL PROVISIONS

B2 DEMOLITION

Section B — **STRUCTURE**

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PERFORMANCE REQUIREMENTS

OBJECTIVES

BP1 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
- (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.

BP2 Procedures and methods of demolition must be adequate to prevent death and injury to persons and avoid damage to neighbouring property.

REQUIRED PERFORMANCE

BP1.1 Design loads

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.

BP1.1.1 The design and construction must take into account the loads resulting from the following acting either singly or in possible combinations:

- (a) self-weight
- (b) imposed loads
- (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.

BP1.1.2 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.

BP1.2 Site works

- (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.

BP1.3 Design criteria

The following criteria must be satisfied:

- (a) during the design life 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 0.1 % within the design life of the building.

Note: the default design life for structural systems is normally 50 years, but the Building Controller may grant exceptions in special cases. See B1.7 and A2.2 re material durability.

BP1.4 Excavations

The following criteria for all excavations must be satisfied. For further information, refer to the National Environment Service.

- (a)** Excavations greater than 1.5 m deep must be either:
 - i)** battered back with a slope no greater than 45° on all sides, or
 - ii)** designed and certified by an appropriately-qualified engineer.
- (b)** Excavations must be set back a minimum of 1.5 m from any property boundary unless specific permission is granted by the Building Controller.

BP2.1 Demolition of buildings

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.

BP2.1.1 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)** any other likely factors.

DEEMED-TO-SATISFY PROVISIONS

STRUCTURAL PROVISIONS

B1.1 General requirements

Materials, components and methods of construction used in a building or structure and all attached services must be capable of sustaining at an acceptable level of safety and serviceability:

- (a)** the most adverse combinations of loads (including combinations of loads that might result in a potential for progressive collapse), and
- (B)** other actions to which they may reasonably be subjected.

B1.2 Building importance level & design criteria

The Importance Level of a building shall be determined in accordance with AS/NZS 1170 Part 0: General principles.

Notwithstanding the above, the following building types shall be designed as Importance Level 4 buildings:

- (a) emergency shelters**
- (b) educational facilities**
- (c) hospital and health-care buildings with post-disaster functions.**

B1.3 Dwellings (Class 1 & 10 buildings)

(a) Home Building Manual

Class 1 and 10 Buildings (as per Clause A3.2) which are constructed using the provisions and details in the Home Building Manual of the Cook Islands appropriately are deemed to satisfy the structural provisions of the Building Code.

(b) Design Actions (Loads)

The general requirements of B1.1 are satisfied if the building or structure can resist loads determined in accordance with the following:

(i) Wind actions:

AS/NZS 1170 Structural Design Actions Part 2 – Wind Actions

When using Part 2 of the Standard the following provisions apply for Dwellings:

For the calculation of the site wind speed $V_{sit, \beta}$, a Regional wind speed V_R of 60 m/s is to be used for all areas and islands of the Cook Islands. The maps of Australia and New Zealand in the Standard are to be disregarded.

The wind direction multiplier M_d shall be taken as 1.0. All other provisions of NZS1170 Part 2 shall apply.

(ii) Dead and Live actions:

AS/NZS 1170 Part 1 – permanent, imposed and other actions

(iii) 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.

AS/NZS 1170 Part 5 – Earthquake Actions: The maps of New Zealand shown in the Standard are to be disregarded. The risk of earthquakes in Cook Islands is so small that no earthquake forces need be considered.

B1.4 Public buildings (Class 2, 3, 4, 5, 6, 7, 8 & 9 buildings)

(c) Design Actions (Loads)

The loading requirements of B1.1 are satisfied if the building or structure can resist loads determined in accordance with the following:

(i) Wind actions:

AS/NZS 1170 Structural Design Actions Part 2 – Wind Actions

When using Part 2 of the Standard, the following provisions apply for public buildings:

- For the calculation of the site wind speed $V_{sit, \beta}$, the Regional wind speed shall be taken from Table 3.1 as per the following, and in accordance with the relevant Importance Level:

BUILDING TYPE	WIND REGION TO BE ADOPTED
Emergency Shelters	
Educational Facilities	
Hospitals	Region D wind speeds
Health-care Buildings	
All buildings with post disaster functions	
All other public buildings	Region C wind speeds

- The maps of Australia and New Zealand in the Standard are to be disregarded.
- The factors F_c and F_d noted in Clause 3.4 shall apply.
- The wind direction multiplier M_d shall be taken as 1.0. All other provisions of NZS1170 Part 2 shall apply.

(ii) Dead and Live actions:

AS/NZS 1170 Part 1 – permanent, imposed and other actions

(iii) 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.

AS/NZS 1170 Part 5 – Earthquake Actions: The maps of New Zealand shown in the Standard are to be disregarded. The risk of earthquakes in Cook Islands is so small that no earthquake forces need be considered.

B1.5 Construction deemed-to-satisfy

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

a) Masonry

- (i) Code of practice for design of masonry structures: NZS 4230
- (ii) Code of practice for masonry buildings not requiring specific design: NZS 4229
- (iii) Code of practice for masonry buildings, materials and workmanship: NZS 4210

(b) Concrete

- (i) The design of concrete structures: NZS 3101
- (ii) Specification for concrete construction: NZS 3109
- (iii) Specification for concrete construction for minor works: NZS 3124

(c) Steel construction: Steel Structures Standard: NZS 3404 Parts 1 & 2

(d) Aluminium construction: Aluminium Structures: AS/NZS 1664

(e) Timber construction: Design of timber structures: NZS 3603

(f) Footings: Footings for Class 1 and 10a buildings: AS 2870

(g) Piling: Piling – Design and Installation: AS 2159

(h) Glass installations: Glazing in Buildings: NZS 4223 - subject to Clause B1.6

(i) Protection from termites: In areas subject to infestation by subterranean termites:

- (i) Physical barriers: Termite Management: AS 3660
- (ii) Soil treatment Protection of Buildings from subterranean termites Chemical treatment of soil for buildings under construction: AS 2057.

(j) Roof construction: National Building Technology Centre Technical Record 440 “Guidelines and Evaluation of Products for Cyclone-Prone Areas” and manufacturer’s recommendations

(k) Particleboard structural flooring: Particleboard flooring: AS 1860

(l) 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.

B1.6 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.

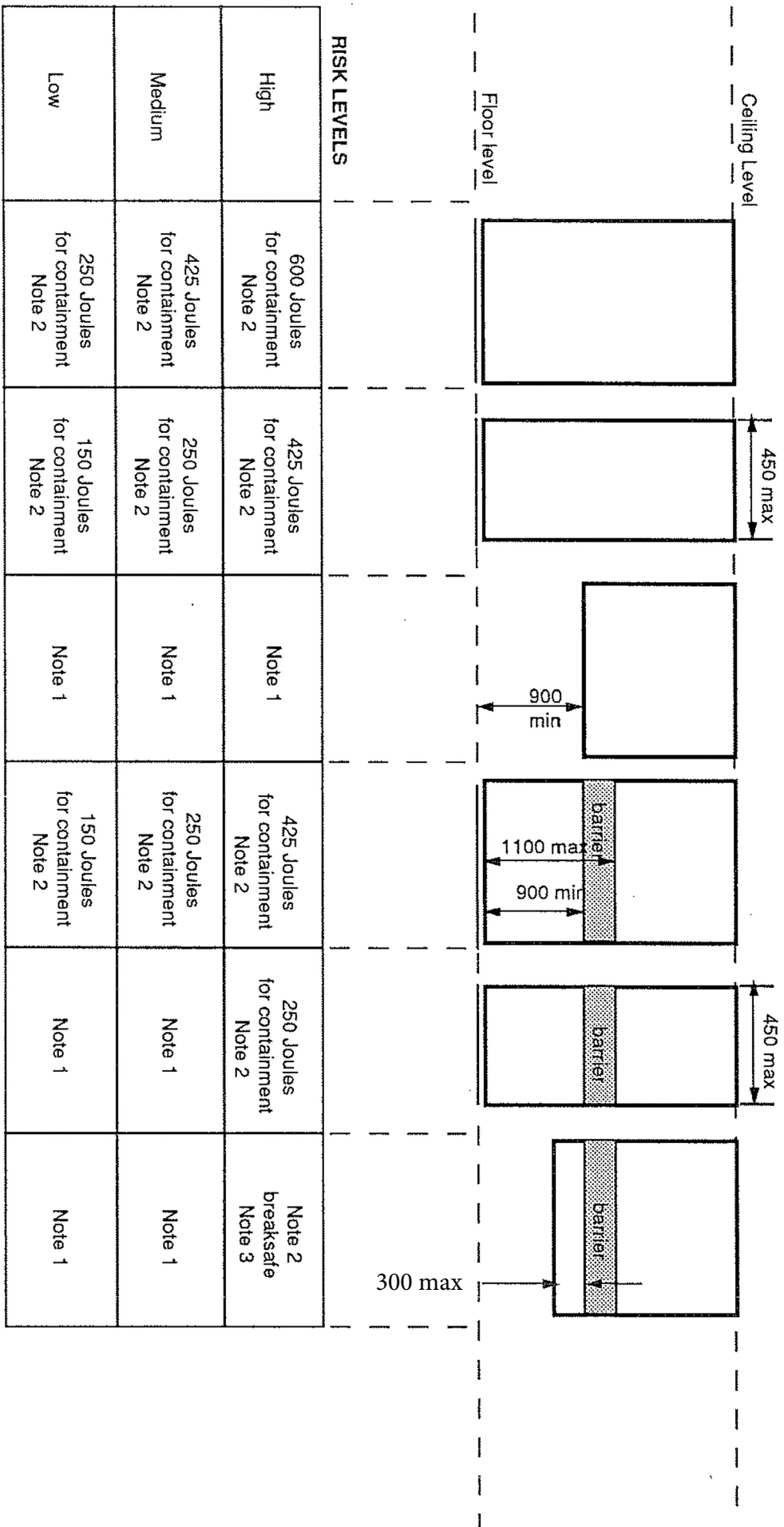
(iii) the strength of glass can be substantially reduced by the lapse of time.

(c) The barrier protection shown in Figure B1.6 must be designed to AS/NZS 1170. The deflection of the barrier must not exceed 50 % of the distance between the hand-rail and the glass when a concentrated force of 1.2 kN is applied to the face of the barrier.

TABLE B1.6:
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 6 m	2, 6, 9b	3, 4, 5, 7, 8, 9a	
3 m to 6 m		2, 6, 9b	3, 4, 5, 7, 8, 9a
up to and including 3 m		6, 9b	2, 3, 4, 5, 7, 8, 9a

GLAZING CONFIGURATION



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 B1.4 CAPACITY REQUIRED OF GLAZING ELEMENTS AGAINST HUMAN IMPACT

B1.7 Structural durability

Because of the environment prevalent in the Cook Islands, the following minimum durability requirements shall apply when the structural integrity of the building depends on material durability:

(a) Concrete construction:

Greater than 30 m inland:	Exposure Classification B2 as per NZS 3101
Offshore or less than 30 m inland:	Exposure Classification C as per NZS 3101

(b) Steel construction:

Category E-M as per AS/NZS 2312

(c) Masonry construction:

As per NZS 3101 for concrete construction.

(d) Timber construction:

Members in contact with the ground:	H5 as per NZS 3602
All other structural members:	H3 as per NZS 3602 as a minimum.

DEMOLITION

B2.1 General requirements

All dangerous buildings as detailed in B2.3 must either be restored to required standards or be demolished. The planning and execution of demolition must:

- (a)** Concrete construction:
- (b)** not put at risk the safety and health of the public and of the workers
- (c)** avoid damage to other properties
- (d)** avoid nuisance to others
- (e)** allow continued access to other properties, and
- (f)** prevent damage to public services and allow continued operation of such services.

B2.2 Applicable standard

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

B2.3 Dangerous buildings

Any building which has any of the conditions or defects described below must be deemed to be a dangerous building if such conditions or defects exist to the extent that the life, health, safety or property of the public or its occupants are endangered whenever:

- (a)** any required exit is not of sufficient width or size or is not so arranged as to provide safe and adequate means of egress in case of fire or other emergency
- (b)** the stress in any materials or member due to all applicable loads, is more than 1.5 times the working stress or stresses allowed for new buildings of similar class and type of construction
- (c)** any portion of the building has been damaged by fire, earthquake, wind, flood or by any other cause, to such an extent that its structural strength or stability is materially less than it was before such catastrophe and is less by 33 percent or more than the minimum requirements for new buildings of similar class and type of construction
- (d)** any portion or member or attachment of the building is likely to fail, or to become detached or dislodged, or to collapse and thereby injure persons or damage property
- (e)** any portion of the building has suffered distortion, cracking or settlement to such an extent that walls or other structural portions have materially less resistance to winds or earthquakes than is required in the case of similar new construction
- (f)** the building or any portion of it is likely to collapse or fail to perform the intended function, as a result of:
 - (i)** dilapidation, deterioration or decay
 - (ii)** faulty construction
 - (iii)** the removal, movement or instability of any portion of the ground necessary for the purpose of supporting such building
 - (iv)** the deterioration, decay or inadequacy of its foundation; or
 - (v)** any other cause.
- (g)** the building exclusive of the foundation, shows 33 percent or more damage or deterioration of any supporting member or 50 percent damage or deterioration of its non-supporting members;

(h) any building has in any non-supporting part, member or portion less than 50 percent, or in any supporting part, member or portion less than 66 percent of the:

(i) strength, or

(ii) fire-resisting requirements; and

(iii) a building because of inadequate maintenance, dilapidation, decay, damage, faulty construction or arrangement, inadequate light, air or sanitation facilities, or otherwise, is likely to cause sickness or disease.

FOUNDATIONS AND GROUND CONDITIONS

3.1 General Requirements

Building foundations must be design to transfer the loads derived from Section B1 to the ground.

The building's foundations elements must be designed in accordance with the appropriate materials Standards, as given in Section B1.

The ground upon which the foundation are bearing shall be good ground. Good ground is defined as;

(a) Solid ground away from areas of swamp or ground likely to settle significantly when loaded.

(b) Any soil or rock capable of permanently withstanding a minimum ultimate bearing capacity of 300 kPa (i.e., an allowable pressure of 100 kPa using a safety factor of 3.0).

Where the site is not founded on good ground, geotechnical advice shall be sought from a suitably-qualified geotechnical engineer for the design of foundation systems.

3.2 Sloping Ground

Where a building is to be constructed on sloping ground, due consideration shall be given to the stability of the ground under loading from the structure. The verticality of foundation elements shall be maintained and the slope shall be battered and benched as required.

If the ground is sloped at greater than 30 degrees form the horizontal, advice shall be sought from a suitably-qualified geotechnical engineer prior to the design and installation of any foundation element.

Cook Islands
**BUILDING
CODE 2019**

**DWELLINGS AND
OUTBUILDINGS**
(CLASS 1 AND 10)

Section DC
**FIRE
RESISTANCE**

**Performance Requirements
Deemed-to-Satisfy Provisions**

DC1 FIRE RESISTANCE AND STABILITY

Section DC

– FIRE RESISTANCE

CONTENTS

PERFORMANCE REQUIREMENTS

DEEMED-TO-SATISFY PROVISIONS

<i>Part</i>		<i>Part</i>	
	DC1 Fire Resistance and Stability		
DC1.1	External walls of Class 1 buildings	DC1.5	Exceptions
DC1.2	Class 1 buildings: Construction of external walls	DC1.6	Common walls
DC1.3	Class 10a buildings: External walls	DC1.7	Separating floors
DC1.4	Allowable encroachments	DC1.8	Sarking-type material

PERFORMANCE REQUIREMENTS

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.

REQUIRED PERFORMANCE

DCP1.1 External walls of Class 1 buildings, located within 1.5 m of the allotment boundary or 3 m from other buildings 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.

DCP 1.2 The external wall of a Class 10 (a) building which is less than 1.5 m away from the allotment boundary other than with a road alignment or public space must not be combustible.

DCP 1.3 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.

DCP 1.4 The underside of a floor separating 2 sole-occupancy units each being a separate domicile must not be combustible.

DCP 1.5 Any sarking-type material used in a Class 1 building must have a flammability index of less than 5.

DEEMED-TO-SATISFY PROVISIONS

FIRE RESISTANCE AND STABILITY

DC1.1 External walls of Class 1 buildings

Except as permitted by Clause DC 1.4 or DC1.5, an external wall of a Class 1 building, and any openings in that wall, must comply with Clause DC 1.2 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.

DC1.2 Class 1 buildings: Construction of external walls

- (a) External walls referred to in Clause DC1.1 must have a FRL of not less than 60/60/60.
- (b) Openings in external walls referred to in Clause DC1.1 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.

DC1.3 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.

DC1.4 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.

DC1.5 Exceptions

Clause DC1.1 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.

DC1.6 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.

(d) 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

(e) be lined with a non-combustible material if it separates Class 10a buildings on different allotments

DC1.7 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.

DC1.8 Sarking-type materials

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

Cook Islands
**BUILDING
CODE 2019**

**DWELLINGS AND
OUTBUILDINGS**
(CLASS 1 AND 10)

Section DD
**ACCESS &
EGRESS**

**Performance Requirements
Deemed-to-Satisfy Provisions**

DD1 CONSTRUCTION OF EXITS

Section DD — **ACCDSS & EGRESS**

CONTENTS

PERFORMANCE REQUIREMENTS

DEEMED-TO-SATISFY PROVISIONS

Part

DD1 Construction of Exits

- DD1.1 Treads and risers
- DD1.2 Curved stairs
- DD1.3 Balustrades
- DD1.4 Parapets on flat roofs Criteria
- DD1.5 Number of exits
- DD1.6 Ramp in exits
- DD1.7 Dimensions of exits

Part

DD2 Access for People with Disabilities

- DD2.1 Access to buildings

PERFORMANCE REQUIREMENTS

OBJECTIVES AND REQUIRED PERFORMANCE

DDP1 A Class 1 or 10 (a) 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.

**DEEMED-TO-SATISFY PROVISIONS
 CONSTRUCTION OF EXITS**

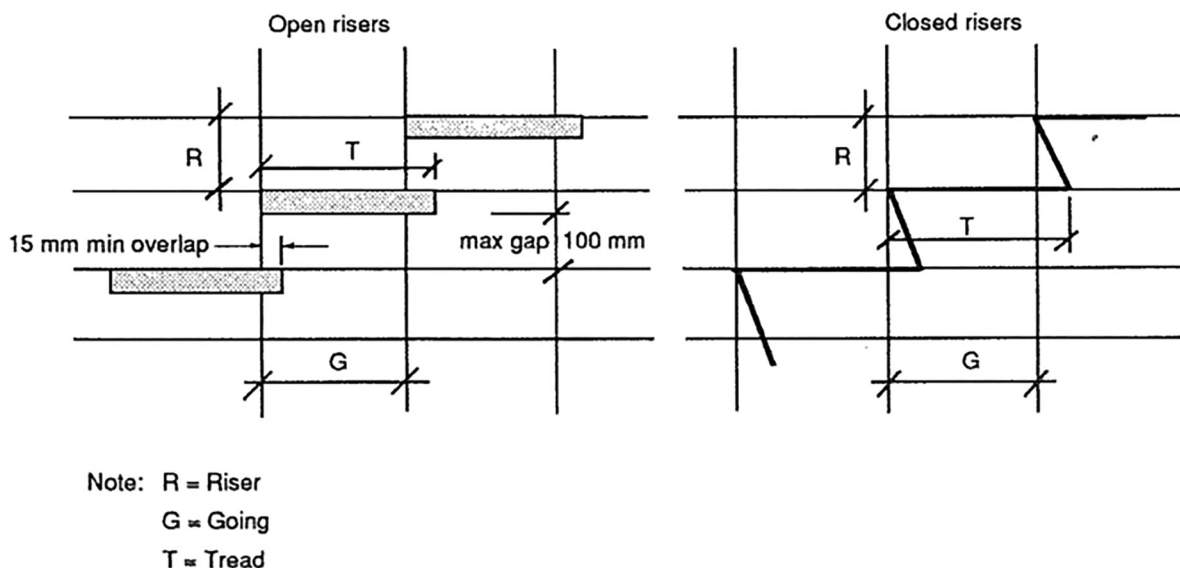
DD1.1 Treads and risers

- (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) not more than 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 100 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 connects more than three storeys; and
 - (vi) the tread must not exceed the going by more than 20 mm.

DD1.2 Curved stairs

Curved stairs must comply with the relevant requirements of DD1.1 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.



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

TABLE DD1.2.1
RISER DIMENSIONS (mm) TO MATCH GOING
 GOINGmm

<i>Pitch</i>	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.

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 100 mm except where the space between rails or the height of the opening is not more than 100 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.

DD1.4 Parapets on flat roofs

Where a flat roof or other elevated place has regular access a parapet or balustrade of not less than 1 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.

DD1.5 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 m². The shutter must be capable of opening to 90 ° to the wall. The top of the window sill must be no more than 900 mm from the floor inside. The height of the window sill from the ground or floor outside must not exceed 1800 mm.

DD1.6 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.

DD1.7 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.

ACCESS FOR PEOPLE WITH DISABILITIES

DD2.1 Access to buildings

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.

Cook Islands
**BUILDING
CODE 2019**

**DWELLINGS AND
OUTBUILDINGS**
(CLASS 1 AND 10)

Section DE
ELECTRICITY

**Performance Requirements
Deemed-to-Satisfy Provisions**

DE1 ELECTRICAL SAFETY

DE2 AMENITY

Section DE — ELECTRICITY

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PERFORMANCE REQUIREMENTS

DEEMED-TO-SATISFY PROVISIONS

<i>Part</i>		<i>Part</i>	
DE1	Electrical Safety	DE2	Amenity
DE1.1	General requirements	DE2.1	Light switch layout
DE1.2	Plug Sockets		

PERFORMANCE REQUIREMENTS

OBJECTIVES

All electrical work associated with a Class1 or 10 building must meet the following objectives

DEP1 Electrical Safety

It must prevent electrocution, burns or fire.

DEP2 Amenity

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

REQUIRED REFORMANCE

DEP1.1 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.

DEP2.1 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.

DEEMED-TO-SATISFY PROVISIONS

ELECTRICAL SAFETY

DE1.1 General requirements

All electrical wiring and installations in or on any class) 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 - buildings, structures and premises (known as the SAA 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.

DE1.2 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; and
- (d)** in the kitchen be located 250 mm above worktops at the back of benches or on a return wall where it exists.

DE1.3 Photovoltaic Energy Systems

All photovoltaic energy systems shall fully comply with the requirements of AS/NZS 5033. Photovoltaic panel systems shall be fixed to the main structure of the building. Fixings shall be designed in accordance with the requirements of Section B – Structure.

AMENITY

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 bed-rooms to the bathroom and toilet. Crossing any major space in the dark must be avoided. The switches must be located close to door openings.

Cook Islands
**BUILDING
CODE 2019**

**DWELLINGS AND
OUTBUILDINGS**
(CLASS 1 AND 10)

Section D F
**HEALTH AND
AMENITY**

**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 DRAINAGE
- DF7** ROOF DRAINAGE

Section DcF — HEALTH AND AMENITY

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PERFORMANCE REQUIREMENTS

DEEMED-TO-SATISFY PROVISIONS

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- 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

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- DF3.2 Reduced height permissible
- DF3.3 Ceiling fans

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- 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

Part

DF5 Water supply Plumbing

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- 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

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*Part***DF4 Light and 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

*Part***Specification**

DF 2.1 Latrines for Areas where there is no Water Supply

DF 5.5 Rainwater Storage

PERFORMANCE REQUIREMENTS**DAMP AND WEATHERPROOFING****OBJECTIVES****DFP1** The design and construction of a Class 1 building 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 waste water
- (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.

REQUIRED PERFORMANCE**DFP 1.1 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 other allotments or of any public infrastructure.

DFP1.2 Cooking and sanitary facilities

Adequate cooking toilet and washing facilities must be provided for the occupants to allow reasonable comfort, hygiene and privacy.

DFP1.3 Room sizes

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

DFP1.4 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.

DFP1.5 Water supply plumbing

Plumbing for water supply must use materials which do not react with the water and thereby make it unsuitable for domestic use. Suitable precautions must be taken to ensure that unsafe or unhygienic materials have no chance of entering the supply system. The installation of hot water systems must not impair the safety of the users. All concealed and difficult-to-access plumbing work must be suitably protected so that there is no likelihood of damage and leakage. The plumbing must take into account the current and anticipated needs of the users and allow for the simultaneous use of the connected system by others. Where rainwater from the roof run off is the source of supply care must be exercised to ensure that there is no reasonable chance for the water to become contaminated. Allowance must be made for lean years of rainfall.

DFP1.6 Sanitary plumbing and drainage

Sanitary plumbing must be laid to self-cleansing grades 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. The size of drains and the layout of their connections must reasonably ensure the current and anticipated needs of the users. The connections to sanitary installations must ensure that foul gases are not allowed to produce unhygienic conditions nor create any nuisance to anyone and are suitably vented.

DFP1.7 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)** Internal box gutters, valley gutters and downpipes - a 100-year return period 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.

DFP1.8 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.

DEEMED-TO-SATISFY PROVISIONS

DAMP AND WEATHERPROOFING

OBJECTIVES

DF1.1 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.

DF1.2 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.

DF1.3 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.

DF1.4 Weatherproofing of roofs and walls

Roofs and external walls must be constructed to prevent rain or dampness penetrating to the inner parts of a building.

DF1.5 Pliable roof sarking

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

DF1.6 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.

DF1.7 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.

DF1.8 Acceptable damp-proof courses

A damp-proof course must consist of:

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

DF1.9 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 2870.1; or
- (b) other suitable means.

COOKING AND SANITARY FACILITIES

DF2.1 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	<p>(a) facilities for the preparation and cooking of food, and for the cleaning of utensils</p>
Where there is piped water supply to the kitchen and ablution areas	<p>(b) a kitchen sink in a kitchen</p> <p>(c) a shower or other adequate personal washing facilities</p> <p>(d) clothes washing facilities</p> <p>(e) a closet pan and facilities for washing hands</p>
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	<p>(f) a paved raised platform with a paved area and drain around it</p> <p>(g) a suitable type of privy as per Specification DF2.1</p>
<p>NOTE:</p> <p>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.</p> <p>ii. Where the layout allows it, facilities in (c), (d) and (e) can be in the same room.</p>	

ROOM SIZES AND HEIGHTS

DF3.1 Height of rooms

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

- (i) habitable room – average 2.4m and minimum of 2.1m; and
- (ii) bathroom, shower room, water closet, laundry, pantry, or the like – 2.1m

DF3.2 Reduced height permissible

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

DF3.3 Ceiling fans

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

LIGHT AND VENTILATION

DF4.1 Provision of natural light

Natural lighting must be provided to all habitable rooms.

DF4.2 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.

DF4.3 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,

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

DF4.4 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.

DF4.5 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 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.

DF4.6 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.

DF4.7 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:

- (a)** the room to be ventilated or from which ventilation is borrowed is not a sanitary compartment
- (b)** ventilation is not borrowed from one bedroom to another or between a bedroom and the kitchen
- (c)** the window, opening, door or other device has a ventilating area of not less than 10 % of the floor area of the room to be ventilated; 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.

DF4.8 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.

DF4.9 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.

DF4.10 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 totaling 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.

WATERSUPPLY PLUMBING

DF5.1 General requirements

The plumbing work for water supply 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-connections and prevention of back flow
- (d) adequate care in the installation of the services
- (e) suitable provision of main and subsidiary storage as required
- (f) adequate connections to sanitary services without endangering health and hygiene; and
- (g) that the installation of hot water systems provide safe and adequate service

DF5.2 Means of compliance

The requirements of DF5.1 are satisfied if all plumbing for water supply is carried out to the relevant provisions of:

- (a) AS/NZS 3500 Part 1 - Water Services and its amendments
- (b) AS/NZS 3500 Part 4 - Heated Water Services and its amendments
- (c) AS/NZS 2845.1 Water Supply Back flow Prevention Devices - Part 1: Materials, Design and Performance Requirements and its amendments

DF5.3 Pipes which are not easy to access

Particular attention is drawn to the provisions in AS 3500 - Parts 1 and 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 3500 - Parts 1 and 4.

DF5.4 Access to 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 or earthquake 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 - Part 4 is the relevant standard for the installation of a household water heater.

DF5.5 Rainwater storage

Where rainwater is collected and stored, the storage and distribution must reasonably ensure that the water is not contaminated by unsafe or unsuitable materials. The capacity of the catchment and storage must be adequate to provide a continued supply of water during periods of low rainfall.

The details given in Specification DF5.5 meet the requirements of this Clause.

SANITARY PLUMBING AND DRAINAGE

DF6.1 General

DF6.1.1 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.

DF6.1.2 Some common terms

Apart from the defined terms given in A1.1 the following terms used in this Section are explained:

(a) Nominal size (DN)

While converting to metric dimensions some manufacturers of pipes and fittings have used hard conversion whereas others have used soft conversion. For these and other reasons it is impractical to specify exact pipe and fitting dimensions. All pipes and fittings in this Section are therefore specified by their nominal size. This is indicated by the letters “DN” followed by a number.

Since this number is only an approximation of the actual size, it is not subject to exact measurement and must not be used in calculations. The nominal size is thus only a numerical designation of the size which is common to all components in a piping system (other than components such as steel tubes which are designated by their outside diameter and other components by their thread size). It is just a convenient round number for reference purposes and is only loosely related to the manufacturing dimensions.

(b) Trap

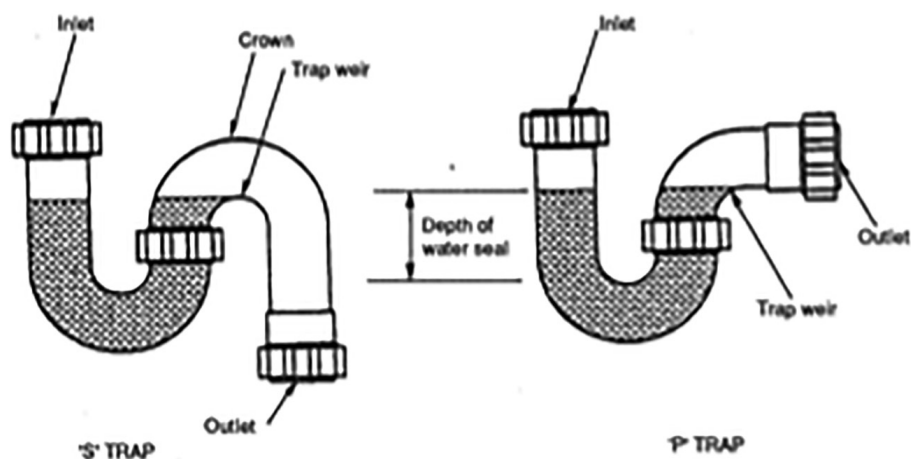
A trap is a device which retains a water seal for preventing the escape of sewer gases from sanitary plumbing. Figure DF6.1.2 shows two common types of fixture traps. There are also traps integral with gullies, water closet pans etc.

The water seal can be broken by self-siphonage or induced siphonage as well as by positive pressure of the gases breaking through the seal. It is also possible for the seal to be dried out by prolonged non-use of the associated part of the system.

The best means of preventing the loss of the seal by siphonage or by positive pressure is to vent the trap to the outside air. Air admittance valves (AAVs) may be used where atmospheric venting of a trap cannot be achieved.

(c) Fixture discharge pipe

This is the discharge pipe to which any single sanitary fixture is connected.



2 FIGURE DF6.1.2 - EXAMPLES OF FIXTURE TRAPS

(d) Gullies

A gully is an assembly used for providing a water seal when handling the discharge from only waste fixtures and not any soil fixture. The water seal prevents the escape of foul gases into the building or into the atmosphere in the vicinity of the assembly.

It is a disconnector gully when it provides a separation through the water seal, between the discharge from waste fixtures and the rest of the sanitary system.

A floor waste gully is a disconnector gully used inside a building with a floor grating or waste outlet fitting on a riser pipe. Discharge pipes from waste fixtures may also connect to a floor-waste gully.

An overflow relief gully functions as a self-cleaning trap and is provided with a loosely-fitted grating. This allows for the relief of any possible surcharge or overflow from the drain. The riser of the gully may have inlets for discharge from waste fixtures.

DF6.2 Means of compliance

The requirements of DF6.1.1 are satisfied if all sanitary plumbing and drainage works are carried out to the relevant provisions of AS 3500 - Part 2 - Sanitary plumbing and drainage and its amendments, as well as this part of the Code.

DF6.3 Fixture unit ratings

In the design of discharge pipes and drains the fixture unit ratings shown in Table DF6.3 must be used. For the fixtures listed in the Table the maximum unvented length of the associated fixture discharge pipe must not exceed 2.5 m except that this may be 6 m for a water closet pan with a DN100 trap and discharge pipe. The length of the pipe is measured along the centre line from the weir of the trap to the point of connection to a graded discharge pipe, drain, stack or other drainage trap.

TABLE DF6.3
FIXTURE UNIT RATINGS

Fixture	Nominal size of trap outlet and fixture discharge pipe	Fixture unit rating
Basin	DN30 or DN40	1
Bath (with or without shower)	DN40	4
Bidet	DN40	1
*Clothes washing machine	DN40	5
* Dishwashing machine	DN40	3
Floor waste gully		
– without fixture	DN50	0
– with fixture	DN40 or DN 50	as per fixture rating
Laundry trough	DN40 or DN 50	5
Shower	DN40 or DN 50	2
Sink		
– less than 45 litres	DN40	2
– more than 45 litres	DN50	3
Water closet pan	DN80 or DN100	5
<p>* (i) When a clothes-washing machine connects to a trough trap, only the trough unit fixture rating is considered.</p> <p>(ii) When a dishwashing machine connects to a sink trap only the sink fixture unit rating is considered.</p>		

DF6.4 Trapping of fixtures and appliances

DF6.4.1 The discharge from all sanitary fixtures and appliances must pass through traps before entering the drain, soil/pipe or waste pipe. The fixture trap must retain a water seal of:

- (a) 50 mm for traps of size DN50 or less
- (b) 75 mm for traps of size greater than DN50

The traps must be located as close as possible to the fixture and not farther than 600 mm from the fixture outlet, except in case of permitted fixture pairs and floor waste gullies.

DF6.4.2 The following fixtures may be connected in pairs to a single fixture trap:

- (a) Wash basins
- (b) Sinks
- (c) Laundry troughs
- (d) Showers

The fixture pairs must be connected so that the centre to centre distance between their outlets is no more than 1.2 m.

DF6.5 Fixture discharge pipes

DF6.5.1 Minimum grades

Discharge pipes must be laid to the minimum grades shown in Table DF6.5.1

TABLE DF6.5.1 MINIMUM GRADES OF DISCHARGE PIPES	
NOMINAL SIZE	MINIMUM GRADE
DN32	1 in 30
DN40	1 in 40
DN65	1 in 40
DN80	1 in 60
DN100	1 in 60

DF6.5.2 Connections

The connection of any fixture discharge pipe to a graded discharge pipe or between two graded discharge pipes must be made as follows:

- (a) With 45° or sweep junction fittings
- (b) Where the pipes are of different sizes:
 - (i) the soffits of both must be in continuous alignment, and
 - (ii) where an unequal junction fitting is used the soffit of the branch pipe must be at the same level or higher than the soffit of the pipe to which it connects; and
- (c) The level of the trap or floor waste gully weir must be at a higher level than the soffit of the graded discharge pipe to which it connects.

DF6.5.3 Cleaning eyes

Fixture discharge pipes must have accessible cleaning eyes at all bends.

DF6.6 Unvented branch drains

Where the risk of escape of dangerous and unpleasant gases into occupied premises is minimal the venting of branch drains is not required. However all of the limitations given in the following sub-clauses and illustrated in Figure DF6.6 must be met in such cases. (For limitation of length of fixture discharge pipes, see DF6.3.)

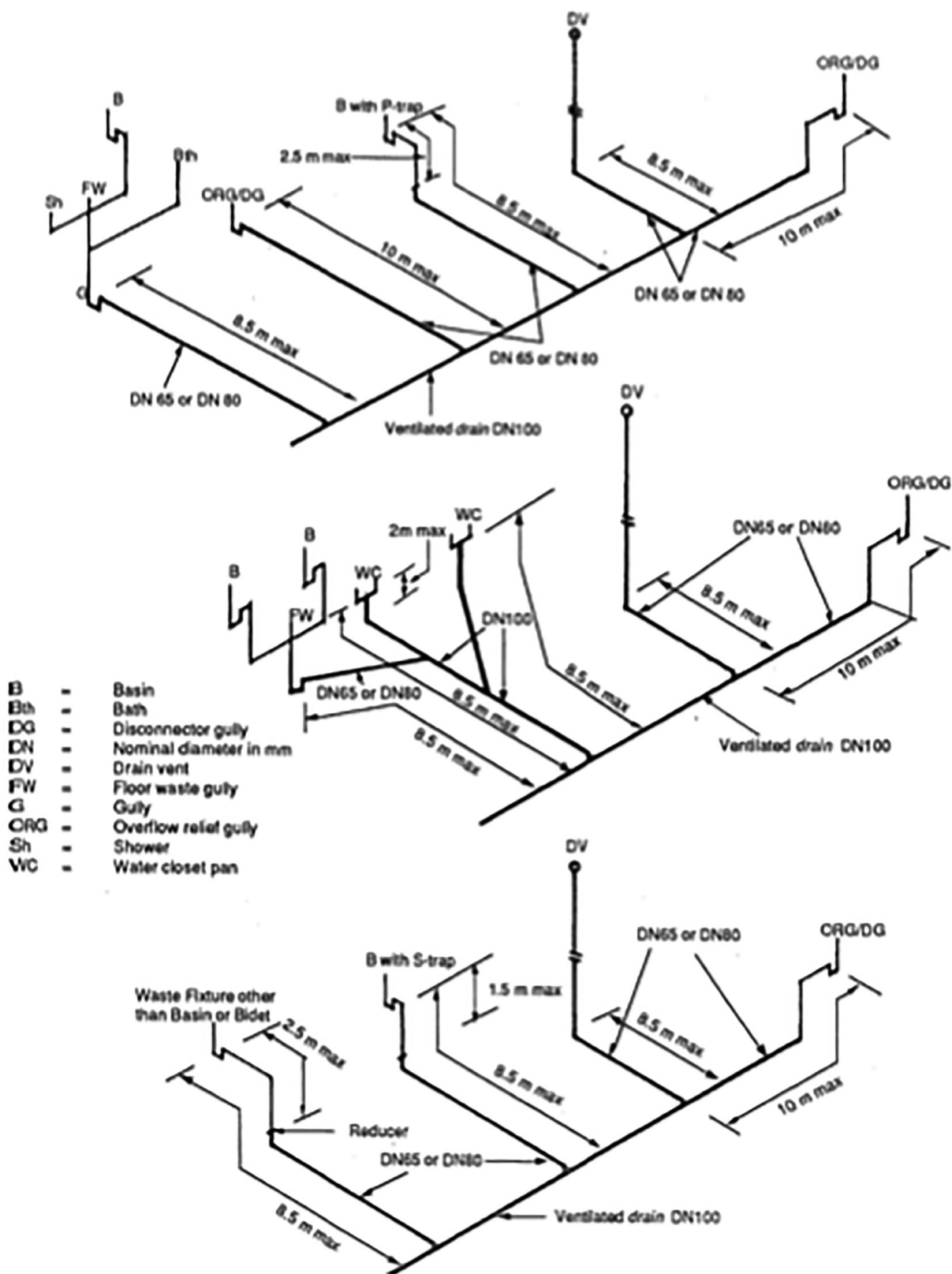


FIGURE DF6.6 - LIMITATIONS ON UNVENTED BRANCH DRAINS

DF6.6.1 Limitations on location or nature of connection

- (a)** The connection of any unvented branch drain to a vented drain must be located at the ground floor level and the vented drain installed on grade below or above ground
- (b)** In the case of an unvented drain receiving discharge from only waste fixtures, it must connect to a gully
- (c)** An unvented drain other than in (b) must conned to a disconnecter gully; or
- (d)** The connection must be from a discharge pipe serving a single fixture and the length of the discharge pipe is:
 - (i)** less than 3.5 m when serving a waste fixture; or
 - (ii)** less than 3.0 m when serving a soil fixture.

DF6.6.2 Limitations on size, length and bends

- (a)** The size of any unvented branch drain must comply with the limitations given in Table DF6.6.

TABLE DF6.6.2	
SIZE OF UNVENTED BRANCH DRAINS	
Nominal size	Maximum sum of fixture unit loadings discharging into the branch drain
DN65	5 (but not from a water closet pan) or 8 from one floor waste gully
DN80	12 (but not from a water closet pan)
DN100	30 (no more than 2 water closet pan connected)

- (b)** The length of an unvented branch drain together with that of the fixture discharge pipe must not exceed:
 - (i)** 8.5 m from the weir of the fixture trap
 - (ii)** 10 m to a disconnecter gully; and
 - (iii)** 2.5 m from the reducer to the weir of the trap, where the fixture discharge pipe is of smaller size than the unvented branch drain.
- (c)** The maximum vertical drop from the crown of the trap to the top of the vented drain to which the unvented branch drain connects must not exceed:
 - (i)** 1,5 m in the case of basins and bidets; and
 - (ii)** 2.5 m in the case of all other fixtures.
- (d)** The total combined number of long bends in a fixture discharge pipe and branch drain, up to the connection with a vented drain must be limited to:
 - (i)** 2 horizontal and 2 vertical with basins and bidets; and
 - (ii)** 2 horizontal and 3 vertical with all other fixtures. The distance between any adjacent horizontal bends must be not less than 300 mm and the vertical drop between two adjacent vertical bends must not exceed 2 m.

NOTE: A bend of 45° or less is not considered to be a bend for the purposes of this Clause.

DF6.7 Venting

In order to prevent the escape of dangerous and unpleasant gases into occupied premises and to ensure that water seals in traps are not destroyed by siphonage, adequate venting must be provided for all fixture discharge pipes and drains except as allowed by D F6.6.

DF6.7.1 Trap vents

The minimum size of a trap vent must be related to the nominal size of the fixture trap as follows:

Size of fixture trap	Size of trap vent
DN32 or DN40	DN32
DN50 to DN100	DN40

Every trap vent must be extended upward at least 50 mm above the flood level rim of the fixture. This may be accomplished in one of the following ways:

- (a) As a vertical vent to open air, the outlet of which is no closer than 900 mm from any opening to the building
- (b) On an ascending grade of at least 1: 80 and then:
 - (i) as a vertical vent to the open air; or
 - (ii) to a connection with a vertical or branch vent.
- (c) Take the vent above the flood level rim of the fixture, then loop it down either vertically or on a downward grade of 1: 80 and connect to a vertical or branch vent.

Trap vents must be located no closer than 75 mm and no farther than 1500 mm from the crown of the trap.

DF6.7.2 Drain vents

(a) General

Vents in drains must be provided:

- (i) at the upstream end of any drain
- (ii) at the upstream end of any branch drain to which a fixture trap or floor waste gully is connected and if the distance from the weir of the trap to the vented drain exceeds 8.5 m
- (iii) at the upstream end of any DN100 branch drain to which 3 or more water closet pans are connected; and
- (iv) at the upstream end of any DN100 branch drain to which no more than 2 water closet pans are connected.

(b) Location

The upstream vent of any drain must be connected:

- (i) at or close to the end of the drain; or
- (ii) at the vent extension of a stack located at or near the upstream end of the drain.

In either case it is permissible to have an unvented length of drain upstream of the vent connection if the unvented length complies with DF6.6.

(c) Size of vents

The minimum size of an upstream vent of any drain is DN50. Subject to this, the vent must be sized by using the ratings given in Table D6.7.2.

TABLE DF6.7.2		
SIZE AND RATING OF DRAIN VENTS		
<i>Fixture units discharging into drain</i>	<i>Vent rating</i>	<i>Vent size</i>
1 to 10 (incl.)	0.5	DN40
10 (excl.) to 30 (incl.)	1	DN50
30 (excl.) to 175 (incl.)	2	DN65
175 (excl.) to 400 (incl.)	3	DN80

When two or more vents are directly connected to the drain these can take the place of a single vent provided the sum of their ratings is not less than the rating required for venting the drain.

DF6.7.3 Termination of vents

(a) Vent pipes from waste fixtures discharging into disconnector gullies and from gullies located within buildings must be vented independently and not be interconnected to any other system vent. Such vents must terminate in the open air:

- (i) at a height of at least 50 mm above the overflow level of the associated fixture
- (ii) at least 900 mm from any opening to the building which is within a horizontal distance of 3 m from the vent; and
- (iii) not less than 150 mm above its point of penetration through any roof covering.

(b) Vents other than in (a) must terminate in the open air:

- (i) not less than 600 mm above any opening into any building which is within a horizontal distance of 3 m from the vent
- (ii) not less than 150 mm above its point of penetration through any roof covering
- (iii) not less than 3 m above any trafficable roof deck which is within a horizontal distance of 3 m from the vent
- (iv) not less than 2 m above or 600 mm below any chimney or similar opening within a horizontal distance of 3 m from the vent
- (v) not less than 5 m from any air intake; and
- (vi) not less than 600 mm above any cave, coping or parapet which is within a horizontal distance of 600 mm from the vent.

DF6.8 Design of pipes and drains

DF6.8.1 Sizing of discharge pipes

Discharge pipes must be not less than the size of the fixture traps to which they are connected. The size must be determined from Table DF6.3 and take into consideration:

- (a) the sum of the fixture unit rating of all fixtures connected to the pipe
- (b) the proposed pipe gradient; and
- (c) the maximum fixture unit loadings given in Table DF6.8.1

TABLE DF6.8.1					
MAXIMUM FIXTURE UNIT LOADINGS FOR GRADED DISCHARGE PIPES					
<i>Grade</i>	<i>Nominal pipe size (mm)</i>				
	40	50	65	80	100
1 in 20	6	15	51	65	376
1 in 30	5	10	29	39	248
1 in 40	4	8	21	27	182
1 in 50	x	x	x	20	142
1 in 60	x	x	x	16	115

NOTE

- (i) x indicates that the combination of pipe size and gradient is not permitted.
- (ii) Not more than 2 water closet pans are to be connected to any DN100 pipe

DF6.8.2 Sizing of drains

The size of a vented drain must be determined by taking into account the total number of fixture units (obtained from Table DF8.3) discharging into the drain.

(a) Normal grades

The minimum normal grade of drains must be as give in Table DF6.8.2A.

TABLE DF6.8.2 A
MINIMUM GRADIENT OF DRAINS

NOMINAL SIZE	MINIMUM GRADE
80	1 in 60
100	1 in 60
125	1 in 80
150	1 in 100

(b) Maximum fixture unit loadings for vented drains

The fixture unit loadings for vented drains must not exceed the values given in Table DF6.8.2 B for the size and grade of the drain shown.

TABLE DF6.8.2B				
MAXIMUM FIXTURE UNIT LOADINGS FOR VENTED DRAINS				
<i>Grade</i>	<i>Nominal pipe size (mm)</i>			
	80	100	125	150
1 in 20	215	515	1450	2920
1 in 30	140	345	1040	2200
1 in 40	100	255	815	1790
1 in 50	76	205	665	1510
1 in 60	61	185	560	1310
1 in 70	50	140	485	1180
1 in 80	42	120	425	1040
1 in 90	x	x	380	935
1 in 100	x	x	340	855
1 in 120	x	x	x	725
1 in 150	x	x	x	595

NOTE x indicates that the combination of nominal size and grade is not permitted.

(c) Reduced grades

Where the minimum grades given in Table DF6.8.2A are not achievable drains may be laid at the reduced grades given in Table DF6.8.2 C. In such a case the minimum fixture unit loadings given in the Table must be connected in advance of the top end of the reduced grade. Where even these reduced grades cannot be achieved provision must be made for regular and automatic flushing of the drain.

TABLE DF6.8.2C				
MINIMUM FIXTURE UNIT LOADINGS FOR REDUCED GRADE DRAINS				
<i>Reduced Grade</i>	<i>Nominal pipe size (mm)</i>			
	40	65	80	100
	<i>Minimum fixture unit loading</i>			
1 in 70	9	10	<i>See Table DF6.8.2A</i>	
1 in 80	10	18	“	“
1 in 90	X	X	27	“
1 in 100	X	X	38	“
1 in 120	X	X	X	75
1 in 150	X	x	x	160

NOTE x means that the grade is not permitted unless special automatic flushing arrangements are made.

(d) A drain must not be oversized for the only purpose of using a lower gradient than the minimum gradient given in Table DF6.8.2A. The size of a drain must not reduce in the direction of flow.

DF6.8.3 Cover over drains

(a) Drains must be protected against any mechanical damage and deformation resulting from the loads over them. Adequate cover must be provided to comply with Table DF6.8.3 unless exempted under (b).

TABLE DF6.8.3		
MINIMUM DEPTH OF COVER OVER DRAINS		
<i>Location</i>	<i>Minimum cover from top of pipe socket to ground surface (mm)</i>	
	Pipes of cast iron or ductile iron	Pipes of other materials
Household driveways		
Other locations where no vehicular loadings are expected	300 Nil	450 300

(b) Where it is not practical to provide the minimum cover to Table DF6.8.3, drains must be covered by a sandy overlay of at least 50 mm and provided with:

- (i)** 75 mm thick concrete paving where light vehicular traffic may be expected; and
- (ii)** 50 mm thick concrete paving at other locations where vehicular traffic is not expected.

The paving must be symmetric to the drain alignment and must have a minimum width equal to the depth of the base of the drain from the top of the paving plus 300 mm.

DF6.8.4 Drains close to buildings

(a) Drains under buildings (note this clause does not relate to public infrastructure which is not to be under buildings)

Where it cannot reasonably be avoided drains may be laid below ground under buildings in which case:

(i) inspection openings must be provided at both ends of the drain adjacent to the building; and

(ii) a minimum of 50 mm of sandy overlay provided over the pipe and below a reinforced concrete floor slab; or

(iii) the drain must be protected from damage.

(b) Proximity of buildings

(i) where a drain is to be laid parallel to a footing the excavation for it must clear a line at 450 from the extremity of the footing. (See Figure DF6.8.4)

(ii) where a drain crosses a strip footing, the angle of crossing must be not less than 45° and the top of the drain must clear the bottom of the footing by not less than 50 mm

(c) Building over drains

Where it is not practical to divert drains in order to avoid erecting buildings over them –

(i) the restrictions listed in (a) and (b) must be observed; and

(ii) other appropriate engineering precautions taken against damage.

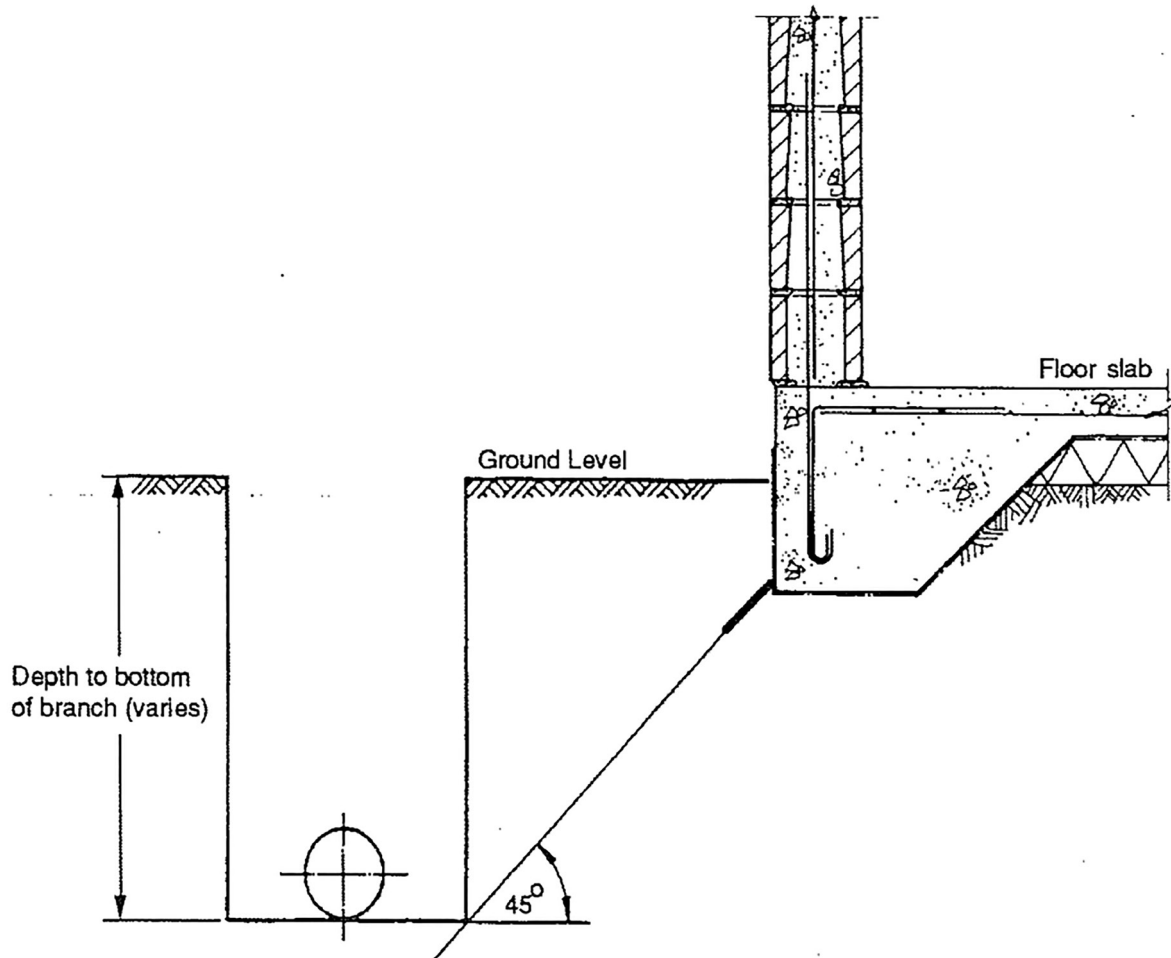


FIGURE DF6.8.4

DF6.9 Gully traps other than floor waste gullies.

Gully traps may be used:

- (a) as overflow relief gullies to provide in the event of sewage surcharge; or
- (b) to provide disconnection between waste discharges and the remainder of the sewerage installation (disconnecter gullies).

DF6.9.1 General

(a) A gully must be installed such that:

- (i) it is supported on a minimum 75 mm thickness of concrete of 17.5 MPa grade; and
- (ii) it is protected from damage at floor level by a concrete surround of minimum width and depth of 75 mm.

(b) The following discharges must not be allowed into a gully:

- (i) from any soil fixture; and
- (ii) any rain water drainage from the roof or ground.

(c) The gully must have its water seal maintained from a waste fixture or floor waste gully. The maximum length of unvented waste pipe discharging into the gully must be 2.5 m from basins or bidets, 6 m from all other waste gullies and fixtures with DN50 or smaller pipes, and 8.5 m from floor waste gullies and fixtures with DN65 or larger pipes.

DF6.9.2 Overflow relief gullies

At least one overflow relief gully must be installed in a drain which is connected to a public sewer

(a) Size

The size of the overflow relief gully is related to the size of the main drain. For a size of main drain of DN80 the gully must also be DN80. For main drains of DN100 to 150 size, the gully must be DN100.

(b) Location

An overflow relief gully must be located within the property, external to the building, as far as practicable from the downstream end of the drain, and so that the top of the gully is accessible and positioned where any overflow can be easily noticed.

(c) Height

A minimum height of 150 mm must be kept between the top of the overflow gully riser and the lowest fixture connected to the drain. The point of measurement on fixtures is given in Table DF6.9.2.

TABLE DF6.9.2	
POINT OF MEASUREMENT OF FIXTURES FOR HEIGHT ABOVE OVERFLOW LEVEL OF GULLY	
Fixture	Point of measurement
<i>Soil</i> fixture with integral trap	Level of water seal surface
Floor waste gully or shower outlet	Top surface level of grate
Other fixtures	Top surface level of fixture outlet

DF6.9.3 Disconnecter gully traps

Where installed within a building these must:

(a) have the gully riser extend to floor level and be sealed with an airtight removable cover; and

(b) a DN50 vent pipe must branch from the riser at an upward grade of not less than 1 in 80 and terminate with a grating at an external wall of the building above any likely flood level. Alternately, the vent pipe can terminate as in DF6.7.3(a). No other fixture or appliance must be connected to the vent pipe.

DF6.10 Floor waste gullies

Floor waste gullies are functionally similar to fixture water traps. Shower outlets may be used as floor waste gullies. Any waste fixture may be connected to a floor waste gully. No trap is required other than for discharge outlets from basins. For other than basins the maximum length of the untrapped waste pipe must not exceed 1.2 m. if any of the fixtures is trapped, the maximum length of the waste pipe is allowed to be up to 2.5 m. However, the traps must not be vented. With the exception of allowed fixture pairs, each fixture must connect individually with the gully at a grade of not less than 1 in 40.

DF6.10.1 Size

The outlet size of a floor waste gully trap is based on the total fixture units of the fixtures and appliances discharging into it. The outlet size must be:

(a) DN50 for a total fixture unit rating of 3 units or less; and

(b) DN65 to DN100 for a total fixture unit rating of 10 or less.

A DN50 outlet and a DN50 riser may be used if the sole function of the gully is to dispose of water spillage and wash-down water. All other gullies must have a minimum riser size of DN80 at floor level. A floor waste gully must have an accessible, removable grate.

DF6.10.2 Height of gully riser

The minimum height of the gully riser from the top of the water seal to the floor surface must comply with Table DF6.10.2. The maximum height must not exceed 600 mm.

TABLE DF6.10.2		
MINIMUM HEIGHT OF FLOOR WASTE GULLY RISERS		
<i>Fixture connected</i>	<i>Minimum height from water seal to floor level (mm)</i>	
	Waste pipe entry at 88.5°	Waste pipe entry at 45°
Shower	150	100
Bath (only one)	250	200
Clothes washing machine	300	250
Other waste fixtures	250	150

DF6.10.3 Maintenance of water seal

At least one waste fixture must be connected to any floor waste gully in order to maintain the water seal. For this reason the minimum depth of water seal must be 65 mm or the values in DF6.4.1, whichever is more.

DF6.11 Inspection openings

DF6.11.1 General

Inspection openings comprise:

- (a) inspection branches or square junctions; or
- (b) inspection chambers.

DF6.11.2 Location

Inspection openings must be provided:

- (a) outside the building on each branch connecting one or more water closet pans
- (b) at intervals of not more than 30 m
- (c) downstream and upstream ends of any section of drain that passes under a building
- (d) where any new section of drain is connected to an existing drain; and
- (e) at the connection to the public sewer.

Appropriate locations are illustrated in Figure DF6.11.2.

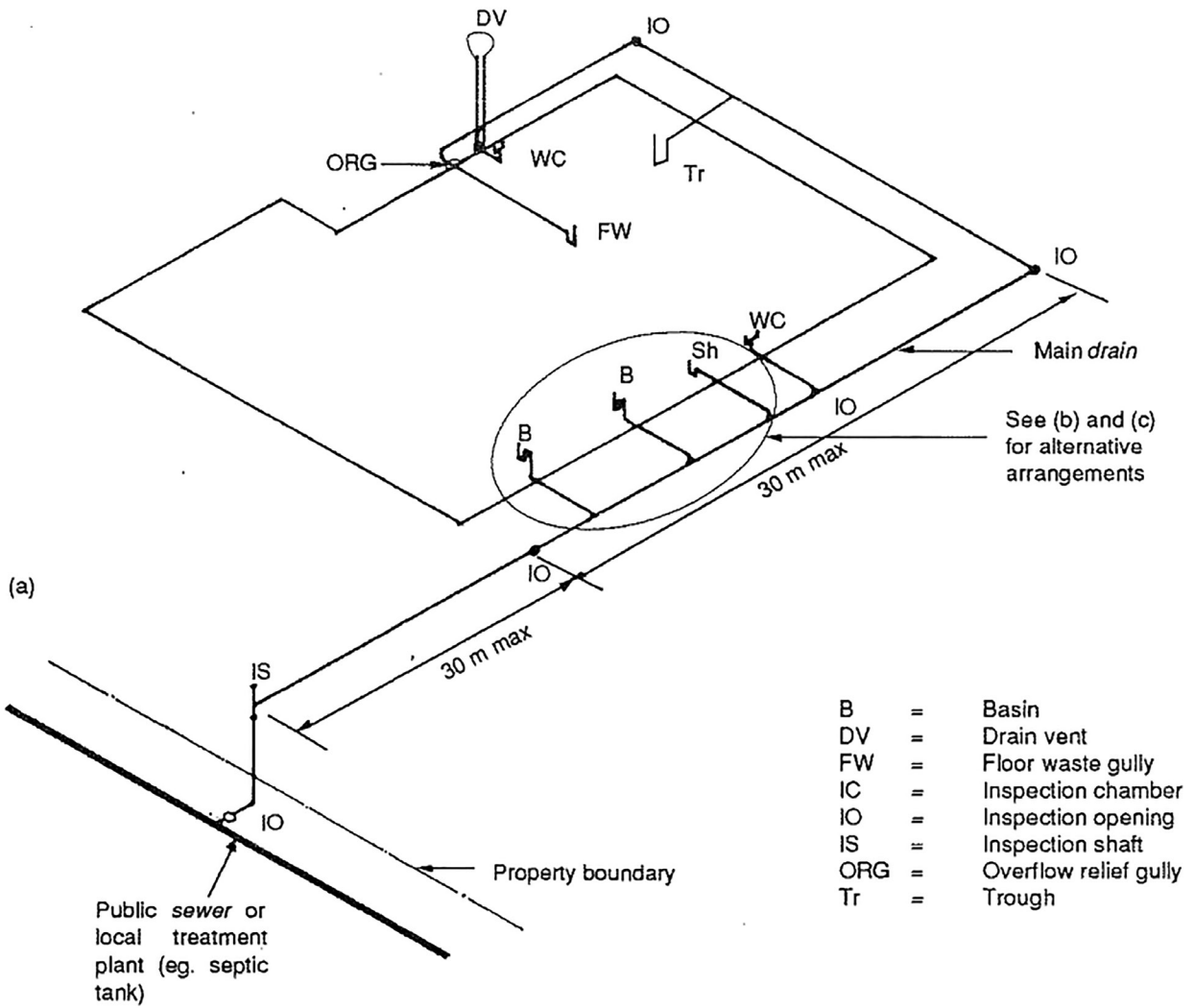


FIGURE DF6.11.2 - LOCATION OF INSPECTION OPENINGS

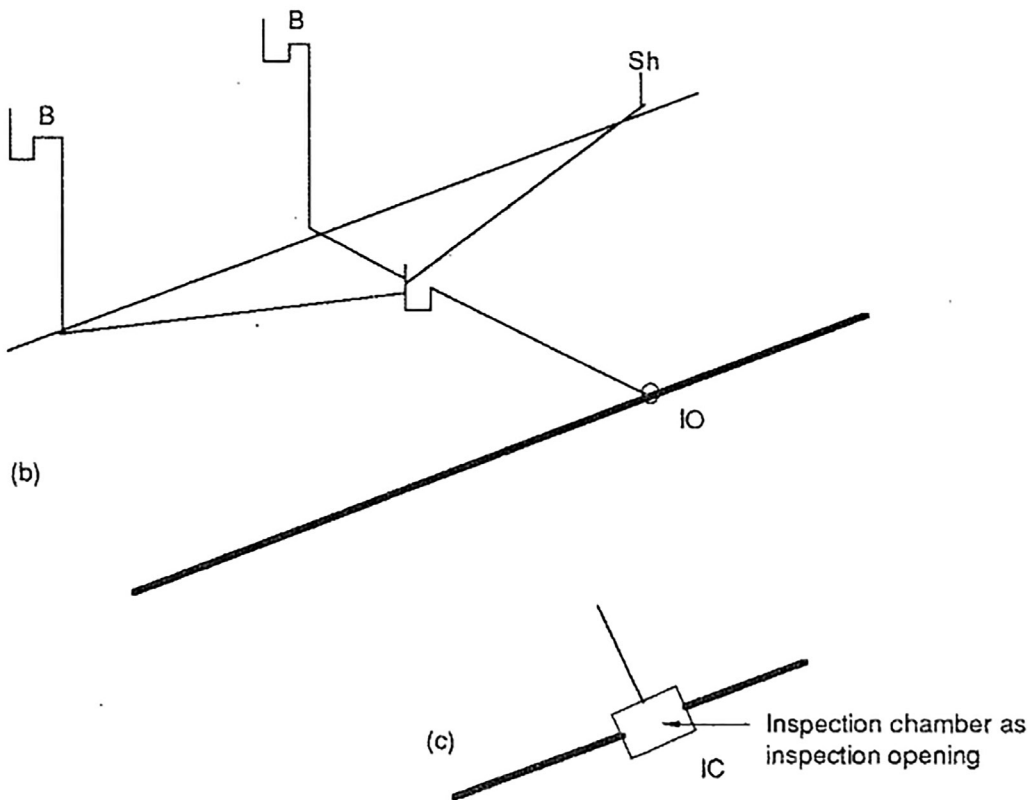


FIGURE DF6.11.2 - LOCATION OF INSPECTION OPENINGS

DF6.11.3 Size

- (a) The size of inspection branches or square junctions must be:
 - (i) the same size as the drain for drains up to DN150; and
 - (ii) not less than DN150 for larger drains,
- (b) The dimensions of inspection chambers must comply with Table DF6.11.3.

TABLE DF6.11.3			
SIZE OF INSPECTION CHAMBERS			
<i>Minimum internal measurement (mm)</i>			
Depth to floor of chamber	Rectangular		Circular
	Length	Width	Diameter
Less than 600	600	450	600
600 to 900	900	600	900
More than 900	1200	750	1050

DF6.11.4 Access for inspection branches and square junctions

Inspection branches and square junctions must be so located that it is possible to use them for inspection and for clearing obstructions in the associated sections of the drain. When located inside buildings, inspection branches and square junctions must have their openings readily accessible. Such openings must have airtight removable caps or plugs with gaskets, rubber rings or such other accessories to maintain tightness. When the caps or plugs are removed for inspection/maintenance, the gasket/rubber ring must be replaced with a new one.

DF6.11.5 Construction of inspection chambers

- (a) Where required
 - (i) An inspection chamber is required where an inspection branch or square junction:
 - (ii) cannot accommodate all the convergent drains; or
 - (iii) will not permit proper inspection or the clearing of obstructions.

(b) Conduits and channels

The conduits in inspection chambers may be open channels of size and shape equal to the associated drains. The floor in inspection chambers must slope at a grade of between 1 in 10 and 1 in 15 towards the channel. Any formed junction must have a centre line radius of not less than 300 mm. A fall of at least 30 mm must be provided in the invert of any channel that curves through 45° or more.

(c) Access opening

A circular or rectangular access opening of 530 mm minimum dimension and fitted with a removable water tight cover must be provided at surface level. The cover must have been designed and installed to take any likely load on it. Where the size of the inspection chamber is larger than the size of the access opening, the top section of the chamber may be suitably tapered. Where this is done the full dimensions of the chamber must be maintained for a height from the chamber floor of at least 1.5 m, and the depth of the narrower shaft at the top not exceed 350 mm. The minimum dimension of the shaft except at the opening must be 600 mm,

(d) Access ladder

Where the depth of the chamber exceeds 1.2 m rungs or rung ladders must be provided to AS 1657.

(e) Materials of construction

Inspection chambers must have theft base and walls of a minimum thickness of 150 mm and constructed of:

- (i)** base - concrete; and
- (ii)** walls - concrete or fully-grouted concrete block masonry.

The concrete must be of 20 MPa grade. The walls and base must be suitably reinforced if required. The channels may be formed of half sections of pipes and fittings. Any access rungs or ladder must be of galvanised steel. The cover and any frame to seal it must be of reinforced concrete or cast iron with safe lifting devices.

The walls and base of any inspection chamber must be cement rendered to a smooth finish. The render may contain a suitable water proofing agent to ensure a waterproof finish. Where there is any likelihood of seepage of sub-soil water into the manhole the external surfaces of the wall must be plastered to a waterproof finish or a suitable water proofing agent added to the concrete in the walls and base.

(f) Inserts

The contact area between pipes or fittings and the walls formed around them, as well as holes broken into or formed in the walls of inspection chambers for insertion of pipes or fittings must be made water tight by:

- (i)** the application of a suitable bonding agent around the pipes
- (ii)** caulking the annular space between the wall and the pipe or fitting with a stiff mix of one part cement and 2 parts sand
- (iii)** sealing with an epoxy-based or other suitable sealant; or
- (iv)** a combination of these methods.

DF6.11.6 Junctions

(a) Junctions of drains must:

- (i)** be swept in the direction of flow or have an oblique junction fitting with an upstream angle of no more than 60 °
- (ii)** not be Y junctions in the horizontal plane; and
- (iii)** where unequal junctions are used have the soffit of the branch in level with or higher than the soffit of the larger size.

(b) Square junctions in drains must only be used:

- (i)** at the connection of an inspection shaft to a graded drain
- (ii)** as the inlet riser of a gully or a floor waste gully
- (iii)** as an inspection opening; or
- (iv)** at the top of a drop junction in place of a bend and inspection opening.

ROOF DRAINAGE

DF7.1 Design of roof gutters

(a) Roof gutters where provided must be sized using the information given in Table DF7.1.

TABLE DF7.1				
GUTTER SIZES				
<i>Type of gutter</i>	<i>Roof catchment area (m²)</i>			
	10	20	50	100
	<i>Required cross-sectional area of gutter (mm²)</i>			
Eaves gutter	120	2200	4550	8100
Internal box and valley gutter	1480	2570	5360	9320

NOTE

1. The roof catchment area is the area of the roof drained by one downpipe. It is taken as the area of the roof from ridge to gutter between two adjacent downpipes.
2. Values can be interpolated for catchment areas falling between the give figures.
3. The gutter sizes do not include any allowance for freeboard. A freeboard of 25 mm for eaves gutters and 35 mm for internal box gutters must be added to the cross-sections derived from the table.

(a) Gutters must have a minimum slope of:

- (i) 1 in 500 for eaves gutters; and
- (ii) 1 in 200 for internal box gutters.

These slopes must be increased where there is any material risk of clogging of the gutters and downpipes with leaves and other such matter.

NOTE:

With high fronted eaves with fascia boards there could be overflow from the back of the gutter into the building if the downpipes or gutters are blocked. One method of preventing such overflow is by providing drainage slots along the front of the gutter at a level lower than the back edge. Another method would be to provide sumps and weirs at the ends of the gutter or where the downpipes take off. The risk of overflow into the building from any internal box gutter can be reduced by providing sumps and weirs at the ends of the gutter.

DF7.2 Design of downpipes

The minimum area of cross-section of a downpipe must be the greater of:

- (a) half the area of cross-section of the gutter it serves; or
- (b) the area calculated for each 10 m² of the roof area drained by it at the rate of:
 - i) 650 mm² for eaves gutters; and
 - ii) 930 mm² for internal box gutters.

DF7.3 Incompatible metals for gutters

Direct contact between the following metals must be avoided in order to prevent corrosion:

Zinc or aluminium	}		{	copper or copper alloys
and	}	and	{	and
alloys of either	}		{	some grades of stainless steel

LATRINES FOR AREAS WHERE THERE IS NO PIPED WATER SUPPLY

DF 1 Scope

This Specification sets out the requirements in relation to the location and types of latrines in areas where there is no piped water supply. It applies to all of the Pa Enua except for Rarotonga and Aitutaki for which the Ministry of Health's current regulations apply.

DF 2 Precautions

Care must be exercised to ensure that

- (a) disease transmitting flies and other insects do not have access to the excreta
- (b) there is no nuisance to the public or the neighbours
- (c) the sub-soil water is not polluted if it is likely to be used for domestic purposes
- (d) the biological oxygen demand (BOD) of any resulting effluent is limited to the requirements of the Department of Health so that streams, rivers and oceans are not polluted.

DF 3 Location

The latrines must be screened from public view and be located not less than:

- (a) 30 m from any well or other similar potable source of water
- (b) 6 m from the front or street boundary of the allotment
- (c) 3 m from any boundary other than the front or street boundary
- (d) 3 m from any dwelling within or outside the allotment.
- (e) 15 m from any stream, lagoon or other water bodies

DF 4 Types of latrines

The following disposal methods can be used.

1. Dry on-site treatment: composting latrines.
2. Wet on-site treatment: wet pit latrines, aqua privies, septic tanks, and biogas plants.

All these disposal methods rely on the reduction of BOD by aerobic bacteria (where free oxygen is available) and/or anaerobic bacteria (where free oxygen is excluded).

4.1 Composting Latrines (Fig 4.1) are of two types, the single-vault continuous operation type and alternative twin-vault batch systems such as the **WHO** Vietnamese design.

Continuous-operation types utilize aerobic bacteria to act on excreta and vegetable wastes suspended on a rack above the floor of the ventilated vault. Urine is evaporated off or drained away. As the mixture decomposes, it falls through the rack and is removed for use as fertilizer.

In the alternating twin-vault type, one vault at a time receives excreta. Urine is drained away in a separate surface channel. The excreta are covered with loose earth, ashes, or sawdust to reduce odours. When the vault is nearly full, it is sealed with lime mortar and left for a few months to compost by anaerobic bacterial action. Contents are then removed and used for fertilizer. During this time the other vault is used as the latrine. Both types work best in warm climates and with little or no urine loading

ANNEXURE 1 OF SPECIFICATION DF2.1

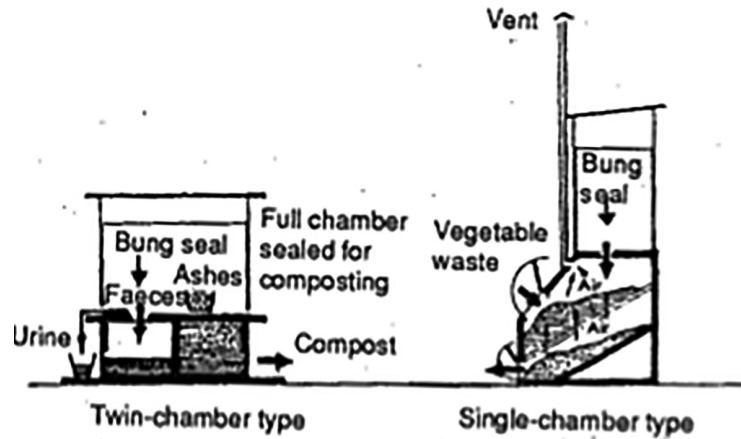


FIGURE 4.1 - COMPOSTING LATRINES

4.2 Dry Pit Latrines have no flushing facility (Fig 4.2). They are manually dug pits or mechanically bored holes a few meters deep over which a squatting plate with a bung seal or seat with lid is placed. These latrines operate more efficiently when the bottom of the pit is below the water table, which allows excreta to be decomposed by anaerobic bacteria below water level and to soak away into the surrounding ground. However this could lead to the pollution of potable water sources in the area. Gases generated, such as methane, are vented through a tall vent pipe. When pits are dry, a combination of anaerobic and aerobic decomposition takes place. When a pit is almost full, the surface cover is removed and the top of the pit filled with a mixture of lime and earth. A new pit is then dug.

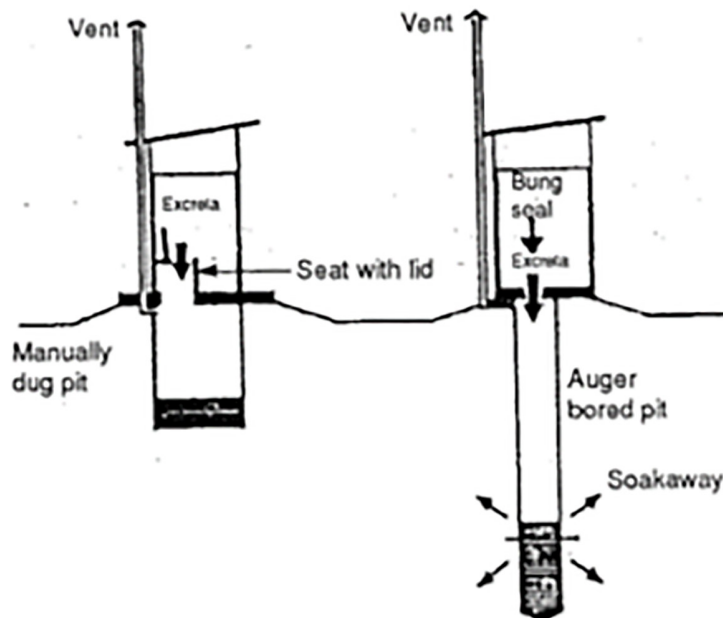


FIGURE 4.2 - DRY (NONFLUSH) PIT LATRINES

DF 4.3 Wet Pit Latrines are bucket-flushed, water-seal, floor-pan latrines with a soak-away pit in porous soil. Digestion of excreta is by anaerobic bacteria below water level. The lower section of the pit is lined to retain water when the pit does not reach the water table. Gases from the digestion are vented through a tall pipe.

For more details of dry pit and wet pit latrines see. Annexure 1 to this Specification.

DF 4.4 Aqua Privies (Fig 4.4) are simplified septic tanks with a single chamber and without a full flush pan. Where bucket-flushed squat plates are used, excreta enters the tank through a short pipe that penetrates below the surface of the liquid in the tank to minimise odours. Alternately,

excreta may enter through a low-volume, water-seal, bucket-flushed floor-trap set in the squat plate. Decomposition is by anaerobic bacteria below water level in a permanent tank, which periodically requires desludging. Gases generated in this process of decomposition are vented through a tall vent pipe. Excess effluent from the tank is drained to absorption trenches.

ANNEXURE 2 OF SPECIFICATION DF2.1

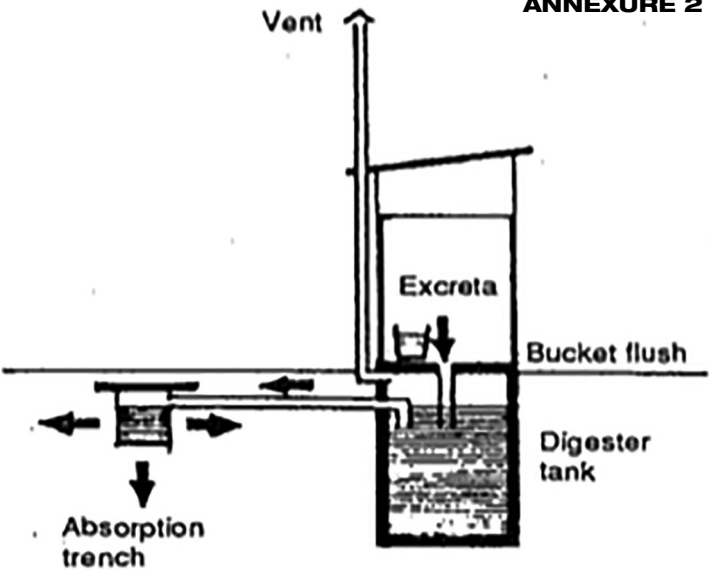


FIGURE 4.4 - AQUA PRIVY

4.5 Septic Tanks can be either single or double chamber. They are generally used with full cistern flush water-seal pans. Single-chamber designs use anaerobic digestion; in double-chamber designs the second chamber is ventilated and uses aerobic bacteria for digestion. The permanent tanks need desludging periodically. The effluent is piped into absorption trenches. For details of septic tanks see Annexure 2 to this Specification.

4.6 Biogas (Gobar Gas) Digesters (Figure 4.6) operate similarly to a single-chamber anaerobic septic tank, but provision is made to trap the gas, which is largely methane, given off during digestion. The methane gas can be used as fuel for cooking and lighting buildings. For efficient gas production, the contents of the digester tank should have a carbon: nitrogen ratio of approximately 30:1. Vegetable wastes are usually added to the excrement to raise the carbon content in the tank. Excess effluent from the tank is often drained into ponds or absorption trenches, where algae are grown as feed for domestic animals such as ducks. The digester tank requires desludging periodically.

The choice of latrine is determined by local ground conditions, rainfall, water table, water supply, ground temperature range, and social, cultural, and religious influences within the community.

ANNEXURE 1 OF SPECIFICATION DF2.1

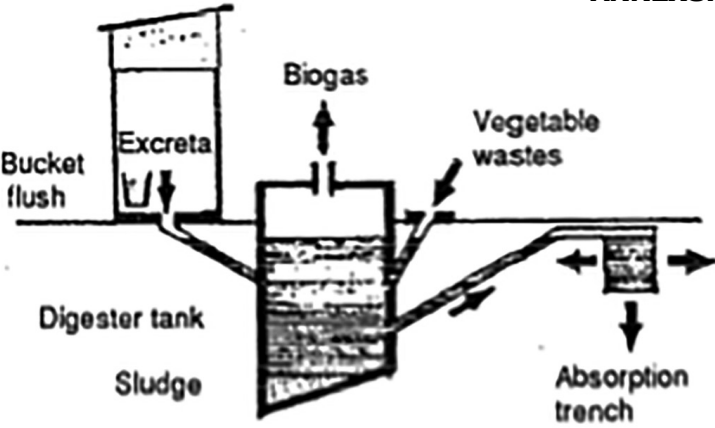


FIGURE 4.6 - BIOGAS DIGESTER

PIT LATRINES

Introduction

Pit latrines can be of two types - dry pit and wet pit.

This specification covers the details of both. When correctly constructed and maintained according to this specification and details available from the Health Department, the nuisance from flies and bad odour could be substantially reduced. It applies to all of the Pa Enua except for Rarotonga and Aitutaki for which the Ministry of Health's current regulations apply.

Location

Pit latrines whether wet or dry must be located:

- (a) at least 30 m away from any well or other potable
- (b) source of water if the pit does not go through any fissured rock or coral
- (c) 3 m from any dwelling within or outside the allotment 6 m from any boundary with a street
- (d) 3 m from boundaries other than with a street
- (e) 15 m from any surface water courses/streams.
- (f) preferably at a lower ground than where a potable source of water is located
- (g) such that it is accessible to the household at all times; and
- (h) so that the prevailing wind around the latrine is not shaded,

Where the pit penetrates through fissured rock or coral through which liquids from the pit might pass unfiltered, the advice of the Health Department must be sought on the location. Otherwise all the fissures must be closed with concrete or cement mortar.

The site must be on firm ground which will not cave in or slump while digging the pit. If there is some problem in this regard, one solution could be to line the affected area with an old drum with both ends removed. The site should not be subject to flooding or remain water-logged.

Calculation of dimensions

The pit volume depends on the number of users, the period for which it is used and a freeboard allowance of 0.5 m depth. If the pit remains dry the annual accumulation of sludge is about 0.08 m³/person. In wet pit latrines or where washing water is allowed to enter it, the accumulation rate could be taken as 0.05 m³.

For example, for a family of 5 which plans to use the pit for 5 years, the volume required to hold the sludge would be:

For a dry pit	$5 \times 0.08 \times 5 = 2.0 \text{ m}^3$
For a pit area of 0.6 m x 1.0 m, the	
Depth required for the sludge	$= 2.0 / (0.6 \times 1.0) = 3.3 \text{ m}$
Add freeboard allowance	$= 0.5 \text{ m}$
Total depth required	$= 3.8 \text{ m}$
For a wet pit, the volume of sludge	$= 5 \times 0.05 \times 5 = 1.25 \text{ m}^3$
For a pit diameter of 600 mm, area	
of cross-section	$= 0.6 \times 0.6 \times 3.14 / 4 = 0.28 \text{ m}^2$
Depth of pit for sludge	$= 1.25 / 0.28 = 4.5 \text{ m}$
Add freeboard	$= 0.5 \text{ m}$
Total depth	$= 5.0 \text{ m}$

If these depths are considered impractical either the sectional size of the pit can be slightly increased (for instance, for 700 mm diameter the depth of the pit would be 3.8 m for a 5-year life) or the depth reduced to cater for a shorter life for the pit.

A cover slab of size 1.4 m x 1.0 m would be appropriate for the dimensions chosen for the dry pit if the sides of the pit are very stable; otherwise the size of the slab must be larger. The pit need not be rectangular in shape. It can be an auger bored circular pit of 600 to 700 mm diameter.

4. Construction

4.1 Digging the pit

The pit may be dug manually in which case it is usually rectangular or square. A power-operated or hand auger can be used to dig circular pits. Whichever method is used care must be exercised to ensure that the dimensions at the top remain true. Otherwise there could be difficulty and additional cost in placing the cover slab.

Where it is necessary to close off any fissures or crevices in rock or coral in the pit, the pit dimensions must be sufficient for someone to be lowered down to do the work. Great care must be exercised in lowering anyone. A safety rope must be used and at the first sign of any cave- in or other problem others on top must promptly pull the person from out of the pit. If the fissures are large concrete to a mix of 1 part cement, 2 parts clean sand and 4 parts gravel/coral/stones must be used to close them. If not use cement mortar with 1 part cement and 2 parts sand. The concrete or mortar must be to a stiff mix.

4.2 Foundation

The foundation provides a sealed support for the cover slab and raises it above the surrounding ground. The foundation may be cast in concrete or be made up of concrete block masonry or durable timber. The ground around the pit must be levelled and preferably raised with a layer of gravel, coral or earth before pouring/erecting the foundation.

4.3 Cover slab

Cover slabs are of two types:

- (a) squat type with small platforms for the feet; or
- (b) a pedestal type on which the user can sit.

The cover slab can be purchased from the Health Department or from private suppliers. It could also be locally precast using detailed instructions available from the Department of Health. Figures 4.3A and B give some details of the cover slab.

The cover slab must be placed over the foundation so that it is fully supported without any gaps. Cement mortar may be used to firmly seat the slab over the foundation. The finished surface of the slab must be at least 150 mm above the immediate surrounds.

4.4 Vent pipe

A 100 mm PVC vent pipe may be erected over the pit to remove foul gases generated by the decomposition of the waste matter. The squat slab has a matching PVC insert shown in Figures 4.4A and 4.5 on which the vent pipe can be erected. The vent pipe must be supported to the frame of the shed over the pit. One way of strapping the pipe is also shown in Figure 4.4A. The vent pipe must be at least 2.5 m high and 500 mm above the roof at the point of penetration or the nearest point. The open end of the vent must be covered with durable fly screen to prevent flies and mosquitoes from entering the pit (Figure 4.4B).

Mosquito breeding inside the pit is not a likely problem where a pour-flush water seal is used over the cover slab (see Figure 4.3B). In the case of a squat slab a wooden bung seal can be used to cover the squat hole when it is not being used. This would prevent mosquitoes and flies from gaining entry into the pit. In the case of seats without a water seal, a folding lid can be used to keep it covered when it is not in use.

It is good to extend the squat hole or (seat without water seal) into the pit by about 300 mm by

using an insert. This would reduce the chances of the foul gases escaping through the hole rather than through the vent. (When the restricted space in the shed gets hot from the sun, foul gases would tend to escape through the hole in the slab rather than through the vent).

4.5 The shed

A typical shed is shown in Figure 4.5. Although it could be built of any locally available material, it should be durable and firmly held down. Otherwise it could be blown away during cyclones and act as a wind-borne missile. The shed must afford privacy and have good ventilation. Good ventilation would keep the shed less hot in summer and thereby reduce the chances of foul gases escaping through the hole in the cover slab. The interior of the shed must be shaded from too much light as flies are attracted to light.

5. Maintenance

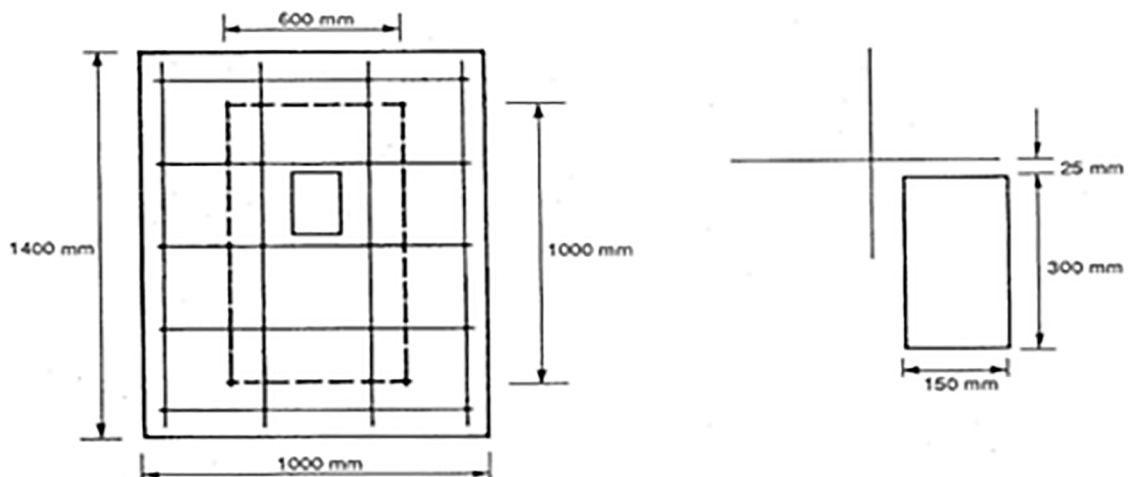
The pit latrine must be kept clean at all times. However, do not use strong disinfectants in large quantities. It is best to use a wet mop or wet rag soaked in diluted disinfectant or cleaning agent to clean the cover slab and seat. If chemicals and cleaning agents are allowed inside the pit, they would drastically affect the bacterial degradation of the waste matter and there could be problems with foul smells and the pit could be filled sooner.

Any erosion of the fill around the foundation must be noted and repaired. The fly screen cover over the vent pipe must also be checked periodically and replaced promptly if damaged. The shed over the pit must be kept in good repair.

6. Pit closure

When the pit is full to within about 0.5 m of the cover slab it must not be used any more. Another pit must be located at least 3 m away (the deeper the pit, the greater the separation distance). The cover slab, vent pipe, and shed can be re-used over the new pit.

The remaining space in the old pit must be filled with earth. It is good to over-fill and form a mound so that enough surplus earth is available when the material subsides with decomposition. The pit can be dug out after a minimum period of one year and the material safely used as a fertiliser.



Note: All reinforcement
10 mm bars with 20 mm
cover

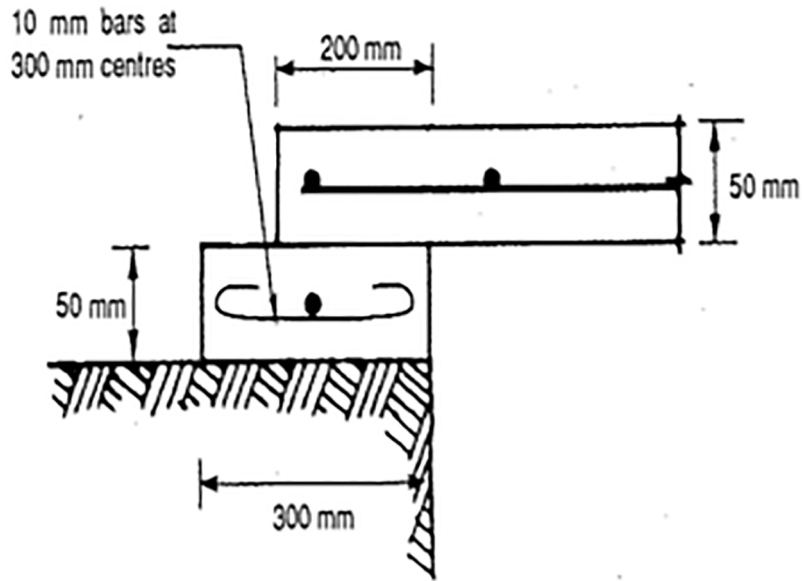


FIGURE 4.3A - DETAILS OF SQUAT TYPE COVER SLAB

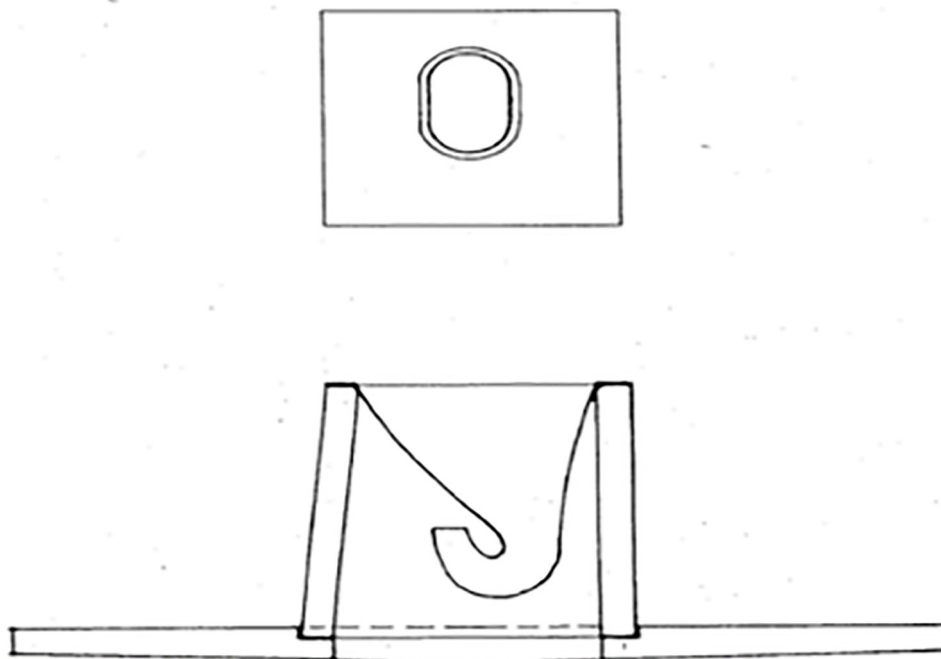


FIGURE 4.3B - COVER SLAB WITH POUR-FLUSH WATER SEAL SEAT

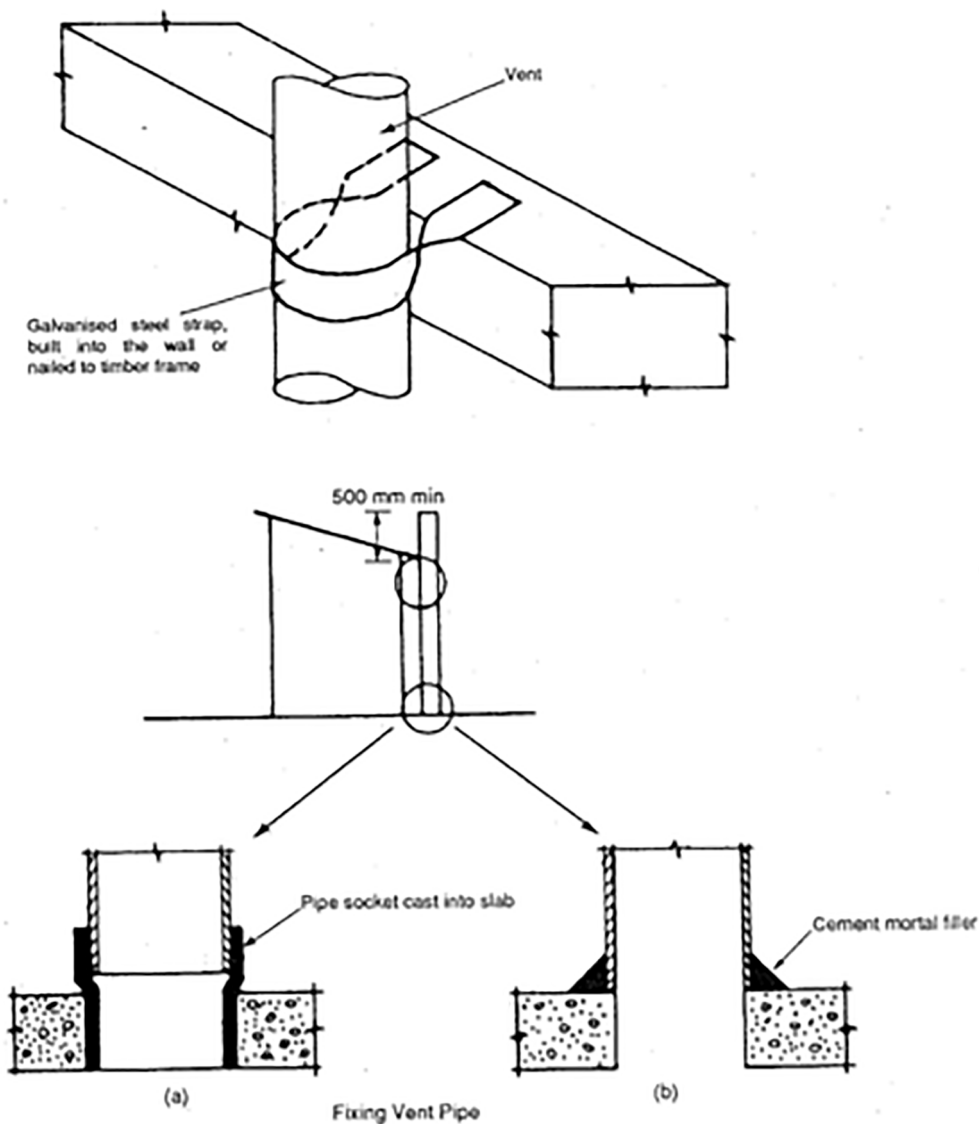


FIGURE 4.4A - METHODS OF FIXING THE VENT PIPE

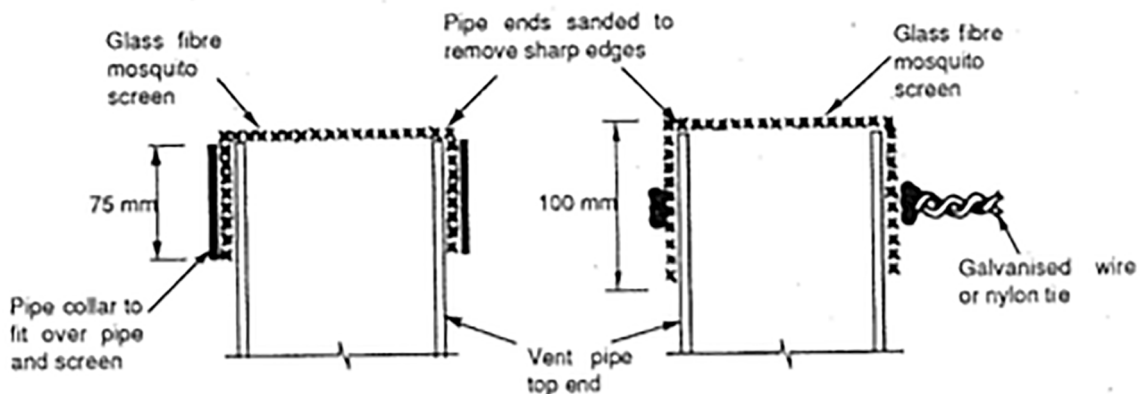


FIGURE 4.4B - FIXING OF INSECT SCREEN OVER VENT PIPE

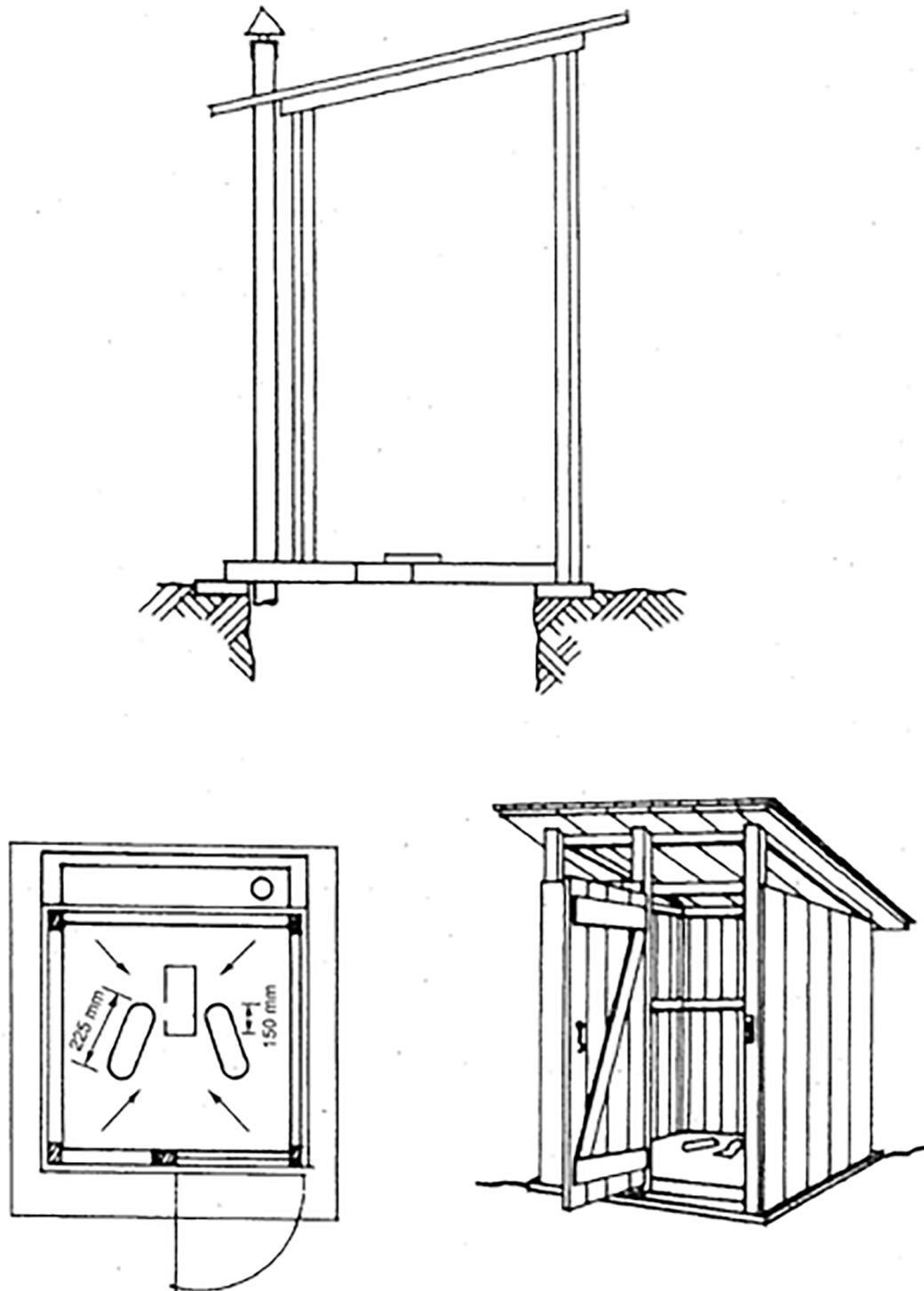


FIGURE 4.5 - GENERAL ARRANGEMENT

SEPTIC TANKS FOR DOMESTIC USE

Function of a septic tank

The basic function of a household septic tank is to receive normal liquid household wastes and to condition them for such a time, and in such a manner, that the clarified effluent may be percolated efficiently into the subsoil, where it is absorbed and evaporated. In order to perform this basic function, all septic tanks must fulfill the following requirements:

(a) Remove solids

A septic tank must have a primary or liquefying chamber of such shape and size that the rate of flow of all sewage is so reduced that at least the larger solids sink to the bottom and are retained and the clarified effluent is discharged. The inlet and outlet pipes of this primary chamber must be so shaped and located that the scum which forms on the surface of the sewage is not disturbed. The capacity of the tank is usually kept equal to the inflow during 24 hours to allow a day's retention.

(b) Promote bacterial action

To ensure that the solids and liquids in the tank will decompose it is necessary that the tank be designed so that either:

- (i) a variety of bacteria - anaerobic bacteria - which thrive in the absence of free oxygen are present; or
- (ii) a variety of bacteria - aerobic bacteria - which thrive with access to air is also present.

A tank that is designed to achieve the purpose defined in (i) is a single-treatment septic tank, and a tank that is designed to achieve the purpose defined in (ii) is a double-treatment septic tank. A double-treatment tank is generally more expensive. Therefore details of only single-treatment tanks with or without aerobic filters will be included in this Specification.

(c) Store sludge

A fine silt-like sludge accumulates at the base of the primary tank. It follows that the primary tank must be of sufficient size to store sludge for a considerable period; otherwise, if the tank is not cleaned out at frequent intervals, the sludge will eventually be scoured from the tank and clog the outlet drain, the absorption trench or soil and an aerobic filter where provided.

Location

Septic tanks and other connected works such as absorption trenches must be located at a sufficient distance to prevent contamination of potable water sources and nuisance. Figure 2 shows typical layouts with the minimum separation distances marked on them. It will be seen that a minimum distance of 30 m is required between soak pits and potable water sources whereas this distance is only 15 m in the case of absorption trenches.

Another important consideration in the siting of a septic tank is that an adequately absorbent area must be available for discharging the effluent through absorption trenches or soak pits.

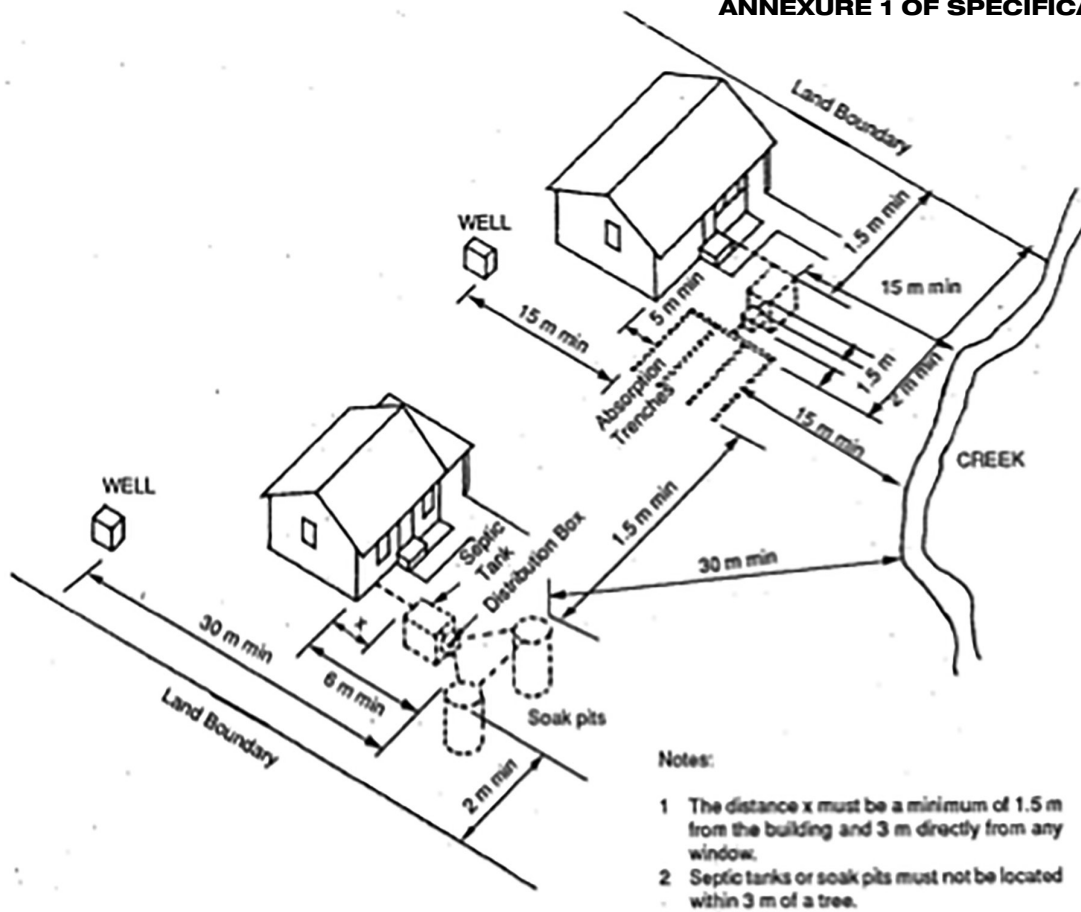


FIGURE 2 - TYPICAL LOCATION OF SEPTIC TANK SYSTEMS WITH MINIMUM REQUIRED SEPARATION DISTANCES

Construction

3.1 Septic tanks may be of reinforced concrete or of reinforced block masonry walls over a reinforced concrete base. Tanks of precast concrete construction may be made from rectangular slabs which are assembled on the site, or be of cylindrical construction, either as a single cylinder open at the top, or a stack of short, open-ended cylinders. There are also prefabricated septic tanks made of fibre glass.

3.2 Whatever form of construction or materials are used for the sides and bottoms of septic tanks the resulting work must be impervious to water. For tanks of rectangular section, it is important that all internal angles be well-rounded, so as to minimize shrinkage cracking. Leakage at the corners of tanks of precast concrete construction made from rectangular slabs, or at the joints of precast tanks made from a number of open-ended cylinders, must be detected and corrected in advance.

3.3 Every septic tank of block masonry or concrete construction must be covered with reinforced concrete slabs and removable manhole covers fitted over every compartment. Concrete and masonry tanks are to be painted with a sealant paint to avoid leakage of raw sewage to ground water. The manholes are used when it is necessary to pump out or otherwise clean the tanks. Inspection openings are also required over the inlet and outlet square junctions. The aerobic filter where provided must be filled with hard, impervious and durable stone, coral or gravel. These must be graded from 60 mm to 75 mm.

3.4 Design details

The design of the type of septic tank system to be installed will be governed by the results of the investigations of the site and locality, taken in conjunction with the results of the percolation test discussed in Clauses 5.2 and 5.3. Where the soil is of a suitable type and is sufficiently absorbent, and where the absorption area is sufficiently large to dispose of the final effluent, a single treatment septic tank will be suitable. See ASNZS 1547 for sizing. If there is any doubt about the porosity of the site and that the effluent might seep on to adjoining premises or public places, then an aerobic filter must be installed with a septic tank. A surface area of one square metre of filtering materials must be provided in aerobic filters for up to every 0.9 m³ of flow of sewage per day. This works out to about 1 m³ of filter for 50 m³ of daily flow of sewage.

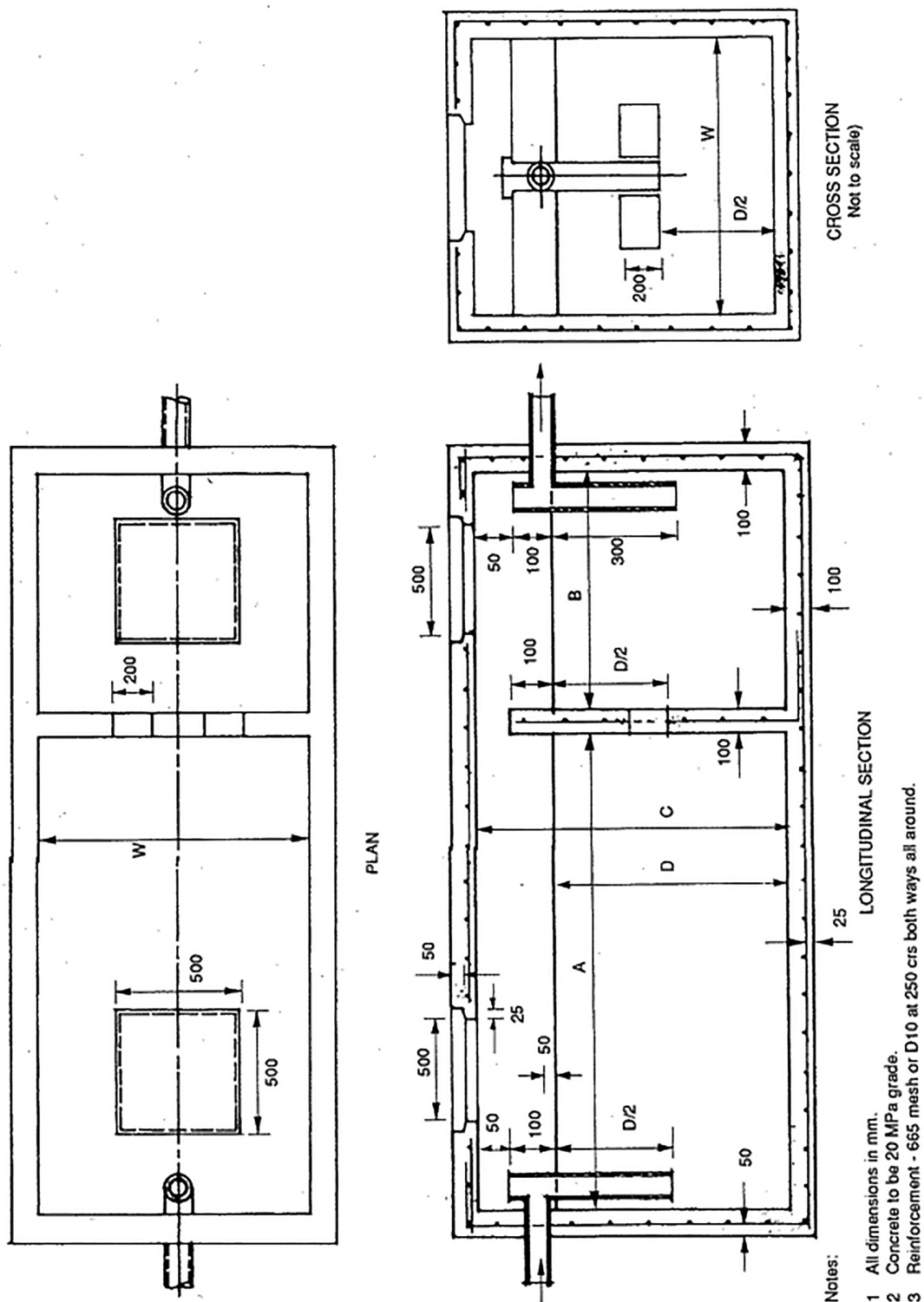


FIGURE 3.4A - DETAILS OF REINFORCED CONCRETE SEPTIC TANK

Figures 3.4A, B and C and Tables 3.4A and B give details of the dimension required of built-in-situ septic tanks. Table 3.4A also gives the volume of 60-75 mm stones for any aerobic filter that may be provided.

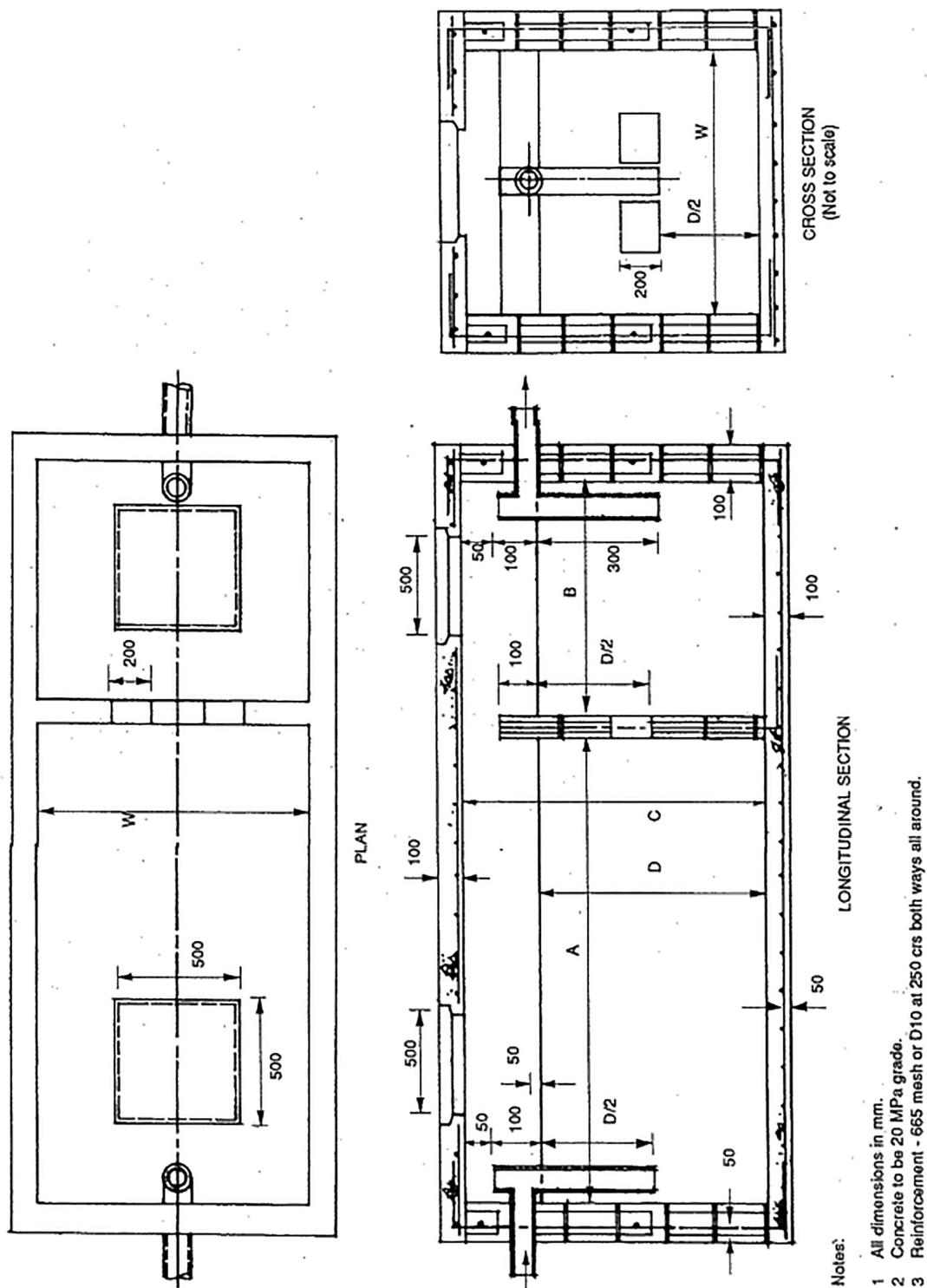


FIGURE 3.4B - DETAILS OF REINFORCED BLOCK MASONRY SEPTIC TANK

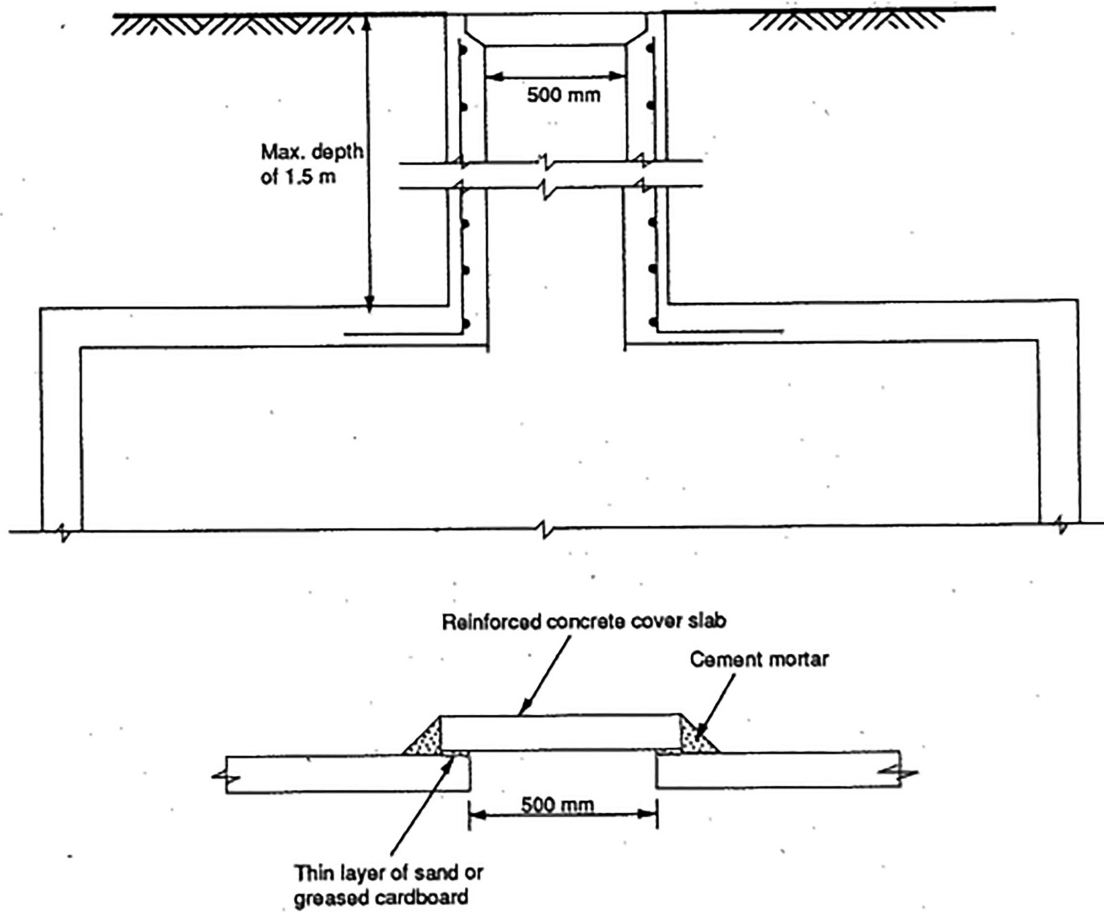


FIGURE 3.4C - TWO ALTERNATIVE METHODS OF PROVIDING MANHOLE COVERS

No. of Persons	ONLY SOIL WASTE						
	A	B	C	D	W	V(m ³)	F(m ³)
6	1000	400	1000	850	800	0.95	0.02
8	1000	600	1000	850	800	1.22	0.02
12	1000	600	1000	850	800	1.22	0.02
15	1000	600	1200	1050	800	1.34	0.03
25	1200	800	1200	1050	1000	2.10	0.05
50	1600	800	1400	1250	1000	3.00	0,06
100	2400	1200	1400	1250	1200	5.40	0.11
150	2600	1400	1600	1450	1400	8.12	0.16
200	3000	1600	1600	1450	1600	10 67	0.21
300	3400	1800	1800	1650	1800	15.44	0.31
400	4000	2200	1800	1550	2000	20.46	0.41
500	4200	2200	1800	1550	2400	25.34	0.51
600	4400	2400	2000	185[3	2400	30.19	0.51

<i>No. of Persons</i>	<i>ALL DOMESTIC WASTE</i>						
	A	B	C	D	W	V(m ³)	F(m ³)
8	1400	800	1000	850	850	1.87	0.04
10	1400	800	1200	850	1050	2.31	0.05
12	1800	800	1200	850	1050	2.73	0.06
15	1800	800	1200	1050	1050	3.28	0.07
25	2000	1200	1400	1050	1250	5.60	0.11
50	3200	1600	1600	1250	1450	11.14	0.22
100	4000	2000	1800	1250	1650	21.78	0.44
150	5000	2400	2000	1450	1850	32.86	0.66
200	5600	2400	2000	1450	1850	44.40	0.89
300	6600	3400	2000	1650	1850	66.60	1.33
400	8000	4000	2000	1550	1850	88.80	1.78
500	8200	4200	2000	1550	1850	110.11	2.20
600	9000	4800	4000	185[3	1850	132.76	2.66

V = Volume of Septic Tank; F = Volume of Aerobic Filter; For details of A, B, C, D and W see Figures 3, 4A and B

TABLE 3.4 B			
REINFORCEMENT FOR MASONRY SEPTIC TANKS			
<i>Block wall thickness</i>	<i>Height of Tank (m)</i>	<i>Vertical bars</i>	<i>Horizontal bars</i>
150	1.0	D10 @ 600	D12 @ 600
	1.2	D10 @ 600	D12 @ 600
	1.4	D10 @ 400	D12 @ 600
200	1.6	D10 @ 400	D12 @ 600
	1.8	D10 @ 400	D12 @ 600
	2.0	D12 @ 400, fill all cells	D12 @ 600

Figure 3.5 shows an arrangement for aerobic filters. The filter chamber can also serve as a distribution box for the absorption trenches.

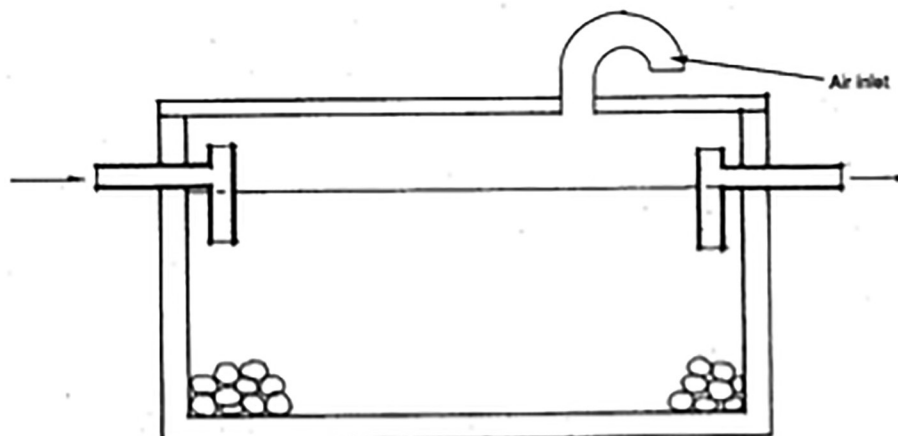


FIGURE 3.5 - AEROBIC FILTER

Grease traps

4.1 The satisfactory disposal of the discharge from kitchen waste fixtures is frequently difficult because it is charged with grease which cannot be satisfactorily dealt with in a septic tank. This difficulty may be overcome by a grease trap located near the kitchen through which all discharge from the kitchen must pass before entering the drain to the septic tank. For satisfactory working of the trap it is necessary that both laundry and roof waters, and liquid and powder detergents, be excluded from it. A grease trap constructed as shown in Figure 4.1 has been found effective in arresting grease. Alternatively, a smaller precast concrete or other type of grease trap may be installed.

The capacity of the grease trap below the level of the invert of the outlet must be not less than the total capacity of the sinks and dishwashers served. The cover over the trap should be removable to facilitate the cleaning of the trap.

4.2 If grease traps are not regularly cleared of the accumulated grease it would give rise to the blocking of drains, unsightly overflow through the sides of the cover slab of the trap and unpleasant

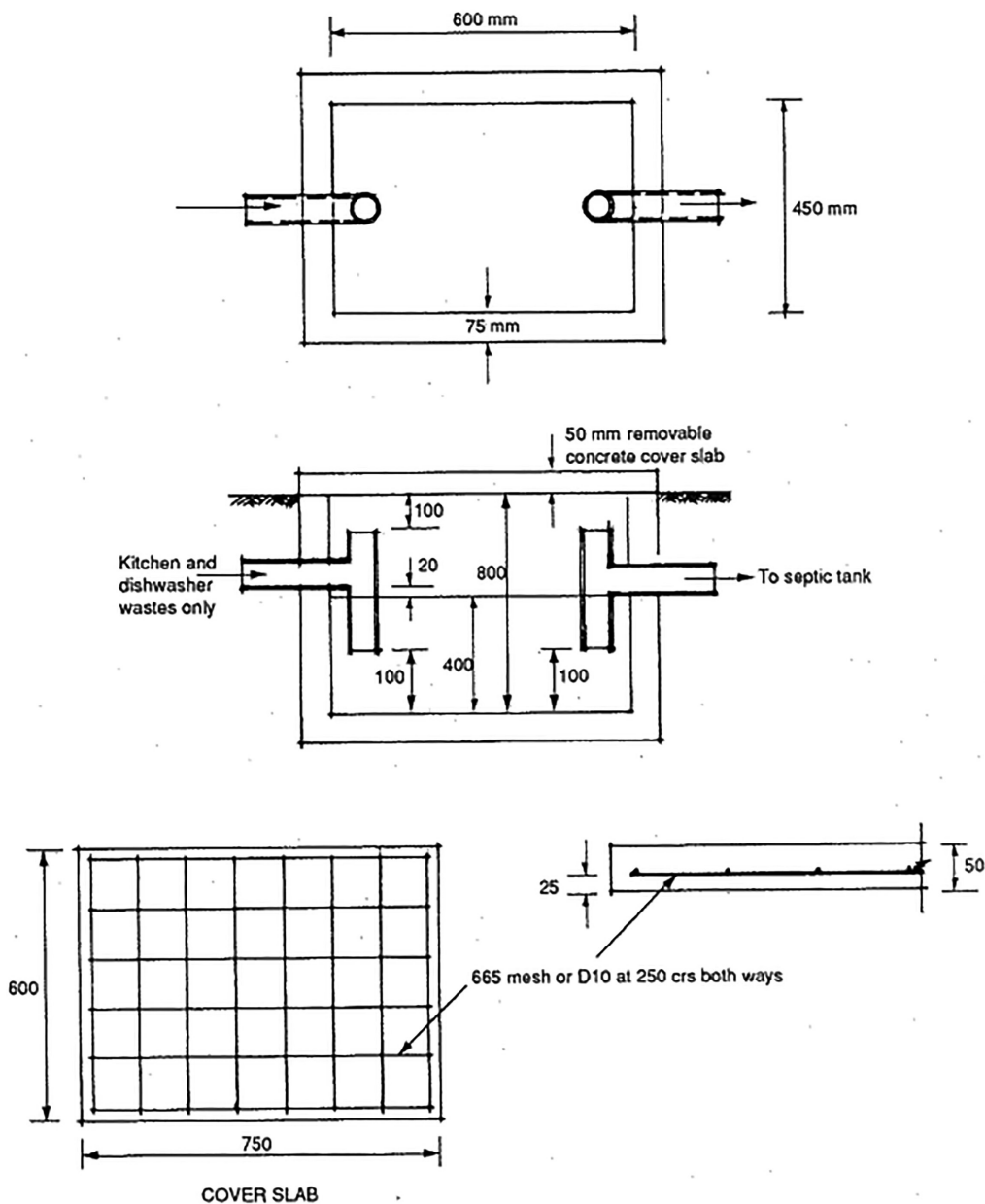


FIGURE 4.1 - DETAILS OF A GREASE TRAP

Effluent absorption area

5.1 An important factor when considering the installation of a septic tank is to determine whether the soil is suitable to absorb the effluent, and whether the soil is of adequate depth and area. Generally, it can be said that the most suitable soil for an absorption area is a sandy or silty loam, and the most unsuitable soil, hard impervious clay, or rock. Where an impervious stratum such as rock or clay is present, it may not be possible to provide an absorption trench. If the slope of the ground allows the provision of imported absorbent fill of sufficient thickness, it will still be possible to have a trench or soak pit.

5.2 The absorption rate of the soil may be ascertained by carrying out the following percolation test:

At a number of representative spots within the area to be used for installation of the absorption drains, dig holes 300 mm square to the depth of the absorption drain. Pour water into the holes to a depth of 150 mm or more, and allow the water to soak away. Again pour water into the holes to a depth of 150 mm and record the times taken for the surface of the water to fall 25 mm.

5.3 The recommended dosage of effluent in litres per metre of absorption trench per day, according to the time taken for the water surface to fall 25 mm in the test is given in Table 5.3, and the minimum length of the absorption trench in metres may be determined from the formula at the base of the Table.

TABLE 5.3	
LENGTH OF ABSORPTION TRENCH FOR DIFFERENT ABSORPTION RATES	
<i>Time for water level in test to fall by 25 mm (minutes)</i>	<i>Dosage of effluent in litres per metre of trench per day (E)</i>
1	75
2	60
5	45
10	30
20	18
30	15
60	11

NOTE:

- (i) Length of absorption trench in metres = 1000 VE, where V is the volume given in cubic metres in Table 3.4A.
- (ii) If the time taken for a fall in level of 25 mm is more than 60 minutes, the soil is not suited for absorption trench method of disposal.

Absorption trenches

6.1 Typical dimensions for an absorption trench are approximately, width 450 mm and minimum depth of 400 mm. The trenches are packed with 75 mm size hard stone, gravel or coral to a height of 150 mm, over which a line of perforated pipes is laid along the centre of the trench, commencing about 300 mm from the beginning of the trench and thereafter running the full length of the trench. The drain pipe conveying the effluent to the trench extends into the trench and butts against the first perforated pipe.

6.2 The joints between the pipes in the trench must not be sealed. The pipes should be surrounded and covered with 75 mm broken hard stone or hard coral to within a few millimetres from the top of the trench, over which should be placed a protective covering of old iron, bag, bark or the like, before covering the trench with soil or turf.

6.3 The absorption trench may also be constructed of concrete slabs laid in such a manner that there are many vertical joints left open so as to allow the effluent to escape. Concrete slabs are used to cover the top of the trench, and these may themselves be covered by soil or turf.

6.4 The absorption trench should be constructed along the general contour of the ground. It must be so positioned that the prepared ground level at the trench is lower than the invert of the outlet pipe from the septic tank so as to prevent the effluent back-flooding into the septic tank. Typical absorption trenches are shown in Figure 6.4 A and their general layout in Figure 6.4 B.

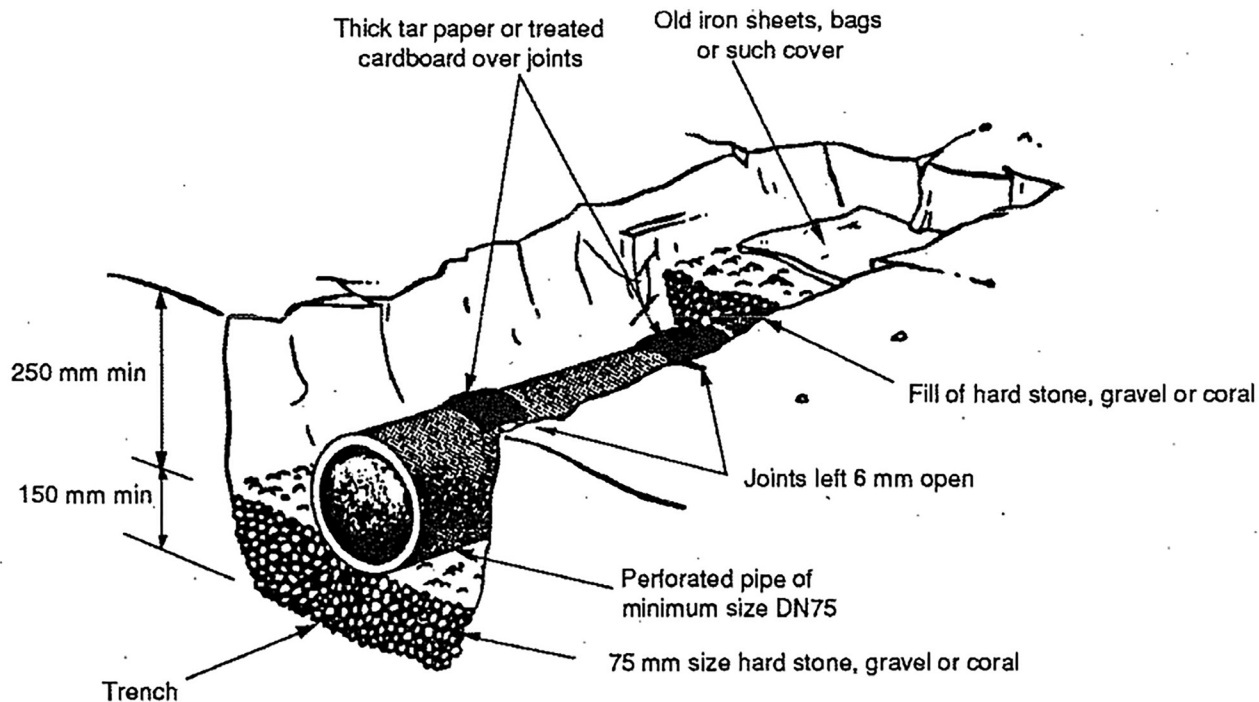


FIGURE 6.4A - EXAMPLE OF AN ABSORPTION TRENCH

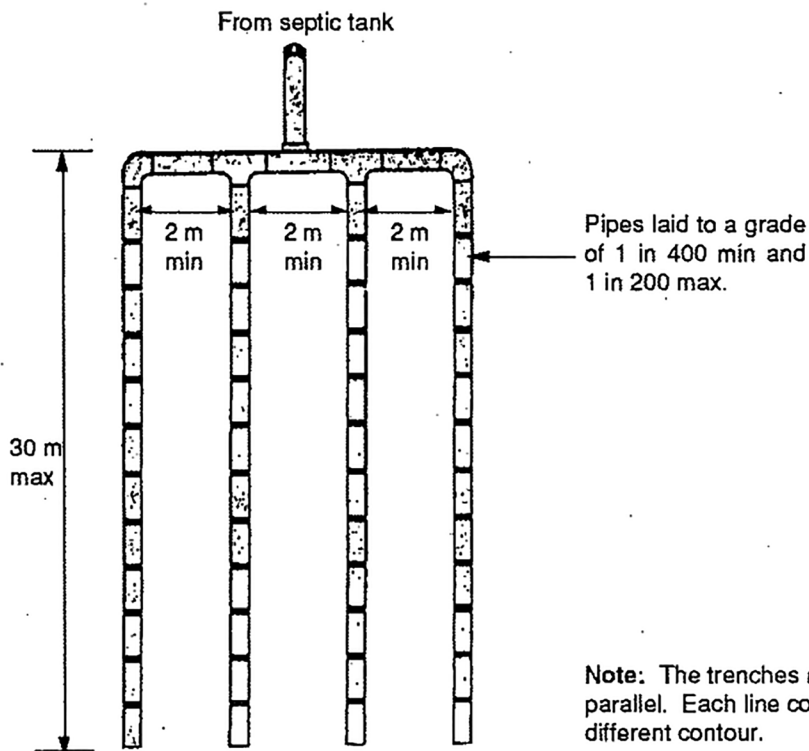


FIGURE 6.4B - GENERAL LAYOUT OF ABSORPTION TRENCH

6.5 Moisture-seeking shrubs or other vegetation planted in the vicinity of the trench will assist in the absorption of the effluent, but care should be taken in selecting the shrubs so that their roots are not likely to interfere with the efficiency of the trench. Roof water, and as far as possible surface and ground water, must be excluded from absorption trenches, so as to maintain their efficiency

Soak pits

These are not permitted on Rarotonga and Aitutaki. Where sufficient area for absorption trenches is not available, but there is sufficient depth of absorbent material, soak pits may be used. A typical arrangement is shown in Figure 7. Old bitumen drums with the ends removed are shown arranged in tiers. The drums are pierced at about 200 mm centres with a pick or so. They are surrounded by 75 mm hard stone, gravel or coral. The effluent is drained into the drums. The minimum thickness of stone surrounding the drums must be 300 mm. The actual dimensions of the soak pit will depend on the nature of the soil and the volume of effluent.

In general, a soak pit is not as effective or desirable a means of disposal as absorption trenches.

RAINWATER HARVESTING AND STORAGE

Introduction

Rainwater harvesting from the roof catchment area depends on a number of factors. Unless these are suitably matched, the supply would not be satisfactory. The factors are:

- (a) the average annual rainfall and its variability through the year
- (b) the roofing material and the available area of the roof
- (c) the daily rate of consumption of water
- (d) the storage volume and the material of the tank; and
- (e) the desired reliability of the supply.

Relationship of rainfall, its variability, roof area and storage volume

The higher the average annual rainfall, the smaller the collection area of roof required for a given rate of consumption. In order to allow for variation in actual rainfall from the monthly averages, it is advisable to have the available roof area to be twice the theoretical area.

If the pattern of rainfall is fairly uniform through the year, the size of storage tank for a given rate of consumption would be relatively smaller. The tank size could be as small as to hold 50 days consumption where rainfall is quite uniform through the year. Where most (such as 75 %) of the annual rainfall occurs in 3 or 4 months it will be necessary to size the tank to hold 100 to 120 days of consumption. This assumes that the available roof collection area is twice the theoretical area. Where the available roof area is less than about 1.4 times the theoretical area, the required storage volume tends to increase very steeply. The size of the tank determined from these considerations should normally give an average reliability of supply with a failure rate of about once every 5 years. If an average chance of failure of supply of once a year is acceptable, the calculated tank size can be reduced by about 30 % in areas of high rainfall and by 40 % in areas of lower rainfall.

Design

The theoretical relationship outlined above can be expressed as:

$$A = 365 \times C/R \text{ where}$$

A is the roof area acting as the catchment in square metres,

C is the daily average consumption of water by the household in litres, and

R is the average annual rainfall in millimetres

However, for the reasons stated earlier, the practical value of the roof catchment is:

$$A = 2 \times 365 \times C/R = 730 C/R$$

The average annual rainfall in Rarotonga is 2034 mm. The bulk of the rain occurs between December and March. Taking these features to be representative of the whole country it will be prudent to allow for rainwater storage to cover 50 days consumption. This would provide for an average risk of failure once in any five-year period.

Taking an average family size of 5 members, each consuming no more than 30 litres of the stored water per day, the storage volume required

$$= 50 \times 30 \times 5 = 7500 \text{ litres}$$

$$= 7.5 \text{ kilolitres} = 1700 \text{ gallons}$$

The minimum roof area required to feed the storage tanks = $730 \times 150/2034 = 54 \text{ m}^2$.

If a risk of failure of once a year is acceptable, the tank size can be reduced by 30 %. If the rate of consumption or average rainfall is different from what has been used in the calculations, the storage capacity and roof area required can easily be recalculated.

Effect of roofing material and the environment

Rainwater, in general, is very pure and hence many metals dissolve in it much faster than in land-based water. Lead, zinc and copper are metals commonly found in roofing materials. These pose a risk to water quality when collecting water from roofs. For instance, if any lead is used in the roof for flashing or in the form of lead-based paint, the rainwater would leach the lead into the storage tank. If this happened the water would not be potable. The nature of the materials used in the roof must be ascertained and their safety confirmed before a decision is taken to use the run-off from the roof. In general galvanised iron sheets, zinc-aluminium coated sheets and a number of other products are safe.

As far as possible leaves and twigs must not be allowed to fall on the roof. The leached extracts from some leaves would make the water unfit for consumption. In addition the organic matter from leaves and twigs would encourage the growth of micro-organisms in the tank, thereby polluting the water. Accumulation of any dust on the roof, such as from industrial activity nearby would also make the water unfit.

Water-safety planning for rain-water harvesting can be incorporated by considering:

- first-flush system
- screening at water tank inlets
- annual maintenance of guttering
- the optimal location of the building
- roof materials.

Tank material

Tanks are generally made of reinforced concrete, galvanised or zinc-aluminium coated steel plates, or sometimes of fibreglass. Whereas suitable fibreglass would be inert and therefore not affected by the rainwater, galvanised steel could be. The greater the purity of the stored water, the greater the risk of the galvanising leaching into the water. If the roofing sheets are of galvanised steel, the stored water would already contain some of the zinc from the roofing material and hence the tank would last longer. This is not the case where the roofing is of zinc-aluminium coated or painted steel or of some other man-made material.

In order to prevent the corrosive effects of pure rainwater on the tank coating, suitably formulated metaphosphates are commercially available. These produce a protective film inside the tank and thus extend the life of metal coated tanks. Such methods must be used from the very first filling of the tank. There are also plastic protective coatings compatible with potability which are applied to metal tanks. The inside of the tank must not be painted with any ordinary paint.

Due to extreme climatic heat in certain islands, consideration of the most appropriate material for the tank should be given. In some instances, plastic or fibreglass tanks may not be appropriate without sufficient insulation to protect them from high temperatures.

In no case must lead be used in any form such as in sheets for flashing or as paint, etc., on roofs from which water is collected.

Erection of rainwater tanks

It is best to erect the tank in a shady location but away from falling leaves which could clog the strainer, and in the case of translucent material like fibre glass, have a dark colour to exclude light. Organic growth could develop on the sides of tanks in the presence of light and warmth. When the tank is part empty the organic growth would decay and give off gases, discolour the water, and produce corrosive acids. The absorption of the gases and acids could also give the water an unpleasant flavour.

The overflow pipes fitted to tanks for the disposal of excess inflow of rainwater must be adequate to prevent uncontrolled overflow. Such pipes must not terminate very close to storm water drains and soak pits as otherwise unpleasant gases might enter the tank. The pipe end and all openings to the tank must be fitted with strong, durable mesh to prevent birds, mosquitoes and other insects gaining entry into the tank.

No copper pipe should be used with any metal water tank. The net pipe must discharge the water through a durable strainer fitted well above the high water level. The inlet must not be close to the tank wall. Where tanks are interconnected each tank must receive at least some of the water directly from the roof. No tank must get its supply entirely from other tanks. It is convenient to have individual domestic tanks of no greater capacity than 4 or 5 kilolitres (1000 gallons).

Cook Islands
**BUILDING
CODE 2019**

**DWELLINGS AND
OUTBUILDINGS**
(CLASS 1 AND 10)

Section DG
ANCILLARY
PROVISIONS

**Performance Requirements
Deemed-to-Satisfy Provisions**

DG1 MINOR STRUCTURES AND COMPONENTS

DG2 FIREPLACES, CHIMNEYS AND FLUES

Section DG — ANCILLARY PROVISIONS

CONTENTS

PERFORMANCE REQUIREMENTS

DEEMED-TO-SATISFY PROVISIONS

<i>Part</i>		<i>Part</i>	
DG1	Minor Structures and Components	DG2	Fireplaces, Chimneys and Flues
DG1.1	Swimming pools	DG2.1	General requirements
DG1.2	Poultry and other Domestic Animal Houses	DG2.1	Open fireplaces deemed-to-satisfy
DG1.3	Fences		

PERFORMANCE REQUIREMENTS

OBJECTIVES AND REQUIRED PERFORMANCE

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.

DGP1 Minor structures and components

DGP1.1 Swimming pools

(a) Suitable means for the disposal of waste and drainage must be provided to a swimming pool.

(b) Access by unsupervised young children to swimming pools must be restricted.

DGP1.2 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.

DGP1.3 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.

DGP2 Fireplaces, chimneys and flues

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.

DEEMED-TO-SATISFY PROVISIONS

MINOR STRUCTURES AND COMPONENTS

DG1.1 Swimming pools

(a) Drainage: A swimming pool must have suitable means of drainage.

(b) Safety fencing: A swimming pool with a depth of water more than 300 mm must have suitable barriers or safety fencing in accordance with AS 1926 to restrict access by young children:

(i) to the allotment or the immediate pool surrounds if there is only one Class 1 building on the allotment; or

(ii) to the immediate pool surrounds if the swimming pool is associated with a number of Class 1 buildings on the same allotment.

DG1.2 Poultry and other domestic animal houses

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

(a) 12 m from any Class 1 building

(b) 10 m from any boundary ; and

(c) 20 m from the boundary adjoining an allotment containing or intended to contain any building other than a Class 1 building.

(d) 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.

DG1.3 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.

DEEMED-TO-SATISFY PROVISIONS

FIREPLACES, CHIMNEYS AND FLUES

DG2.1 General requirements

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.

DG2.2 Open fireplaces deemed-to-satisfy

An open fireplace, or solid-fuel burning appliance in which the fuel-burning compartment is not enclosed, satisfies EIG2.1 if it has:

- (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.

Cook Islands
**BUILDING
CODE 2019**

**PUBLIC BUILDINGS AND
GROUP DWELLINGS**
(CLASS 2 TO 9)

Section NC
**FIRE
RESISTANCE**

**Performance Requirements
Deemed-to-Satisfy Provisions**

- NC1** FIRE RESISTANCE AND STABILITY
- NC2** COMPARTMENTATION AND SEPARATION
- NC3** PROTECTION OF OPENINGS

Section *NC* —FIRE RESISTANCE

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PERFORMANCE REQUIREMENTS

OBJECTIVES

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

NCP1 Fire Resistance and Stability

- (a) A building must be constructed so that it is protected from fire in any other 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 fire-fighters; and
 - (iii) there will be little risk of collapse onto adjoining property.

NCP2 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.

NCP3 Protection of Openings

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

REQUIRED PERFORMANCE

NCP1.1 In order to maintain the structural adequacy and stability of any building for a sufficient time for the safety of the users fire fighters and others, the following must be ensured -

- (a) the loadbearing elements must have the FRL appropriate to their function in 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.

NCP2.1 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;
- (b) control the spread of fire or smoke to adjoining buildings; and
- (c) facilitate access to the building by fire-fighters.

NCP 3.1 Openings of any nature in the envelope surrounding fire compartments must be so protected that they do not allow the passage of dangerous amounts of heat, flames, smoke and gases 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 fire fighters 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.

DEEMED-TO-SATISFY PROVISIONS

FIRE RESISTANCE AND STABILITY

NC1.1 Type of construction required

(a) The minimum Type of fire-resisting construction of a building must be that give in Table NC1.1, except as allowed for -

- (i) open spectator stands and indoor sports stadiums in NCI .4; and
- (ii) lightweight construction in NC1.5

(b) Type A construction is the most fire-resistant and Type C the least fire-resistant of the Types of construction.

TABLE NC1.1									
TYPE OF CONSTRUCTION REQUIRED									
<i>RISE (in storeys)</i>	<i>CLASS OF BUILDING OR PART</i>								
	2	3	4	4	5	6	7	8	9
5 or MORE	A	A	A	A	A	A	A	A	A
3 or 4	B	B	B	B	B	B	B	B	B
1 or 2	C	C	C	C	C	C	C	C	C

NOTE:

1. See Specification NC1.1 for details of Types A, B and C construction.

NC1.2 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.

NC1.3 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.

NC1.4 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.

NC1.5 Lightweight construction

Lightweight construction must comply with Specification NC1.5 if it is used in construction which is required to be fire-resisting.

NC1.6 Early Fire Hazard Indices

The Early Fire Hazard Indices of materials and assemblies inside Class 2 to 9 buildings must comply with Specification NC1.6.

COMPARTMENTATION AND SEPARATION

NC2.1 Application

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

NC2.2 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 NC2.2 except as permitted in NC2.3.

(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 NC2.2				
TYPE OF CONSTRUCTION REQUIRED				
<i>MAXIMUM SIZE OF FIRE COMPARTMENTS</i>				
	TYPE OF CONSTRUCTION OF BUILDING			
		Type A	Type B	Type C
CLASS 5, 6, 7, 8 or 9b	Max floor area	2,000 m ²	1,500 m ²	1,000 m ²
	Max volume	12,000 m ³	9,000 m ³	6,000 m ³

NOTE:

Subject to the requirements of table 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 Class A; and

(ii) 4 times where the sprinkler system has a single water supply to Class C.

(c) The size of any fire compartment in a Class 3 building must not exceed 600 m² except if fully protected by a sprinkler system to any Class of water supply to NZS 4541, this area may be increased to 1500 m².

NC2.3 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 NC2.2 to the following limits and conditions-

(a) Up to 18000 m² if

(i) the building is Class 7 or 8, it contains not more than 2 storeys and an open space complying with NC2.4(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 NC2.4(b) is provided.

(b) More than 18000 m² it -

(i) the building is protected throughout with a sprinkler system and perimeter vehicular access complying with NC2.4(b) is provided;

(ii) if the ceiling height of the fire compartment is not more than 12 m, it has a smoke exhaust system in accordance with specification NE2.6 or smoke-and-heat vents and the space below the roof is divided into compartments in accordance with AS 2665; and

(iii) if the ceiling height is more than 12 m, it has a smoke exhaust system in accordance with Specification NE2.6.

NC2.4 Requirements for open spaces and vehicular access

(a) An open space required by NC2.3 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.

NC2.5 Class 9a buildings

The building must be divided into fire compartments with a maximum floor area of 1700 m² 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 m² and again subdivided into parts of 425 m² 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 m² 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 NC3.4 and which do not extend higher than 800 mm from the underside of an imperforate roof covering, floor or ceiling above it; and
 - (iii) 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 Specification NC1.1;
- (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.

NC2.6 Separation of openings in external walls

In any building which is other than -

- fully protected with a sprinkler system;
- an open deck car park; or
- 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 at B1.3 and B1.4.

NC2.7 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 NC1.1 for each of the adjoining parts; and if these are different, the greater FRL;

(b) any openings in a fire wall comply with Part NC3;

(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.

NC2.8 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 NC1.1 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 NC1.1 for the classifications concerned.

NC2.9 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 NC1.1 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.

NC2.10 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 NC1.1 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 NC3.

NC2.11 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.

NC2.12 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 pressurizing equipment; or

(d) boilers, emergency batteries, emergency generators or central smoke control plant, except -

(i) equipment located in a separate storey (or in the topmost storey) and separated from the remainder of the building by floor construction having a FRL of 60/60/60;

(ii) smoke control exhaust fans located in the air stream if they are constructed for high temperature operation in accordance with Specification NE2.6; or

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

NC2.13 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 - /120/60 fire doors;

(c) electricity supply cables between a main and the substation, and between the substation and the main switchboard, must be enclosed or otherwise protected by construction having a FRL of not less than 120/120/120; 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 -/120/60 fire shutter.

PROTECTION OF OPENINGS

NC3.1 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 103 mm² 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.

NC3.2 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 NC3.4 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 113 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.

NC3.3 Separation of openings in different fire compartments

Unless they are protected in accordance with NC3.4, the distance between openings in external walls in compartments separated by a fire wall must not be less than that set out in Table NC3.3.

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

NC3.4 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;

(b) These methods of protection may be replaced with specifically engineered external drenchers provided an adequate supply of water can be ensured.

(c) Fire doors, smoke doors, fire windows and fire shutters satisfy (a) if they comply with Specification NC3.4.

NC3.5 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 NC1.1 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 NC1.1 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.

NC3.6 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 NZS 4232; 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.

NC3.7 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 NC1.1 for the fire wall; or

(b) in all classes of buildings, by a single fire door which has a FRL of not less than that required by Specification NC1.1 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.

NC3.8 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 NC3.4 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.

NC3.9 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 pressurizing 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.

NC3.10 Openings in fire-isolated lift shafts

(a) Doorways - If a lift shaft is required to be fire- isolated under Part NC2, 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 103 mm² in area.

NC3.11 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 - /30/30 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.

NC3.12 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 NC1.1 or protected in accordance with NC3.14.

NC3.13 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/-; or

(b) a self-closing -/30/- fire door or hopper; or

(c) an access panel having a FRL of not less than - /30/-.

NC3.14 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.

NC3.15 Installation deemed-to-satisfy

Installation satisfies NC3.14 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 NC3.15 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 NC3.15 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 NC1.1 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 NC3.15 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 NC3.15.

FIRE-RESISTING CONSTRUCTION

SCOPE

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

GENERAL REQUIREMENTS

2.1. 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.

2.2. 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.

2.3. 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 nonloadbearing; 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.

2.4. Attachments not to impair fire-resistance

(a) A combustible material may be used as a finish or lining to a wall or roof, or in a sign, sunscreen or blind, awning, or other attachment to a building element which has the required FRL if -

(i) the material is exempt under Clause 7 of Specification NC1.6 or complies with the Early Fire Hazard Indices prescribed in Clause 2 of the same Specification.

(ii) it is not located near or directly above a required exit so as to make the exit unusable in a fire; and

(iii) it does not otherwise constitute an undue risk of fire spread via the facade of the building.

(b) The attachment of a facing or finish, or the installation of ducting or any other service, to a part of a building required to have a FRL must not impair the required FRL of that part.

2.5. 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.

TYPE A FIRE-RESISTING CONSTRUCTION

3.1. 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;

(iv) an internal wall required to be fire-resisting; and

(v) ventilating, pipe, garbage, or similar shaft that is not for the discharge of hot products of combustion,

(d) must be of non-combustible construction and if of lightweight construction comply with Specification NC1.5;

(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.

3.2. 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.

3.3. 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.

3.4. 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

TABLE 3
TYPE A 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		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, TURSSSES and COLUMNS		90/-/-	90/-/-
FLOORS		90/90/90	120/120/120
ROOFS		90/60/30	120/60/30
MAIN ROOF BEAMS		90/-/-	120/-/-

3.5. ROOFS: Concession

A roof need not comply with Table 3 if -

(a) in other than a Class 2 or 3 building -

- (i)** it has an effective height of not more than 25 m and the roof covering and its supporting members are of non-combustible construction; or
- (ii)** 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; or
- (iii)** the building has a non-combustible roof covering and the storey immediately below the roof has an automatic sprinkler system installed throughout; or

(b) in a Class 2 or 3 building -

- (i)** all internal walls bounding the sole-occupancy units on the topmost storey extend to the underside of a non-combustible roof covering; or
- (ii)** the sole-occupancy unit is the only unit in that storey.

3.6. 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 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 NC3.4;
- (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.

3.7. 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.

3.8. 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.

3.9. Carparks: Concessions

The FRLs in Table 3.9 apply to a carpark instead of those in Table 3.

TABLE 3.9
FRL FOR CARPARKS

<i>BUILDING ELEMENT</i>	<i>FRL</i>
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 m ² /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 m ² /tonne	-/-/-
Any other floor beam	60/-/-
Floor slab or vehicle ramp	60/60/60
Roof and columns supporting only the roof	-/-/-

3.10. Mezzanine floors: Concession

Except in a Class 9b building which is a spectator viewing area that accommodates more than 100 persons under MD1.13, 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

<i>LEVEL OTHERWISE REQUIRED FOR ANY FRL CRITERION (mins)</i>	<i>INCREASE IN LEVEL TO (not less than):</i>
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.

3.11 SPRINKLERS: Concession

Each of the three criteria of the FRL otherwise required under Tables 3 and 3.9 may be reduced by 30 minutes if the building is fully protected with a sprinkler system.

TYPE B FIRE-RESISTING CONSTRUCTION

4.1. 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,
- (e)** unless the wall bounds a sole-occupancy unit in the topmost (or only) storey and there is only one unit in that storey;
- (f)** 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 NC1.5;
- (g)** 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
- (h)** 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

<i>BUILDING ELEMENT</i>	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	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 hallways 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, TRUSSES and COLUMNS	60/-/-	60/-/-
FLOORS	60/30/30	60/60/60
MAIN ROOF BEAMS	60/-/-	60/-/-
*See NC2.5(d) for Class 9a buildings		

4.2. Carparks: Concessions

The FRLs in Table 4.2 apply to a carpark instead of those in Table 4.

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 m ² /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 m ² /tonne	-/-/-
Any other floor beam	60/-/-

4.3. Sprinklers: Concession

Each of the three criteria of the FRL otherwise required under Tables 4 and 4.2 may be reduced by 30 minutes if the building is fully protected with a sprinkler system.

TYPE C FIRE-RESISTING CONSTRUCTION**5.1. 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 NC1.5.
- (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,

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

(f) 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			

5.2. Carparks: Concessions

The FRLs in Table 5.2 apply to a 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 m ² /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 m ² /tonne	-/-/-
Any other floor beam	60/-/-

STRUCTURAL TESTS FOR LIGHTWEIGHT CONSTRUCTION

SCOPE

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

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.

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.

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.

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.

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.

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)

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 falling 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),

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).

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).

EARLY FIRE HAZARD INDICES

SCOPE

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

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 sacking-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 A2.4, 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.

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 sacking-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 sacking-type material used in the form of an exposed wall or ceiling, or as a finish or attachment thereto, must have a Flammability Index of 0.

Class 2, 3 and 9 buildings: Public areas

A material, other than a sacking-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;
- (ii) as the covering of fixed seating in the audience seating area; or
- (iii) in a cinema projection room.

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.

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.

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;
 - (ii) adhesives; or
 - (iii) damp-proof courses, lashings, 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 m² 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.

FIRE DOORS, SMOKE DOORS, FIRE WINDOWS AND SHUTTERS

SCOPE

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

Fire doors

A required fire door must comply with NZS 4232, 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 face of the glazing must not exceed 10 kW/m² 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.

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;
- (e) and if necessary, be fitted with smoke seals.

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 NZS 4232 if a metallic fire shutter is not prohibited by NC3.5.

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.

PENETRATION OF WALLS, FLOORS AND CEILINGS BY SERVICES

SCOPE

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

Application

A required fire door must comply with NZS 4232, except that -

(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 NC3.14.

(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.

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.

Pipes penetrating sanitary compartments

If a pipe of metal or UPVC penetrates the floor of a sanitary compartment in accordance with NC3.15(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 fire-stopped in accordance with Clause 7.

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 mm² 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 mm² 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.

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.

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 NC3.15(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 wall or a wall of hollow blockwork) or a hollow floor/ceiling system, the cavity must be so framed and packed with fire-stopping material that 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

Cook Islands
BUILDING
CODE 2019

**PUBLIC BUILDINGS AND
GROUP DWELLINGS**
(CLASS 2 TO 9)

Section ND
**ACCESS AND
EGRESS**

**Performance Requirements
Deemed-to-Satisfy Provisions**

ND1 PROVISION FOR ESCAPE

ND2 CONSTRUCTION OF EXITS

ND3 ACCESS FOR PEOPLE WITH DISABILITIES

Section ND — ACCESS AND EGRESS

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PERFORMANCE REQUIREMENTS

OBJECTIVES

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

NDP1 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.

NDP2 Construction of exits

(a) Stairways, ramps and passageways must be such 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.

NDP3 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.

REQUIRED PERFORMANCE

NDP1.1 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 m² floor area, to a single exit within 1 minute.

NDP2.1 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/ m² 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.

NDP3.1 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.

DEEMED-TO-SATISFY PROVISIONS

PROVISION FOR ESCAPE

ND1.1 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.

ND1.2 Number of exits required

(a) All buildings – Every building must have at least one required exit.

(b) Class 2 to 8 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 three or more storeys or an effective height of more than 10 m.

(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 m². 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 m² 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 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 NC2.5.

(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.

ND1.3 When smoke or fire-isolated exits are required

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

(a) smoke isolated to the relevant requirements of ND2.6(b) and (c) if it connects 3 or more consecutive storeys; and

(b) fire-isolated if it connects 5 or more consecutive storeys.

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

ND1.4 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:

(c) 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.

(d) 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. **NDP3.1** 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.

(e) **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.

(f) **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

(iii) any wall be non-combustible and extend to the underside of the floor above or of the roof covering

(iv) only have doorways which are fitted with smoke doors complying with Specification NC3.4 and which do not extend higher than 800 mm from the underside of an imperforate roof covering, floor or ceiling above it; and

v) 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.

ND1.5 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.

ND1.6 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.

ND1.7 Travel via smoke or 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 ND2.6 must be provided; or
- (ii) the exit must be pressurised in accordance with 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.

ND1.8 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 NC3.4.

ND1.9 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 G 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.

ND1.10 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 Part 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.

ND1.11 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 ND1.13) from both parts of the storey, of not less than:
 - (i)** 2.5 m² per patient in a Class 9a building; and
 - (ii)** 0.5 m² per person in any other case.

ND1.12 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.

ND1.13 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 ND1.13.1		
AREA PER PERSON ACCORDING TO USE		
TYPE OF USE		m² 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

ND1.14 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.

ND1.15 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.

(g) causes a change of direction in proceeding to a required exit, the distance is measured along the path of travel past that wall.

(h) If permanent fixed seating is provided, the distance is measured along the path of travel between the rows of seats.

CONSTRUCTION OF EXITS

ND2.1 Application of Part

Except for ND2.13 and ND2.16, this Part 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.

ND2.2 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.

ND2.3 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 ND2.2, or only of:

- (a) reinforced or pre-stressed concrete
- (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/m³ 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.

ND2.4 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.

ND2.5 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.

ND2.6 Smoke lobbies

A smoke lobby required by ND1.7 must:

- (a) have a floor area not less than 6 m²
- (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 than 30/30/- (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 NC3.4, which are self-closing or held open by a fail-safe automatic magnetic release device; and
- (d) be pressurised to NE2.7 as part of the exit if the exit is required to be pressurised.

ND2.7 Installations in exits and paths of travel

- (a) Access to service shafts and services other than to fire-fighting or detection equipment as permitted in Section NE, 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
- (e) unless it is enclosed by non-combustible construction or a fire protective covering.

ND2.8 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.

ND2.9 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.

ND2.10 Ramps

ND2.10.1 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 Part ND3
- (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.

ND2.10.2 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 ND2.10.1		
SPACING OF CLEATS FOR SERVICE RAMPS		
<i>Ramp slope not more than</i>	CLEAT SPACING (mm)	
	Goods carried	No goods carried
1:6	360	460
1:5	330	430
1:4	300	400
1:3	280	380

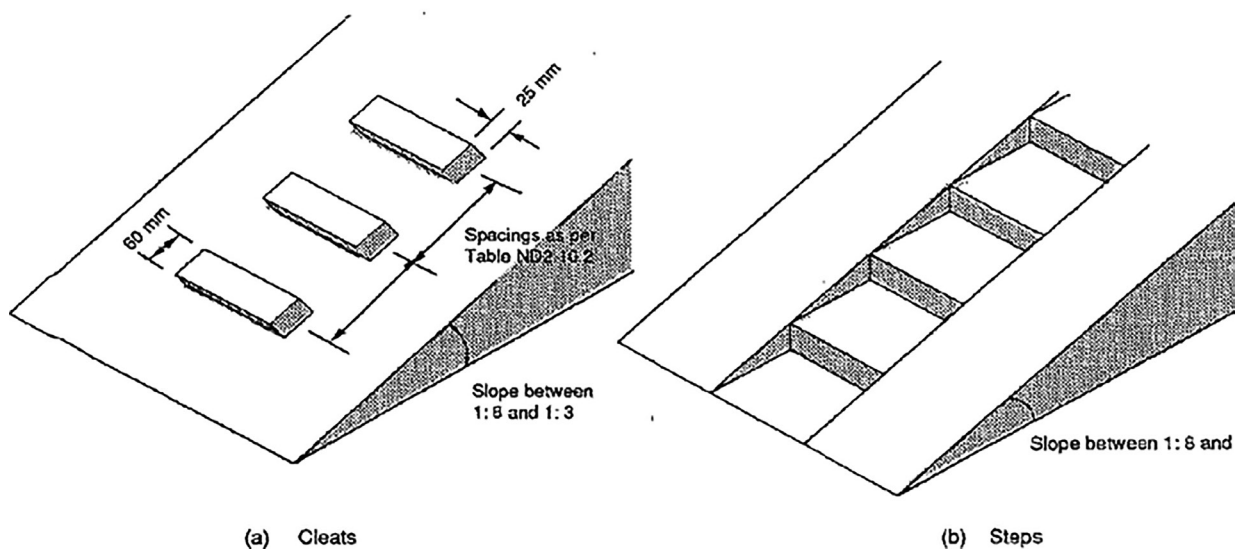


FIGURE ND2.10.1 - EXAMPLES OF SERVICE RAMPS WITH CLEATS

ND2.11 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.

ND2.12 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.

ND2.13 Treads and risers

ND2.13.1 Straight flights

- (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 (including a sole-occupancy unit in a Class 2 or 3 building or Class 4 part) satisfies (a) if it has:
 - (i) not more than 18 nor less than 2 risers in each flight, except in a Class 9 building subject to ND1.7(d)
 - (ii) subject to (ix), going and riser dimensions in accordance with Figure ND2.13.1 and Table ND2.13.1 that are constant throughout each flight
 - (iii) risers which do not have any openings that would allow a 100 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 nosings
 - (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
 - (vi) in a Class 9 building - not more than 36 successive risers and landings without a change in direction of at least 30°; and
 - (vii) across fall of between 1:100 and 1:50 where the stairway is subject to wetting
 - (viii) treads not exceed the goings by more than 30 mm; and
 - (ix) in a sole occupancy unit in a Class 2 building or Class 4 part, or where it is not part of a required exit and to which there is no normal access to the public, going and riser dimensions to Table DD1.1.

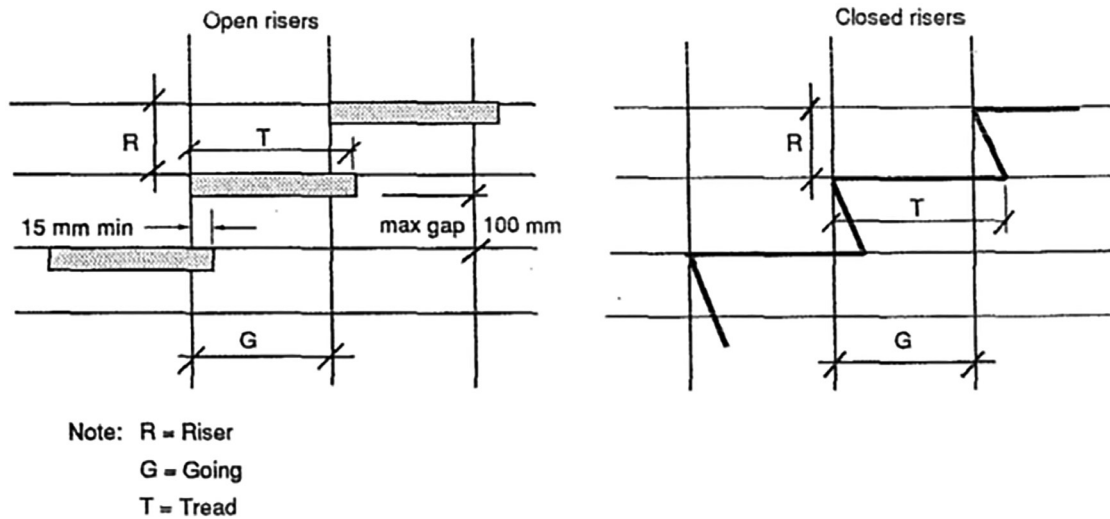


FIGURE ND2.13.1 - MEASUREMENT OF RISER GOING AND TREAD

Pitch	GOING (mm)								
	250	260	270	280	290	300	310	320	330
37°	188								
36°	182	188							
35°	175	182	189						
34°	168	175	182	188					
33°	162	169	175	181	188				
32°	156	162	168	174	181	187			
31°	150	156	162	167	174	180	186		
30°		150	156	161	167	173	179	185	
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:

(a) 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.

(b) The dimensions shown within the outlined box are preferred because they are less strenuous for individuals on crutches or with minor disabilities.

ND2.13.2 Curved stairs

Curved stairs must comply with the relevant requirements of ND2.13.1 as well as the following:

- (a)** For the purposes of satisfying Table ND2.13.1 or Table DD1.1 in the case of stairs in ND2.13.1 (ix), the going must be measured:
 - (i)** along half way across the width of the stair where the clear width is less than 900 mm; 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.

ND2.14 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.

ND2.15 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
- (b)** 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.

ND2.16 Balustrades

- (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
- (b)** except at the perimeter of a stage, rigging loft, loading dock, an area accessible only to maintenance staff, or the like.
- (c)** 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.
- (d) 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) the space between balusters or the width of any opening in the balustrade (including any openable window or panel) is not more than 100 mm except where the space between rails or the height of any opening is not more than 100 mm.
- (e) 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 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
- (f) 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) the space between balusters or the width of any opening in the balustrade (including any openable window or panel) is not more than 100 mm except where the space between rails or the height of the opening is not more than 100 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.
- (g) 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) the space between balusters or the width of any opening in the balustrade is not more than 100 mm except where the space between rails or the height of the opening is not more than 100 mm.

ND2.17 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) not more than 2 m apart in the case of intermediate handrails; fixed at a height of not less than 700 mm above the nosings of stair treads in a Class 9b building that is used as a primary school

(iv) 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

(v) continuous between stair flight landings and have no obstruction on or above them that will tend to break a hand-hold.

(c) Handrails in a Class 9a 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.

ND2.18 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.

ND2.19 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 m²

(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.

ND2.20 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

(b) the measurement of encroachment in each case is to include door handles or other furniture or attachments to the door

(c) must swing in the direction of egress unless:

(i) it serves a building or part with a floor area not more than 200 m², 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

(d) must not otherwise impede the path or direction of egress.

ND2.21 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 1200 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 fail-safe 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 fail-safe device which automatically unlocks the door upon the activation of any sprinkler system or smoke or thermal detector system installed throughout the building.

ND2.22 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 building; or

(b) a building more than 25 m in effective height unless all the doors are automatically unlocked by a fail-safe 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.

ACCESS FOR PEOPLE WITH DISABILITIES

ND3.1 Application of Part

This Part applies to all Class 3, 5, 6, 7, 8 and 9 buildings.

ND3.2 Access to buildings

Access for people with disabilities must be provided to all buildings by means of a continuous path of travel in accordance with AS 1428.1, or NZS 4121:

- (a)** from 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.

ND3.3 Parts of buildings to be accessible

(a) Access for people with disabilities must be provided to the all areas required for building occupants, visitors and members of the public to access the primary functions of the building. If the primary functions are accessible at ground floor or at mezzanine or first floor via a lift or ramp, an exemption to providing disabled access to other areas of the building (the upper floors) can be requested from the Cook Islands Ministry of Internal Affairs and must be submitted as part of the Building Permit application.

(b) 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' store room, maintenance access-way, rigging loft, or the like.

(c) 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.

(d) 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, excluding any references to AS 1735.12.

ND3.4 Concessions

It is not necessary to provide access for people with disabilities:

- (a)** to more than 30 % of the public space in a restaurant, cafe, bar, function room, or the like, in a Class 6 or Class 9b building
- (b)** to more than 1 car parking space for each 100 spaces in a public carpark, or
- (c)** to any area if access would be inappropriate because of the particular purpose for which the area is used.

Cook Islands
BUILDING
CODE 2019

**PUBLIC BUILDINGS AND
GROUP DWELLINGS**
(CLASS 2 TO 9)

Section NE
**SERVICE AND
EQUIPMENT**

**Performance Requirements
Deemed-to-Satisfy Provisions**

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NE2 SMOKE CONTROL

NE3 LIFT INSTALLATIONS

NE4 EMERGENCY LIGHTING AND EXIT SIGNS

NE5 MAINTENANCE OF SAFETY INSTALLATIONS

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Section *NE* SERVICES AND EQUIPMENT

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PERFORMANCE REQUIREMENTS

OBJECTIVES

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

NEP1 Fire-fighting 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 the 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.

NEP2 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.

NEP3 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 fire-fighting and emergency personnel.

NEP4 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 counter measures and summon emergency personnel.

NEP5 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.

NEP6 Electrical work

All electrical work must meet the following objectives:

- (a) It must prevent electrocution, burns or fire
- (b) It must satisfy the reasonable expectations of the users by ensuring that it is adequate for their intended use, both current and anticipated.

REQUIRED PERFORMANCE

NEP1.1 Active fire fighting

In determining the type and extent of active fire-fighting 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 fire-fighting system.

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) all tall buildings
- (b) buildings of medium size or larger, frequented by the public and where flammable and consumer goods are displayed; and
- (c) occupancies of excessive hazard of moderate size or larger,

the detection systems on initiation must automatically activate suitable fire-fighting systems.

NEP2.1 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 on-going 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 or locality 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.

NEP3.1 Lift installations

Lift installations in tall buildings must be capable of transporting stretchers without discomfort. Effective warning must be displayed against the use of lifts during fires or earthquakes. In very tall buildings at least one lift must be such that it can be safely operated. During emergencies such as fires and be switched during the emergency for operation by only emergency personnel such as fire fighters.

NEP4.1 Emergency lighting

In moderately tall or higher residential buildings, in other than small buildings where the occupants are transient, and in all other buildings emergency lighting must be provided to clearly indicate, exits and the doors guarding such exits must be identifiably marked. Such buildings must also have emergency lighting 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.

NEP6.1.1 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)** 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 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 simply system be so 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.

NEP6.1.2 Amenity

The supply system must have an adequate capacity to serve the reasonable anticipated needs of the users.

DEEMED-TO-SATISFY PROVISIONS

FIRE-FIGHTING EQUIPMENT

NE1.1 Application of Part

This Part applies to Class 2, 3, 4, 5, 6, 7, 8 and 9 buildings.

NE1.2 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 5 storeys or more where an adjoining permanently charged fire main and water supply system is not available, adequate on-site water storage and suitable fire pumps must be provided to give the rates and pressures of flow for firefighting, as per NZS 4510. The system provided may in addition serve any required sprinkler system or other required water type in-built fire protection system.

(c) A fire main and water supply system must comply with Specification NE1.2.

NE1.3 Riser main system

Riser mains to NZS 4510 must be provided in buildings with a rise of 5 storeys or more. In buildings with a rise of up to 8 storeys, a charged dry riser main system is allowable; for taller buildings, a wet riser main system is required. Any wet riser main system must be connected to a permanently-charged fire main. In buildings with a rise of more than 8 storeys, a dedicated automatic starting fire-pump or pumps in accordance with NZS 4510 must be installed in the system to boost the pressure and/or the rates of flow to the values required by the Standard.

NE1.4 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 m²
- (ii)** in every storey if the building contains 5 storeys or more; and
- (iii)** on the roof if the building has a rise of more than 8 storeys except on
 - a roof having a pitch of more than 10 °; or
 - a roof of a plant room or other subsidiary structure on the main roof.

(a) 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

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.

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.

NE1.5 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 FIREHOSE 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,

NE1.6 Sprinklers

A required sprinkler system must:

(a) comply with Specification NE1.6; and

(b) be installed in buildings as listed in Table NE1.6.

NE1.7 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 NE1.6
REQUIREMENTS FOR SPRINKLERS

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 m ² , or (b) a volume more than 10,000 m ³ .
Class 6	in fire compartments with: (a) a floor area of more than 2000 m ² , or (b) a volume more than 12,000 m ³ .
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.	

Table NE1.7 shows the commonly-available portable extinguishers and their selection for

NE1.8 Fire and smoke alarms

NE1.8.1 A suitable automatic fire and smoke alarm system complying with Specification

NE1.8 must be installed in:

- (a) each storey if the building has a rise of 5 to 8 storeys
- (b) a Class 3 building:
 - (i) if rooms for residential use are above a height of 2 storeys; 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) unless agreed to be omitted by the Building Controller/Committee.

Table NE1.7
PORTABLE FIRE EXTINGUISHER SELECTION CHART

Class and Type of Fire		CONTENTS OF EXTINGUISHER ARE			
		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.

NE 1.8.2 A manually-operated evacuation alarm system to the relevant provisions of Specification NE1.8 must be provided in any building of:

- (a) Class 3 containing more than 20 beds where the rooms for residential use are located up to a height of only 2 storeys
- (b) Class 5 with a rise of 3 or 4 storeys and a storey floor area of more than 500 m²
- (c) Class 6, 7 or 8 excluding a public carpark with a rise of up to 4 storeys and a storey floor area of more than 500 m²
- (d) Class 9(a) ; and
- (e) in the residential part of a school accommodating more than 20 persons at a level above or below the entrance level. Also in all other Class 9b buildings (including schools) with a rise of up to 4 storeys and a storey floor area of more than 250 m²; and

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.

NE1.9 Fire control centres

A fire control centre facility in accordance with Specification NE1.9 must be provided in:

- (a) all buildings with an effective height of more than 25 m; and
- (b) a Class 6, 7, 8 or 9 building with a total floor area more than 18,000 m².

NE1.10 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.

NE1.11 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 fire-fighting purposes.

SMOKE CONTROL

NE2.1 Smoke venting

Buildings must have a system to control smoke as listed in Table NE2.1.

TABLE NE2.1	
REQUIREMENTS FOR SMOKE CONTROL	
<i>BUILDING</i>	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 m ² 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

NE2.2 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	
<i>EXIT TYPE</i>	REQUIREMENT
<p>A required fire-isolated stairway serving any storey above an effective height of 25 m.</p> <p>A required fire-isolated stairway serving 3 or more below-ground storeys.</p> <p>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.</p>	<p>Either:</p> <p>(a) a pressurisation system in accordance with NE2.7; or</p> <p>(b) Open access ramps or balconies in accordance with ND2.5</p>
<p>NOTE: A below-ground storey is one where egress involves an upward vertical climb of more than 1.5 m.</p>	

NE2.3 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.

NE2.4 Air-handling systems

If an air-handling system is installed in a building it must operate in accordance with Specification NE2.4.

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 m²
- (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 or NZS 4512; 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 m² 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 m² of floor area.

NE2.6 Smoke exhaust systems

A required smoke exhaust system must comply with Specification NE2.6.

NE2.7 Pressurisation

A required pressurisation system must:

- (a) comply with AS 1668.1 except that, instead of the criterion of 50 Pa pressure differential across each door when all doors are closed, it must be 25 Pa
- (b) not allow openable windows or other openable devices (other than necessary doorways, pressure-controlled relief louvres and windows openable by a key) in the stairway, ramp or passageway; and
- (c) not serve more than one fire-isolated exit system and not form part of any other air-handling system.

LIFT INSTALLATIONS

NE3.1 Application of Part

This Part applies to Class 2, 3, 4, 5, 6, 7, 8 and 9 buildings.

NE3.2 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 have a stretcher facility in accordance with (b).

(b) A lift required to comply with NE3.2(a) or NE3.4(b) 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.

NE3.3 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 dumb-waiter or the like that is for the transport of goods only; and

(iii) comply with the details and dimensions of Figure NE3.3 and consist of:

– incised, inlaid or embossed letters on a metal, wood, plastic or similar plate securely and permanently attached to the wall; or

– letters incised or inlaid directly into the surface of the material forming the wall.

NE3.4 Emergency lifts

(a) Among the lifts serving every storey of a building with an effective height of 75 m or more, at least one must be capable of being used as an emergency lift.

(b) An emergency lift required by (a) must:

(i) comply with AS 1735.2

(ii) be of sufficient size to take a stretcher facility in accordance with NE3.2(b), and

(iii) have a rating of at least 612 kg.

**DO NOT USE LIFTS
IF THERE IS A FIRE
OR AN EARTHQUAKE**



FIGURE NE3.3 - WARNING SIGN FOR PASSENGER LIFTS

EMERGENCY LIGHTING, EXIT SIGNS AND WARNING SYSTEMS

NE4.1 Application of Part

This Part applies to Class 2, 3, 4, 5, 6, 7, 8 and 9 buildings.

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 located in Class 2 buildings of 5 storeys or more, Class 3 buildings containing 30 beds or more, a building with Class 4 parts located at or higher than 15 m effective height, and in all Class 5, 6, 7, 8 and 9 buildings

(b) in every storey of a Class 5, 6, 7, 8 or 9 building where the storey has a floor area more than 500 m²:

(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 250 m² if it does not open to a corridor or space which has emergency lighting.

(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 building of 5 storeys or more, in a Class 3 building containing 30 beds or more, in a Class 4 part located at or above 15 m effective height, 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 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, ramp or passageway connecting more than 3 consecutive storeys in other than Class 2 buildings

(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 500 m²; 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 1000 m²

(ii) any point on the floor of that storey is more than 30 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 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 200 m², and

(h) in every required fire control centre.

NE4.3 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.

NE4.4 Design and operation of emergency lighting

(a) Emergency lighting systems must:

(i) be automatic in operation

(ii) provide sufficient illumination without undue delay for safe evacuation of all areas of the building where it is required

(iii) if it is a central system, be suitably protected from damage by fire; and

(iv) operate without interruption for a minimum of 1 hour.

(b) Emergency lighting in accordance with AS 2293 satisfies (a).

NE4.5 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.

NE4.6 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.

NE4.7 Class 2, 3 and 4 buildings: Exemptions

NE4.5 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.

NE4.8 Design and operation of exit signs

(c) Every required exit sign must:

(i) be clear and legible and have letters and symbols of adequate size

- (ii)** be illuminated at a level sufficient for it to be clearly visible at all times when the building is occupied by any person having the right of legal entry to the building
 - (iii)** be installed so that if the normal power supply fails, emergency illumination is provided to the sign in the case of those buildings covered by NE4.2, and
 - (iv)** if illuminated by an emergency lighting system incorporating wiring and a power source, comply with NE4.4.
- (d)** Exit signs in accordance with AS 2293 satisfy (a).

MAINTENANCE OF SAFETY INSTALLATIONS

NE5.1 Application of Part

This Part applies to Class 2, 3, 4, 5, 6, 7, 8, and 9 buildings.

NE5.2 Maintenance requirements

Safety installations in buildings must be adequately maintained to the requirements of Table NE5.2.

TABLE NE5.2	
SCHEDULE OF MAINTENANCE	
<i>ITEM TO BE INSPECTED OR TESTED</i>	NATURE OF INSPECTION AND/OR TEST, AND FREQUENCY
<p>1. OPENING PROTECTION</p> <p>A required fire door, fire window, fire shutter or smoke door</p>	<p>Operate and inspect for compliance with the provisions of Part NC3 and Specification NC3.4</p> <p style="text-align: right;">Monthly</p>
<p>2. MEANS OF EGRESS</p> <p>(a) Exits and paths of travel including doors, doorways and exit signs</p> <p>(b) Required handrails and balustrades</p> <p>(c) Arrangements for safe egress in buildings with special security provisions</p>	<p>Inspect to ensure compliance with Section ND</p> <p style="text-align: right;">Monthly</p> <p style="text-align: right;">Annually</p> <p style="text-align: right;">Monthly</p>
<p>3. SIGNS</p> <p>(a) Signs concerning use of lifts in the event of fire</p> <p>(b) Exit sign illumination:</p> <p style="padding-left: 40px;">Internally-illuminated signs</p> <p style="padding-left: 40px;">Externally-illuminated signs</p>	<p>Inspect for legibility and installation in compliance with Part NE4</p> <p style="text-align: right;">Annually</p> <p>Check that the lamp matches the approved lamp-rating marked on the sign fitting</p> <p style="text-align: right;">Monthly</p> <p>Check that the illumination is adequate</p> <p style="text-align: right;">Monthly</p>
<p>4. EMERGENCY LIGHTING</p> <p>Required emergency lighting</p>	<p>(a) Operate in conditions of simulated failure of power to the distribution board concerned and check for compliance with the provisions of Part NE4</p> <p style="text-align: right;">Monthly</p> <p>(b) Where batteries are involved:</p> <p>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</p> <p style="text-align: right;">Monthly</p> <p>(c) Check battery charger for correct operation</p> <p style="text-align: right;">Monthly</p>

TABLE NE5.2	
SCHEDULE OF MAINTENANCE	
<i>ITEM TO BE INSPECTED OR TESTED</i>	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	
(a) Exits and paths of travel including doors, doorways and exit signs	Inspect to ensure compliance with Section ND 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

ELECTRICAL WORK

NE6.1 Safety

NE6.1.1 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 3000 - Electrical installations - buildings, structures and premises (known as the SAA Wiring Rules). The capacity of the system must allow for the long-term anticipated requirements of the occupants.

NE6.1.2 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
 - (ii)** trailing cords and cables do not have to cross circulation routes
 - (iii)** not be located behind door-swings; and
 - (iv)** 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.

NE6.1.3 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.

NE6.2 Amenity

NE6.2.1 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 bed-rooms 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.

FIRE MAINS AND WATER SUPPLY SERVICES

Scope

This Specification refers to fire mains and water supply services for fire-fighting equipment in buildings.

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 fire-fighting equipment
- (b) not incorporate plastic pipes above ground, and
- (c) not be used for other than fire-fighting purposes except a fire main serving only hose reels may be connected to a metered supply if:
 - (i) the required flow rate and pressure can be maintained at the most hydraulically-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 Clast 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.

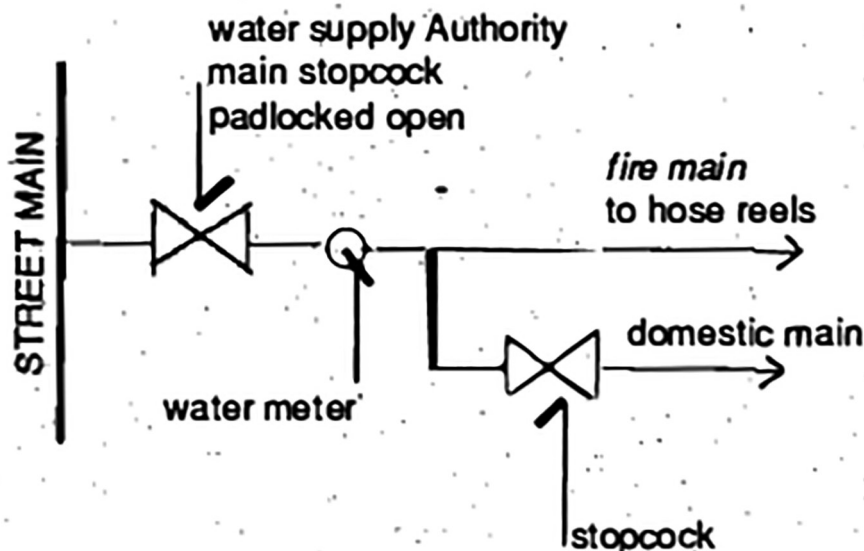


FIGURE 2 - WATER SUPPLY RETICULATION: COMBINED SERVICES

Water supplies for sprinkler systems

All water supplies for sprinkler systems must satisfy the requirements of NZS 4541. Further:

- (a) a Class C single supply system must comprise:
 - (i) a street main which may be boosted by a diesel fire pump unit
 - (ii) on-site storage or any source allowed by the Standard, or

- (iii) a combined supply from two street mains which individually are inadequate, 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 on-site storage or other source allowed by the Standard, with an independent electric or diesel fire pump.

Fire pump enclosures

Fire pumps must be located in a room or enclosure which has a FRL of not less than 60/60/30 and is:

- (a) within the building; or
- (b) external but not within 6 m of the building and any fire-source feature:

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
- (iii) 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
- (iv) the operational discharge pressure and pressure at zero flow of any pump installed in the system
- (v) the capacity of any tank connected to the system
- (vi) the height of the highest hydrant outlet above the lowest booster inlet connection, and
- (vii) 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.

FIRE SPRINKLER SYSTEMS

SCOPE

This specification sets out requirements for the design and installation of automatic fire sprinkler systems.

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 NE1.2.

Interpretation

A reference to FRR in NZS 4541 means FRL as defined in this code.

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 NC 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 unsprinklered part in accordance with Part NC2, and
 - (ii) any opening in the fire separating construction between the sprinklered and unsprinklered parts is protected in accordance with Part NC3.

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 Part NC3 must be used for, protection of openings.

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.

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.

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 therefore 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	
<i>Flash fires are likely to occur in these occupancies. These include the following:</i>	
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	Groceries (items not packaged)
Electrical appliances	Metal goods (in cartons)
Fibreboard (high-density Hardboard)	Textiles
Glassware and crockery (in cartons)	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	Linoleum products.
Baled cork	Palletized whisky stocks
Baled waste paper	Plastics (non-foamed) other than celluloid (horizontal storage)
Cartons and carton flats	Rolled pulp and paper (horizontal storage)
Cartons containing alcohols in cans or bottles	Rolled asphalt paper (horizontal storage)
Cartons of canned lacquers which dry by solvent evaporation	Veneer sheets
Chipboard	Wood patterns
Fibreboard (low density soft board)	Wooden furniture

(c) Category III - Examples of Category III storage are as follows:

Bitumen coated or wax coated paper	Rolled asphalt paper (vertical storage)
Celluloid	Rubber goods
Esparto (loose)	Ventilated wood stacks
Flammable liquids in combustible containers	Waxed or asphalt-coated paper and containers in cartons
Foamed plastics and foamed rubber products (with or without cartons) other than those specified in Category IV	Woodwool
Rolled pulp and paper (vertical storage)	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
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FIRE DETECTION AND ALARM SYSTEMS

Scope

This Specification describes the installation and operation of automatic fire detection and alarm systems, and manually operated evacuation alarm systems. The automatic systems may also be used to operate a smoke control system within a building.

Automatic systems

An automatic fire detection and alarm system must comply with NZS 4512 subject to this Specification

2.1 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, and
- (c) activate any installed automatic smoke control system, and
- (d) provide for manual operation as an evacuation system.

2.2 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.

2.3 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.

2.4 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

3. 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.

FIRE EMERGENCY CONTROL CENTRES

Scope

This Specification describes the Construction and contents of required fire-control centres or rooms.

Purpose and content

A fire-control centre or room must:

- (a)** provide an area from which fire-fighting operations or other emergency procedures can be directed or controlled
- (b)** contain controls, panels, telephones, furniture, equipment and the like associated with the required fire services in the building, and
- (c)** not be used for any purpose other than the control of:
 - (i)** fire-fighting activities, and
 - (ii)** other measures concerning the safety or security of the building occupants.

Location of fire-control centre or room

A fire-control centre or room must be so located in a building that egress from any part of its floor, to a public road or open space, does not involve changes in level which in aggregate exceed 300 mm.

Construction

A fire-control centre in a building more than 50 m in effective height must be in a separate room where:

- (a)** the enclosing construction is, of concrete, masonry or the like, sufficiently impact-resistant to withstand the impact of any likely falling debris, and with a FRL of not less than 120/120/120
- (b)** any material used as a finish, surface, lining or the like within the room complies with the requirements for fire-isolated stairways in Specification NC1.6
- (c)** services, pipes, ducts and the like that are not directly required for the proper functioning of the fire-control room do not pass through it, and
- (d)** openings in the walls, floors or ceiling which separate the room from the interior of the building are confined to necessary doorways, ventilation and other openings for services, necessary for the proper functioning of the facility.

Protection of openings

Openings permitted by Clause 4 must be protected as follows:

- (a)** Openings for windows, doorways, ventilation, service pipes, conduits and the like, in an external wall of the building that faces a public road or open space, must be protected in accordance with Part NC3 as applicable.
- (b)** Openings in the floors, ceilings and internal walls enclosing a fire-control room must, except for doorways, be protected in accordance with Part NC3, as appropriate.
- (c)** A door opening in the internal walls enclosing a fire-control room, must be fitted with a self-closing 120/120/30 smoke-sealed fire door.
- (d)** Openings associated with natural or mechanical ventilation must:
 - (i)** not be made in any ceiling or floor immediately above or below the fire-control room, and
 - (ii)** be protected by a 120/120/- fire damper if the opening is for a duct through a wall required to have a FRL, other than an external wall.

Exit doors

- (a)** Required doors to a fire-control room must open into the room, be lockable and located so that persons using escape routes from the building will not obstruct or hinder access to the room.
- (b)** The fire-control room must be accessible via two paths of travel:
 - (i)** one from the front entrance of the building, and
 - (ii)** one direct from a public place or fire-isolated passageway which leads to a public place and has a FRL of not less than 120/120/120.

Size and contents

- (a)** A fire-control room must contain not less than:
 - (i)** a Fire Indicator Panel and necessary control switches and visual status indication for all required fire pumps, smoke control fans and other required fire-safety equipment installed in the building
 - (ii)** a telephone directly connected to an external telephone exchange
 - (iii)** a blackboard or whiteboard not less than 1200 mm wide and 1000 mm high
 - (iv)** a pin-up board not less than 1200 mm wide x 1000 mm high; and
 - (v)** a raked plan layout table of size not less than the plans to be laid out upon the table, and plans of the structural, architectural, electrical, mechanical, lift and fire service details which may be stored beneath the plan layout table or within other suitable storage facility located in the room.
- (b)** in addition, a fire-control room may contain:
 - (i)** master emergency control panels, lift annunciator panels, remote switching controls for gas or electrical supplies and emergency generator backup, and
 - (ii)** building security, surveillance and management systems if they are completely segregated from all other systems.
- (c)** A fire-control room must:
 - (i)** have a gross area of not less than 10 m² and the length of any internal side must be not less than 2.5 m
 - (ii)** if only the minimum prescribed equipment is installed - have a net floor area of not less than 8 m² with a clear space of not less than 1.5 m² in front of the Fire Indicator Panel, and
 - (iii)** if additional equipment is installed, have an additional area of not less than 2 m² net floor area for each additional facility and a clear space of not less than 1.5 m² in front of each additional control or indicator panel,

and the area required, for any path of travel through the room to other areas must be provided in addition to the requirements of (ii) and (iii).

Ventilation and power supply

A fire-control room must be ventilated by:

- (a)** natural ventilation from a window or doorway in external wall of the building which opens directly into the fire-control room from a roadway or open space, or
- (b)** a pressurising system that only serves the fire-control room, and:

- (i) is installed in accordance with AS 1668.1 as though the room is a fire-isolated stairway
- (ii) is activated automatically by operation of the fire alarm or sprinkler system installed in the building and manually by an over-riding control in the room
- (iii) provides a flow of fresh air through the room of not less than 30 air changes per hour when the system is operating and any door to the room is open
- (iv) has fans, motors and ductwork that form part of the system but not contained within the fire-control room protected by enclosing construction with a FRL of not less than 120/120/120, and
- (v) has any electrical supply to the fire-control room or equipment necessary for its operation connected to the supply side of the main disconnection switch for the building and electrical service cables of copper-sheathed mineral-insulated cable with copper conductors,

and, no openable window or other openable device other than necessary doorways, pressure-controlled relief louvres and windows operable by a key, must be provided in the fire-control room.

Sign

The external face of the door to the fire-control room must have a sign with the words:

Fire Control Room

in letters not less than 50 mm high and colour which contrasts with that of the background.

10. Lighting

Emergency lighting in accordance with Part NE4 must be provided in a fire-control room, except that an illumination level of not less than 400 Lux must be maintained at the surface of the plan table.

Equipment not permitted within a fire-control centre or room

An internal combustion engine, pumps, sprinkler control valves, pipes and ancillary fittings must not be located in a fire-control centre or room, but may be located in rooms accessed through the fire-control centre or room.

Ambient Sound Level

The ambient sound level within the fire-control centre or room measured when all fire safety equipment is operating in the manner in which it operates in an emergency, must not exceed 65 dB(A), when determined in accordance with AS 2107.

AIR HANDLING SYSTEMS IN BUILDINGS

Scope

This Specification outlines the performance and operation of mechanical ventilation and air conditioning systems as they relate to smoke control in buildings.

Commonly-used systems

The following commonly-used systems may be installed:

- (a) small stand-alone or window units without ducting
- (b) central chilled water systems with fan coil 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.

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.

Compliance

The action required under 3 (a), (b) or (c) must be automatic and be activated by:

- (a) smoke detectors located in each store or fire compartment in accordance with Specification NE1.8 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.

SMOKE EXHAUST SYSTEMS

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.

Fan capacity

Fan systems must have an exhaust capacity in accordance with the height of the building as specified in Figure 2.

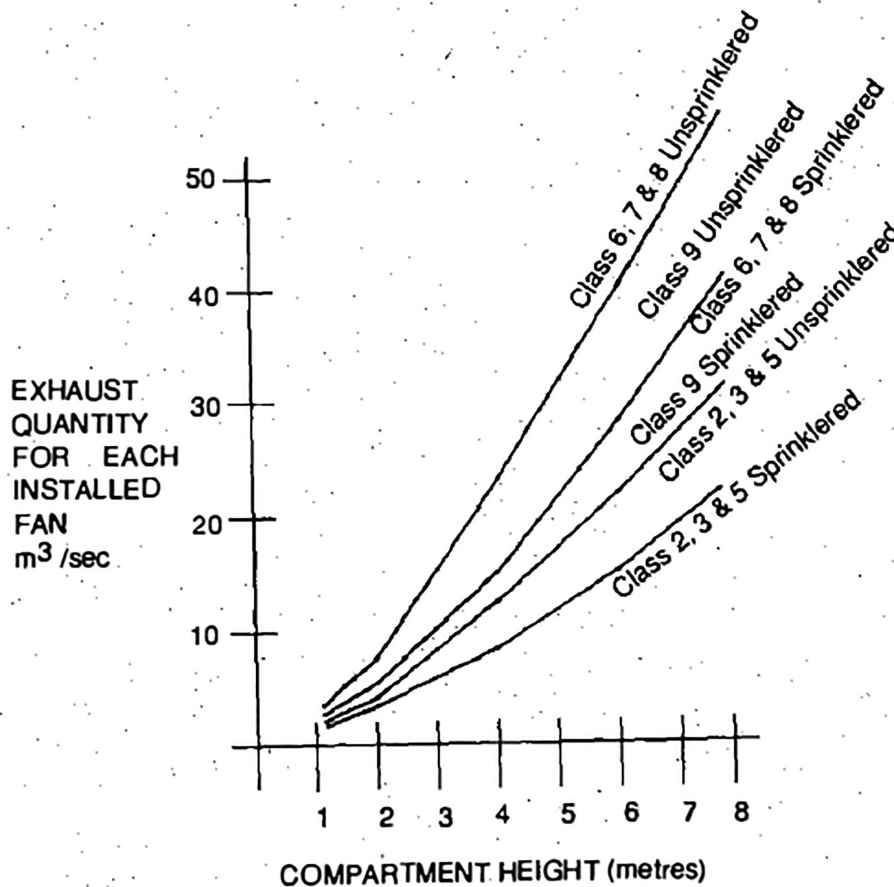


FIGURE 2 - EXHAUST CAPACITY OF FANS

Compartmentation at ceiling level

The storey or room at ceiling level:

- (a) must be divided into compartments not more than 1500 m² 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.

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 m² 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.

Make-up air

Low-level fresh-air inlet openings or doors must be sized to provide adequate low-velocity 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.

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 NE1.9
- (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 m² 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 m² 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 m² 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 m² arranged to activate the exhaust system and transmit an alarm to the Fire Brigade.

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.

Resistance to high temperatures

If not adequately shielded from the airflow:

(a) all parts of exhaust fans and other equipment required to operate in a smoke-laden environment; and

(b) parts of the building required to be smoke-resisting,

must be capable of withstanding a temperature of 200 °C for a period of not less than 1 hour.

Cook Islands
BUILDING
CODE 2019

**PUBLIC BUILDINGS AND
GROUP DWELLINGS**
(CLASS 2 TO 9)

Section NF
**HEALTH AND
AMENITY**

**Performance Requirements
Deemed-to-Satisfy Provisions**

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NF2 SANITARY FACILITIES

NF3 ROOM SIZES

NF4 LIGHT AND VENTILATION

NF5 WATERSUPPLY PLUMBING

NF6 SANITARY PLUMBING AND DRAINAGE

NF7 ROOF DRAINAGE

Section *NcF* **HEALTH AND AMENITY**

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PERFORMANCE REQUIREMENTS

OBJECTIVES

A building must be designed and constructed to meet the following objectives:

NFP1 Damp and Weatherproofing

Suitable damp and weatherproofing must be 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) 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.

NFP2 Cooking and Sanitary Facilities

Adequate 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.

NFP3 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.

NFP4 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.

NFP5 Water Supply Plumbing

An appropriate safe and hygienic system of plumbing for the supply of water for domestic needs must be provided.

NFP6 Sanitary Plumbing

An appropriate system of drainage for the hygienic waterborne conveyance of waste water must be provided.

NFP7 Roof Drainage

A roof drainage system is to be provided. It must give reasonable protection against the overflow of rainwater into the building.

NFP8 Site Drainage

Unhealthy ponding of water in the allotment must not be allowed and the erection of the building or any alteration to it must not adversely affect the drainage of other allotments or of any public land or infrastructure.

REQUIRED PERFORMANCE

NFP1.1 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.

NFP2.1 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.

NFP3.1 Room sizes

The size and disposition of rooms in a building must be consistent with the requirements of health and hygiene.

NFP4.1 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.

NFP5.1 Water supply plumbing

Plumbing for potable watersupply must use materials which do not react with the water and thereby make it unsuitable. Suitable precautions must be taken to ensure that unsafe or unhygienic materials have no chance of entering the supply system. The installation of hot water systems must not impair the safety of the users. All concealed and difficult-to-access plumbing work must be suitably protected so that there is no likelihood of damage and leakage. The plumbing must take into account the current and anticipated needs of the user and allow for the simultaneous use of the connected system by others.

NFP6.1 Sanitary plumbing and drainage

Sanitary plumbing must be laid to self-cleansing grades 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. The size of drains and the layout of their connections must reasonably ensure the current and anticipated needs of the users. The connections to sanitary installations must ensure that foul gases are not allowed to produce unhygienic conditions nor create any nuisance to anyone and are suitably vented.

NFP7.1 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) 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.

NFP9.1 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.

DEEMED-TO-SATISFY PROVISIONS

DAMP AND WEATHERPROOFING

NF1.1 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.

NF1.2 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.

NF1.3 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.

NF1.4 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 and 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 stand or open deck carpark.

NF1.5 Pliable roof sarking

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

NF1.6 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 if it is within 75 mm of the 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.

NF1.7 Damp-proof courses

Except in a building that is exempt from weatherproofing under NF1.4, 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.

NF1.8 Acceptable damp-proof courses

A damp-proof course must consist of:

(a) a material that complies with AS 2904

(b) suitable termite shields placed on piers; or

(c) other suitable material.

NF1.9 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:

(i) the insertion of a vapour barrier in accordance with AS 2870.1; or

(ii) other suitable means; and

(b) damp-proofing need not be provided if the building is exempt from weatherproofing under NF1.4.

SANITARY AND OTHER FACILITIES

NF2.1 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

TABLE NF2.1	
PROVISION OF SANITARY AND OTHER FACILITIES	
<i>CLASS OF BUILDING - MINIMUM FACILITIES REQUIRED</i>	
<p>Class 2 Within each sole-occupancy unit</p> <p>(a) A kitchen sink and facilities for the preparation and cooking of food</p> <p>(b) A shower; and</p> <p>(c) A closet pan and facilities for washing hands.</p> <p>Class 2 For each building</p> <p>(a) A separate laundry for each 4 sole-occupancy units, or part without its own clothes washing facilities, comprising at least one washtub and space for a washing machine</p> <p>(b) Clothes drying facilities comprising:</p> <p style="padding-left: 20px;">(i) Lines or clothes hoists with not less than 7.5 m of line per sole-occupancy unit; or</p> <p style="padding-left: 20px;">(ii) One heat-operated drying cabinet or appliance for each 4 sole-occupancy units, or part, without its own drying facilities.</p> <p>Class 2 Facilities for employees</p> <p>(a) If the building contains more than 32 sole-occupancy units, or if a group of Class 2 buildings on the one allotment contains in total, more than 32 sole-occupancy units</p> <p>(b) A closet pan and washbasin in a compartment or room at or near ground level and accessible to employees without having to entering a sole-occupancy unit.</p>	
<p>Class 3 Facilities for residents</p> <p>For each 10 residents for whom private facilities are not provided:</p> <p>(a) A shower; and</p> <p>(b) A closet pan and washbasin, except that if one urinal is provided for each 25 males up to 50 and one additional urinal for each additional 50 males or part thereof, one closet pan for each 12 males may be provided.</p> <p>(c) If these facilities are situated outside the building, they should be conveniently accessible.</p>	
<p>Class 4 For each sole-occupancy unit</p> <p>(d) A kitchen sink and facilities for the preparation and cooking of food</p> <p>(e) A shower</p> <p>(f) A closet pan and washbasin</p> <p>(g) Clothes washing facilities, comprising a washtub and space in the same room for a washing machine; and</p> <p>(h) A clothes line or hoist, or space for a heat-operated drying cabinet or similar appliance for the exclusive use of the occupants.</p>	

NF2.2 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.

NF2.3 Facilities in Class 3 to 9 Buildings

Sanitary facilities must be provided in Class 3, 5, 6, 7, 8 and 9 buildings in accordance with Table NF2.3.

TABLE NF2.3										
SANITARY AND OTHER FACILITIES										
Class of building	User	Max Number Served by:								
		Closet Fixture(s)			Urinal(s)			Washbasin(s)		
		1 Up to	2 Up to	Each Extra	1 Up to	2 Up to	Each Extra	1 Up to	2 Up to	Each Extra
3, 5, 6 and 9 other than schools	Employees									
	Males	20	40	20	25	50	50	60	120	60
	Females	15	30	15	-	-	-	60	120	60
7 and 8	Employees									
	Males	20	40	20	25	50	50	30	60	30
	Females	15	30	15	-	-	-	30	60	30
6 – Department stores, shopping centres and, individual shops in excess of 900 m ² total floor area	Patrons									
	Males	50	2400	1200	600	1200	1200	1000	4000	2000
	Females	300	600	1200	-	-	-	1000	4000	2000
6 – Restaurants, cafes, bars, public halls, function rooms and 9a – out-patients	Patrons									
	Males	50	200	250	50	200	100	50	200	250
	Females	30	70	80	-	-	-	50	200	250
9a – Health-care buildings (Other than for out-patients)	Resident Patients									
	Males	-	16	8	-	-	-	16	32	16
	Females	-	16	8	-	-	-	16	32	16
Other facilities – One shower for each 8, or part, patients or inmates										

9b – Schools not being early child-hood centres	Staff and Employees									
	Males	20	40	20	25	50	50	30	60	30
	Females	15	30	15	-	-	-	30	60	30
	Students									
	Males	30	70	70	30	70	40	60	140	140
	Females	20	340	30	-	-	-	60	140	140
9b – Early childhood centres	Children									
	Children	50	200	250	50	200	100	50	200	250
	- Other facilities: One shower for each 10 or part, participants									
9b – Sporting venues, theatres, cinemas, art galleries or the like and churches, chapels or the like	Participants at sporting venues, theatres or the like									
	Males	20	40	20	10	20	10	20	40	20
	Females	15	30	15	-	-	-	20	40	20
	- Other facilities: One shower for each 10 or part, participants									
	Spectators or patrons									
	Males	250	500	500	100	200	100	250	500	500
Females	75	250	250	-	-	-	250	500	500	

NF2.4 Facilities for people with disabilities

Sanitary facilities must be provided in accordance with Table NF2.4 in every Class 3, 5, 6, 7 and 9 building that is required by Part ND3 to be accessible to people with disabilities.

TABLE NF2.4
SANITARY FACILITIES FOR PEOPLE WITH DISABILITIES

CLASS OF BUILDING — MINIMUM FACILITY FOR USE BY PEOPLE WITH DISABILITIES

Class 3 – In every sole-occupancy unit to which access for people with disabilities is required:

- (a) One closet pan and washbasin; and
- (b) One shower

Class 5, 6, 7 and 9 buildings with floor area more than 1000 m² and

Class 3 if accommodation is other than in sole-occupancy units, or other parts of the building are required to be accessible

NUMBER OF PERSONS FOR WHOM TOTAL FACILITIES NORMALLY REQUIRED

MINIMUM NUMBER FOR USE BY PEOPLE WITH DISABILITIES

Closet pans plus urinals

1-100	(a) One unisex facility; or (b) One closet pan and washbasin for each sex
101-200	(a) 2 unisex facilities; or (b) One closet pan and washbasin for each sex and one unisex facility
More than 200	(a) 2 unisex facilities or one closet pan and washbasin for each sex and one unisex facility; and (b) One additional unisex facility or one closet pan and washbasin for each sex for each additional 100 person.

In all cases, facilities for females must include adequate means for the disposal of sanitary towels/

Bath or shower One shower or shower-bath for each 10 or part thereof normally required, but not less than one for use by both sexes

NF2.5 Construction of sanitary compartments

(a) Partitions - Other than in any early childhood centre, sanitary compartments must have doors and partitions must 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.

NF2.6 Interpretation: Urinals and washbasins

(c) 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.

(d) A washbasin may be either:

- (i)** an individual basin; or
- (ii)** a part of a hand wash trough served by a single water tap.

ROOM SIZES

NF3.1 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 (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) Ancillary and other spaces:

- (i)** bathroom, shower room, water closet, toilet room, airlock, tea preparation room, pantry, store room, garage, carparking area, or the like, in any class of building - 2.1 m.

NF3.2 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.

NF3.3 Ceiling fans

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

LIGHT AND VENTILATION

NF4.1 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 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.

NF4.2 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 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 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.

NF4.3 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 verandah) 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 verandah 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.

NF4.4 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 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.

NF4.5 Ventilation of rooms

(c) 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.

(d) Provision of either:

- (i) natural ventilation complying with NF4.6; or
- (ii) a mechanical ventilation or air conditioning system complying with AS 1668.2, with provision for natural ventilation to NF4.6 for use in case of a lengthy failure of the mechanical system, satisfies (a).
- (iii) 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 NF4.6. Otherwise the mechanical system must have a complete stand-by system including for power generation.

NF4.6 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.

NF4.7 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 one bedroom to another or between a bedroom and the kitchen
 - (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.

NF4.8 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.

NF4.9 Airlocks

If a room containing a closet pan or urinal is prohibited under NF4.8 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 m² 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.

NF4.10 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.

NF4.11 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.

NF4.12 Uncovered space for Class 4 parts

Class 4 parts of buildings must have sole access to a space open to the sky of 20 m² minimum area. Of this at least 5 m² 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.

NF4.13 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, cleaners, cupboards, and healthcare rooms.

WATER SUPPLY PLUMBING

NF5.1 General requirements

The plumbing work for water supply 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-connections and prevention of backflow
- (d) adequate care in the installation of the services
- (e) suitable provision of main and subsidiary storage as required
- (f) adequate connections to sanitary services without endangering health and hygiene; and
- (g) the installation of hot water systems to provide safe and adequate service.

NF5.2 Means of compliance

The requirements of NF5.1 are satisfied if all plumbing for water supply is carried out to the relevant provisions of:

- (a) AS/NZS 3500 Part 1 - Water Services and its amendments
- (b) AS/NZS 3500 Part 4 - Heated Water Services and its amendments
- (c) AS/NZS 2845.1 Water Supply Backflow Prevention Devices - Part 1: Materials, Design and Performance Requirements and its amendments

NF5.3 Pipes which are not easy to access

Particular attention is drawn to the provisions in AS 3500 - Parts 1 and 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 3500 - Parts 1 and 4.

NF5.4 Access to 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 or earthquake 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 - Part 4 is the relevant standard for the installation of a household water heater.
- (c) Solar thermal - solar thermal systems shall comply with AS/NZS 2712 and shall be sufficiently braced against any applicable wind or earthquake loadings. Consideration of additional gravity loads due to solar thermal systems shall be given during the structural design of the building.

NF5.5 Rainwater storage

Where rainwater is collected and stored, the storage and distribution must reasonably ensure that the water is not contaminated by unsafe or unsuitable materials. The capacity of the catchment and storage must be adequate to provide a continued supply of water during eperiods of low rainfall.

The details given in Specification DF5.5 meet the requirements of this Clause.

SANITARY PLUMBING AND DRAINAGE

NF6.1 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.

NF6.2 Means of compliance

The requirements of NF6.1 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.

NF6.3 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.

NF6.4 Grease trap

Where the nature of the occupancy is such that the waste water 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.

NF6.5 Trade wastes

Any trade waste unacceptable to the Authority having jurisdiction must be pre-treated before it enters the disposal system.

NF6.6 Small treatment plants

Where there is no public sewerage or public treatment systems available the following methods may be used for the treatment and disposal of sewage:

In Rarotonga and Aitutaki wastewater treatment and disposal are subject to the Public Health Sewage (Wastewater treatment and disposal) Regulations 2014. All systems shall comply with the requirements of these regulations and receive the required approvals from the Ministry of Health.

In locations other than Rarotonga and Aitutaki one of the following methods may be used for the treatment of sewage:

- (a) Packaged treatment plants
- (b) Septic tanks
- (c) Any other suitable method.

The details given in Annexure 2 to Specification DF2.1 may be used for the preliminary design of the main elements of a septic tank system if such a system is considered.

ROOF DRAINAGE

NF7.1 General Requirements

Gutters and downpipes shall be provided and must have sufficient capacity to reasonably prevent the overflow of rain water 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 80 mm/hr
- (b)** Box and valley gutters - a 100-year return intensity of 100 mm/hr
- (c)** Gutters and downpipes for temporary buildings - a 5-year return intensity of rainfall of 63 mm/hr.

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

NF7.2 Means of compliance

The requirements of NF7.1 are satisfied if the requirements of AS 2179 - Metal rainwater goods - Specification and AS 3500 Part 3 - Plumbing and Drainage: Stormwater Drainage, are met. Specification NF7.2 covers some of these requirements.

SIZING OF GUTTERS AND DOWNPIPES

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.

1.1. Rainfall intensity

In rainstorms long periods of steady rainfall are interspersed with peak intensities for short periods. The roof-drainage system must be capable of handling the peak intensities without flooding or overflow. Peak intensities for Cook Islands are as follows:

5-year return period 62 mm/hr

20-year return period 80 mm/hr

100-year return period 100 mm/hr

Any known local variations should be taken into account. The 5-year return intensity is used in the design of temporary structures of short life. The design of eaves gutters of permanent buildings must be based on the 20-year return intensity and of internal box gutters and valley gutters on the 100-year return intensity. A freeboard of 25 mm for eaves gutters and of 35 mm for internal box gutters and valley gutters are required to provide against overflow into buildings.

2. CATCHMENT

A roof drainage system is best analysed by dividing it into lengths of gutter each sloping down from a high point to an outlet with a downpipe. A long length of roof usually drains into several lengths of gutter separated by expansion joints that are also high points. The catchment area for a length of gutter is determined by multiplying the rafter length by the length of gutter (G) and adding a proportion of any vertical surface against which rain can be driven. A reasonable procedure is to add half the area of a very exposed vertical surface and smaller proportions for less extreme conditions (see Figure 2.1).

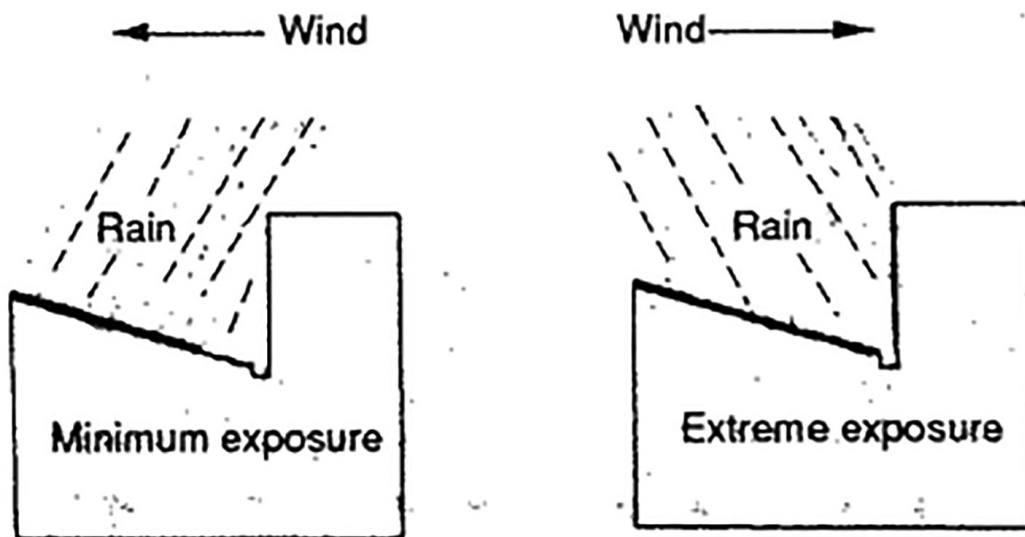
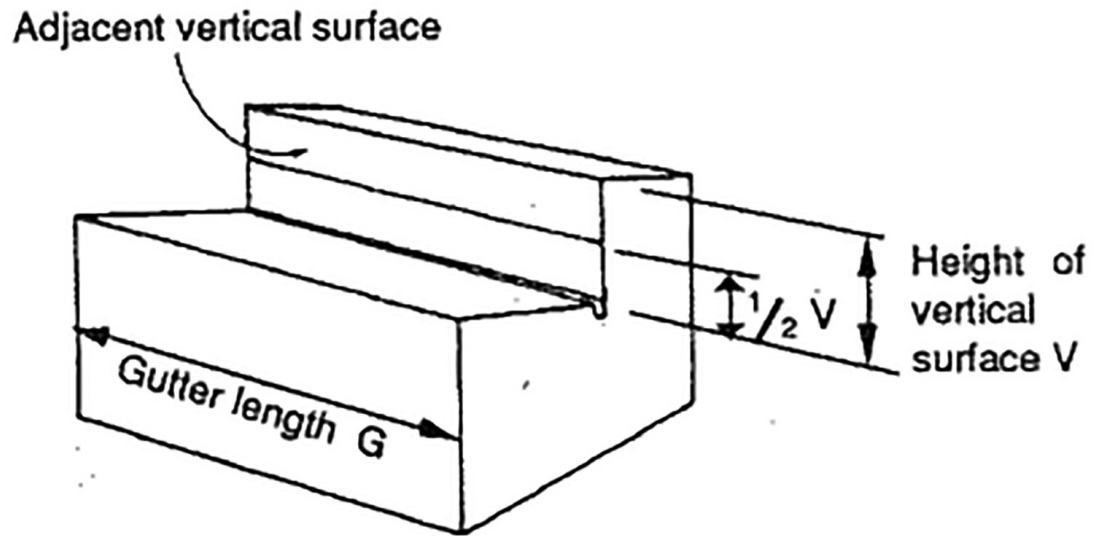


FIGURE 2.1 - EFFECT OF VERTICAL SURFACE ON CATCHMENT

The length G of a gutter is measured as the distance from a high point in the gutter to the downpipe when the downpipe is at the end of the gutter and between high points when the downpipe is not at the end (see Figure 2.2).

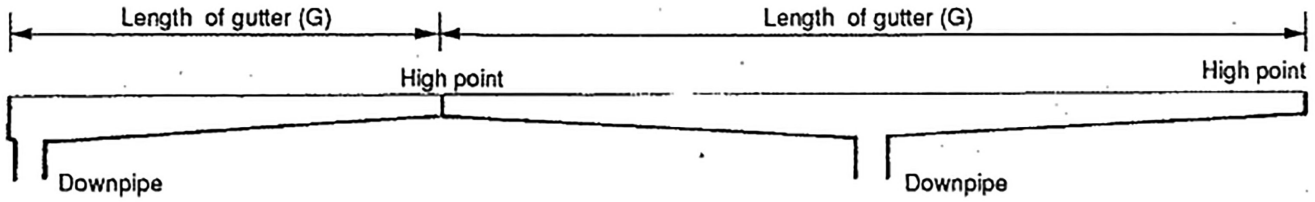


FIGURE 2.2 - MEASURING GUTTER LENGTH

3. EAVES GUTTER

The procedure for the design of eaves gutters is as follows:

3.1 Size

Space the downpipes suitably and calculate the catchment area per downpipe. For eaves gutters of permanent buildings determine the gutter discharge area by matching - the catchment area against the 80 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.

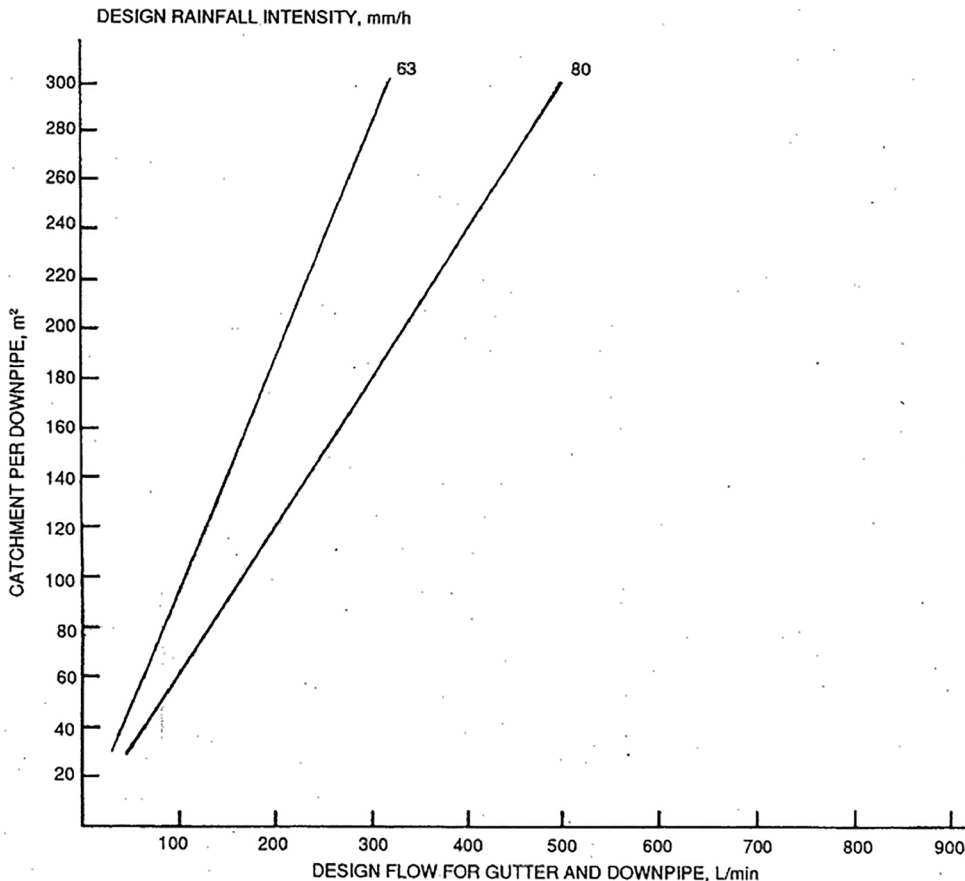


FIGURE 3.1 - EAVES GUTTER SIZING

The nett cross-sectional area of each vertical downpipe, including the nozzle must be not less than 50 per cent of the gutter discharge area.

3.2 Slope

The fall of an eaves gutter must never be less than 1 in 500 but, in areas where dust or debris is likely to build up between rain periods, the slope must be as steep as 1 in 50.

3.3 Leaf guards and overflows

Leaf guards must be fitted to prevent the nozzle to the downpipe from becoming blocked wherever leaves or other debris are likely to collect in the gutter. If the eaves gutter has a fascia front higher than the rear lip, an overflow must be fitted at a level below that of the lowest point in the rear lip.

3.4 Proportion

The proportions of a rectangular eaves gutter are ideal when its width is twice the maximum depth of water flowing in it. Although a narrow deep gutter will provide a greater head of water over the outlet with a consequent improvement in the discharge capacity of the outlet, a shallower gutter is usually easier to maintain.

4. INTERNAL 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.

4.1 Size of gutter

Space the downpipes suitably and calculate the catchment area per downpipe. From Figure 4.1.1 using the calculated catchment area and 100 mm/hr rain intensity, determine the design flow for the gutter and the downpipe. Select a width of not less than 300 mm for the box gutter. The required depth can then be read from Figure 4.1.2 by using the selected width and the design flow. The depth allows for a freeboard of 35 mm which will be necessary during cyclonic winds along with normal turbulence and ripples. The depth thus determined assumes that the gutter is laid to zero slope. To adjust for the slope, use the depth determined from Figure 4.1.2 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.

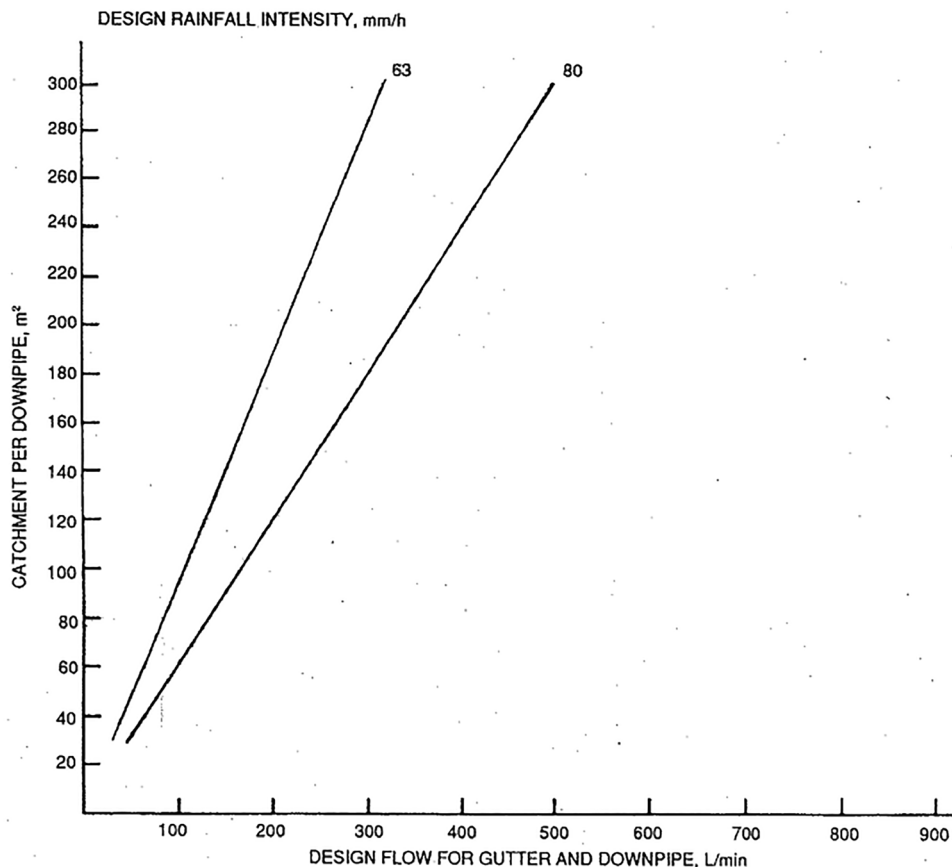
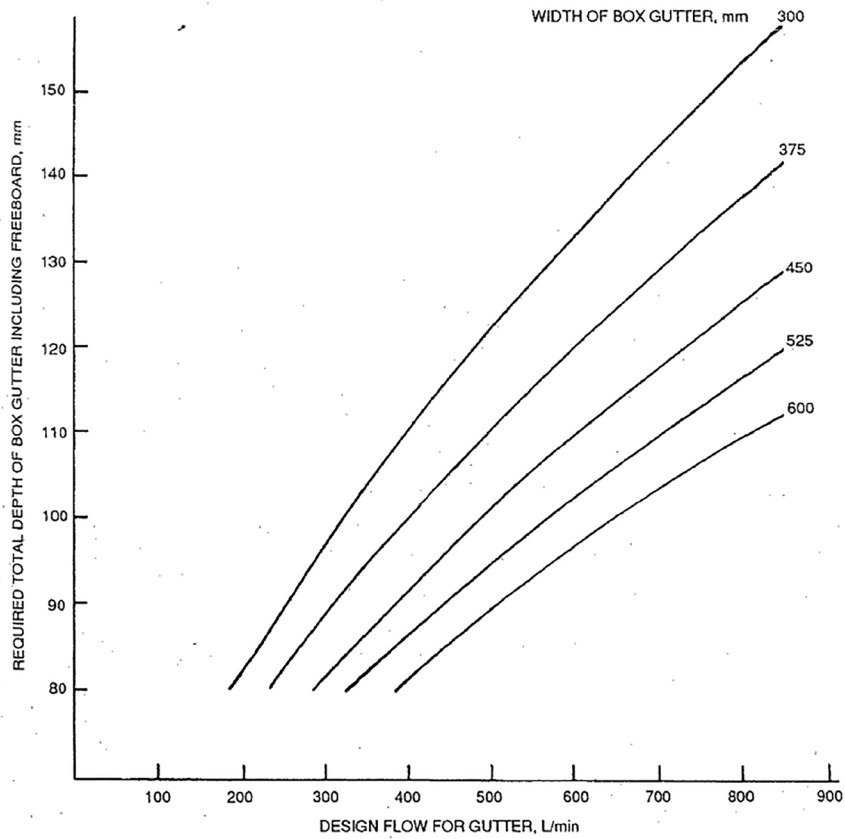


FIGURE 4.1.1 - INTERNAL BOX GUTTER DESIGN FLOW



Notes:

- 1 Graph assumes zero slope. To take advantage of slope, see Fig. 4.1.3.
- 2 Graph assumes 35 mm freeboard.

FIGURE 4.1.2 - REQUIRED DEPTH OF BOX GUTTER FOR DESIGN FLOW

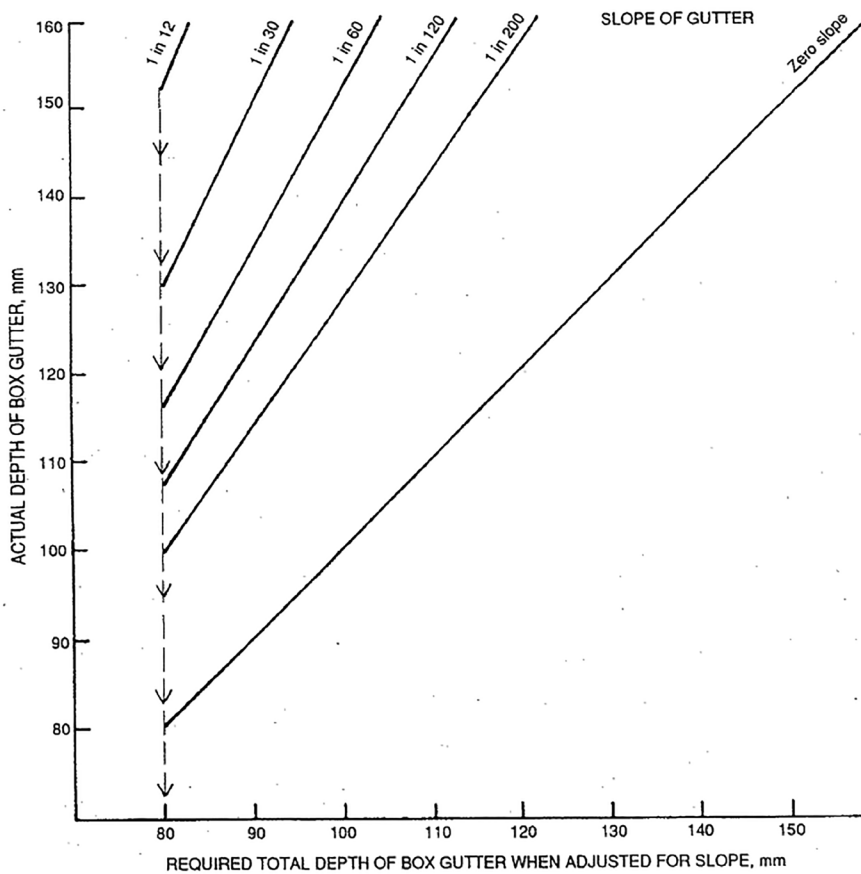


FIGURE 4.1.3 - BOX GUTTER DEPTH - ADJUSTED FOR SLOPE

3.2 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.

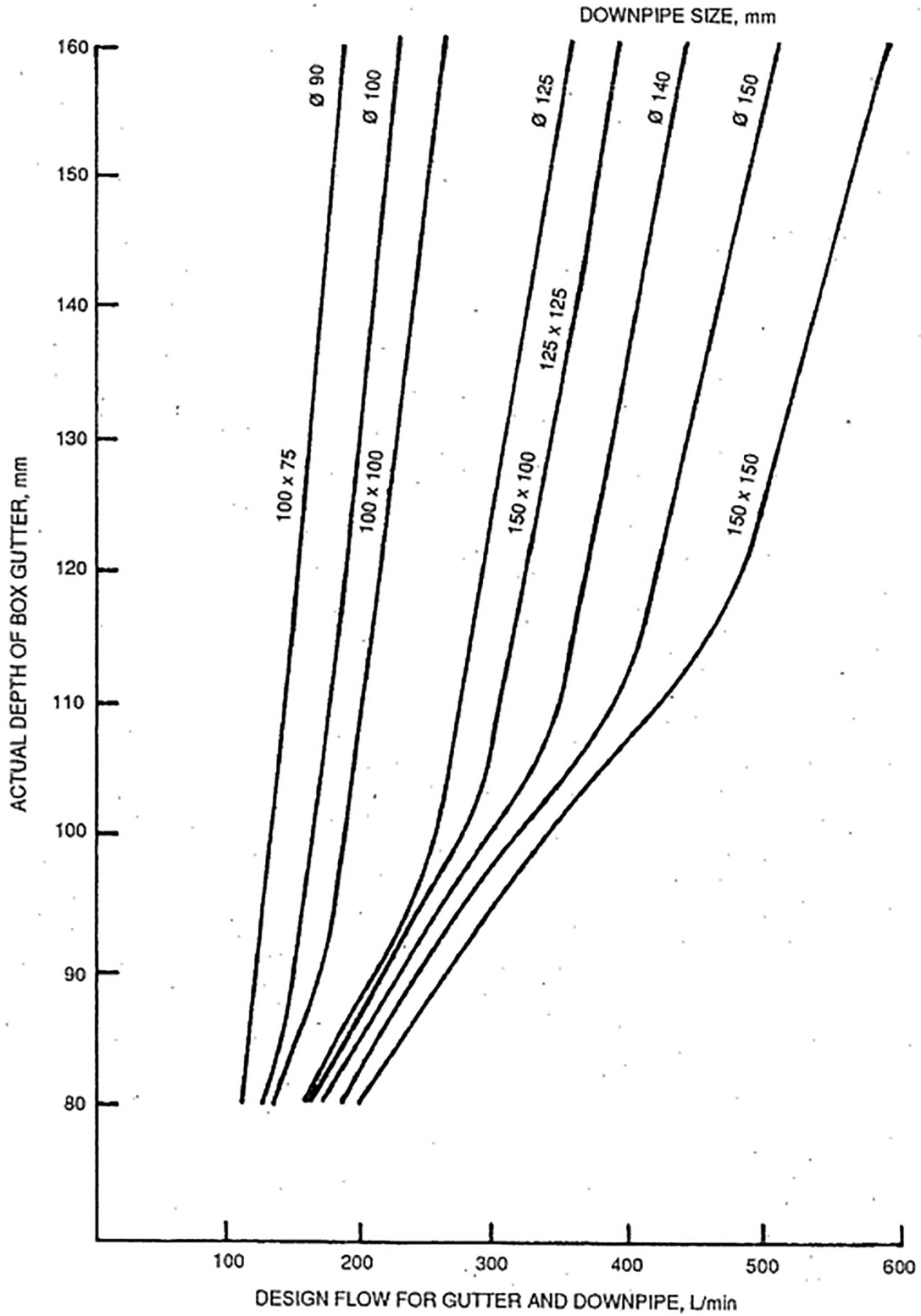


FIGURE 4.2 - REQUIRED SIZE OF DOWNPIPE FOR BOX GUTTER (RAINHEAD AND SUMP NOT CONSIDERED)

4.3 Overflow

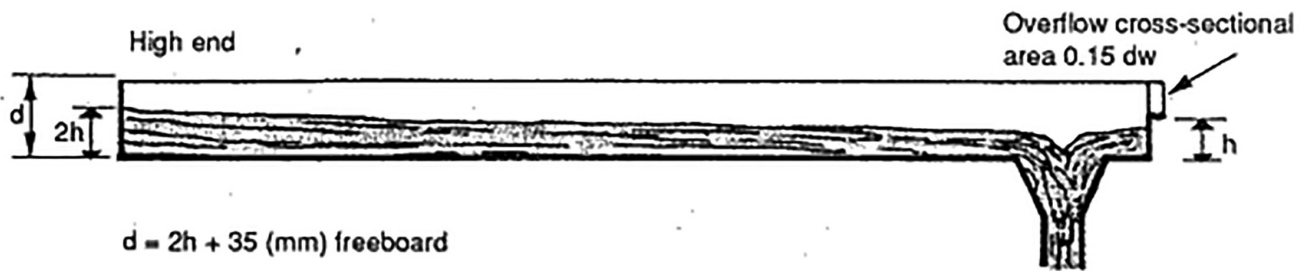


FIGURE 4.3.1 - OVERFLOW OUTLET

A box gutter discharging directly into a downpipe must have an overflow outlet to allow for blockage and to provide for rainfall intensities greater than those used for design. To cope only with peaks in rainfall it is sufficient for the overflow outlet to have a cross-sectional area equal to 15 percent of the total cross-sectional area of the gutter that is an overflow area of $0.15 dw$ (see Figure 4.3.1).

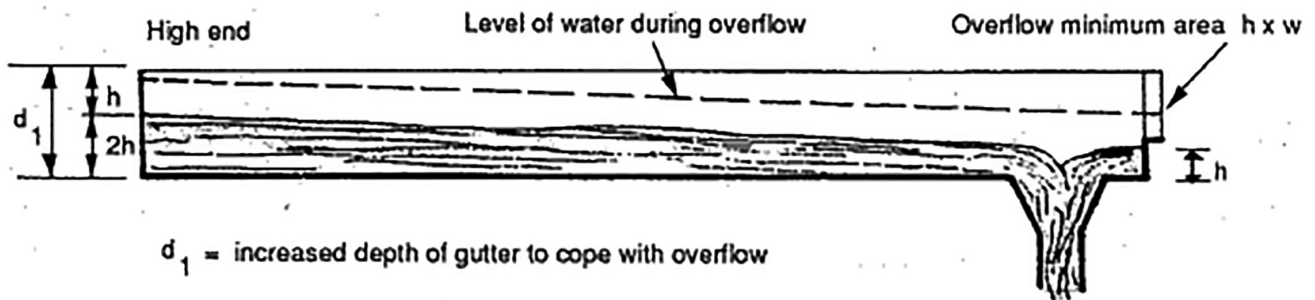


FIGURE 4.3.2 - OVERFLOW WITH BLOCKED DOWNPIPE

But, if the overflow is intended to cope with the effect of a total blockage of the downpipe during a peak period, then the cross-sectional area of the overflow outlet must equal the cross-sectional area of the water flow at the outlet of the gutter ($h \times w$ 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 a crisis (see Figure 4.3.2). 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.

5. RAINHEADS AND SUMPS

5.1 Rainheads

The rainhead is a device used to increase the capacity of a downpipe at the end of a box gutter and to allow for overflow in case of a blocked downpipe. The discharge capacity of an outlet increases with the depth of water (head) over the outlet. The rainhead is located at the far end of 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. The detailed design of rainheads is given in AS 3500.

5.3 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. The detailed design of sumps is given in AS 3500.

6. DOWNPIPES

6.1 Location

Downpipes must be located externally but, where it is necessary to locate a downpipe internally, the pipe must be accessible so that any blockage can be cleared. Access for cleaning must be provided at the base of all downpipes that are connected directly to a storm water drain. Downpipes are most efficient when located at the centre of a length of gutter.

6.2 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.

6.3 Gratings

Where a grating or strainer is fitted to a rain-water outlet, the total area of the perforations in the grating must be at least 1.5 times the cross-sectional area of the outlet. Strainer gratings must project above the calculated level of flow at the outlet and must be cleared of accumulated debris regularly.

7. INCOMPATIBLE MATERIALS

Dissimilar metals must be separated by a non-conducting gasket or similar device to prevent electro-chemical corrosion. Water draining from copper components must not discharge onto non-copper components for the same reason. However, water can be safely drained from non-copper onto copper components. (The prevention of electro-chemical corrosion between metals will not necessarily prevent atmospheric corrosion of the individual metals).

8. EXPANSION JOINTS FOR GUTTERS

Metal gutters must be provided with expansion joints to prevent distortion and resulting damage and reduced flow. The maximum length between expansion joints is given in Table 8.

<i>Material</i>	<i>Estimated exposed temperature range (°C)</i>	Distance between 20 mm expansion joints (m)
Aluminium	45	18
Copper	55	21
Stainless Steel	40	30
Steel	50	33
Zinc	50	15

9 STORMWATER

9.1 Where a downpipe discharges into a storm water 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 greater than that of the downpipe. Underground stormwater pipes draining roof and paved catchments must be laid in straight lines at uniform gradients between sumps or collection pits. Large paved areas and roadways must slope towards drainage points with a minimum cross-fall of 1 in 60 for bitumen or concrete surfaces and 1 in 120 for concrete kerb channels.

9.2 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/h. 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 (m ²) 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

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PUBLIC BUILDINGS AND
GROUP DWELLINGS
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Section NG
ANCILLARY
PROVISIONS

Performance Requirements
Deemed-to-Satisfy Provisions

NG1 MINOR STRUCTURES AND COMPONENTS

NG2 FIREPLACES, CHIMNEYS AND FLUES

NG3 ATRIUM CONSTRUCTION

Section *NG* — **ANCILLARY PROVISIONS**

CONTENTS

PERFORMANCE REQUIREMENTS

DEEMED-TO-SATISFY PROVISIONS

Part		Part	
NG1	Minor Structures and Components	NG2	Fireplaces, Chimneys and Flues
NG1.1	Swimming pools	NG2.1	General requirements
NG1.2	Refrigerated chambers, strong rooms and vaults	NG2.2	Open fireplaces
NG1.3	Parapets on flat roofs	NG2.3	Incinerator rooms
NG1.4	Projections over public places		
NG1.5	Moveable awnings or sunshades over public places	NG3	Atrium Construction
NG1.6	Fences		

PERFORMANCE REQUIREMENTS

OBJECTIVES AND REQUIRED PERFORMANCE

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 objectives, in addition to those listed for Sections B, NC, ND, NE and NF where relevant, are fulfilled:

NGP1 Minor structures and components

NGP1.1 Swimming pools

(a) Suitable means for the disposal of waste and drainage must be provided to a swimming pool.

(b) Access by unsupervised young children to swimming pools must be restricted.

NGP1.2 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.

NGP1.3 Safety at elevated places

Elevated places with regular access such as some flat roofs must have adequate protection to prevent anyone from falling.

NGP1.4 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 Road Manager.

NGP1.5 Aesthetics

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

NGP2 Fireplaces, chimneys and flues

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.

NGP3 Atrium construction

The construction of an atrium must not unduly increase the danger to occupants from fire or smoke.

DEEMED-TO-SATISFY PROVISIONS

MINOR STRUCTURES AND COMPONENTS

NG1.1 Swimming pools

- (a) Drainage: A swimming pool must have suitable means of drainage.
- (b) Safety fencing: A swimming pool with a depth of water more than 300 mm must have suitable barriers or safety fencing in accordance with AS 1926 to restrict access by young children to the immediate pool surrounds if the swimming pool is associated with a Class 2 or 3 building or is a public pool.

NG1.2 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.

NG1.3 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.

NG1.4 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 Road Manager.

NG1.5 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.

NG1.6 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.

FIREPLACES, CHIMNEYS AND FLUES

NG2.1 General requirements

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.

NG2.2 Open fireplaces

An open fireplace, or solid-fuel burning appliance in which the fuel-burning compartment is not enclosed, satisfies NG2.1 if it has:

- (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.

NG2.3 Incinerator rooms

(e) 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.

(f) If an incinerator is in a separate room, that room must be separated from other parts of the building by construction with a FAL of not less than 60/60/60.

ATRIUM CONSTRUCTION

NG3.1 The design of an atrium, along with the attendant life-safety provisions such as fire prevention, firefighting, smoke exhaust systems, etc, must fulfill up-to-date and relevant fire engineering principles and practices.

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**PUBLIC BUILDINGS AND
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(CLASS 2 TO 9)

Section NH
**SPECIAL USE
BUILDINGS**

**Performance Requirements
Deemed-to-Satisfy Provisions**

NH1 THEATRES, STAGES AND PUBLIC HALLS

Section NH

— SPECIAL USE BUILDINGS

CONTENTS

OBJECTIVES

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NH1.1	Application of Part	NH 1.6	Access to platforms and lofts
NH1.2	Separation and smoke control		
NH1.3	Proscenium wall construction	Specifications	
NH1.4	Seating area	Specifications NH1.2	Construction of Theatres with Proscenium Wall

PERFORMANCE REQUIREMENTS

OBJECTIVES AND REQUIRED PERFORMANCE

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, NC, ND, NE, and NF where relevant, are fulfilled.

NHP1 Theatres, Stages and Public Halls

NGP1.1 Swimming pools

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.

DEEMED-TO-SATISFY PROVISIONS

THEATRES, STAGES AND PUBLIC HALLS

NH1.1 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 m²; or
- (b) has a stage with an associated rigging loft.

NH1.2 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 NH1.2.

NH1.3 Proscenium wall construction

A proscenium wall and mechanical exhaust system required by NH1.2(b) must comply with Specification NH1.2.

NH1.4 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 30 °
 - (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.

NH1.5 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.

NH1.6 Access to platforms and lofts

A stairway that provides access to a service platform, rigging loft, or the like, must comply with AS 1657.

CONSTRUCTION OF THEATRES WITH PROSCENIUM WALLS

Scope

This Specification contains the requirements for the construction of proscenium walls and mechanical ventilation for theatres, public halls, or the like.

Separation of stage areas, etc.

(a) Dressing rooms, scene docks, property rooms, workshops, associated store rooms 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 NC1.5.

(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 NC1.5.

(c) Any doorway in the construction referred to in paragraphs (a) and (b) must be protected by a -/60/30 self-closing fire door.

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 NC1.5.

Combustible, materials not to cross proscenium wall

Timber purlins or other combustible material must not pass through or cross any proscenium wall.

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.

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.

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.m² of the performing area of the stage; 20 L/s.m² of the remaining area of the stage; and

(ii) 20 L/s.m² of the remaining area of the stage.

